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| **Course Code** | **12CH220/17CH2011** | **Duration** | **3hrs** |
| **Course Name** | **CHEMISTRY IN EVERYDAY LIFE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Define clinical pathology. | | CO1 | R | 1 |
| 2. | Which of the following is used externally to stop the spread of pathogens: antibiotics or antiseptics? | | CO1 | R | 1 |
| 3. | The quality controller in perfume industry is known as \_\_\_\_\_\_\_\_\_\_\_. | | CO2 | U | 1 |
| 4. | By using which reagent, the common group is incorporated in explosives like TNT, Gun Cotton and RDX? | | CO2 | U | 1 |
| 5. | Five different tastes put together as one is known as \_\_\_\_\_\_\_\_\_\_\_ taste. | | CO3 | A | 1 |
| 6. | What do you mean by Chinese Syndrome? | | CO3 | A | 1 |
| 7. | The burning sensation of chilly is due to \_\_\_\_\_\_\_\_\_\_. | | CO4 | E | 1 |
| 8. | Air is considered as one among the other ingredients in ice cream. State True/False. | | CO4 | E | 1 |
| 9. | Why organic foods are costly? | | CO5 | R | 1 |
| 10. | Molecule of excitement is \_\_\_\_\_\_\_\_\_\_\_. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Write a note on common natural disinfectants. | | CO1 | R | 3 |
| 12. | Stress free life reduces risk on catching diseases – comment on this. | | CO2 | U | 3 |
| 13. | Give the advantages of microban technology used in household articles. | | CO3 | A | 3 |
| 14. | Kitchen gas burner burns yellow when a pot of boiling water overflows. Give reason. | | CO4 | E | 3 |
| 15. | Chocolates relive depression – Justify. | | CO5 | R | 3 |
| 16. | Write a short note on dopamine. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Can cancer be detected at an early stage? Why is it detected in our country at the 3rd or 4th stage only? | CO1 | R | 6 |
|  | b. | As an individual and engineer, what way can you help yourself and the society to avoid and eradicate so called incurable diseases like AIDS, Cancer etc as it was/is done in the case of Polio. | CO2 | U | 6 |
| 18. | a. | On what basis a drug will be categorized under ‘Banned Drug’? Give an example. | CO3 | E | 6 |
|  | b. | Write a note on ‘NOTES’ in perfume? When can you use perfume and deodorant? | CO4 | R | 6 |
| 19. | a. | Give the advantages and disadvantages of natural dyes. | CO2 | R | 6 |
|  | b. | What is MSG? By regularly adding MSG in our diets the effects like obesity, behavioral changes can be found - give reasons. | CO4 | E | 6 |
| 20. | a. | ‘Crying’ is it needed? While cutting onion, our eyes get irritated followed by tears, explain the chemistry involved in this process. How can you avoid irritation of eyes during cutting onion? | CO5 | A | 6 |
|  | b. | Write a short note on PAH? Are you exposed to PAH? What are the effects of it and how will you avoid the same? | CO6 | U | 6 |
| 21. | a. | Give an example for disappearing ink with the chemistry concept. | CO5 | An | 6 |
|  | b. | Negative emotions releases a hormone ‘CORTISOL’ which destroys the immune system. How can you handle your negative emotions and help your immune system? | CO5 | E | 6 |
| 22. | a. | Explain the chemistry concepts involved in ice cream making. (emulsifier, stabilizer, depression in freezing point). | CO3 | U | 6 |
|  | b. | Write a note on certification marks on grains and pulses. | CO4 | R | 6 |
| 23. | a. | Cotton fabrics absorb more water. Reason out. | CO4 | An | 6 |
|  | b. | Give the test for identification of adulterant for the following and state the effect of the adulterant? i) Mango, ii) Apple, iii) Ghee, iv) Pepper | CO5 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Iodine – an important element in controlling thyroid gland: Give the effect on its deficiency and excess. Which food items can supply the same? | CO4 | A | 6 |
|  | b. | Write a short note on neurotransmitters. | CO6 | E | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | The students will know the practical aspects of chemistry in day-to-day life. |
| CO2 | The students will learn the chemistry concepts in day-to-day activities. |
| CO3 | The students will think innovative and develop application oriented products. |
| CO4 | The students will gain knowledge in buying certified food products. |
| CO5 | The students will make right choice in choosing the right food. |
| CO6 | The students will gain right perspective to guard the environment |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1, 1, 3, 6 |  |  |  |  |  | 11 |
| CO2 | 6 | 1, 1, 3, 6 |  |  |  |  | 17 |
| CO3 |  | 6 | 1, 1, 3 |  | 6 |  | 17 |
| CO4 | 6, 6 |  | 6 | 6 | 1, 1, 3, 6 |  | 35 |
| CO5 | 1, 1, 3 |  | 6, 6 | 6 | 6 |  | 29 |
| CO6 | 3 | 6 |  |  | 6 |  | 15 |
| 37 23 23 12 29 | | | | | | | **124** |



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| **Course Code** | **16CH2005**/**17CH2005** | **Duration** | **3hrs** |
| **Course Name** | **REACTION MECHANISM AND HETEROCYCLIC CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Complete the following reaction and outline its mechanism | CO1 | A | 10 |
|  | b. | i) Discuss the factors affecting reactivity in aromatic nucleophilic substitution reaction?  ii) Predict the X and Y of the following | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | i) Write a short note on Chichibabin reaction.  ii) Explain ArSN1 reaction and its mechanism. | CO2 | U | 10 |
|  | b. | i) Discuss the properties and applications of diazonium salts. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain arenium ion mechanism and energy profile diagram. | CO2 | R | 10 |
|  | b. | Derive hammett equation? Explain the terms & write uses of hammett plots. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the stork enamine synthesis for alkylation and acylation. | CO2 | U | 10 |
|  | b. | Explain the Se1 mechanism with its suitable example. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the mechanism of Michael addition reaction with its two applications? | CO3 | U | 10 |
|  | b. | Predict the product the following? Name the reaction and write its mechanism | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the synthetic applications of Mannich reaction. | CO4 | U | 10 |
|  | b. | Write a short note on i) Hoffmann elimination ii) Chugaev elimination. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Predict the major organic product for each of the reaction shown below:  i)    ii)    iii) | CO5 | U | 10 |
|  | b. | Explain the E1, E2 reaction and its mechanism. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the Paal-knorr synthesis of thiophene and its applications. | CO6 | U | 10 |
|  | b. | Explain the structure and properties of furan, pyrrole. | CO6 | An | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write a short note on synthesis and reactions of thiazole. | CO6 | U | 10 |
|  | b. | Explain the synthesis and properties of piperdine. | CO6 | An | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Elucidate the mechanisms of organic reactions. |
| CO2 | Propose more complex synthesis. |
| CO3 | Predict the reactivity of an organic compound from its structure. |
| CO4 | Develop the knowledge on the fundamental theoretical understanding of heterocyclic chemistry. |
| CO5 | Propose synthesis of heterocyclic from the major classes. |
| CO6 | Get the ability to relate significant chemical properties to structure. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 10 | 10 |  |  |  | 20 |
| CO2 | 10 | 30 |  | 20 |  |  | 60 |
| CO3 | 10 | 10 |  |  |  |  | 20 |
| CO4 |  | 10 |  | 10 |  |  | 20 |
| CO5 |  | 10 | 10 |  |  |  | 20 |
| CO6 |  | 20 |  | 20 |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **17CH1002** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Write the expansion of EDTA. | | CO1 | R | 1 |
| 2. | 1 ppm is equal to   1. 1oCl (b) 1mg/L (c) 10mg/L (d) 1oFr | | CO1 | An | 1 |
| 3. | The relationship between Cp and Cv for ideal gas is \_\_\_\_\_\_ | | CO2 | A | 1 |
| 4. | State second law of thermodynamics. | | CO2 | R | 1 |
| 5. | Define: Electrode potential. | | CO3 | R | 1 |
| 6. | In Fuel cells chemical energy is converted into \_\_\_\_ energy | | CO3 | U | 1 |
| 7. | The metal used as sacrificial anode among the following is \_\_\_   1. Platinum (b) Tin (c) Silver (d) Magnesium | | CO4 | An | 1 |
| 8. | Among the following polymers, which is the natural polymer?   1. PVC (b) Polyethylene (c) Polystyrene (d) Rubber | | CO5 | An | 1 |
| 9. | Proteins are made up of \_\_\_\_\_\_\_ | | CO5 | U | 1 |
| 10. | Nanomaterial has the critical dimension in the range on the scale of   1. 0.1 to 10 nm (b) 1 to 100 nm (c) 1 to 10 nm (d) 0.1 to 100 nm | | CO6 | An | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | What are the units of hardness? | | CO1 | U | 3 |
| 12. | State zeroth and first laws of thermodynamics. | | CO2 | R | 3 |
| 13. | Outline the importance of electrochemical series. | | CO3 | A | 3 |
| 14. | Discuss any two corrosion control methods. | | CO4 | An | 3 |
| 15. | Explain polymerization process with an example. | | CO5 | U | 3 |
| 16. | State the applications of solar cells. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | With a clean diagram, explain zeolite process. | CO1 | U | 8 |
|  | b. | State the disadvantages of scales and sludges. | CO1 | An | 4 |
|  |  |  |  |  |  |
| 18. |  | Describe the steps involved in municipal water treatment. | CO1 | A | 12 |
|  |  |  |  |  |  |
| 19. |  | Define the following   1. Open System (ii) Closed System (iii) Isolated system   (iv) Exothermic process (v) Endothermic process (vi) Entropy | CO2 | U | 12 |
|  |  |  |  |  |  |
| 20. | a. | Derive Nernst Equation | CO3 | A | 6 |
|  | b. | Describe the construction of primary cells with an example. | CO3 | A | 6 |
|  |  |  |  |  |  |
| 21. |  | Describe the working and applications of lead-acid battery. | CO3 | A | 12 |
|  |  |  |  |  |  |
| 22. |  | Analyze the factors that influence the corrosion process. | CO4 | An | 12 |
|  |  |  |  |  |  |
| 23. | a. | Explain the applications of polymers in various fields. | CO5 | A | 6 |
|  | b. | Describe the process of injection moulding. | CO5 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Discuss the various types of preparations of nanomaterials. | CO6 | An | 6 |
|  | b. | What are the applications of nanomaterials? | CO6 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To recognize hard water and softening methods. |
| CO2 | To understand chemical thermodynamics. |
| CO3 | To identify the types of batteries. |
| CO4 | To explain the problems associated with corrosion. |
| CO5 | To appraise the significances of polymers. |
| CO6 | To utilize the knowledge of advanced materials. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 1 | 11 | 12 | 5 | - | - | 29 |
| CO2 | 4 | 12 | 1 | - | - | - | 17 |
| CO3 | 1 | 1 | 27 | - | - | - | 29 |
| CO4 | - | - | - | 16 | - | - | 16 |
| CO5 | - | 10 | 6 | 1 | - | - | 17 |
| CO6 | - | - | 9 | 7 | - | - | 16 |
|  | | | | | | | **124** |



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| **Course Code** | **14CH1003 / 17CH1004** | **Duration** | **3hrs** |
| **Course Name** | **ENVIRONMENTAL STUDIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Deforestation is occurring at an alarming rate all over the world. Analyze the causes and list out the harmful effects of deforestation in detail. | CO1 | A | 15 |
|  | b. | Recall the advantages of dams, which are touted as “Temples of Modern India” by Pandit Jawaharlal Nehru. | CO1 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Based on the understanding of environmental studies, discuss in detail the role of an individual in conserving natural resources. | CO1 | U | 15 |
|  | b. | Compare and contrast between renewable and non-renewable energy resources. | CO1 | An | 5 |
|  |  |  |  |  |  |
| 3. | a. | Deduce the structure and functions of an ecosystem in detail. | CO2 | An | 15 |
|  | b. | Explain the 10% energy rule in an ecosystem. | CO2 | A | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Biodiversity is the essence of life on planet earth. Elaborate in detail about the values of biodiversity. | CO2 | U | 15 |
|  | b. | List out the significant threats to biodiversity. | CO2 | R | 5 |
|  |  |  |  |  |  |
| 5. | a. | A clean atmosphere is not only essential but a key to a healthy living. Describe the causes, effects and control measures of air pollution. | CO3 | U | 15 |
|  | b. | People love to relax in noise free environment. But, the human beings are living in a noisy environment. Explain in brief about the man-made causes of noise pollution. | CO3 | A | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | A growing population demands very stringent health measures. In spite of several governmental and non-governmental organizations efforts, HIV/AIDS problem is on the raise. Enlist the reasons for the same in detail. | CO6 | R | 15 |
|  | b. | Population growth is a major factor affecting the development of countries like India. Infer the factors causing the population to grow exponentially. | CO6 | An | 5 |
|  |  |  |  |  |  |
| 7. | a. | Classify and explain in detail the various ways in which rain water harvesting is carried out across India. | CO4 | An | 15 |
|  | b. | State the effects of global warming in brief. | CO4 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Tabulate the significant aspects of Wildlife Protection Act enacted by the Government of India. | CO4 | R | 15 |
|  | b. | Articulate upon the salient features of Forest Conservation Act of India. | CO4 | A | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Examine the man-made causes of soil pollution, and list out its harmful effects to the environment and human beings. Explain the control measures of the same in detail. | CO5 | A | 15 |
|  | b. | Analyze the principles of green chemistry. | CO5 | An | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the natural environment and its relationships with human activities. |
| CO2 | Acquire practical skills for solving pollution related problems. |
| CO3 | Design and evaluate strategies and apply green technologies. |
| CO4 | Identify the methods for sustainable development and for the remediation or restoration of degraded environments. |
| CO5 | Integrate facts, concepts, and methods from multiple disciplines and apply to environmental and social problems. |
| CO6 | Analyze the connectivity between the man-made activities, pollution, environmental issues, social problems, and ecofriendly solutions. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 5 | 15 | 15 | 5 | -- | -- | 40 |
| CO2 | 5 | 15 | 5 | 15 | -- | -- | 40 |
| CO3 | -- | 15 | 5 | -- | -- | -- | 20 |
| CO4 | 20 | -- | 5 | 15 | -- | -- | 40 |
| CO5 | -- | -- | 15 | 5 | -- | -- | 20 |
| CO6 | 15 | -- | -- | 5 | -- | -- | 20 |
| Sub-Total | 45 | 45 | 45 | 45 | -- | -- |  |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **17CH2011** | **Duration** | **3hrs** |
| **Course Name** | **CHEMISTRY IN EVERYDAY LIFE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | What way clinical chemistry reports the medical doctors? | | CO1 | R | 1 |
| 2. | Antibiotic and antiseptic, which one can be used externally? | | CO1 | R | 1 |
| 3. | In perfume industry a ‘nose’ is called -------------. | | CO 2 | U | 1 |
| 4. | By using which reagent, the common group is incorporated in explosives like TNT, Gun Cotton and RDX? | | CO2 | U | 1 |
| 5. | What is ‘Umami’ taste? | | CO 3 | A | 1 |
| 6. | Give the other names given for MSG in sauces, soup powders and noodle’s masalas. | | CO3 | A | 1 |
| 7. | The burning sensation of chilly is not relieved by drinking water- True/False. | | CO4 | E | 1 |
| 8. | The maximum % of air in branded and quality ice cream should be \_\_\_\_\_\_\_. | | CO4 | E | 1 |
| 9. | Reason out- why organic foods are costly? | | CO5 | R | 1 |
| 10. | Molecule of happiness is ------ | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Differentiate between: sterilization and disinfection. | | CO1 | R | 3 |
| 12. | Write a note on preventing diabetes through proper diet and stress free life. | | CO2 | U | 3 |
| 13. | The foaming in tooth paste is due to what? How much % of SLS is allowed? | | CO3 | A | 3 |
| 14. | Give reason. Kitchen gas burner burns yellow when a pot of boiling water overflows.Why? | | CO4 | E | 3 |
| 15. | What is a balanced diet? | | CO5 | R | 3 |
| 16. | Write a short note on dopamine. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Give the definition of the following with example. Sanitization and decontamination. | CO1 | R | 6 |
|  | b. | The common cold & cough drugs like Vicks, Action 500, and D’Cold and Analgin (Baralgon) are banned in India- Mention the ill effects of using these drugs. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Adding aginomotto regularly in our diet causes obesity, give reason? | CO3 | E | 6 |
|  | b. | Explain the chemistry of perfumes in spreading the aroma? | CO4 | R | 6 |
|  |  |  |  |  |  |
| 19. | a. | Give the composition of tear drop? Why psychic cry is needed? | CO2 | R | 6 |
|  | b. | Your lipid profile data says that LDL (>100 mg/dL), triglyceride (>150 mg/dL) is more than the normal? What steps will you adopt to bring to normal level without medicine? | CO4 | E | 6 |
|  |  |  |  |  |  |
| 20. | a. | Write short notes on certification marks on food products? | CO5 | A | 6 |
|  | b. | Give the advantages and disadvantages of polyphenol (Tea), caffeine (coffee) and capsaicin(chilly) | CO6 | U | 6 |
|  |  |  |  |  |  |
| 21. | a. | Write a note on the bad effect of crackers. Would you choose to burst crackers during festive seasons –Give reason? | CO5 | An | 6 |
|  | b. | Which type of fabric will you choose to wear in summer and why? | CO5 | E | 6 |
|  |  |  |  |  |  |
| 22. | a. | What are the general composition of a hair dye and specify the role of each? | CO3 | U | 6 |
|  | b. | Flesh of fish smell different than other meat, give reason? | CO4 | R | 6 |
|  |  |  |  |  |  |
| 23. | a. | Which one decides your better immune system Diet/Emotions? - Justify your answer. | CO4 | An | 6 |
|  | b. | Give the test for identification of adulterant for the following and state the effect of the adulterant? - Banana, Turmeric | CO5 | A | 6 |
| **Compulsory:** | | | | | |
| 24. | a. | What do you mean by balanced diet and give its components? How will it help the individual to maintain his/her health? | CO4 | A | 6 |
|  | b. | Why iodine is added with common salt? Is it needed for everyone? | CO6 | E | 6 |

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|  | **COURSE OUTCOMES** |
| CO1 | The students will know the practical aspects of chemistry in day-to-day life. |
| CO2 | The students will learn the chemistry concepts in day-to-day activities. |
| CO3 | The students will think innovative and develop application oriented products. |
| CO4 | The students will gain knowledge in buying certified food products. |
| CO5 | The students will make right choice in choosing the right food. |
| CO6 | The students will gain right perspective to guard the environment |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1, 1, 3, 6 |  |  |  |  |  | 11 |
| CO2 | 6 | 1, 1, 3, 6 |  |  |  |  | 17 |
| CO3 |  | 6 | 1, 1, 3 |  | 6 |  | 17 |
| CO4 | 6, 6 |  | 6 | 6 | 1, 1, 3, 6 |  | 35 |
| CO5 | 1, 1, 3 |  | 6, 6 | 6 | 6 |  | 29 |
| CO6 | 3 | 6 |  |  | 6 |  | 15 |
| 37 23 23 12 29 | | | | | | | **124** |



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| **Course Code** | **17CH3022** | **Duration** | **3hrs** |
| **Course Name** | **MOLECULAR AND MATERIAL SELF- ASSEMBLY** | **Max. Marks** | **100** |

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| **Q.No.** | | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | | |
| 1. | a. | | With suitable illustrations, highlight the salient features of core-shell magnetic nanoclusters and water-soluble nanoclusters. | CO3 | An | 10 |
|  | b. | | Briefly explain about SAM crystal engineering. | CO1 | A | 10 |
|  |  | | **(OR)** |  |  |  |
| 2. | a. | | How are polyelectrolyte colloid multilayers prepared? What are their applications? | CO3 | U | 10 |
|  | b. | | Give an account of patterned multilayers and non-electrostatic self-assembly. | CO5 | An | 10 |
|  |  | |  |  |  |  |
| 3. | a. | | Explain the following:  i) Modulated diameter gold nanorods.  ii)Self-assembling nanorods of gold using DNA. | CO3 | U | 10 |
|  | b. | | Describe the methodology of fabrication of conducting metallopolymer / electrode devices with a neat sketch. | CO2 | An | 10 |
|  |  | | **(OR)** |  |  |  |
| 4. | a. | | With suitable illustrations explain block copolymer lithography. | CO6 | A | 10 |
|  | b. | | Give a detailed account of the preparation of nanowires from block copolymers. | CO6 | U | 10 |
|  |  | |  |  |  |  |
| 5. | a. | | Explain the synthesis of capped semiconductor nanoclusters. | CO4 | U | 10 |
|  | b. | | How crystals are engineered using oriented zeolite films? | CO3 | A | 10 |
|  |  | | **(OR)** |  |  |  |
| 6. | a. | | Describe the formation of LBL films with a suitable diagram. | CO2 | A | 10 |
|  | b. | | Illustrate the fabrication process of microlens array by thermal reflow method with a schematic diagram. | CO1 | An | 10 |
|  |  | |  |  |  |  |
| 7. | a. | | Briefly explain about the template synthesis of nanowires. | CO3 | U | 10 |
|  | b. | | Write two chemical reactions involved in the formation of SAM. | CO5 | An | 10 |
|  |  | | **(OR)** |  |  |  |
| 8. | a. | | Describe the preparation of gold monothiolate-protected clusters (AuMPCs) with suitable diagram. | CO4 | An | 10 |
|  | b. | | Write notes on hydrothermal synthesis of magnetite nanorods. | CO3 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **(COMPULSORY QUESTION)** | | | | | | |
| 9. | a. | | Explain the concept of self-assembled monolayers. How are they prepared? What are their applications? | CO1 | A | 10 |
|  | b. | | Give a detailed account on i) nanocluster phase transition  ii) capped gold nanoclusters | CO4 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the formation of self-assembly in nanomaterials. |
| CO2 | Describe the process of bottom-up approach based on self-assembly. |
| CO3 | Give examples of nanocluster self-assembly. |
| CO4 | Design self -assembled monolayers through different approaches. |
| CO5 | Understand the fundamental principles of self- assembling block co-polymers. |
| CO6 | Relate significant self- assembled properties to structure. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 20 | 10 |  |  | 30 |
| CO2 |  |  | 10 | 10 |  |  | 20 |
| CO3 |  | 30 | 20 | 10 |  |  | 60 |
| CO4 |  | 20 | 10 |  |  |  | 30 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  | 10 | 10 |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **17CH3024** | **Duration** | **3hrs** |
| **Course Name** | **ANALYTICAL CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the basic principle, instrumentation, and application of column chromatography. | CO1 | U | 10 |
|  | b. | Write a note on the principle, instrumentation, and application of Thin Layer Chromatography. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Explain the principle, instrumentation, and application of the following:   1. Ion-exchange chromatography. 2. HPLC. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Explain in short about Infrared Spectroscopy. | CO2 | U | 5 |
|  | b. | Explain the molecular vibrations and stretching observed in the organic compounds with the diagram. | CO2 | U | 15 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the sample preparation, working, uses, and applications of Infrared Spectroscopy. Explain in brief the Morse potential. | CO2 | U | 15 |
|  | b. | Compare the various types of electromagnetic radiation. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 5. | a. | Describe the following:   1. Fingerprint region in the IR spectrum. 2. Instrumentation of IR spectroscopy. | CO2 | U | (5 + 5) |
|  | b. | Describe the instrumentation of UV-vis spectroscopy. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the various types of electronic transitions in UV-vis spectroscopy. | CO4 | U | 10 |
|  | b. | Explain the basic principle, instrumentation, and application of Gas chromatography. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Write any five applications of UV-vis spectroscopy. | CO4 | A | 10 |
|  | b. | Write any five applications of IR spectroscopy. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the principles and application of Differential Thermal Analysis. | CO6 | U | 10 |
|  | b. | Explain the principles and application of Thermogravimetric Analysis. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the phenomenon of Nuclear Magnetic Resonance. Which nuclei are NMR active? | CO2 | A | 10 |
|  | b. | Elaborate on the factors affecting chemical shift values of proton NMR spectra. | CO3 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Distinguish between different chromatographic techniques. |
| CO2 | Select appropriate technique for analysis. |
| CO3 | Plan the analysis of any prepared compound. |
| CO4 | Utilize the proper spectroscopic technique for the characterization. |
| CO5 | Interpret the spectra obtained from various techniques. |
| CO6 | Apply the thermal methods and X-ray diffraction methods. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 40 | - | - | - | - | 50 |
| CO2 | - | 55 | 10 | - | - | - | 65 |
| CO3 | - | 5 | - | 10 | - | - | 15 |
| CO4 | - | 10 | 10 | - | - | - | 20 |
| CO5 | - | - | 10 | - | - | - | 10 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **17CH3026** | **Duration** | **3hrs** |
| **Course Name** | **SUPRAMOLECULAR CHEMISTRY** | **Max. Marks** | **100** |

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| **Q.No.** | | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | | |
| 1. | a. | | Explain the structure, composition and catalysis property of Zeolites. | CO3 | U | 10 |
|  | b. | | Illustrate knots and catenanes with examples | CO3 | A | 10 |
|  |  | | **(OR)** |  |  |  |
| 2. | a. | | Indicate the types of supramolecular interactions. | CO2 | U | 10 |
|  | b. | | Explain the preparation, host-guest properties and applications of Crown ethers. | CO5 | A | 10 |
|  |  | |  |  |  |  |
| 3. | a. | | Identify the following compounds:  C:\Users\USER\Desktop\Presentation1\Slide1.JPG | CO3 | A | 5 |
|  | b. | | Describe the high dilution synthesis of a macrocycle with an example. | CO2 | U | 15 |
|  |  | | **(OR)** |  |  |  |
| 4. | a. | | Generalize the advantages and disadvantages of metal organic frame works. | CO5 | An | 10 |
|  | b. | | Illustrate Borromeates. | CO3 | U | 10 |
|  |  | |  |  |  |  |
| 5. | a. | | Distinguish Katapinands and spherands with suitable examples. | CO2 | A | 10 |
|  | b. | | Describe the structure and properties of urea, thiourea and trimesic acid clathrates. | CO5 | A | 10 |
|  |  | | **(OR)** |  |  |  |
| 6. | a. | | Discuss the concepts in crystal engineering and cambridge structural data base. | CO6 | U | 10 |
|  | b. | | Compare the lock and key principle with the Induced fit model with examples. | CO1 | A | 10 |
|  |  | |  |  |  |  |
| 7. | a. | | Explain the different types of synthesis of rotaxanes. | CO2 | U | 10 |
|  | b. | | Discuss Racks, Ladders and Grids using suitable diagrams. | CO4 | A | 10 |
|  |  | | **(OR)** |  |  |  |
| 8. | a. | | Describe the nomenclature of catenanes. | CO2 | U | 5 |
|  | b. | | Interpret guest and host chemistry with suitable examples. | CO1 | A | 15 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | |
| 9. | a. | | If a solution of a compound (20g/mL of solution) has measured rotation of +10˚ in a 2 dm long sample tube. Find its specific rotation. | CO1 | A | 10 |
|  | b. | | Explain complementarity and lock key principles in supramolecular chemistry | CO2 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the selectivity in supramolecule formation. |
| CO2 | Identify the various factors affecting the formation of supramolecules. |
| CO3 | Understand the concepts of solution host-guest chemistry. |
| CO4 | Design the various types of supramolecular architectures. |
| CO5 | Recognize the importance of coordination polymers. |
| CO6 | Apply the supramolecules in various fields. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  | 35 |  |  |  | 35 |
| CO2 |  | 50 | 10 |  |  |  | 60 |
| CO3 |  | 20 | 15 |  |  |  | 35 |
| CO4 |  |  | 10 |  |  |  | 10 |
| CO5 |  |  | 20 | 10 |  |  | 30 |
| CO6 |  | 10 |  |  |  |  | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **18CH2001** | **Duration** | **3hrs** |
| **Course Name** | **ENVIRONMENTAL STUDIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Human activities have no impact on the environment. True or False? | | CO1 | U | 1 |
| 2. | Which of the following is a renewable energy source?   1. Coal b) Sunlight c) Mineral d) Petroleum | | CO1 | R | 1 |
| 3. | Give examples for biotic and abiotic components related to ecosystem. | | CO2 | An | 1 |
| 4. | The ratio between energy flow at different points in a food chain is known as   1. Ecological capacity b) Ecological efficiency   c) Ecological assimilation c) Ecological potential | | CO2 | A | 1 |
| 5. | Recall any two importance of bio-diversity in an eco-system. | | CO3 | R | 1 |
| 6. | The biodiversity can be documented within a campus by conducting ---------. | | CO3 | R | 1 |
| 7. | Carbon monoxide is a major pollutant of  a. Water b. air c. noise d. soil | | CO4 | R | 1 |
| 8. | How can individuals reduce their energy consumption to prevent pollution? | | CO4 | E | 1 |
| 9. | The Water (Prevention and Control of Pollution) Act was enacted in the year ------------. | | CO5 | R | 1 |
| 10. | Disasters can be broadly termed as \_\_\_\_\_\_\_\_\_\_ types.  a. 4 b. 2 c. 3 d. 5 | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Summarize the causes of deforestation. | | CO1 | U | 3 |
| 12. | Interpret the consumers in an ecosystem, and what are the different types of consumers? | | CO2 | R | 3 |
| 13. | Appraise the biogeographical classification of India. | | CO3 | An | 3 |
| 14. | How does thermal pollution affect aquatic ecosystems? | | CO4 | A | 3 |
| 15. | Describe global warming and discuss on the important gases responsible for that effect. | | CO5 | U | 3 |
| 16. | Infer the role of Information Technology in human health. | | CO6 | R | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Discuss the renewable and non- renewable energy sources. What are the benefits of using renewable energy sources? | CO1 | U | 6 |
|  | b. | Categorize the land resources. Explain how land resources could be protected for future generations. | CO1 | R | 6 |
| 18. | a. | Explain the structure and functions of an ecosystem. | CO2 | U | 6 |
|  | b. | Describe the ecological succession and its types. | CO2 | R | 6 |
| 19. | a. | Assess the hotspot of biodiversity. Discuss the criteria and the threats. | CO3 | An | 6 |
|  | b. | Compare and contrast in-situ and ex-situ conservation approaches, and discuss their relative advantages and disadvantages. | CO3 | C | 6 |
| 20. | a. | Compile the working principle of Cottrell’s electrostatic precipitator. | CO4 | A | 6 |
|  | b. | Examine nuclear waste pollution, and what are the sources and types of nuclear waste? | CO4 | R | 6 |
| 21. | a. | Explain the major energy-related challenges faced by urban areas? Discuss the role of energy demand, supply, and infrastructure in these challenges. | CO5 | R | 6 |
|  | b. | Enumerate the causes, impacts and management of depletion of ozone layer. | CO5 | U | 6 |
| 22. | a. | Interpret the impact of human population growth on the environment, and analyze the potential consequences of unchecked population growth. | CO6 | An | 6 |
|  | b. | Elaborate the main strategies that can be used for disaster management in flood-prone areas, and how effective are they? Provide examples to support your answer. | CO6 | U | 6 |
| 23. | a. | Explain the difference between a food web and a food chain, and provide an example of each. | CO2 | An | 6 |
|  | b. | Discuss the terms "rainwater harvesting" and "watershed management," and describe the potential benefits of these practices for water conservation and sustainable development. | CO5 | U | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Analyze the impact of timber extraction and dams on forests and tribal people. | CO1 | An | 6 |
|  | b. | Highlight the principles of green chemistry. | CO4 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the natural environment and its relationships with human activities. |
| CO2 | Acquire practical skills for solving pollution related problems. |
| CO3 | Design and evaluate strategies and apply green technologies. |
| CO4 | Identify the methods for sustainable development and for the remediation or restoration of degraded environments. |
| CO5 | Integrate facts, concepts, and methods from multiple disciplines and apply to environmental and social problems. |
| CO6 | Analyze the connectivity between the man made activities-Pollution-environmental issues-social problems-ecofriendly solutions. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 13 | 10 | - | 12 | - |  | 35 |
| CO2 | 9 | 6 | 1 | 4 |  |  | 20 |
| CO3 | 2 |  |  | 6 | 1 | 6 | 15 |
| CO4 | 7 |  | 15 |  |  |  | 22 |
| CO5 | 7 | 9 |  |  |  |  | 16 |
| CO6 | 4 | 6 |  | 6 |  |  | 16 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **18CH2001** | **Duration** | **3hrs** |
| **Course Name** | **ENVIRONMENTAL STUDIES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | Which of the following is not a natural resource?  a) Soil; b) Coal; c) Plastic; d) Water. | | CO1 | R | 1 |
| 2. | India’s largest wind energy farm is located at Tamil Nādu. – **True or False**. | | CO1 | R | 1 |
| 3. | The system resulting from the integration of all the living and non-living factors of the environment is called as the \_\_\_\_\_\_. | | CO2 | U | 1 |
| 4. | Give an example for tertiary consumer. | | CO2 | U | 1 |
| 5. | Give an example for genetic biodiversity. | | CO3 | U | 1 |
| 6. | Define biodiversity. | | CO3 | R | 1 |
| 7. | In Nuclear reactors, radioactive elements such as uranium, plutonium etc. are used as \_\_\_\_\_\_\_\_\_. | | CO4 | U | 1 |
| 8. | Water pollution leads to increase in the BOD, where BOD stands for \_\_\_\_\_\_. | | CO4 | R | 1 |
| 9. | \_\_\_\_\_\_\_\_\_ layer is the triatomic form of oxygen. | | CO5 | R | 1 |
| 10. | Nitrogen is a greenhouse gas. – **True or False**. | | CO5 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Point out the disadvantages of Dams. | | CO1 | U | 3 |
| 12. | Define: producers, consumers, and decomposers. | | CO2 | R | 3 |
| 13. | Name any three biodiversity hot spots in India. | | CO3 | R | 3 |
| 14. | List the measures for controlling air pollution. | | CO4 | R | 3 |
| 15. | Annotate the Chipko Movement. | | CO5 | U | 3 |
| 16. | Give any three misconceptions regarding AIDS. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Illustrate the need of renewable energy as the source of sustainable energy in the current scenario. | CO1 | U | 6 |
| b. | Examine the consequences of deforestation. | CO1 | A | 6 |
|  | | | | | |
| 18. | a. | Deliberate the Structure and function of an ecosystem. | CO2 | U | 6 |
| b. | Appraise the need of ecological succession in the ecosystem. | CO2 | A | 6 |
|  | | | | | |
| 19. | a. | Interpret the endangered and endemic species of India. | CO3 | U | 6 |
| b. | Summarize the Ex-situ conservation of biodiversity. | CO3 | U | 6 |
|  | | | | | |
| 20. | a. | Paraphrase the major soil pollutants and discuss the methods to control soil pollution. | CO4 | U | 6 |
| b. | Identify the causes for Noise Pollution. | CO4 | A | 6 |
|  | | | | | |
| 21. | a. | Analyze the issues and possible solutions for climate change and global warming. | CO5 | An | 6 |
| b. | Articulate the need for watershed management. | CO5 | U | 6 |
|  | | | | | |
| 22. | a. | Designate in detail a food chain with suitable example. | CO2 | An | 6 |
| b. | Describe the threats to biodiversity in terms of poaching of wildlife and man-wildlife conflicts. | CO2 | U | 6 |
|  | | | | | |
| 23. | a. | Analyze the problems encountered due to acid rain and its causes. | CO5 | An | 6 |
| b. | Define ozone layer depletion and list out their effects on biosphere. | CO5 | U | 6 |
|  | | | | | |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Examine the methods involved in flood and earthquake management. | CO6 | An | 6 |
| b. | Explain various issues related to population explosion. | CO6 | U | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Realize the need of Electric vehicles |
| CO2 | State different types of Electric & Hybrid Vehicles |
| CO3 | Use the energy on-board optimally |
| CO4 | Understand the design and mathematical modelling of EV and drives |
| CO5 | Analyze the latest control techniques for vehicle control |
| CO6 | Simulate and observe the behaviour of the EV |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 2 | 9 | 6 | - | - | - | **17** |
| CO2 | 3 | 14 | 6 | 6 | - | - | **29** |
| CO3 | 4 | 13 | - | - | - | - | **17** |
| CO4 | 4 | 7 | 6 | - | - | - | **17** |
| CO5 | 1 | 16 | - | 12 | - | - | **29** |
| CO6 | - | 9 | - | 6 | - | - | **15** |
|  | | | | | | | **124** |

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**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| --- | --- | --- | --- |
| **Course Code** | **19CH1003** | **Duration** | **3hrs** |
| **Course Name** | **ENGINEERING CHEMISTRY FOR MECHANICAL ENGINEERING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | Give an example of covalent compound. | | CO1 | R | 1 |
| 2. | Atoms undergo bonding in order to \_\_\_\_\_\_\_\_\_\_\_. | | CO1 | U | 1 |
| 3. | Hardness of water is conventionally expressed in terms of equivalent amount of \_\_\_\_\_\_\_\_\_\_\_. | | CO2 | R | 1 |
| 4. | All carbonate and bicarbonates are \_\_\_\_\_\_\_\_\_\_\_. | | CO2 | R | 1 |
| 5. | Nylon is a \_\_\_\_\_\_\_\_\_\_\_. | | CO3 | R | 1 |
| 6. | Give an example of isotactic polymer. | | CO3 | U | 1 |
| 7. | Arrange wood, peat, lignite, bitminuous coal and anthracite in decreasing order of their moisture contents | | CO4 | R | 1 |
| 8. | What is the approximate composition in terms of hydrocarbon containing C atoms in Petrolium Ether? | | CO4 | R | 1 |
| 9. | A fuel cell is used to convert chemical energy into \_\_\_\_\_\_\_\_\_\_\_.. | | CO5 | U | 1 |
| 10. | In HCHO → HCOOH conversion, indicate whether oxidation or reduction is occurring. | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | Explain why H-O-H bond angel in H2O molecule is shorter than 109.5o. | | CO1 | A | 3 |
| 12. | Differentiate between scale and sludges. | | CO2 | R | 3 |
| 13. | Point out any two differences between thermosetting plastics and thermoplastics. | | CO3 | R | 3 |
| 14. | Define fuels and how it’s forming. | | CO4 | R | 3 |
| 15. | Explain Redox reactions with example. | | CO5 | A | 3 |
| 16. | Write down features of absorption photometer. | | CO6 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Write down the electronic configurations for H2, Be2, C2 and F2 using MO theory. | CO1 | U | 6 |
|  | b. | Draw molecular orbital diagram of O2 molecule and find out bond order and magnetic properties. | CO1 | A | 6 |
| 18. | a. | How does the boiler corrosion happen in (DO & CO2) method? | CO2 | U | 6 |
|  | b. | A sample of water is found to contains following dissolving salts in milligrams per litre Mg (HCO3)2 = 73, CaCl2 = 111,  Ca (HCO3)2 = 81. Calculate temporary and permanent hardness and total hardness. | CO2 | U | 6 |
| 19. | a. | Illustrate on the taxicity of polymers. | CO3 | An | 6 |
|  | b. | Explain the role of ingredients used in moulding of plastics with examples. | CO3 | A | 6 |
| 20. | a. | Write down calorific value and Dulong’s formula. | CO4 | U | 6 |
|  | b. | Explain flue gas analysis by Orsat method and rocket propellants. | CO4 | R | 6 |
| 21. | a. | Define types of combustion. | CO5 | U | 6 |
|  | b. | Explain lead acid battery and fuel cells. | CO5 | A | 6 |
| 22. | a. | Express the sp3 Hybridization with an example. | CO1 | R | 6 |
|  | b. | Draw the MO diagram of N2 molecular and find its bond order and magnetic properties. | CO1 | U | 6 |
| 23. | a. | Define addition polymer, condensation polymer and copolymer. | CO3 | R | 6 |
|  | b. | Write down preparation, properties and uses of polyethylene, polyvinyl chloride and Bakelite. | CO3 | R | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Arrange benzene, anapthalene, and anthracene in increasing order of λmax. | CO6 | R | 6 |
|  | b. | Calculate (i) the frequency (ii) wave number (iii) energy in ergs for typical UV radiation of 2000 Å. | CO6 | R | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Formulate electronic structures and correlate its properties. |
| CO2 | Learn the various factors in water quality and its technology. |
| CO3 | Realize the potential applications of polymers. |
| CO4 | Analyze the combustion process of common fuels. |
| CO5 | Learn the various energy storage systems and conversion devices. |
| CO6 | Apply the instrumental methods for various types of analysis. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 1 | 7 | 9 |  |  |  | 17 |
| CO2 | 4 | 12 |  |  |  |  | 16 |
| CO3 | 16 | 1 | 6 | 6 |  |  | 29 |
| CO4 | 11 | 6 |  |  |  |  | 17 |
| CO5 | 1 | 7 | 9 |  |  |  | 17 |
| CO6 | 12 |  | 3 |  |  |  | 15 |
|  | | | | | | | **124** |



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| **Course Code** | **19CH3002** | **Duration** | **3hrs** |
| **Course Name** | **WASTE TO ENERGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (5 X 16 = 80 MARKS)**  **(Answer any five from the following)** | | | | | |
| 1. | a. | Explain the industrial waste management methods used in India. | CO1 | U | 6 |
|  | b. | Describe the chemical properties of Municipal Solid waste. Find out total energy of MSW. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 2. | a. | Describe the catalysis mechanism for heterogeneous catalyst with schematic diagram. | CO2 | U | 10 |
|  | b. | How to synthesis the catalyst using top down and bottom up methods? | CO2 | R | 6 |
|  |  |  |  |  |  |
| 3. | a. | Explain the sustainable technology applied in Biodiesel. | CO3 | A | 8 |
|  | b. | List out the physical properties of Biodiesel compared with corresponding oil. | CO3 | U | 8 |
|  |  |  |  |  |  |
| 4. | a. | Highlight the advantages of Biogas as a fuel. | CO4 | U | 6 |
|  | b. | Describe the construction and working model of floating dome biogas plant. | CO4 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the manufacturing methods of charcoal. | CO5 | A | 10 |
|  | b. | Highlight the Physical and chemical properties of pyrolytic oil. | CO5 | R | 6 |
|  |  |  |  |  |  |
| 6. | a. | Calculate the energy content of solid waste having following composition using modified Dulongs formula:  Carbon is 56.5%, Hydrogen is 14.3%, Oxygen is 31.1%, Nitrogen 07%, Sulfur is 0.3% and Ash is 7.5%. | CO1 | R | 10 |
|  | b. | Describe the Proximate analysis of Solid waste. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 7. | a. | Write short on catalytic poisoning and autocatalyst. | CO2 | R | 8 |
|  | b. | How the waste material acts as super capacitor explain with a research example? | CO2 | E | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **(Compulsory Question)** | | | | | |
| 8. | a. | Briefly discuss the construction and working method for fixed bed gasifier. | CO6 | An | 10 |
|  | b. | Highlight the advantages and disadvantages for fluidized bed gasifier. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the concept of waste to energy conversion, based on its properties. |
| CO2 | Select the conditions for biomass pyrolysis. |
| CO3 | Develop a small size biomass gasifier. |
| CO4 | Prepare biodiesel and analyze its performance. |
| CO5 | Understand the current research scenario in waste to energy application. |
| CO6 | Design a community biogas plant. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 6 | 16 | - | - | - | 32 |
| CO2 | 14 | 10 | - | - | 8 |  | 32 |
| CO3 | - | 8 | 8 | - | - | - | 16 |
| CO4 | 10 | 6 | - | - | - |  | 16 |
| CO5 | 6 | - | 10 | - | - | - | 16 |
| CO6 | - | 10 |  | 10 | - | - | 20 |
|  | | | | | | | **132** |



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| **Course Code** | **20CH1001** | **Duration** | **3hrs** |
| **Course Name** | **Essentials of Chemistry for Aerospace Engineers** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)** | | | | | |
| 1. | The region of space around the nucleus where the probability of finding an electron is maximum is called an **\_\_\_\_\_** | | CO1 | R | 1 |
| 2. | Draw the structure of an atom. | | CO1 | R | 1 |
| 3. | State the purpose of protective coatings. | | CO2 | R | 1 |
| 4. | List a few metals used to coat the substrate in electroplating. | | CO2 | R | 1 |
| 5. | Mention the difference between LCV and HCV. | | CO3 | R | 1 |
| 6. | State the major component in natural gas composition? | | CO4 | R | 1 |
| 7. | State the need for salt bridge in Daniel cell. | | CO5 | R | 1 |
| 8. | State the significance of Nernst equation. | | CO5 | R | 1 |
| 9. | Define Spectroscopy. | | CO6 | R | 1 |
| 10. | State the significance of Absorption Spectroscopy. | | CO6 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)** | | | | | |
| 11. | List any six important feature of quantum mechanical model of an atom. | | CO1 | R | 3 |
| 12. | Differentiate between varnish and lacquer. | | CO2 | U | 3 |
| 13. | Write down any four characteristics of good fuel. | | CO3 | R | 3 |
| 14. | Briefly classify explosive based on their sensitivity. | | CO4 | U | 3 |
| 15. | Mention the advantages and disadvantages of lead acid battery. | | CO5 | R | 3 |
| 16. | Differentiate between absorption and emission spectroscopic. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q.No 17 to 23, Q.No 24 is Compulsory)** | | | | | |
| 17. | a. | Explain Bhors atomic model with neat sketch. | CO1 | A | 6 |
|  | b. | Discuss wave nature of EMR by Maxwell. | CO1 | A | 6 |
|  |  |  |  |  |  |
| 18. |  | Explain the process of electroplating with necessary diagram also explain barrel Plating and strip plating. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 19 | a. | Draw the schematic diagram of bomb calorimeter. | CO3 | A | 2 |
|  | b. | Explain the procedure to determine the calorific value of the fuel using bomb calorimeter. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 20 |  | Write short notes on  Low explosives.  High explosives (any 3) | CO4 | U | 4  8 |
|  |  |  |  |  |  |
| 21. |  | Explain knocking with diagram.  Explain octane number with diagram.  Explain cetane number with diagram. | CO4 | A | 4  4  4 |
|  |  |  |  |  |  |
| 22. |  | Briefly explain any one energy storage device with neat sketch. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 23. |  | Explain infrared spectroscopy with neat sketch. | CO6 | A | 12 |
| **COMPULSORY QUESTION** | | | | | |
| 24. |  | Discuss the application and the working principle of mass spectroscopy | CO6 | A | 12 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Formulate atomic structures and correlate its properties. |
| CO2 | Realize the potential applications of protective coating. |
| CO3 | Relate the unique properties of fuels. |
| CO4 | Analyze the combustion process of common fuels. |
| CO5 | Learn the various energy storage systems and conversion devices. |
| CO6 | Describe the techniques involved in spectroscopy. |

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| **Assessment Pattern as per Bloom’s Level** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 5 |  | 12 |  |  |  | 17 |
| CO2 | 2 | 3 | 12 |  |  |  | 17 |
| CO3 | 5 |  | 12 |  |  |  | 17 |
| CO4 | 1 | 15 | 12 |  |  |  | 28 |
| CO5 | 5 |  | 12 |  |  |  | 17 |
| CO6 | 1 | 3 | 24 |  |  |  | 28 |
|  | | | | | | | **124** |



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| **Course Code** | **20CH1003** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED CHEMISTRY FOR FOOD PROCESSING TECHNOLOGY** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | On polymerization the ethylene glycol combine with \_\_\_\_\_ will produce PET. | | CO1 | U | 1 |
| 2. | Write down the formula to calculate the stress. | | CO1 | R | 1 |
| 3. | The butter is an example of \_\_\_\_\_\_\_ | | CO2 | An | 1 |
| 4. | The solid particles dispersed in liquid medium is called \_\_\_\_\_\_. | | CO2 | A | 1 |
| 5. | Which colour indicate that the food is spoiled? | | CO3 | U | 1 |
| 6. | Label the other name of spherical fullerenes. | | CO3 | R | 1 |
| 7. | Give an example for natural composite. | | CO4 | U | 1 |
| 8. | On what basis the composites are classified? | | CO4 | U | 1 |
| 9. | Chemical energy is converted to \_\_\_\_\_\_\_\_ energy by a fuel cell. | | CO5 | R | 1 |
| 10. | List out the components of biogas | | CO5 | R | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Specify the requirements of ideal packaging material. | | CO1 | R | 3 |
| 12. | Write a short note on Emulsion. | | CO2 | R | 3 |
| 13. | Identify the physical and chemical methods involving in Encapsulation. | | CO3 | U | 3 |
| 14. | Draft the advantages of Composites materials. | | CO4 | U | 3 |
| 15. | State about the Dry battery. | | CO5 | R | 3 |
| 16. | Quote the Principle of Spectroscopy. | | CO6 | U | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Illustrate the Preparation and application of PTFE. | CO1 | U | 8 |
|  | b. | Pen down about the PVC. | CO1 | R | 4 |
|  |  |  |  |  |  |
| 18. | a. | Describe the Preparation of colloids. | CO2 | R | 6 |
|  | b. | Enumerate the application of colloids in medical industries. | CO2 | U | 6 |
|  |  |  |  |  |  |
| 19. | a. | Differentiate the two synthetic approaches for preparing the Nano materials. | CO3 | An | 6 |
|  | b. | Conclude the carbon nanotube. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 20. | a. | Classify the types of Nano composites. | CO4 | R | 6 |
|  | b. | Analyze how the nano composites are helpful to reduce food spoilage. | CO4 | An | 6 |
|  |  |  |  |  |  |
| 21. | a. | Criticize the way to generating renewable energy from food waste using bio-battery. | CO5 | E | 6 |
|  | b. | Evaluate the sources of Bio-mass. | CO5 | E | 6 |
|  |  |  |  |  |  |
| 22. | a. | Discriminate the thermoplastics and thermosetting plastics. | CO1 | E | 6 |
|  | b. | Summarize the Ball milling technique. | CO3 | U | 6 |
|  |  |  |  |  |  |
| 23. | a. | Categorize the application of composites for food packaging technology. | CO4 | U | 6 |
|  | b. | Estimate the applications of electronic spectroscopy in characterization of food analysis. | CO6 | U | 6 |
|  | | | | | |
| 24. | a. | Enumerate the classification of colloids. | CO2 | R | 8 |
|  | b. | Mention the applications of nano technology in food industries. | CO3 | U | 4 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Categorize various types of polymers used in food processing technology |
| CO2 | Describe the applications of colloids in food processing |
| CO3 | Summarize the use of nanomaterials in food processing technology |
| CO4 | Apply the nanocomposites in food processing technology |
| CO5 | Describe the use of bio-batteries |
| CO6 | Discuss about the characterization techniques of biomolecules |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 8 | 9 | - | - | 6 |  | 23 |
| CO2 | 17 | 6 | 1 | 1 | - |  | 25 |
| CO3 | 1 | 20 | - | 6 | - |  | 27 |
| CO4 | 6 | 11 | - | 6 | - |  | 23 |
| CO5 | 5 | - | - | - | 12 |  | 17 |
| CO6 | - | 9 | - | - | - |  | 9 |
|  | | | | | | | **124** |



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| **Course Code** | **20CH2001** | **Duration** | **3hrs** |
| **Course Name** | **COMPLEMENTARY CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define the following terms and illustrate with examples   1. Atomic mass (ii) Molecular mass (ii) Mole (iv) Valency | CO1 | Understand | 10 |
|  | b. | Compare the characteristics of Arrhenius acids and bases with the Lewis acids and bases. | CO1 | Analyze | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the oxidation and reduction reactions with examples. Describe the rules for finding the oxidation number of an element in a compound. | CO1 | Understand | 10 |
|  | b. | Summarize the importance of pH and pOH. How are they expressed? State the applications of buffer solution. | CO1 | Apply | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss Bohr’s atomic theory. State its merits and limitations. | CO2 | Analyze | 10 |
|  | b. | What are the various types of quantum number? How are they related to each other. Explain with an example. | CO2 | Understand | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the following.   1. Hund’s rule 2. Heisenberg’s uncertainty principle | CO2 | Understand | 10 |
|  | b. | Draw the shapes of s, p and d orbitals. | CO2 | Apply | 10 |
|  |  |  |  |  |  |
| 5. | a. | What are the differences between the ionic bond and the covalent bond? | CO3 | Analyze | 10 |
|  | b. | Describe molecular orbital theory. How is it useful in evaluating the magnetic properties and bond order? Illustrate with an example. | CO3 | Evaluate | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss VSEPR theory with examples. | CO3 | Understand | 10 |
|  | b. | Explain the following with examples   1. Coordinate covalent bond 2. Hydrogen bond | CO3 | Understand | 10 |
|  |  |  |  |  |  |
| 7. | a. | Describe the following terms.   1. Hydrostatic pressure 2. Vapor Pressure 3. Molar refraction 4. Free volume of a liquid | CO4 | Understand | 12 |
|  | b. | Summarize the importance of phase diagrams | CO4 | Apply | 8 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | What are the various ways of expressing the concentration of a solution? Explain with examples. | CO4 | Understand | 12 |
|  | b. | Define: Cohesive and adhesive forces. Compare their characteristics | CO4 | Analyze | 8 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Compare the characteristics of physisorption and chemisorption. | CO5 | Analyze | 10 |
|  | b. | Describe the various properties of colloidal solutions. | CO6 | Understand | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | To realize the importance of acids and bases. |
| CO2 | To summarize the importance of the atomic structure. |
| CO3 | To understand the theories of chemical bonding. |
| CO4 | To learn the physical properties of the liquid. |
| CO5 | To understand the basics of surface chemistry. |
| CO6 | To recognize the importance of colloids in forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | 10 | 10 | - | - | 40 |
| CO2 | - | 20 | 10 | 10 | - | - | 40 |
| CO3 | - | 20 | - | 10 | 10 | - | 40 |
| CO4 | - | 24 | 8 | 8 | - | - | 40 |
| CO5 | - | - | - | 10 | - | - | 10 |
| CO6 | - | 10 | - | - | - | - | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH2003** | **Duration** | **3hrs** |
| **Course Name** | **INORGANIC CHEMISTRY FOR FORENSIC SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | | **BL** | | **Marks** | |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | | | | |
| 1. | a. | Describe the general periodic characteristics of S block elements. | | CO 1 | | U | | 10 |
|  | b. | Explain the ionic, atomic radii and ionization energy changes along the groups and periods in modern periodic table. | | CO 1 | | R | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 2. | a. | Highlight the changes of metallic properties of d block elements. | | CO 1 | | An | | 10 |
|  | b. | Briefly explain the metallic and nonmetallic characteristics of p block elements. | | CO 1 | | R | | 10 |
|  |  |  | |  | |  | |  |
| 3. | a. | Enumurate the types of radioactive decay with suitable examples. | | CO 2 | | U | | 10 |
|  | b. | Highlight the applications of radioisotopes in biology and Forensic science. | | CO 2 | | A | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 4. | a. | Write a note on radioactive elements. How does U238 emits the radiation? | | CO 2 | | R | | 10 |
|  | b. | What is nuclear binding energy? Differentiate the nuclear fission and fusion reactions with examples. | | CO 2 | | U | | 10 |
|  |  |  | |  | |  | |  |
| 5. | a. | Explain in detail the geometry of Fe[CN6]3- with Werner’s theory. | | CO 3 | | U | | 10 |
|  | b. | How the hybrid orbitals determines the geometry of Ni[Cl4]2- and Ni[CN4]2- complexes. | | CO 3 | | A | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 6. | a. | Differentiate the chelate effect and macrocyclic effect with suitable examples. | | CO 3 | | R | | 10 |
|  | b. | Highlight the salient features of the molecular orbital theory with suitable example. | | CO 3 | | U | | 10 |
|  |  |  | |  | |  | |  |
| 7. | a. | Classify the proteins and explain their action with suitable example and neat diagram. | | CO 4 | | An | | 10 |
|  | b. | Highlight the mechanism of oxygen transportation. | | CO 4 | | U | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 8. | a. | Write short notes on enzyme action of penicillin. | | CO 5 | | R | | 8 |
|  | b. | Describe the structure and mechanism of action of sodium potassium pump. | | CO 5 | | A | | 12 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | | | |
| 9. | a. | Briefly discuss the hazardous effects of lead and arsenic poisoning. | | CO 6 | | U | | 10 |
|  | b. | Explain the schiff bases and their applications in forensic science. | | CO 6 | | R | | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Understand the periodic properties. |
| CO2 | Learn the applications of radioisotopes. |
| CO3 | Understand the nature of bonding in coordination complexes. |
| CO4 | Predict the factors affecting the stability of metal complexes. |
| CO5 | Summarize the importance of metals in biology. |
| CO6 | Realize the role of metals in Forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 10 | 10 | - | - | - | 40 |
| CO2 | 10 | 20 | 10 | - | - | - | 40 |
| CO3 | 10 | 20 | 10 | - | - | - | 40 |
| CO4 | - | 10 | - | 10 | - | - | 20 |
| CO5 | 10 | - | 10 | - | - | - | 20 |
| CO6 | 10 | 10 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH2005** | **Duration** | **3hrs** |
| **Course Name** | **ANALYTICAL CHEMISTRY FOR FORENSIC SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Give the answers to the correct number of significant figures.  a. 7.55 meters x 0.34 meter  b. 2.10 meters x 0.70 meter  c. 2.4526 meters2 ÷ 8.4 meters | CO1 | An | 10 |
| b. | The actual length of a field is 500 feet. A measuring instrument shows the length to be 508 feet. Find out:  a) the absolute error in the measured length of the field.  b) the relative error in the measured length of the field. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Calculate the mead, median and standard deviation for the following set of values: 20.21, 20.04, 20.13 and 20.19. | CO1 | A | 10 |
|  | b. | What are significant digits? Write rules for multiplication and division. | CO1 | R | 10 |
| 3. | a. | Discuss briefly the theory of solvent extraction. Describe its experimental arrangement with examples. | CO2 | U | 10 |
| b. | What is chromatography? Explain the principle involved in purification of compound by thin layer chromatography(TLC)? | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | What is the principle involved in the purification organic compounds by crystallization? | CO2 | R | 10 |
|  | b. | What is purification? Write any two methods of purification using organic compounds? | CO2 | U | 10 |
| 5. | a. | What happens when an acid dissolve in water? Write an example for Arrhenius acids and bases. | CO3 | R | 10 |
|  | b. | Calculate the strength of the following solutions.  a.) 18 g of NaOH present in 250 ml of the solution.  b.) 17 g H2SO4 is present in 100 ml of the solution. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Calculate the normality of 20 g of NaOH is 250 ml of the solution. (Acidity of NaOH = 1) | CO3 | A | 10 |
|  | b. | What is EDTA? Which complexation reaction can be involved for the metal-EDTA complex? | CO3 | E | 10 |
| 7. | a. | What are the significance of solubility products? | CO4 | U | 10 |
|  | b. | Write the expression of solubility equilibrium for the following,   1. MgF2 2. CaCl2 3. NaCl | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define solubility equilibrium. Write difference between solubility and equilibrium. | CO5 | U | 10 |
|  | b. | Define solubility. Explain in details of the factors affection solubility. | CO5 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | In the thermogravimetric analysis of the mixture of calcium oxalate and magnesium oxalate the weight loss was found to be 24.6 mg between 400-500o C and 23.9 mg between 650-850o C. Find out the weight percentage of calcium oxalate and magnesium oxalate in the mixture. | CO5 | An | 10 |
|  | b. | What is mean by thermal analysis? Draw the TGA curve of calcium oxalate monohydrate. | CO5 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know the methodology to handle chemicals, heating methods and error analysis. |
| CO2 | Understand the principle of techniques used for the purification of compounds. |
| CO3 | Know about importance of various titrimetric methods. |
| CO4 | Get knowledge about solubility criteria, precipitation titrations and gravimetric analysis. |
| CO5 | Receive the importance of thermogravimetric, differential thermal and electrogravimetry analysis. |
| CO6 | Understand the basics of analytical chemistry for application in forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 |  | 10 | 10 |  |  | 30 |
| CO2 | 20 | 20 |  |  |  |  | 40 |
| CO3 | 10 |  | 20 |  | 10 |  | 40 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 |  | 10 | 10 | 10 |  |  | 30 |
| CO6 |  |  |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH2006** | **Duration** | **3hrs** |
| **Course Name** | **ORGANIC CHEMISTRY FOR FORENSIC SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the concept of Homolytic and Heterolytic cleavages with examples. | CO1 | Understand | 10 |
|  | b. | Narrate the electromeric effects and its types with examples. | CO1 | Apply | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | What you mean Mesomeric Effect and explain with examples? | CO1 | Analysis | 10 |
|  | b. | a) Discuss the stability of carbocations with examples  b) Describe the concept of hyperconjugations. | CO1 | Apply | 10 |
|  |  |  |  |  |  |
| 3. | a. | List out the criteria of Aromaticity with examples. | CO2 | Analysis | 10 |
|  | b. | Discuss the Electrophilic substitution reaction of pyrazole and pyrimidine with equations. | CO2 | Apply | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the Paal-Knorr synthesis of Furan and Thiophene. | CO2 | Analysis | 10 |
|  | b. | Discuss the aromaticity of Pyrrole, Pyridine and Pyrazole. | CO2 | Apply | 10 |
|  |  |  |  |  |  |
| 5. | a. | Give the mechanism of SN1 and E2 reactions with examples. | CO3 | Analysis | 10 |
|  | b. | Describe the mechanism of electrophilic addition of alkene with HX. | CO3 | Apply | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Define peroxide effect and explain the addition to the unsymmetrical alkene. | CO3 | Analysis | 10 |
|  | b. | Write the mechanism of Aromatic nucleophilic substitution reactions? Explain with example? | CO3 | Apply | 10 |
|  |  |  |  |  |  |
| 7. | a. | Discuss the optical isomerism of Lactic acid and Tartaric acid. | CO4 | Analysis | 10 |
|  | b. | Discuss the Cahn–Ingold–Prelog Priority System for naming the R and S-configurations of the chirality centers. | CO4 | Apply | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Predict the R and S configuration of the following compounds: | CO4 | Analysis | 10 |
|  | b. | What do you learn on Geometrical isomerism and explain with examples. | CO4 | Apply | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Draw the structure of Poly peptides and Explain the structure of Proteins. | CO5 | Analysis | 10 |
|  | b. | Discuss the various types of RNA and its functions. | CO5 | Apply | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the basic principles of chemical structures and its bonding characteristics. |
| CO2 | Predict the organic reaction mechanisms of organic reactions. |
| CO3 | Understand the structures of heterocyclic compounds. |
| CO4 | Describe the reaction intermediates. |
| CO5 | Explain the principles of stereochemistry. |
| CO6 | Relate the applications of the biological molecules in various domains. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  |  |  |  |  |  |
| CO2 |  |  |  |  |  |  |  |
| CO3 |  |  |  |  |  |  |  |
| CO4 |  |  |  |  |  |  |  |
| CO5 |  |  |  |  |  |  |  |
| CO6 |  |  |  |  |  |  |  |
|  | | | | | | | **180** |



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| **Course Code** | **20CH2007** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTATION TECHNIQUES FOR FORENSIC SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the application of NMR spectroscopy. Calculate the Chemical shift in ppm for a proton that has resonance at 130Hz downfield from TMS on NMR spectrophotometer that operates at 30MHz. | CO1 | An | 10 |
|  | b. | Sketch the different molecular vibrations with neat diagram and find out the fundamental vibrations of the following molecules:  **i)** Water  **ii)** Methane | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Enumerate the principle, instrumentation and applications of Infra-Red spectroscopy with neat diagram. | CO1 | R | 10 |
|  | b. | Describe the principle, instrumentation of Nuclear Magnetic Resonance spectroscopy with neat diagram. | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Enumerate the principle, forensic application and instrumentation of ultra violet spectroscopy with neat diagram. | CO2 | U | 10 |
|  | b. | Sketch the diagram of different energy level and discuss different types of transitions with example. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Sketch various shifts and effects in ultra violet spectroscopy. | CO2 | U | 10 |
|  | b. | Explain Jablonski diagram with neat diagram. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Prioritize the principle, instrumentation and forensic application of Phosphorescence spectroscopy with neat diagram. | CO3 | An | 10 |
|  | b. | Enumerate Photomultiplier tube with neat diagram | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Distinguish luminescence and explain its types. | CO3 | U | 10 |
|  | b. | Prioritize the Instrumentation and forensic applications of Fluorescence spectroscopy with neat diagram. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Discuss the principle and application of polarography with dropping mercury electrode. | CO4 | U | 10 |
|  | b. | Discuss in detail the X- ray spectroscopy. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the principle, instrumentation and application of Potentiometry techniques. | CO4 | U | 10 |
|  | b. | Identify the different types of sensors with examples. | CO4 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain Radio Analytical techniques and its applications. | CO6 | An | 10 |
|  | b. | Describe the applications of Neutron Activation Analysis. | CO5 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know the importance of IR and NMR spectroscopy techniques and their application in forensic science. |
| CO2 | Understand the forensic applications of UV and visible spectroscopic techniques. |
| CO3 | Know the principle and instrumentation of fluorescence and phosphorescence spectrophotometry. |
| CO4 | Understand the importance of electrochemical techniques in forensic science. |
| CO5 | Understand the principle of radio analytical techniques. |
| CO6 | Know the concepts and forensic applications of advanced techniques. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | - | 10 | 10 | - | - | 40 |
| CO2 | - | 40 | - | - | - | - | 40 |
| CO3 | 10 | 10 | - | 20 | - | - | 40 |
| CO4 | 20 | 20 | - | - | - | - | 40 |
| CO5 | - | - | - | 10 | - | - | 10 |
| CO6 | - | - | - | 10 | - | - | 10 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| --- | --- | --- | --- |
| **Course Code** | **20CH2007** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTATION TECHNIQUES FOR FORENSIC SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the principle, instrumentation of NMR spectroscopy with neat diagram. | CO1 | R | 10 |
|  | b. | Enumerate the principle, instrumentation and application of IR spectroscopy with neat diagram. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the application of NMR spectroscopy. Calculate the Chemical shift n ppm for a proton that has resonance at 150Hz downfield from TMS on NMR spectrophotometer that operates at 50MHz. | CO1 | An | 10 |
|  | b. | Sketch the different molecular vibrations with neat diagram and  Find out the fundamental vibrations of the following molecule.  i) Carbon dioxide  ii) Benzeneiii) Water iv) Methane | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss Jablonski diagram with neat diagram. | CO2 | U | 10 |
|  | b. | Discuss various shifts and effects in UV spectroscopy. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Sketch the diagram of different energy level and discuss different types of transitions with example. | CO2 | U | 10 |
|  | b. | Enumerate the principle, forensic application and instrumentation of UV spectroscopy with neat diagram. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Prioritize the principle, Instrumentation and forensic application of Fluorescence spectroscopy with neat diagram. | CO3 | An | 10 |
|  | b. | Enumerate Photomultiplier tube with neat diagram | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Prioritize the principle, Instrumentation and forensic application of Phosphorescence spectroscopy with neat diagram. | CO3 | An | 10 |
|  | b. | Define luminescence and explain its types. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the principle, instrumentation and application of Potentiometry techniques. | CO4 | U | 10 |
|  | b. | Discuss the principle and application of polarography with dropping mercury electrode. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss in detail on X- ray spectroscopy. | CO4 | R | 10 |
|  | b. | Identify the different types of sensors with examples. | CO4 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Categorize Neutron Activation Analysis | CO5 | An | 10 |
|  | b. | Distinguish Radio Analytical Techniques and its applications. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know the importance of IR and NMR spectroscopy techniques and their application in forensic science |
| CO2 | Understand the forensic applications of UV and visible spectroscopic techniques |
| CO3 | Know the principle and instrumentation of fluorescence and phosphorescence spectrophotometry |
| CO4 | Understand the importance of electrochemical techniques in forensic science |
| CO5 | Understand the principle of radio analytical techniques |
| CO6 | Know the concepts and forensic applications of advanced techniques |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | - | 10 | 10 | - | - | 40 |
| CO2 | - | 40 | - | - | - | - | 40 |
| CO3 | 10 | 10 | - | 20 | - | - | 40 |
| CO4 | 20 | 20 | - | - | - | - | 40 |
| CO5 | - | - | - | 10 | - | - | 10 |
| CO6 | - | - | - | 10 | - | - | 10 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20CH2009** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the test for the adulteration of kerosene in petrol by simple tests and list out the composition of petrol. | CO1 | An | 10 |
|  | b. | Illustrate the various fractions obtained in fractional distillation of crude oil with a neat sketch. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Differentiate the following terms with examples:  Simple distillation, Fractional distillation and Steam distillation, | CO3 | R | 10 |
|  | b. | Explain the different types of petrochemicals obtained from crude oil with respect to their commercial uses. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Prepare a report on the chemistry of fire, its composition and the products formed? | CO3 | E | 10 |
|  | b. | Predict the possible information that a forensic investigator receive from different types of fire patterns in a fire scene. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | FireScenes.Net | Fire scene photography from across the country  Pen down the possible forensic informations from the smokes produced in different fire scences as shown in the above pictures. | CO1 | A | 10 |
|  | b. | Evidence collection and preservation is one of the most important tasks associated with fire investigation. Justify the statement with proper examples. | CO4 | E | 10 |
|  |  |  |  |  |  |
| 5. | a. | With the graphical representation, discuss the identification, consequences and warning signs of a Flash over. | CO3 | A | 10 |
|  | b. | Describe the method of evidence collection and packing. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Brief on GC-MS principle and its application in analyzing a petrochemical found in a Crime Scene. | CO3 | U | 10 |
|  | b. | Discuss different types of ignitable materials that one can encounter in an arson scene. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the structure, synthesis, properties and applications of RDX and PETN. | CO5 | R | 10 |
|  | b. | Demonstrate the mechanism of explosion in detail with examples. | CO6 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Represent any three improvised explosive devices (IED) with examples. | CO4 | An | 10 |
|  | b. | Comment on the observations done during a ‘Bomb Scene Management’ by a forensic investigator. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Describe the diverse ways of the detection of hidden explosives with proper justification. | CO5 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the methods of analyzing trace amounts of petroleum products in crime scene evidence. |
| CO2 | Comprehend the method of searching, collecting, preserving and analyzing arson evidence. |
| CO3 | Deliver the process of post-fire analysis of materials. |
| CO4 | Realize the classification of explosives, including the synthesis and characterization of representative analogs. |
| CO5 | Apply the techniques of locating hidden explosives. |
| CO6 | Interpret the significance of bomb scene management. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | - | 20 | 10 | - | - | 30 |
| CO2 | - | 10 | - | - | - | - | 10 |
| CO3 | 10 | 10 | 10 | - | 10 | - | 40 |
| CO4 | 10 | 20 | - | 10 | 10 | - | 50 |
| CO5 | 10 | - | 20 | - | - | - | 30 |
| CO6 | - | 10 | - | 10 | - | - | 20 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **20CH2010** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC TOXICOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | How will you determine the ash content and aniline point in the petroleum products? | CO4 | An | 10 |
|  | b. | How will you determine moisture or water content in the petroleum sample. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Write the procedure to find out the carbon residue and viscosity of the petroleum product. | CO1 | U | 10 |
|  | b. | Write the procedure to find out the metal content and insolubles of the petroleum product. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Write a note on dope test and excretion of drugs from the body. | CO2 | R | 10 |
|  | b. | Write a note on Stass Otto method for extraction of drugs and presumptive test for morphine and other opium. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write the general characteristics, symptoms and the withdrawal symptoms of depressants along with an example. | CO2 | U | 10 |
|  | b. | Write a detailed account on collection and preservation of drug evidence. | CO6 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Write short note on alcohol, illicit liquor, proof spirit and detoxification of alcohol. | CO3 | U | 10 |
|  | b. | Write short note on absorption of alcohol and consequences of drunken driving. | CO3 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write a detailed account on alcoholic and non-alcoholic beverages. | CO3 | R | 10 |
|  | b. | Write a detailed account on interpretation of GC-MS spectra. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Write a detailed account on flashover. | CO5 | A | 10 |
|  | b. | Write note on fire extinguisher and degrees of arson. | CO4 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write the steps involved in documenting of fire scene and explain them in detail. | CO5 | C | 10 |
|  | b. | Define the terms: Ignition point, Auto-ignition point, Combustible and flammable liquids, Fire triangle and Backdraft. | CO4 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write the extraction process of toxic anions from the matrices using protein precipitation and dialysis method. | CO6 | E | 10 |
|  | b. | Write a note on the tests to identify methanol, ethanol and phosphine from the extracted samples. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Know about chemistry of petroleum products forensic science |
| CO2 | Know the narcotics, drugs and psychotropic substances forensic science |
| CO3 | Know the forensic identification of illicit liquors |
| CO4 | Know the techniques of locating hidden explosives |
| CO5 | Understand the method of searching, collecting, preserving and analyzing arson evidence |
| CO6 | Know about toxicology and poisons |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | 10 |  |  |  | 30 |
| CO2 | 10 | 10 | 10 |  |  |  | 30 |
| CO3 | 10 | 10 |  |  | 10 |  | 30 |
| CO4 | 10 |  |  | 10 | 10 |  | 30 |
| CO5 |  | 10 | 10 |  |  | 10 | 30 |
| CO6 |  |  | 10 | 10 | 10 |  | 30 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH2010** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC TOXICOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | How will you determine the carbon residue and insolubles in the petroleum products? | CO1 | U | 10 |
|  | b. | Write the procedure to find out the acid value and lead content of the petroleum product. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | How will you determine the vapour pressure and viscosity of the petroleum products? | CO1 | A | 10 |
|  | b. | How will you determine the ash content and the metal content in the petroleum products? | CO4 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Write the general characteristics, symptoms and the withdrawal symptoms of depressants along with an example. | CO2 | U | 10 |
|  | b. | How will you analyze the presence of drugs in breast milk, saliva and post-mortem blood? | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write a detailed account on collection and preservation of drug evidence. | CO2 | A | 10 |
|  | b. | Write a note on the extraction process of the visceral samples along with TLC results for acidic and basic drugs in testing narcotics, drugs and psychotropic substances. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Define arson and write a brief note on arson motives, degrees of arson, its forensic and legal concepts. | CO4 | R | 10 |
|  | b. | Write a detailed account on interpretation of GC-MS spectra. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write a detailed account on alcoholic and non-alcoholic beverages. | CO3 | R | 10 |
|  | b. | Write short note on absorption of alcohol and consequences of drunken driving. | CO3 | E | 10 |
|  |  |  |  |  |  |
| 7. | a. | Write the steps involved in documenting of fire scene and explain them in detail. | CO5 | C | 10 |
|  | b. | Write a detailed account on flashover. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Give an account on actions of poisons and the factors influencing its action. | CO5 | An | 10 |
|  | b. | How will you determine the unabsorbed poisons from the body? | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | How will you detect the presence of methyl alcohol and barbiturates in the extracted sample? | CO6 | E | 10 |
|  | b. | How is FPN reagent, iodoplatinate solution, marquis reagent and Dragendorff’s reagent prepared? | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know about chemistry of petroleum products forensic science. |
| CO2 | Know the narcotics, drugs and psychotropic substances forensic science. |
| CO3 | Know the forensic identification of illicit liquors. |
| CO4 | Know the techniques of locating hidden explosives. |
| CO5 | Understand the method of searching, collecting, preserving and analyzing arson evidence. |
| CO6 | Know about toxicology and poisons. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 | 10 |  |  |  | 30 |
| CO2 | 10 | 10 | 10 |  |  |  | 30 |
| CO3 | 10 | 10 |  | 10 |  |  | 30 |
| CO4 | 10 |  |  | 10 | 10 |  | 30 |
| CO5 |  |  | 10 | 10 |  | 10 | 30 |
| CO6 |  | 10 | 10 |  | 10 |  | 30 |
|  | | | | | | | **180** |

Graphical user interface, application

Description automatically generated with medium confidence

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| **Course Code** | **20CH2012** | **Duration** | **3hrs** |
| **Course Name** | **CRIME INVESTIGATION TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | What is chromatography? Explain stationary and mobile phase. | CO1 | U | 10 |
| b. | What is column chromatography? List out any five applications of column chromatography in forensic science. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss briefly about the instrumentation of HPLC technique. | CO1 | A | 10 |
|  | b. | List out the applications of using HPLC in separation procedures. | CO1 | A | 10 |
| 3. | a. | Describe in detail the method and principle of thin layer chromatographic technique. | CO2 | R | 10 |
| b. | Calculate the Rf value for the red ink by using the data in the table and the equation below.  Distance moved by red ink 23 mm  Distance from start line to solvent front 44 mm | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | It was suspected that a particular mixture contained three components: X, Y and Z. To check this, the mixture was analyzed by thin layer chromatography. In this experiment a nonpolar solvent was used with a polar stationary phase. The following results were obtained:    1.Which suspected components (X, Y or Z) are present in the sample?  2. Are there other components in the sample?  3.What is the Rf value of the unidentified component?  4.Which of the suspected components is the most polar? the least polar? | CO2 | An | 20 |
| 5. | a. | Explain in detail the applications of X-ray crystallography in materials identifications with suitable examples. | CO3 | An | 10 |
|  | b. | Give detailed account on Instrumentation of X-ray crystallography: | CO3 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Recall the properties of X-rays with proper explanations. | CO3 | R | 10 |
|  | b. | Show the seven crystal systems with suitable notations. | CO3 | U | 10 |
| 7. | a. | Compare electron microscope and optical microscope. | CO4 | U | 10 |
|  | b. | Explain in detail about how the contrast of image is enhanced in SEM and TEM. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Outline the instrumental components of electron microscope. | CO5 | U | 10 |
|  | b. | Summarize the applications of SEM and TEM in forensic science. | CO5 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Compare the applications of optical and IR photography in crime scene investigations. | CO6 | R | 10 |
|  | b. | Explain in detail the principles and applications of photography in forensic science. | CO6 | R | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know principle of chromatographic techniques. |
| CO2 | Know applications of chromatographic techniques. |
| CO3 | Understand the principles of X-ray diffraction techniques. |
| CO4 | Realize the importance of Electron microscopy. |
| CO5 | Understand the applications of electron microscopic techniques. |
| CO6 | Understand advance photographic methods for forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 | 20 |  |  |  | 40 |
| CO2 | 10 |  |  | 30 |  |  | 40 |
| CO3 | 10 | 10 |  | 10 | 10 |  | 40 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 | 10 | 10 |  |  |  |  | 20 |
| CO6 | 20 |  |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH2013** | **Duration** | **3hrs** |
| **Course Name** | **NANOCHEMISTRY IN FORENSIC SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | How will you prepare nano-sized particles by Top-Down approach? What will be the merits and demerits? | CO1 | A | 10 |
|  | b. | Narrate the challenges of nanotechnology with examples. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the concept of Core-shell nanomaterials and its applications. | CO1 | A | 10 |
|  | b. | Describe the classifications of dimension-based nanomaterials with examples. | CO1 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the preparation of nanoparticles using sol-gel method with diagram. | CO2 | An | 10 |
|  | b. | Elaborate VLS method for one-dimensional nanoparticles. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Illustrate the process of Chemical Vapor Deposition for the preparation of nanofilms. | CO2 | A | 10 |
|  | b. | How will you prepare nanofiber using electrospinning method? | CO2 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain in specific on Carbon counts of Fullerenes and its applications. | CO3 | R | 10 |
|  | b. | Elaborate the SWCNT and MWCNT and their applications. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain with neat diagram the functions of soft lithography. | CO3 | A | 10 |
|  | b. | Explain with examples, the salient features of nanomedicines. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Discuss the concept of epitaxy and the working principles of molecular beam epitaxy. | CO4 | An | 10 |
|  | b. | Explain with examples, the important aspects of Nanosensors. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss the nanoparticle drug systems employed in oral and nasal administration. | CO5 | A | 10 |
|  | b. | Illustrate the application of nanoparticles in the various types of crime scenes. | CO6 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | List out any five nanomaterials used in electronic applications with examples. | CO5 | A | 10 |
|  | b. | How will you justify forensic evidence analysis using nanotechnology? Explain. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know the evolution of nanotechnology. |
| CO2 | Understand the classification of nanomaterials. |
| CO3 | Understand the various types of synthesis of nanomaterials. |
| CO4 | Characterize the nanomaterials. |
| CO5 | Know the applications of nanomaterials. |
| CO6 | Understand the application of nanomaterials in forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 10 | 20 | 10 |  |  | 40 |
| CO2 |  |  | 20 | 20 |  |  | 40 |
| CO3 | 10 |  | 20 |  |  |  | 30 |
| CO4 |  |  | 10 | 20 |  |  | 30 |
| CO5 |  |  | 20 |  |  |  | 20 |
| CO6 |  |  |  | 20 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3003** | **Duration** | **3hrs** |
| **Course Name** | **ORGANIC REACTION MECHANISM AND STEREOCHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Draw all the possible resonance structure in the following compounds.  i) Aniline ii) Phenol iii) Benzaldehyde iv) Benzene | CO1 | U | 10 |
|  | b. | i) Derive hammett equation? Explain the terms & write uses of hammett plots. ii) What is Kinetic isotopic effect? Give one example for primary and secondary isotope effect. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Apply Huckel’s rule to predict the aromaticity of the following compounds. | CO1 | U | 10 |
|  | b. | i) Write differences between inductive effect and resonance effect?  ii) What are characteristics of resonance? | CO1 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Differentiate SN1 and SN2 type of reactions with mechanism. | CO2 | R | 10 |
|  | b. | i) Why benzyne mechanism is called elimination addition mechanism?  ii) Write properties of diazonium salts. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain factors affecting reactivity in aromatic nucleophilic Substitutions. | CO2 | U | 10 |
|  | b. | Suggest any three methods to prepare benzyne intermediate. | CO3 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | State the following rules.  i) Saytzev rule ii) Brett’s rule iii) Markovnikov’s rule | CO3 | U | 10 |
|  | b. | Explain Arenium ion mechanism and energy profile diagram. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write a short note on  i) Reimer-Tiemann reaction.  ii) VilsmeierHaack reaction. | CO4 | U | 10 |
|  | b. | Elaborate the arenium ion mechanism of aromatic electrophilic substitution. Give reason for the ortho/para and meta selectivity. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | State the CIP rule of assigning priority and configuration to chiral molecules. | CO5 | A | 10 |
|  | b. | Define the following terms.   1. Geometrical isomerism ii. Optical isomerism   iii. Enantiomers iv. Diastereomers | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | i) What is Fischer-projection and Newman project formula?  ii) What is the difference between Newman and sawhorse projection? | CO5 | R | 10 |
|  | b. | Discuss the optical activity of suitable substituted allenes, biaryls and spiro compounds. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the conformation of ethane and cyclohexane. | CO6 | U | 10 |
|  | b. | Write an essay on Sharpless epoxidation of allyl alcohol. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Student will be able to explain the role of electronic effects in predicting the reaction pathway |
| CO2 | propose the possible mechanism for organic transformation. |
| CO3 | predict the product formed in the reaction by applying the mechanism |
| CO4 | explain the product selectivity in the organic reactions |
| CO5 | assign configuration for chiral molecule and predict stable conformer |
| CO6 | reason out for the stereoselectivity in organic reactions in the presence chiral environment |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 20 | 10 |  |  |  | 40 |
| CO2 | 10 | 10 |  | 10 |  |  | 30 |
| CO3 | 20 | 10 |  |  |  |  | 30 |
| CO4 |  | 10 | 10 |  |  |  | 20 |
| CO5 | 10 | 20 | 10 |  |  |  | 40 |
| CO6 |  | 10 |  | 10 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3004** | **Duration** | **3hrs** |
| **Course Name** | **STATISTICAL THERMODYNAMICS AND QUANTUM CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Derive Boltzmann distribution law. | CO1 | U | 14 |
|  | b. | What are the two types of quantum statistics? Compare their characteristics. | CO1 | An | 6 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Derive the expression for molar entropy of an ideal monoatomic gas. | CO1 | A | 14 |
|  | b. | Write a note on negative temperature. | CO1 | U | 6 |
|  |  |  |  |  |  |
| 3. | a. | Obtain the expression for heat capacity of solids using Einstein’s theory. | CO2 | A | 12 |
|  | b. | With a neat diagram, explain the structure of electrical double layer. | CO2 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss the principles of irreversible thermodynamics. | CO2 | U | 12 |
|  | b. | Define the following phenomena and state their expressions.   1. Electroosmosis (ii) Streaming potential   (iii) Electroosmotic pressure (iv) Streaming current | CO2 | A | 8 |
|  |  |  |  |  |  |
| 5. | a. | Analyze any three phenomena that could not be explained by the classical mechanics. | CO3 | An | 12 |
|  | b. | Explain the following   1. Laplacian operator (ii) Hamiltonian operator (iii) Commutation operator | CO3 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Analyze the various transitions possible in hydrogen spectrum. | CO3 | An | 14 |
|  | b. | Discuss about the wave-particle duality. | CO3 | An | 6 |
|  |  |  |  |  |  |
| 7. | a. | Derive time independent Schrodinger wave equation. What are the conditions that should be satisfied to obtain acceptable solutions for Schrodinger equation? | CO4 | An | 14 |
|  | b. | Describe briefly about variation theory. | CO4 | U | 6 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write the Hamiltonian operator for hydrogen molecule and discuss the MO treatment of hydrogen molecule. | CO5 | A | 14 |
|  | b. | Briefly explain about the perturbation theory. | CO4 | U | 6 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe Huckel’s theory with an example. | CO6 | A | 14 |
|  | b. | Explain L-S coupling with an example. | CO5 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To relate various thermodynamic parameters. |
| CO2 | To know about the applications of irreversible thermodynamics. |
| CO3 | To understand the importance and application of quantization in molecular energy levels. |
| CO4 | To explain the shape, energy of atomic orbitals and molecular orbitals and the bond formation between atoms. |
| CO5 | To know about LCAO, MO and VB treatments of hydrogen molecule. |
| CO6 | To understand the importance of Huckel theory of linear conjugated systems and cyclic systems. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | - | 20 | 14 | 6 | - | - | 40 |
| CO2 | - | 20 | 20 | - | - | - | 40 |
| CO3 | - | 8 | - | 32 | - | - | 40 |
| CO4 | - | 12 | - | 14 | - | - | 26 |
| CO5 | - | - | 20 | - | - | - | 20 |
| CO6 | - | - | 14 | - | - | - | 14 |
|  | | | | | | | **180** |



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| **Course Code:** | **20CH3005** | **Duration :** | **3hrs** |
| **Course Name:** | **COORDINATION CHEMISTRY OF TRANSITION ELEMENTS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **CO/BL** | **Marks** |
|  |  | **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** |  |  |
| 1. | a. | Draw the Orgel diagrams for dn (n =1,2) configurations and explain its importance. | CO 1/ A | 10 |
|  | b. | Compare the characteristics of LMCT and MLCT in metal complexes. | CO 1/ An | 10 |
| **(OR)** | | | | |
| 2. | a. | Discuss the various types of electronic transitions possible in a coordination complex. | CO 1/An | 10 |
|  | b. | Explain a method to estimate the magnetic susceptibility of a metal complex. | CO 2/ E | 10 |
|  |  |  |  |  |
| 3. | a. | Describe the various types of structural isomerism in metal complex. | CO 3 / U | 10 |
|  | b. | Explain the factors affecting the stability constant of a metal complex. | CO 4/ An | 10 |
| **(OR)** | | | | |
| 4. | a. | Define: Stability constant. Derive the relationship between the overall stability constant and the stepwise stability constant. | CO 4/ U | 10 |
|  | b. | Explain chelate effect and macrocyclic effect with examples. | CO 4/ U | 10 |
|  |  |  |  |  |
| 5. | a. | Explain SN1 mechanism in coordination complex with example. | CO 5/ U | 10 |
|  | b. | Define: Trans effect. Write the trans affect series. State the applications of trans effect. | CO 5/ A | 10 |
| **(OR)** | | | | |
| 6. | a. | Discuss SN2 mechanism in coordination complex with example. | CO 5/ U | 10 |
|  | b. | Explain the theories of trans effect series. | CO 5/ U | 10 |
|  |  |  |  |  |
| 7. | a. | Summarize the mechanism of outer sphere electron transfer in coordination metal complex. | CO 5/ A | 10 |
|  | b. | Outline the applications of electron transfer reactions. | CO 5/ A | 10 |
| **(OR)** | | | | |
| 8. | a. | Discuss the mechanism of inner sphere electron transfer reaction in transition metal complex. | CO 5/ A | 10 |
|  | b. | Explain Marcus theory and its applications. | CO 5/ U | 10 |
|  | | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** |  |  |
| 9. | a. | Using a diagram, explain the origin of σ, π, and δ interactions between the d orbitals in metal clusters. | CO 6/ A | 10 |
|  | b. | Analyse the structures of tetracarboxylate and halogen complexes of Molybdenum and Tungsten. | CO 6/ An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To characterize the electronic spectra of metal complexes. |
| CO2 | To predict the magnetic properties of coordination complexes. |
| CO3 | To discuss the isomerism in coordination complexes. |
| CO4 | To summarize the factors affecting the stability of metal complexes. |
| CO5 | To categorize the types of mechanisms in reactions of metal complexes. |
| CO6 | To describe the importance of metal-metal multiple bonds. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 10 | 20 | - | - | 30 |
| CO2 | - | - | - | - | 10 | - | 10 |
| CO3 | - | 10 | - | - | - | - | 10 |
| CO4 | - | 20 | - | 10 | - | - | 30 |
| CO5 | - | 40 | 40 | - | - | - | 80 |
| CO6 | - | - | 10 | 10 | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3005** | **Duration** | **3hrs** |
| **Course Name** | **COORDINATION CHEMISTRY OF TRANSITION ELEMENTS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | How many microstates are possible for d2 configuration? Derive the terms generated for d2 configuration and identify the ground term among them. | CO1 | An | 12 |
|  | b. | Draw the orgel diagram for the following configurations in tetrahedral and octahedral field. (a) d4 (b) d3. | CO1 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Compare the characteristics of metal to ligand charge transfer transitions with ligand to metal charge transfer transitions. | CO1 | An | 10 |
|  | b. | Explain Jahn-Teller effect with examples. Compare the strength of Jahn-Teller effect for high spin and low spin octahedral complexes with d4, d5, d6 and d7 configurations. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Using Gouy balance how will you determine the magnetic susceptibility of a compound? | CO2 | A | 10 |
|  | b. | Explain the various types of structural isomerism exhibited by the coordination complexes with examples. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss the various types of magnetic moments possible in a metal complex and elucidate them with examples. | CO2 | An | 10 |
|  | b. | With examples, outline the importance of optical rotatory dispersion and circular dichroism in metal complexes. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Outline the role of chelate effect and macrocyclic effect in enhancing the stability of metal complexes. Explain with examples. | CO4 | An | 10 |
|  | b. | Analyze the mechanism of SN2 substitution reaction in a metal complex with an example. Explain the steps involved and write the rate equation. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe a method to evaluate the stability constant of a metal complex. | CO4 | E | 10 |
|  | b. | Explain the following reactions with examples.   1. Anation reaction 2. Reactions of the coordinated ligand | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Define trans effect and recall the trans effect series. Explain it with examples. | CO5 | U | 10 |
|  | b. | Outline the mechanism of inner sphere electron transfer reaction. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Summarize the applications of the trans effect. | CO5 | A | 10 |
|  | b. | Describe Marcus theory and its role in outer sphere electron transfer reaction. | CO5 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the origin of σ, π, and δ interactions between the d orbitals in metal clusters. Give examples of compounds having these interactions. | CO6 | An | 10 |
|  | b. | Discuss the reactions of metal clusters containing M-M quadruple bond. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To characterize the electronic spectra of metal complexes. |
| CO2 | To predict the magnetic properties of coordination complexes. |
| CO3 | To discuss the isomerism in coordination complexes. |
| CO4 | To summarize the factors affecting the stability of metal complexes. |
| CO5 | To categorize the types of mechanisms in reactions of metal complexes. |
| CO6 | To describe the importance of metal-metal multiple bonds. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 10 | 10 | 20 |  |  | 40 |
| CO2 |  |  | 10 | 10 |  |  | 20 |
| CO3 |  | 10 | 10 |  |  |  | 20 |
| CO4 |  |  |  | 10 | 10 |  | 20 |
| CO5 |  | 20 | 10 | 30 |  |  | 60 |
| CO6 |  |  | 10 | 10 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3006** | **Duration :** | **3hrs** |
| **Course Name** | **PRINCIPLES OF MOLECULAR SPECTROSCOPY** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **CO/BL** | **Marks** |
|  |  | **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** |  |  |
| 1. | a. | Explain suitable selection rules for Microwave, IR, Raman, NMR and ESR spectroscopy. | CO1/A | 10 |
|  | b. | The vibration frequency of 1H35Cl is 2990.6 cm-1; without calculating the bond force constant, estimate the vibrational frequencies for 1H37Cl, 2D35Cl and 2D37Cl. | CO1/U | 10 |
| **(OR)** | | | | |
| 2. | a. | How many normal modes of vibration are possible for the following molecules?  NH3, HCN, SO2 (bent), C2H2, C6H6, CH4, OCS (linear) | CO1/U | 10 |
|  | b. | The first rotational line of CO occur at 3.84235 cm-1 (J=0 to J=1). Calculate the moment of inertia and bond length of CO molecule. | CO1/A | 10 |
|  |  |  |  |  |
| 3. | a. | Discuss the factors influencing the vibrational frequencies. | CO2/A | 10 |
|  | b. | Short note the following   1. Overtone. 2. Combination bands. 3. Fermi resonance. 4. Franck-Condon Principle. | CO2/U | 10 |
| **(OR)** | | | | |
| 4. | a. | Explore the the vibrational frequency associated with Morse oscillator. | CO2/An | 10 |
|  | b. | Explain the Rayleigh scattering and Raman scattering with illustration. | CO2/A | 10 |
| 5. | a. | Predict the EPR spectrum of the following compounds: (i) •CH2-CH3 (ii) •CH3 (iii)Mn2+ (I=5/2) (iv)  Naphthalene radical (V) Anthracene radical. | CO3/A | 10 |
|  | b. | (i) What would be the chemical shift of a peak that occurs 655.2 Hz downfield of TMS on a spectrum recorded using a 90 MHz spectrometer?  (ii) 1H NMR spectroscopic data for an organic compound C8H6O2 is δ 8.6 (4H) 10.5 (2H). Identfy the compound. | CO3/U | 10 |
| **(OR)** | | | | |
| 6. | a. | Explain factors influencing the chemical shift. | CO3/U | 10 |
|  | b. | Explain the Zeeman effect. | CO3/A | 10 |

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| 7. | a. | Explain the theory and principle of Mossbauer spectroscopy. | CO3/A | 10 |
|  | b. | Explain the theory and principle of XPS. | CO4/U | 10 |
| **(OR)** | | | | |
| 8. | a. | Explain the following   1. Isomer shift. 2. Hyperfine splitting. 3. Quadrupole effects. 4. Stokes Shift. | CO4/U | 10 |
|  | b. | How will you obtain a photoelectron spectrum? Find binding energy of an electron. | CO5/An | 10 |
|  | | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** |  |  |
| 9 | a. | Explain different photo processes using Jablonski diagram. | CO5/U | 10 |
|  | b. | Explain the Fluorescence Resonance Energy Transfer process. | CO6/An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Discuss the principle and application of microwave spectroscopy. |
| CO2 | Relate the principle and application of microwave spectroscopy. |
| CO3 | Understand the principle and application of Vibration and Raman spectroscopy. |
| CO4 | Show the principle and application of NMR and ESR in organic and inorganic sample analysis. |
| CO5 | Examine the principle and application of Mossbauer and PES in material analysis. |
| CO6 | Explain the principle and application of electronic and emission spectroscopy. in material analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | 20 | - | - | - | 40 |
| CO2 | - | 10 | 20 | 10 | - | - | 40 |
| CO3 | - | 20 | 30 | - | - | - | 50 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | - | 10 | - | 10 | - | - | 20 |
| CO6 | - | - | - | 10 | - | - | 10 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20CH3006** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF MOLECULAR SPECTROSCOPY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Provide the selection rules for Microwave, IR, Raman, NMR and ESR spectroscopy. | CO1 | U | 10 |
|  | b. | Explain the following   1. Franck-Condon Principle 2. Overtone 3. Beer-Lambert law 4. Fermi resonance | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the electronic spectroscopy of polyatomic molecules with appropriate example. | CO6 | U | 10 |
|  | b. | Derive the term symbol for H2 and (σg)1 | CO6 | A | 10 |
|  |  |  |  |  | 10 |
| 3. | a. | The first rotational line of CO occur at 3.84235 cm-1 (J=0 to J=1). Calculate the moment of inertia and bond length of CO molecule. | CO3 | An | 10 |
|  | b. | Find the number of modes of vibrations possible for the following molecules.  NH3, HCN, SO2 (bent), C2H2, C6H6, CH4, OCS (linear) | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Distinguish between simple harmonic oscillator and anharmonic oscillator. | CO3 | U | 10 |
|  | b. | HCl molecule has a rotational constant B value of 1059.3 m-1 and a centrifugal constant D of 5.3 x 10-2 m-1. Estimate the vibrational frequency and force constant of the molecule. | CO2 | E | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the factors influencing the IR-vibrational frequencies. | CO3 | An | 10 |
|  | b. | Describe the Rayleigh scattering and Raman scattering with illustration. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | What is chemical shift? Explain the factors influencing chemical shift. | CO4 | A | 10 |
|  | b. | (i) TMS is used as a reference in NMR.Why?  (ii) Explain the relaxation process in NMR. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Predict the EPR spectrum of the following compounds: (i) •CH2-CH3 (ii) •CH3 (iii)Mn2+ (I=5/2) (iv)  Naphthalene radical (V) Anthracene radical | CO4 | E | 10 |
|  | b. | What is Zeeman effect? Describe the splitting of the electron spin energy levels in a magnetic field in ESR. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the theory and principle of Mossbauer spectroscopy. | CO5 | U | 10 |
|  | b. | Explain the theory and principle of UPS and XPS. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain different photo processes using Jablonski diagram. | CO6 | A | 10 |
|  | b. | Discuss the following   1. Fluorescence quantum yield . 2. Fluorescence Quenching and its type. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Discuss the principle and application of microwave spectroscopy. |
| CO2 | Relate the principle and application of microwave spectroscopy. |
| CO3 | Understand the principle and application of Vibration and Raman spectroscopy. |
| CO4 | Show the principle and application of NMR and ESR in organic and inorganic sample analysis. |
| CO5 | Examine the principle and application of Mossbauer and PES in material analysis. |
| CO6 | Explain the principle and application of electronic and emission spectroscopy. in material analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 10 |  |  |  |  | 10 |
| CO2 | 10 |  |  |  | 10 |  | 20 |
| CO3 |  | 20 | 10 | 20 |  |  | 50 |
| CO4 |  | 10 | 20 |  | 10 |  | 40 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 |  | 10 | 20 | 10 |  |  | 40 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **20CH3006** | **Duration** | **3hrs** |
| **Course Name** | **PRINCIPLES OF MOLECULAR SPECTROSCOPY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | What are the selection rules for Microwave, IR, Raman, NMR and ESR spectroscopy? | CO1 | U | 10 |
|  | b. | Explain the following   1. Franck-Condon Principle 2. Overtone 3. Beer-Lambert law 4. Fermi resonance | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the electronic spectroscopy of polyatomic molecules with appropriate example. | CO6 | U | 10 |
|  | b. | Derive the term symbol for H2 and (σu)1. | CO6 | A | 10 |
|  |  |  |  |  | 10 |
| 3. | a. | The first rotational line of CO occur at 3.84235 cm-1 (J=0 to J=1). Calculate the moment of inertia and bond length of CO molecule. | CO3 | An | 10 |
|  | b. | Find the number of modes of vibrations possible for the following molecules.  NH3, HCN, SO2 (bent), C2H2, C6H6, CH4, OCS (linear) | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Distinguish between rigid rotor and non-rigid rotor. | CO3 | U | 10 |
|  | b. | The vibration frequency of 1H35Cl is 2990.6 cm-1 without calculating the bond force constant, estimate the vibrational frequencies for 1H37Cl, 2D35Cl and 2D37Cl. | CO2 | E | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the factors influencing the IR-vibrational frequencies. | CO3 | An | 10 |
|  | b. | Describe the Rayleigh scattering and Raman scattering with illustration. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | What is chemical shift? Explain factors influencing the chemical shift. | CO4 | A | 10 |
|  | b. | (i) TMS is used as a reference in NMR.Why?  (ii) Discuss the NMR spectra of AX, A3X and AB systems with suitable example | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Predict the EPR spectrum of the following compounds: (i) •CH2-CH3 (ii) •CH3 (iii)Mn2+ (I=5/2) (iv)  Naphthalene radical (V) Anthracene radical | CO4 | E | 10 |
|  | b. | What is Zeeman effect? Describe the splitting of the electron spin energy levels in a magnetic field in ESR. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the following   1. Isomer shift 2. Hyperfine splitting 3. Quadrupole effects 4. Stokes Shift | CO5 | U | 10 |
|  | b. | Explain the theory and principle of UPS and XPS | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain different photo processes using Jablonski diagram. | CO6 | A | 10 |
|  | b. | Discuss the Fluorescence Resonance Energy Transfer process with example | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Discuss the principle and application of microwave spectroscopy |
| CO2 | Relate the principle and application of microwave spectroscopy |
| CO3 | Understand the principle and application of Vibration and Raman spectroscopy |
| CO4 | Show the principle and application of NMR and ESR in organic and inorganic sample analysis |
| CO5 | Examine the principle and application of Mossbauer and PES in material analysis |
| CO6 | Explain the principle and application of electronic and emission spectroscopy. in material analysis |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 10 |  |  |  |  | 10 |
| CO2 | 10 |  |  |  | 10 |  | 20 |
| CO3 |  | 20 | 10 | 20 |  |  | 50 |
| CO4 |  | 10 | 20 |  | 10 |  | 40 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 |  | 10 | 20 | 10 |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3007** | **Duration** | **3hrs** |
| **Course Name** | **SYNTHETIC REAGENTS AND METHODOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write short note on i) Sonogashira coupling ii) Tsuji Trost reaction. | CO1 | U | 10 |
|  | b. | Predict the product ‘X’ of the following and write its mechanism | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Write a short note on metal hydrides in reduction reaction. | CO1 | R | 10 |
|  | b. | i) Explain Heck reaction? Write its mechanism.  ii) Explain two applications of heck reaction. | CO1 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Name the reaction & predict the product of the following reaction.    ii) | CO2 | A | 10 |
|  | b. | Write the applications of glacier-coupling reaction. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write a short note on i)Jone’s reagent ii) PDC iii) MnO2. | CO2 | R | 10 |
|  | b. | i)Explain Oppenauer oxidation and its mechanism?  ii) Which alcohol is most resistant to oxidation? | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Give the synthetic applications of the following reagents  i) Wittig salt ii) mCPBA iii) Tebbe reagent. | CO3 | A | 10 |
|  | b. | Name the following reaction. Write its mechanism and predict the product of the following. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Predict the product of the following and write its mechanism. | CO4 | A | 10 |
|  | b. | Write a short note on i) Lossen rearrangements ii) Neber rearrangement. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Identify the similarities in mechanism between Wolf and Curtius rearrangement. | CO4 | U | 10 |
|  | b. | Name the reaction & Predict the Product of the following  i)    ii) | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write a short note on pinacol-pinacolone rearrangement? Write its applications? | CO4 | R | 10 |
|  | b. | Predict the reactant **X** of the following? Name the reaction and write its two applications | CO4 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the terms i) Target molecule ii) Synthons iii) synthetic equivalent iv) Chemoselectivity v)Stereoselectivity | CO5 | A | 10 |
|  | b. | Paracetamol is an amide that can be disconnected either to amine **+**acyl amide or to amine + anhydride. Which reagent is best can often only be determined by experimentation? | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To understand the importance of metal catalyzed coupling reactions in synthesis. |
| CO2 | Describe the usefulness of multi component coupling in synthesis. |
| CO3 | To know the reagents used for oxidation and reduction reactions. |
| CO4 | To predict the product formed in molecular rearrangements. |
| CO5 | Apply modern synthetic reagents in organic synthesis. |
| CO6 | Apply retrosynthetic and selectivity approach to complex target molecules. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | 10 | 10 |  |  | 40 |
| CO2 | 10 | 20 | 10 | - |  |  | 40 |
| CO3 | - | - | 10 | 10 |  |  | 20 |
| CO4 | 10 | 10 | 30 | 10 |  |  | 60 |
| CO5 | - | - | 10 | - |  |  | 10 |
| CO6 | - | - | - | 10 |  |  | 10 |
|  | | | | | | | **180** |

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Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

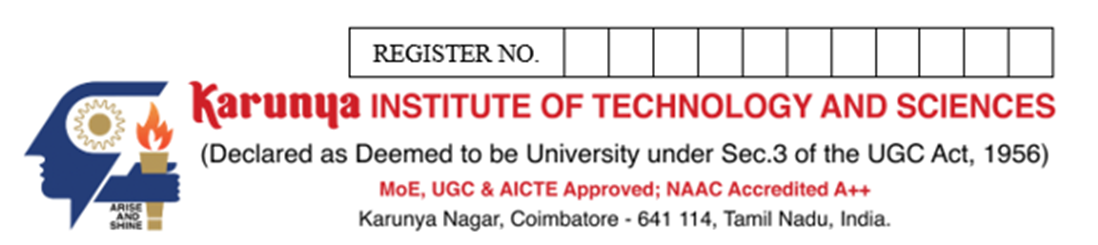
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| --- | --- | --- | --- |
| **Course Code** | **20CH3007** | **Duration** | **3hrs** |
| **Course Name** | **SYNTHETIC REAGENTS AND METHODOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write short note on i) Stille coupling ii) Negishi coupling reaction | CO1 | U | 10 |
|  | b. | Predict the product ‘X’ of the following and write its mechanism | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the applications of coupling reactions. | CO1 | R | 10 |
|  | b. | Mention the synthetic uses of the following oxidizing agents.  i) PDC ii) MnO2 iii) Dess-Martin periodinane iv) KMnO4 | CO1 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Name the reaction & predict the product ‘Z’ of the following  i)    ii) | CO2 | A | 10 |
|  | b. | Write the applications of Raney/Ni, LIBH4, Pd/C | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write a short note on i) cyclohexenone ii) Bouvelt-Blanc reduction, | CO2 | R | 10 |
|  | b. | i) Explain Oppenauer oxidation and its mechanism.  ii) Which alcohol is most resistant to oxidation? | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Give the synthetic applications of the following reagents  i) DDQ ii) DCC iii) Trimethylsulfonium | CO3 | A | 10 |
|  | b. | Name the following reaction. Write its mechanism and predict the product of the following. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Predict the product of the following and write its mechanism. | CO4 | A | 10 |
|  | b. | Write a short note on i) Curtius rearrangements ii) Benzidine rearrangement | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Identify the similarities in mechanism between Wolf and Curtius rearrangement | CO4 | U | 10 |
|  | b. | Name the reaction & Predict the Product of the following.  i)    ii) | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write a short note on wolf rearrangement? Write its applications? | CO4 | R | 10 |
|  | b. | Predict the reactant **X** of the following? Name the reaction and write its two applications | CO4 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write a short note on Umpolung of Reactivity? | CO5 | A | 10 |
|  | b. | Write concept of protecting groups and its application in organic reactions | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To understand the importance of metal catalyzed coupling reactions in synthesis |
| CO2 | Describe the usefulness of multi component coupling in synthesis. |
| CO3 | To know the reagents used for oxidation and reduction reactions. |
| CO4 | To predict the product formed in molecular rearrangements |
| CO5 | To understand the concept of Umpolung of Reactivity |
| CO6 | Apply retrosynthetic and selectivity approach to complex target molecules |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | 10 | 10 | - | - | 40 |
| CO2 | 10 | 20 | 10 | - | - | - | 40 |
| CO3 | - | - | 10 | 10 | - | - | 20 |
| CO4 | 10 | 10 | 30 | 10 | - | - | 60 |
| CO5 | - | - | 10 | - | - | - | 10 |
| CO6 | - | - | - | 10 | - | - | 10 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION - JUNE 2023**

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| **Course Code** | **20CH3008** | **Duration** | **3hrs** |
| **Course Name** | **GROUP THEORY AND APPLIED PHYSICAL CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1 |  | Define the following terminology with an example.   1. Abelian Group. 2. Cyclic Group. | CO1 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Identify the point groups of the following molecules   1. Toluene. 2. Tetrachloroplatinate (II). | CO1 | A | 20 |
| 3. |  | Derive the reducible representations of H2O with respect to Cartesian coordinates of each atom and Construct the corresponding character table containing only area I & area II. | CO2 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | List out any five properties of a Group and draw the group multiplication table of C3V point group. | CO2 | R | 20 |
| 5. | a. | Explain the concepts adsorption and absorption with examples. | CO3 | U | 10 |
|  | b. | Compare physisorption and chemisorption. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Discuss in detail the classifications of colloids with examples and applications. | CO3 | R | 20 |
| 7. |  | Elaborate Fluorescence, Phosphorescence and Delayed fluorescence. How can each of the above processes be identified? | CO4 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Discuss in detail any five important applications of photochemistry with suitable examples. | CO5 | R | 20 |
| **PART – A(4 X 20= 80 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Electrical Helmholtz double layer: Discuss briefly Gouy-Chapmann and stern models. | CO6 | U | 20 |

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|  | **COURSE OUTCOMES** |
| CO1 | Appreciate the symmetry in molecules and in nature. |
| CO2 | Able to identify and group the objects or molecules of same category based on the symmetry elements. |
| CO3 | Distinguish different isotherms. |
| CO4 | Recognize the importance of photosensitization of chemiluminescence. |
| CO5 | Understand the basic principles of electrochemistry. |
| CO6 | Know about electrokinetics. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 |  | 20 |  |  |  | 40 |
| CO2 | 20 |  | 20 |  |  |  | 40 |
| CO3 | 30 | 10 |  |  |  |  | 40 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 | 20 |  |  |  |  |  | 20 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3008** | **Duration** | **3hrs** |
| **Course Name** | **GROUP THEORY AND APPLIED PHYSICAL CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. |  | Identify the point groups of the following molecules   1. Cyclopentadiene 2. Thiophene 3. PCl5 4. CH2Cl2 | CO1 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Find out the symmetry elements present in the following molecules   1. Benzene 2. Cis-butadiene 3. Trans-butadiene 4. Dichoromethane | CO1 | A | 20 |
| 3. |  | Find out the reducible representations of H2O with respect to total movement of the molecule and find out IR active vibrations from the following character table  Answered: cis-C2H2Cl2 belongs to C2v point group.… | bartleby | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Find out the list of symmetry elements present in cis-butadiene and derive the reducible representations with respect to π orbitals. | CO2 | U | 20 |
| 5. | a. | Explain in detail about adsorption and list out its chemical applications. | CO3 | R | 10 |
|  | b. | Discuss in detail about Freundlich adsorption isotherm. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss in detail about any two methods of purification of colloidal solutions. | CO3 | R | 10 |
|  | b. | List out any five applications of colloids. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Draw Jablonski diagram and explain each excitation and deactivation processes briefly. | CO4 | U | 10 |
|  | b. | Phosphorescence is having more advantages than fluorescence in terms of applications. Give your thoughts. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Radiative and non-radiative decay process. Give detailed account with suitable examples. | CO5 | U | 10 |
|  | b. | Photosensitization: Explain by taking a suitable example. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Explain the following concepts: conductance, transport number, Wien effect, electrophoresis and electro osmosis. | CO6 | R | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Appreciate the symmetry in molecules and in nature. |
| CO2 | Able to identify and group the objects or molecules of same category based on the symmetry elements. |
| CO3 | Distinguish different isotherms. |
| CO4 | Recognize the importance of photosensitization of chemiluminescence. |
| CO5 | Understand the basic principles of electrochemistry. |
| CO6 | Know about electrokinetics. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 40 |  |  |  | 40 |
| CO2 |  | 40 |  |  |  |  | 40 |
| CO3 | 20 | 10 | 10 |  |  |  | 40 |
| CO4 |  | 10 | 10 |  |  |  | 20 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 | 20 |  |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3009** | **Duration** | **3hrs** |
| **Course Name** | **ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Compare the covalent model and ionic model of counting electron in transition metal complexes. Illustrate with examples. | CO1 | Analyze | 10 |
|  | b. | Using molecular orbital theory, describe the bonding in metal-carbonyl complexes. | CO2 | Analyze | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | What are the applications of 18 electron rule? | CO1 | Apply | 5 |
|  | b. | Define: Hapticity. Explain with examples. | CO1 | Understand | 5 |
|  | c | Analyze the various factors affecting the stretching frequency of metal carbonyl complexes. | CO2 | Analyze | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the preparation and bonding modes of metal nitrosyl complexes. | CO2 | Analyze | 10 |
|  | b. | Write down the various types of reactions carried out in ferrocene. | CO2 | Apply | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the preparation and reactivity of Fischer and Schrock carbene complexes. | CO2 | Understand | 10 |
|  | b. | Analyze the structure of ferrocene using molecular orbital theory. | CO2 | Analyze | 10 |
|  |  |  |  |  |  |
| 5. | a. | Categorize the various types of ligand substitution reactions in organometallic complexes. | CO3 | Analyze | 10 |
|  | b. | Explain the steps involved in Wacker process using the catalytic cycle. | CO4 | Analyze | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Illustrate with examples   1. Oxidative addition reaction 2. Insertion reaction | CO3 | Understand | 10 |
|  | b. | Describe the steps involved in oxo process. Explain using the catalytic cycle. | CO4 | Analyze | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the function of Hemoglobin. | CO5 | Analyze | 10 |
|  | b. | Write a detailed account on biomaterials. | CO5 | Understand | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss about the various types of Iron-Sulfur clusters utilized in electron transfer reaction. | CO5 | Understand | 10 |
|  | b. | Write a detailed account on applications of vitamin B12- based enzymes. | CO5 | Apply | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the various types of photochemical pathways that can occur in a noctahedral complex. | CO6 | Analyze | 10 |
|  | b. | Describe the steps involved in photochemical reduction of water using Ruthenium bipyridyl complex. | CO6 | Analyze | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To apply the 18 electron rule. |
| CO2 | To describe the structure of various types of transition metal organometallic complexes. |
| CO3 | To utilize the reactions of organometallic complexes. |
| CO4 | To practice the applications of organometallic complexes in catalysis. |
| CO5 | To discuss the role of metals in biology. |
| CO6 | To identify the metal complexes that can be used for solar energy conversion. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 5 | 5 | 10 |  |  | 20 |
| CO2 |  | 10 | 10 | 40 |  |  | 60 |
| CO3 |  | 10 |  | 10 |  |  | 20 |
| CO4 |  |  |  | 20 |  |  | 20 |
| CO5 |  | 20 | 10 | 10 |  |  | 40 |
| CO6 |  |  |  | 20 |  |  | 20 |
|  | | | | | | | **180** |

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Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **20CH3010** | **Duration :** | **3hrs** |
| **Course Name** | **PERICYCLIC REACTIONS AND BIOMOLECULES** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **CO/BL** | **Marks** |
| 1. | a. | Illustrate Ireland-Claisen Rearrangement with reaction | CO1 /A | 10 |
|  | b. | Describe [3,3] and [2,3] sigmatropic reactions with examples. | CO1 /An | 10 |
| **(OR)** | | | | |
| 2. | a. | List out the various types of pericyclic reactions with explain. | CO1/A | 10 |
|  | b. | Describe the mechanism of Oxy-Cope and Claisen rearrangement | CO1 /A | 10 |
|  | | | | |
| 3. | a. | Illustrate Paterno-Buchi reactions with examples. | CO2/An | 10 |
|  | b. | Discuss the di-pi-methane and Oxa-di-pi-methane rearrangement | CO2 /A | 10 |
| **(OR)** | | | | |
| 4. | a. | Elaborate the photochemical reactions of Norrish I and II types with examples. | CO3/An | 10 |
|  | b. | Describe the Photo Fries Rearrangement | CO3 /A | 10 |
|  | | | | |
| 5. | a. | Describe Bischler Synthesis and Reissert Synthesis. | CO3 /A | 10 |
|  | b. | Discuss the synthesis, properties, and applications of Pyrazine. | CO4/An | 10 |
| **(OR)** | | | | |
| 6. | a. | Narrate the synthesis, properties, and applications of Imidazole. | CO3 /A | 10 |
|  | b. | Write down the mechanism of Fisher-Indole Synthesis. | CO3/An | 10 |
|  | | | | |
| 7. | a. | Illustrate the synthesis of Menthol and Nicotine. | CO4 /A | 10 |
|  | b. | Narrate the extraction techniques of phytocompounds from natural resources? | CO4 /A | 10 |
| **(OR)** | | | | |
| 8. | a. | Describe the structure elucidation of Steroids. | CO5 /A | 10 |
|  | b. | Discuss the isoprene structures of Terpenoids | CO5 /E | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Illustrate the structure and functions of carbohydrates. | CO6 /C | 10 |
|  | b. | Describe the primary, secondary, and tertiary structure of DNA. | CO6 /C | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Apply the principles and applications of pericyclic reactions to predict the product. |
| CO2 | Reason out for the product formed in the photochemical reaction |
| CO3 | Describe the synthesis of heterocycles molecules from suitable precursors |
| CO4 | Summarize the properties and applications of heterocyclic compounds |
| CO5 | Elaborate the extraction and structural elucidation of natural products |
| CO6 | Explain the structure and role of biomolecules in living system |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | - | 30 | 10 | - | - | 40 |
| CO2 |  |  | 10 | 10 |  |  | 20 |
| CO3 | - | - | 40 | 10 | - | - | 50 |
| CO4 | - | - | 20 | 10 |  |  | 30 |
| CO5 | - | - | 10 | - | 10 | - | 20 |
| CO6 | - | - | - | - | - | 20 | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3019** | **Duration :** | **3hrs** |
| **Course Name** | **NUCLEAR CHEMISTRY AND SOLID STATE CHEMISTRY** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **CO/BL** | **Marks** |
|  |  | **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** |  |  |
| 1. | a. | Briefly discuss the factors affecting nuclear stability with suitable example. | CO1 / R | 10 |
|  | b. | Write Short notes one nuclear tunneling effect and nuclear cross section. | CO1 / U | 10 |
| **(OR)** | | | | |
| 2. | a. | Describe the types of nuclear reaction with neat diagram. | CO1 / A | 10 |
|  | b. | Highlight the salient features of Breeder reactor. | CO2 / U | 5 |
|  | c. | List out the advantages of radio isotope in brain tumer and bone fracture. | CO2 / E | 5 |
|  |  |  |  |  |
| 3. | a. | Elaborately discuss the sterile insect technique with suitable example. | CO2 / A | 10 |
|  | b. | Highlight the application of carbon dating application in water and petroleum. | CO2 / R | 10 |
| **(OR)** | | | | |
| 4. | a. | Explain the thermo nuclear reaction with proton and proton and CNO cycle. | CO1 / U | 10 |
|  | b. | Write short notes on Q value and Transuranium. | CO1 / R | 10 |
|  |  |  |  |  |
| 5. | a. | Describe the types of crystals structures with suitable example. | CO3 / U | 10 |
|  | b. | Highlight the elements of crystal in cubic crystal. | CO3 / R | 10 |
| **(OR)** | | | | |
| 6. | a. | Explain the photo electric effect and peltier effect with example. | CO3 / An | 10 |
|  | b. | Write short notes on dia, para, and ferro and ferri magnetic materials. | CO3 / A | 10 |
|  |  |  |  |  |
| 7. | a. | Briefly discuss the co precipitation and sol gel method of preparation of solid state reactions. | CO4 / U | 10 |
|  | b. | Highlight the advantage of high pressure synthesis method to preparation of solid state materials. | CO4 / A | 10 |
| **(OR)** | | | | |
| 8. | a. | Describe the principle and instrumentation of XRD technique. | CO4 / U | 10 |
|  | b. | Write short notes on intercalation and deintercalation. | CO4 / R | 10 |
|  | | **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** |  |  |
| 9. | a. | Explain the preparation of nanomaterials through ball milling and chemical vapour deposition method. | CO5 / A | 10 |
|  | b. | Classify the coordination polymers and application of coordination polymers. | CO6 / R | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | 1. Describe the basic concepts of nuclear chemistry. |
| CO2 | 2. Summarize the applications of radioisotopes. |
| CO3 | 3. Outline the band theory of solids. |
| CO4 | 4. Classify the various types of solid state reactions. |
| CO5 | 5. Categorize the nanomaterials. |
| CO6 | 6. Demonstrate the applications of coordination polymers. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 20 | 10 | - | - | - | 50 |
| CO2 | 10 | 5 | 10 | - | 5 |  | 30 |
| CO3 | 10 | 10 | 10 | 10 | - | - | 40 |
| CO4 | 10 | 20 | 10 | - |  |  | 40 |
| CO5 | 10 | - | - | 10 | - | - | 10 |
| CO6 | 10 | - | - | - | - | - | 10 |
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| **Course Code** | **20CH3019** | **Duration** | **3hrs** |
| **Course Name** | **NUCLEAR CHEMISTRY AND SOLID STATE CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write short notes on nuclear tunneling effect and nuclear cross section. | CO1 | R | 10 |
|  | b. | Briefly discuss the factors affecting nuclear stability with suitable example. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the types of nuclear reaction with neat diagram. | CO1 | A | 10 |
|  | b. | Highlight the salient features of Breeder reactor. | CO2 | U | 5 |
|  | c. | List out the advantages of radio isotope in brain tumer and bone fracture. | CO2 | E | 5 |
|  |  |  |  |  |  |
| 3. | a. | Highlight the involvement of carbon dating application in water and petroleum industries. | CO2 | R | 10 |
|  | b. | Elaborately discuss the sterile insect technique with suitable example. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Write short notes on Q value and Transuraniens. | CO1 | R | 10 |
|  | b. | Explain the thermo nuclear reaction with proton and proton and CNO cycle. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Highlight the elements of crystal in cubic crystal. | CO3 | R | 10 |
|  | b. | Describe the types of crystals structures with suitable example. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write short notes on dia, para, ferro and ferri magnetic materials. | CO3 | A | 10 |
|  | b. | Explain the photo electric effect and peltier effect with example. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Highlight the advantage of high pressure synthesis method to preparation of solid state materials. | CO4 | A | 10 |
|  | b. | Discuss the co precipitation and sol gel method for the preparation of solid state reactions. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write short notes on intercalation and deintercalation. | CO4 | R | 10 |
|  | b. | Describe the principle and instrumentation of XRD technique. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Classify the coordination polymers and write their applications. | CO6 | R | 10 |
|  | b. | Explain the preparation of nanomaterials through ball milling and chemical vapour deposition method. | CO5 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe the basic concepts of nuclear chemistry. |
| CO2 | Summarize the applications of radioisotopes. |
| CO3 | Outline the band theory of solids. |
| CO4 | Classify the various types of solid state reactions. |
| CO5 | Categorize the nanomaterials. |
| CO6 | Demonstrate the applications of coordination polymers. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 20 | 10 | - | - | - | 50 |
| CO2 | 10 | 5 | 10 | - | 5 |  | 30 |
| CO3 | 10 | 10 | 10 | 10 | - | - | 40 |
| CO4 | 10 | 20 | 10 | - |  |  | 40 |
| CO5 | - | - | - | 10 | - | - | 10 |
| CO6 | 10 | - | - | - | - | - | 10 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **20CH3020** | **Duration** | **3hrs** |
| **Course Name** | **ORGANIC SPECTROSCOPY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Recall the Principle and instrumentation of UV-Vis Spectroscopy. | CO1 | R | 10 |
|  | b. | Discuss the applications of the Woodward–Fischer rules. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the following with suitable example   1. CD spectroscopy (ii) Cotton effect | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. | a. | Enumerate the possible modes of stretching and bending vibrations observed in IR spectroscopy.? | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss the Finger Print region in detail with its potential applications. | CO2 | U | 20 |
|  |  |  |  |  |  |
| 5. | a. | Define chemical shift? Explain the different factors affecting chemical shift. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the Spin-spin coupling and spin spin splitting in NMR Spectroscopy? | CO3 | U | 20 |
|  |  |  |  |  |  |
| 7. | a. | Analyze the applications of NMR spectroscopy in various fields. | CO4 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Exemplify the following with suitable examples  (i) DEPT spectroscopy (ii) NOESY. | CO5 | U | 10 |
|  | b. | Comment on the A2, AB, and AX Spin Systems? | CO5 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Illustrate the following with examples   1. McLafferty rearrangement. 2. Nitrogen rule. | CO6 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the principles and applications of UV-Visible spectroscopy and ORD in elucidating the structure of organic compounds. |
| CO2 | Illustrate the principle and applications of IR spectroscopy in elucidating the structure of organic compounds. |
| CO3 | Describe the basic principle and applications of NMR spectroscopy in elucidating the structure of organic compounds. |
| CO4 | Interpret proton decoupled NMR spectra, DEPT, 2D NMR and multi nuclear NMR spectroscopic analysis. |
| CO5 | Analyze the basic principle and applications of mass spectroscopy in elucidating the structure of organic compounds. |
| CO6 | Apply the combined spectroscopic data in elucidating the structure of unknown organic compounds. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 20 | 10 | - | - | - | 40 |
| CO2 | - | 40 | - | - | - | - | 40 |
| CO3 | 20 | 20 | - | - | - | - | 40 |
| CO4 | - | - | - | 20 | - | - | 20 |
| CO5 | - | 10 | - | 10 | - | - | 20 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3020** | **Duration** | **3hrs** |
| **Course Name** | **ORGANIC SPECTROSCOPY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Differentiate the following pairs using UV-Vis Spectra using Woodward-Fieser rules | CO1 | A | 12 |
|  | b. | Discuss the factors affecting the λmax and absorption intensity UV-visible spectroscopy. | CO1 | U | 8 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the following with suitable example  (a) Chromophore  (b) Auxochrome  (c) Cotton effect  (d) Octant rule  (e) Axial halo ketone rule | CO1 | U | 10 |
|  | b. | (i) What is Fieser-Kuhn rule? Calculate λmax value of the following compound | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the principle, instrumentation and applications of FTIR spectroscopy | CO2 | U | 10 |
|  | b. | Explain the factors influencing vibrational frequencies. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Indicate the IR vibrational frequency for the following functionalities.  Imine, Nitrile, Alcohol, Ketone, Amine, Aldehyde, Esters, Amide and Alkane | CO2 | An | 10 |
|  | b. | Explain the possible modes of stretching and bending vibrations observed in IR spectroscopy. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | What is chemical shift? Explain various factors which are affecting the chemical shift. | CO3 | A | 10 |
|  | b. | Tetramethylsilane is used as a reference in NMR.Why? | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the following   1. Spin – spin relaxation 2. Spin – lattice relaxation 3. 1H NMR Splitting Pattern 4. Coupling constant | CO3 | A | 10 |
|  | b. | How would you distinguish the following pair of compounds using 1H NMR spectroscopy? | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Discuss the principle, instrumentation and applications of NMR spectroscopy. | CO3 | A | 10 |
|  | b. | Write a short note on the following   1. NOE Effect 2. COSY 3. NOESY 4. ROSEY | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the following   1. DEPT spectroscopy 2. HETCOR spectroscopy 3. First order NMR spectra 4. Second order NMR spectra | CO4 | U | 10 |
|  | b. | Discuss the principle, instrumentation and applications of Mass spectroscopy. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the following   1. McLafferty rearrangement mass spectroscopy 2. Nitrogen rule 3. A2, AB and AX Spin Systems | CO5 | A | 10 |
|  | b. | Discuss the fragmentation pattern of 2-Butanone and cyclohexanone with m/z value | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the principles and applications of UV-Visible spectroscopy and ORD in elucidating the structure of organic compounds |
| CO2 | Illustrate the principle and applications of IR spectroscopy in elucidating the structure of organic compounds |
| CO3 | Describe the basic principle and applications of NMR spectroscopy in elucidating the structure of organic compounds |
| CO4 | Interpret proton decoupled NMR spectra, DEPT, 2D NMR and multi nuclear NMR spectroscopic analysis |
| CO5 | Analyze the basic principle and applications of mass spectroscopy in elucidating the structure of organic compounds. |
| CO6 | Apply the combined spectroscopic data in elucidating the structure of unknown organic compounds |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 19 | 22 | - | - | - | 40 |
| CO2 | - | 20 | 10 | 10 | - | - | 40 |
| CO3 | - | 10 | 30 | 10 | - | - | 50 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | - | 10 | 10 | - | - | - | 20 |
| CO6 | - | - | - | 10 | - | - | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3022** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED ELECTROCHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | By applying Ohm’s law explain the current-voltage relationship. | CO1 | A | 4 |
|  | b. | Analyse the principle of conductometric and potentiometric titrations and explain them with neat diagram. | CO1 | An | 16 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain diffusion and convection way of mass transfer in an electrochemical system. | CO1 | R | 4 |
|  | b. | By understanding the principle of polarography explain the polarography technique in detail with application. | CO1 | U | 16 |
|  |  |  |  |  |  |
| 3. | a. | Highlight the differences between galvanic and electrolytic cell using a simple diagram. | CO2 | U | 6 |
|  | b. | How will you synthesize chlorine and sodium hydroxide using mercury and membrane cells? | CO2 | R | 14 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | In a galvanic cell of Zn(S) / ZnSO4 (1M) // CuSO4 (1M) / Cu(S), the anodic potential is -0.73V and cathodic potential is +0.34V. Calculate the overall cell voltage. | CO2 | A | 4 |
|  | b. | Using the theory of Forester and Muller explain the electrolytic preparation of chlorates. | CO2 | R | 16 |
|  |  |  |  |  |  |
| 5. |  | Apply electrometallurgy principle for the electrowinning and electrorefining processes of copper. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain any five characteristics of electrodeposits and factors relating to it. | CO3 | R | 10 |
|  | b. | Using electrochemical principle explain the electroplating process of nickel. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Classify batteries based on their various characteristics. | CO4 | R | 6 |
|  | b. | Discuss the electrochemistry of acid and alkaline primary batteries | CO4 | U | 14 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the electrochemistry of charging and discharging of simple lead-acid battery. | CO4 | U | 12 |
|  | b. | Discuss the salient features of a hydrogen-oxygen fuel cell. | CO4 | R | 8 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the mechanism of dry and electrochemical corrosion. | CO5 | R | 10 |
|  | b. | By using various inhibitors, how corrosion can be controlled? | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamentals of electroanalytical techniques. |
| CO2 | Know about electrochemical synthetic routes. |
| CO3 | Understand the concept of electrometallurgy and electroplating procedures. |
| CO4 | Classify the batteries based on their application. |
| CO5 | Know about different types of corrosion. |
| CO6 | Choose the methods to resist corrosion. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 04 | 16 | 04 | 16 |  |  | 40 |
| CO2 | 30 | 06 | 04 |  |  |  | 40 |
| CO3 | 10 | 10 | 20 |  |  |  | 40 |
| CO4 | 14 | 26 |  |  |  |  | 40 |
| CO5 | 10 |  |  |  |  |  | 10 |
| CO6 |  |  | 10 |  |  |  | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3023** | **Duration** | **3hrs** |
| **Course Name** | **RESEARCH METHODOLOGY AND IPR** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | List out the available resources in the chemical literature and explain the importance of citation index. | CO1 | An | 10 |
|  | b. | Illustrate how chemical database is useful for the identification of research problem. | CO1 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | How will you calculate impact factor of a journal? Explain its significance. | CO1 | An | 10 |
|  | b. | Give your opinion on Scopus Index and Web of Science Indexing. | CO1 | E | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the concept of energy minimization process and its advantages. | CO2 | A | 10 |
|  | b. | Illustrate the significance of substructure identifications with examples. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Name the tools used to draw the following structures. Explain the salient features of the tools. | CO2 | An | 10 |
|  | b. | How will you get the chemical compounds and chemical suppliers from the literature? Explain. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Narrate the process of estimation of moisture content using Karl-Fisher titrations with equations. | CO3 | E | 10 |
|  | b. | How will you extract the organic compounds using Soxhlet Apparatus? Explain with diagram. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the concept of Dean-Stark Apparatus and write their specific uses. | CO3 | A | 10 |
|  | b. | Draft your findings as a manuscript for a research paper with the sub-titles. | CO4 | C | 10 |
|  |  |  |  |  |  |
| 7. | a. | How a research proposal will be evaluated? Discuss its components. | CO4 | A | 10 |
|  | b. | Explain the difference between informal and formal reports. | CO4 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | How will you handle the chemical literature for technological research and innovation? Explain. | CO5 | An | 10 |
|  | b. | Narrate the process of patenting a product with novelty and discuss its importance. | CO6 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss your opinion on Licensing and Technology Transfer. | CO5 | An | 10 |
|  | b. | Explain the concept of trademarks and geographical indications. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Describe a research problem using the available chemistry literature. |
| CO2 | Analyze the components of rating like impact factor, citation index. |
| CO3 | Realize the potential applications of chemical softwares. |
| CO4 | Formulate the chemical reaction design and set-ups. |
| CO5 | Create a research problem/proposal/manuscript with the awareness of plagiarism. |
| CO6 | Learn the procedure for IPR. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  |  |  | 20 | 20 |  | 40 |
| CO2 |  |  | 20 | 20 |  |  | 40 |
| CO3 |  |  | 10 | 10 | 10 |  | 30 |
| CO4 |  |  | 10 | 10 |  | 10 | 30 |
| CO5 |  |  |  | 20 |  |  | 20 |
| CO6 |  |  | 20 |  |  |  | 20 |
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| **Course Code** | **20CH3024** | **Duration** | **3hrs** |
| **Course Name** | **APPLIED POLYMER CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the Classification of polymers with neat representation. | CO1 | U | 10 |
|  | b. | Describe the following terms with suitable examples   1. Polymerization reactions 2. Functionality and its significance | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Classify tacticity. Explain it with polypropylene molecule. | CO1 | An | 10 |
|  | b. | Explain the degree of polymerization and biopolymers. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the mechanism of Free radical polymerization with suitable examples. | CO2 | A | 10 |
|  | b. | Compare and contrast addition and step growth polymerization with examples. | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Sketch cationic mechanism with suitable examples. | CO2 | A | 10 |
|  | b. | Sketch anionic mechanism with suitable examples. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Calculate the number average and weight average molecular masses of polypropylene polymer with the following composition.  [Polypropylene]400 is 25%, ; [Polypropylene]800 is 35%,; [Polypropylene]600 is 40%.  (Given that at.mass of C = 12 and H= 1) | CO3 | An | 10 |
|  | b. | i) A polymer contains   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Polymer of DP | 400 | 500 | 600 | 800 | 1000 | | % | 10 | 15 | 35 | 15 | 25 |   Calculate its average degree of polymerization  ii) Explain in detail about glass transition temperature | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Specify synthesis, properties and uses of the following   1. Hypalon 2. Nylon-6,6 | CO3 | A | 10 |
|  | b. | Distinguish Polyphosphazines and Extrusion moulding process. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Distinguish GRP and explain compression moulding techniques with neat diagram. | CO3 | An | 10 |
|  | b. | Describe the vulcanization of rubber and write the demerits of natural rubber. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Distinguish GRM and explain injection moulding techniques with neat diagram. | CO4 | A | 10 |
|  | b. | Explain the following spinning process.   1. Dry method 2. Wet Method | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Give an account on filament winding techniques and Ablation. | CO5 | U | 10 |
|  | b. | Describe the application of polymer nanocomposites in various fields and hand layup techniques. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Acquire the basic knowledge about polymers. |
| CO2 | Know the Synthesis of various polymers, properties and choose the methods for characterizing the polymer. |
| CO3 | Understand the thermal and mechanical properties of various polymers. |
| CO4 | Develop various fabrication techniques. |
| CO5 | Understand the filler-matrix interaction . |
| CO6 | Recognize the importance and applications of nanofillers. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 20 | - | - | - | - | 20 |
| CO2 | - | - | 20 | 20 | - | - | 40 |
| CO3 | - | 10 | 20 | 30 | - | - | 60 |
| CO4 | - | 10 | 10 | - | - | - | 20 |
| CO5 | - | 10 | - | - | - | - | 10 |
| CO6 | - | 10 | - | - | - | - | 10 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3028** | **Duration** | **3hrs** |
| **Course Name** | **MEDICINAL CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss drug metabolism & its phases. | CO1 | R | 10 |
|  | b. | i) What are the five benefits of gene therapy? ii) What is drug resistance? How does antibiotic resistance occur and give two examples for drug resistance. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Write a note on: i) Prodrug ii) SAR iii) Enzyme inhibitors  iv) Drug disposition v) Xenobiotic | CO2 | An | 10 |
|  | b. | i) What are the 5 stages of clinical trials?  ii) What is the difference between drug discovery and drug development? | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | i) What is “rule of five”? What are principles involved in pharmacokinetics?  ii) What are four factors that affect absorption of a drug? | CO3 | A | 10 |
|  | b. | Write the abbreviations for i) DMT ii) LSD iii) DCGI iv) MHRA  v) FDA vi) QSAR vii) MDMA viii) PABA ix) UDP x) UGTs | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | i) What is the main aim of conducting structure activity relationship in drug discovery? ii) Explain occupancy theory and Rate theory? | CO4 | U | 10 |
|  | b. | i) What are the three main issues involving in drug development?  ii) What are the aims of drug design? | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | i) What are hard drugs & soft drugs?  ii) Write six objectives of prodrug design? | CO5 | U | 10 |
|  | b. | i)What are ideal characteristics and applications of artificial enzymes? ii) Define therapeutic index and write therapeutic index formula for animals? | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write structural formula for the following  i) Oxyphenylbutazone ii) Levodopa iii) Cetylpyridinium chloride  iv) Chloramphenicol v) Hydralazine | CO5 | U | 10 |
|  | b. | i) Explain enzyme stimulation and enzyme inhibition with suitable example? ii) Explain how drugs are eliminated from the kidney? | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Describe the classification of cardiovascular drugs? Give the suitable example for each? | CO6 | R | 10 |
|  | b. | Define Lipophilicity, Partition Co-efficient, Electronic Ionization constant and drug receptors? | CO6 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the classification of antibiotics? Give the suitable example for each? | CO6 | R | 10 |
|  | b. | i) Write the general structure of penicillin and cephalosporins?  ii) Why cephalosporins are more stable than penicillins? | CO6 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss the methods adopted for determining the mechanism of a reaction? | CO6 | U | 10 |
|  | b. | Explain cyclodextrin, cyclophane, crown ethers as enzyme mimics. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To understand the concept of drug metabolism, gene therapy and drug resistance. |
| CO2 | To know the stages of drug discovery & drug development. |
| CO3 | To evaluate the principles of pharmacokinetics and abbreviations in medicinal chemistry. |
| CO4 | To understand the SAR, theories of drug activity & aims of drug design. |
| CO5 | To distinguish the hard and soft drugs, concept of prodrug design & testing drugs in Vivo studies. |
| CO6 | To understand the classification of antibiotics, cardiovascular drugs & physiochemical parameters.  To interpret the types of approaches used in artificial enzymes & detailed reaction mechanism. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 | 10 |  |  | 10 |  |  | 20 |
| CO3 |  |  | 10 | 20 |  |  | 30 |
| CO4 |  | 10 | 10 |  |  |  | 20 |
| CO5 |  | 20 | 10 |  |  |  | 30 |
| CO6 | 20 | 20 | 10 | 10 |  |  | 60 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3031** | **Duration :** | **3hrs** |
| **Course Name** | **NANOMATERIALS SYNTHESIS AND CHARACTERIZATION** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **CO/BL** | **Marks** |
|  |  | **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** |  |  |
| 1. | a. | Describe the various challenges of nanotechnology. | CO1 / A | 5 |
|  | b. | List out the various applications of nanotechnology. | CO1/ An | 5 |
|  | c. | Illustrate the classifications of nanostructured materials with suitable examples. | CO1 / E | 10 |
| **(OR)** | | | | |
| 2. | a. | Describe nanosized material properties different from the bulk materials and explain with suitable examples. | CO1 / E | 10 |
|  | b. | Justify nanotechnology is an interdisciplinary subject and its implications to the science subjects. | CO1 / An | 10 |
|  |  |  |  |  |
| 3. | a. | How will you prepare nano-sized particles by Top-Down approach? What will be the merits and demerits? | CO2 / A | 10 |
|  | b. | Discuss the preparation of nanoparticles using sol-gel method with diagram. | CO2/ An | 10 |
| **(OR)** | | | | |
| 4. | a. | How will you develop nano sheets by molecular beam epitaxy? | CO2 / E | 10 |
|  | b. | How will you prepare self-assembly nanofilm by Langmuir-Blodgett method? | CO2 / A | 10 |
|  |  |  |  |  |
| 5. | a. | List out the various applications of Single wall CNT. | CO3/ An | 5 |
|  | b. | Discuss the technique of functionalized carbon-based materials. | CO3 / A | 5 |
|  | c. | Elaborate VLS method for one-dimensional nanoparticles. | CO3 / E | 10 |
| **(OR)** | | | | |
| 6. | a. | Narrate the synthesis of graphene oxide and its functionalization techniques. | CO3 / E | 10 |
|  | b. | Discuss the synthesis, properties and applications of MWCNT. | CO3 / An | 10 |
|  |  |  |  |  |
| 7. | a. | Describe the various spectroscopic techniques for the characterization of nanomaterials. | CO4 / E | 10 |
|  | b. | How will you use the tool XRD for the characterizations carbon based materials? | CO4 / A | 10 |
| **(OR)** | | | | |
| 8. | a. | Illustrate the applications of TGA and DSC for the characterization of nanomaterials | CO6/ An | 10 |
|  | b. | Narrate the concept of XPS for the characterization of graphene oxide | CO5 / E | 10 |
|  | | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** |  |  |
| 9. | a. | List out the various nanomaterials used in energy applications | CO6 / E | 10 |
|  | b. | Illustrate any five nanomaterials useful for our everyday life. | CO5 / E | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize major classes of nanomaterials and chemistry behind. |
| CO2 | Describe relationships among structure & composition, physical & chemical properties. |
| CO3 | Analyze the sustainability of nanomaterials processing and applications. |
| CO4 | Apply appropriate laboratory techniques to process nanomaterials, and determine their properties. |
| CO5 | Synthesis dimension-based nanomaterials and characterization. |
| CO6 | Create the application based innovative nanomaterials. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 5 | 15 | 20 | - | 40 |
| CO2 |  |  | 20 | 10 | 10 |  | 40 |
| CO3 | - | - | 5 | 15 | 20 | - | 40 |
| CO4 | - | - | 10 | - | 10 |  | 20 |
| CO5 | - | - | - | - | 20 | - | 20 |
| CO6 | - | - | - | 10 | 10 | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3042** | **Duration** | **3hrs** |
| **Course Name** | **SUPRAMOLECULAR CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the High dilution synthesis of a macrocycle with an example. | CO1 | U | 10 |
|  | b. | Exemplify “Selectivity” with pictorial representations. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the different types of Supramolecular Interactions with examples. | CO1 | R | 10 |
|  | b. | Demonstrate the Lock and key principle and its drawback with a neat sketch. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. |  | Prepare a detailed report on crown ethers. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Elucidate the various criteria for the construction of suitable receptors for anions with examples. | CO3 | U | 20 |
|  |  |  |  |  |  |
| 5. |  | Reproduce the various methodologies involved in the synthesis of rotaxanes with pictorial representation. | CO3 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Predict the general name for the following structures  C:\Users\USER\Desktop\Picture3.png | CO4 | A | 5 |
|  | b. | Analyze the structure, properties and applications of Racks, Ladders and Grids with pictorial representations. | CO4 | An | 15 |
|  |  |  |  |  |  |
| 7. |  | Analyze the structure, catalysis property and applications of Zeolites. | CO5 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Distinguish urea and thiourea clathrates. | CO5 | U | 10 |
|  | b. | Evaluate the Metal Organic Frame works as useful materials. | CO5 | E | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Summarize the various applications of Supramolecular chemistry with examples. | CO6 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | 1. Understand the various types of bonding in supramolecular chemistry. |
| CO2 | 2. Recognize the selectivity in formation of supramolecular chemistry and catalysis. |
| CO3 | 3. Identify and design receptors for cations, anions and neutral molecules. |
| CO4 | 4. Synthesize and assemble molecular structures of different shapes and dimensions. |
| CO5 | 5. Construct supramolecular architecture based on of crystal engineering concepts. |
| CO6 | 6. Identify the application of supramolecular chemistry in appropriate fields. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | - | - | - | - | 20 |
| CO2 | 10 | 10 | - | - | - | - | 20 |
| CO3 | 20 | 20 | 20 | - | - | - | 60 |
| CO4 | - | - | 5 | 15 | - | - | 20 |
| CO5 | - | 10 | - | 20 | 10 | - | 40 |
| CO6 | - | - | 20 | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3043** | **Duration** | **3hrs** |
| **Course Name** | **ANALYTICAL CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Recall the Principle and instrumentation of HPLC. | CO1 | R | 10 |
|  | b. | Discuss the Principle, instrumentation and applications of Column Chromatography. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. |  | Explain the Principle, instrumentation and applications of Thin Layer Chromatography. | CO1 | U | 20 |
|  |  |  |  |  |  |
| 3. |  | Discuss the Principle, instrumentation and applications of IR Spectroscopy. | CO2 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 4. |  | Discuss the Finger Print region in detail with its potential applications. | CO2 | A | 20 |
|  |  |  |  |  |  |
| 5. |  | Generalize the Woodward-Fieser rules for dienes. | CO3 | A | 20 |
|  |  | **(OR)** |  |  |  |
| 6. |  | Illustrate the updated Jablonski diagram with pictorial representations. | CO4 | A | 20 |
|  |  |  |  |  |  |
| 7. |  | Analyze the applications of NMR spectroscopy in various fields. | CO4 | An | 20 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Pen down the factors affecting Chemical Shifts. | CO5 | R | 10 |
|  | b. | Discuss the Spin-spin coupling – spin spin splitting in NMR Spectroscopy. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Enlighten the principle, instrumentation and application of TGA. | CO6 | R | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Distinguish between different chromatographic techniques. |
| CO2 | Apply the appropriate technique for analysis. |
| CO3 | Attain the knowledge on analysis of any prepared compound. |
| CO4 | Utilize the proper spectroscopic technique for the characterization. |
| CO5 | Interpret the spectra obtained from various techniques. |
| CO6 | Demonstrate the thermal methods and x-ray diffraction methods of analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 30 | - | - | - | - | 40 |
| CO2 | - | 20 | 20 | - | - | - | 40 |
| CO3 | - | - | 20 | - | - | - | 20 |
| CO4 | - | - | 20 | 20 | - | - | 40 |
| CO5 | 10 | 10 | - | - | - | - | 20 |
| CO6 | 20 | - | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3044** | **Duration** | **3hrs** |
| **Course Name** | **ESSENTIALS OF FORENSIC CHEMISTRY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the analysis methods for Natural products and Rubber. | CO2 | A | 10 |
|  | b. | Distinguish the qualitative and quantitative analysis in forensic science. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Enunciate the analysis of cosmetics and their role in crime investigation. | CO1 | A | 10 |
|  | b. | Briefly discuss the preparation method of heroin and morphine. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Clarify the test methods for adulteration of petroleum products. | CO3 | U | 10 |
|  | b. | Explain the procedure involved in analysis of N, P and K. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Highlights the BIS specifications ofpetrol, kerosene and diesel, | CO3 | U | 10 |
|  | b. | Provide the forensic importance for analysis of dyes used in petroleum products. | CO1 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Debate the classification and forensic examination of NDPS. | CO4 | U | 10 |
|  | b. | Classify the alcoholic and non-alcoholic beverages. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the method for the analysis of narcotic drugs and psychotropic substances | CO4 | A | 10 |
|  | b. | Write short notes on illicit liquor and country made liquor. | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | What are chemical and instrumental methods used for systematic analysis of explosives and explosion residues. | CO5 | U | 10 |
|  | b. | Provide the characteristics of high and low explosives. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | As a Forensic scientist, explain the procedure to follow an explosion incident with suitable diagram. | CO5 | An | 10 |
|  | b. | Elaborately discuss the chemistry of Explosives. | CO5 | U | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the types of fire and fire extinguishers with suitable examples. | CO6 | U | 10 |
|  | b. | Short note on fire tetrahedron, fire point, ignition point, auto ignition point and vapour pressure. | CO6 | A | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the methods involved in forensic chemistry |
| CO2 | Realize their significance of forensic chemistry in various fields |
| CO3 | Analyze the various types of petroleum products. |
| CO4 | Realize the classification of beverages |
| CO5 | Apply the techniques of locating hidden explosives |
| CO6 | Characterize and analyze arson evidence and post-fire analysis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 10 | 10 | 10 | - | - | 30 |
| CO2 | - | - | 10 | - | - | - | 10 |
| CO3 | - | 20 | - | 10 | - | - | 30 |
| CO4 | - | 10 | 20 | 10 | - | - | 40 |
| CO5 | - | 20 | 10 | 10 | - | - | 40 |
| CO6 | - | 20 | 10 | - | - | - | 30 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3045** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC TOOLS AND TECHNIQUES** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the nature and scope of analytical chemistry. Give the classification of analytical methods. | CO1 | U | 10 |
|  | b. | Explain the law of mass action along with its examples. | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Define the following terms:   1. Scientific volume. 2. Density. 3. Specific gravity. 4. Specific volume. 5. Ratio strength. | CO2 | R | 10 |
|  | b. | Define the following terms:   1. Molarity. 2. Molality. 3. Normality. 4. Buffer solution. 5. Oxidant and reductant. | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss how to calculate the equivalence point and end point. | CO3 | U | 10 |
|  | b. | Explain the different microchemicaltests and physical tests used for qualitative analysis. | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the principle, procedure and significance of complexometric titration. | CO4 | A | 10 |
|  | b. | Explain the principle, procedure and significance of redox titration. | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe the factors affecting gravimetric analysis. | CO5 | U | 10 |
|  | b. | Write a note on basic digestion of precipitates and thermal decomposition of precipitates. | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe the theory of indicators with examples. | CO3 | U | 10 |
|  | b. | Define the following terms:   1. Iodimetry. 2. Titration. 3. Complexometry. 4. Argentometry. 5. Permanganometry. | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | Describe le chatelier and braun principle in detail with examples. | CO1 | U | 10 |
|  | b. | Give the classification of acids and bases on the basis of dissociation. | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Differentiate electrolytes and non-electrolytes. | CO2 | An | 10 |
|  | b. | Differentiate acids and bases. | An | 10 |
| **PART – B(1 X 20= 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the different types of separation methods in detail. | CO6 | A | 10 |
|  | b. | Explain the chemistry and forensic significance of phenolphthalein in bribe trap cases. | A | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the methods involved in analytical chemistry. |
| CO2 | Understand the terms used in analytical chemistry. |
| CO3 | Realize the significance qualitative analysis. |
| CO4 | Realize the importance of volumetric analysis. |
| CO5 | Understand the importance of gravimetric analysis. |
| CO6 | Apply the various types of separation methods. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 20 | 20 |  |  |  | 40 |
| CO2 | 20 |  |  | 20 |  |  | 40 |
| CO3 | 10 | 30 |  |  |  |  | 40 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 |  | 10 | 10 |  |  |  | 20 |
| CO6 |  |  | 20 |  |  |  | 20 |
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| **Course Code** | **20CH3046** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTAL METHODS OF ANALYSIS-I** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write in detail the applications of atomic absorption spectroscopy with examples. | CO1 | R | 10 |
|  | b. | Explain the types of ions produced in Mass Spectroscopy. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | i) Write differences between atomic fluorescence spectrometry and atomic emission spectrometry.  ii) Draw a neat labeled diagram for instrumentation of atomic absorption spectroscopy. | CO1 | U | 10 |
|  | b. | Discuss the forensic applications of spectroscopy. | CO1 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | What are the necessary conditions for a compound to be infrared active? | CO2 | R | 10 |
|  | b. | Explain the principle and instrumentation of UV-Visible spectroscopy. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the terms with examples a) Auxochrome b)Chromophore  c) Bathochromic shift d) Hypsochromic shift. | CO2 | R | 10 |
|  | b. | Discuss the types of electronic transitions in UV-Visible spectroscopy. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Answer the following questions  i) Explain π-π\* and n-ϭ\* transitions  ii) In uv-spectrum, the electronic band is usually broad-Justify. | CO2 | A | 10 |
|  | b. | Distinguish between the following on the basis of I.R.Spectroscopy   1. CH3CH2CHO b) CH3COCH3 | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | How will you account for the positive and negative coupling constants in NMR? | CO4 | A | 10 |
|  | b. | Explain the proton NMR for the following compound in the form of spectrum | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Discuss the applications of NMR to inorganic compounds. | CO4 | U | 10 |
|  | b. | Explain McLafferty rearrangement with two examples. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | How will you distinguish between the following isomeric esters by 1HNMR? PhCH2OCOCH3 and Ph CH2COOCH3. | CO4 | An | 10 |
|  | b. | Discuss the principle of NMR spectroscopy and explain how this technique is used in elucidating of structures of the molecules | CO4 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write the principle, instrumentation and applications of conductometry. | CO6 | A | 10 |
|  | b. | Discuss the applications of radiochemical techniques in forensic science. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the principles of atomic absorption spectroscopy. |
| CO2 | Realize the importance of UV-Visible Spectroscopy. |
| CO3 | Apply the principles , application of IR spectroscopy. |
| CO4 | Understand the principles of NMR spectroscopy. |
| CO5 | Realize the importance of radiochemical methods in forensic science. |
| CO6 | Utilize the role of electrochemical methods in forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 | 10 | 10 |  |  | 40 |
| CO2 | 20 | 20 | 10 | - |  |  | 50 |
| CO3 | - | - | - | 10 |  |  | 10 |
| CO4 | 10 | 10 | 20 | 20 |  |  | 60 |
| CO5 | - | - | - | - |  |  | 00 |
| CO6 | - | - | 10 | 10 |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3047** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED FORENSIC TOXICOLOGY AND PHARMACOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write a brief note on types of poisoning and its symptoms. | CO1 | R | 10 |
|  | b. | What are the samples to be collected for survival and fatal cases? How can it be preserved? | CO2 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Define poisons. Write its classification with flowchart and explain the types based on its mode of action. | CO2 | U | 15 |
|  | b. | Write about the areas of toxicology and the role of a forensic toxicologist. | CO1 | A | 5 |
|  |  |  |  |  |  |
| 3. | a. | Write a note on the storage of toxicants in bone, adipose tissue and fat. | CO2 | R | 10 |
|  | b. | Give a brief account on toxicity testing for acute, chronic and reproductive toxicity. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Considering your body as a single, kinetically, homogeneous unit, how will you derive the expressions for the rate of absorption, elimination and other parameters in the intravenous type? | CO3 | A | 15 |
|  | b. | Draw the flowchart of the extraction process of the drug from blood. | CO3 | R | 5 |
|  |  |  |  |  |  |
| 5. | a. | Write a note on Enzyme-Multiplied Immunoassay Technique and Fluorescence Polarization Immunoassay. | CO4 | R | 10 |
|  | b. | Give an account on Therapeutic drug monitoring. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Write note on the biological sample preparation, the process of deproteinization and deconjugation. | CO5 | A | 15 |
|  | b. | Write a short note on the spectroscopic identification of samples. | CO3 | U | 5 |
|  |  |  |  |  |  |
| 7. | a. | Give a detailed account on emergency management of a poisoned patient. | CO1 | U | 12 |
|  | b. | Write note on recovery and after care of patients. | CO5 | E | 8 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write a note on gastric lavage and induction of emesis. | CO6 | An | 15 |
|  | b. | Write the general studies and analysis of Opium. | CO4 | A | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write note on cyanogenic glycosides and its effects on processing, soaking, fermentation, storage, cooking and drying. | CO6 | U | 15 |
|  | b. | Write a note on mechanism of toxicity of aconite. | CO6 | A | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | To understand the various types of poisoning. |
| CO2 | To understand the principles of toxicology. |
| CO3 | To summarize the methods involved in toxicological analysis. |
| CO4 | To understand the methods involved in elimination of poisons. |
| CO5 | To know the pathways of drug metabolism. |
| CO6 | To summarize the types of vegetable poison. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 12 | 5 |  |  |  | 27 |
| CO2 | 10 | 15 |  | 10 |  |  | 35 |
| CO3 | 5 | 5 | 15 |  |  |  | 25 |
| CO4 | 10 | 10 | 5 |  |  |  | 25 |
| CO5 |  |  | 15 | 10 | 8 |  | 33 |
| CO6 |  | 15 | 5 | 15 |  |  | 35 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3047** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED FORENSIC TOXICOLOGY AND PHARMACOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | What is toxicology, its branches and relevance of Forensic Toxicology? | CO1 | U | 10 |
|  | b. | Write a note on Duration and Frequency of exposure with the help of dose-response curve. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Write a note on fate of poison in body and various routes of administration of poisons. | CO1 | U | 10 |
|  | b. | Write a note on Antidotes. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the various extraction methods used in toxicology. | CO3 | U | 10 |
|  | b. | Write a short note on management of Acute Poisoning. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the technique of immunoassay used in the field of Forensic Toxicology. | CO3 | A | 10 |
|  | b. | Write a note on Chromatographic techniques used in toxicology. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain Pharmacokinetics. | CO2 | A | 10 |
|  | b. | Write a note on field testing. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the classification of poisons on the basis of site and mode of action. | CO2 | R | 10 |
|  | b. | Write a short note on collection, preservation, packing and forwarding of viscera. | CO5 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Write a note on sample preparation techniques used in Forensic Toxicology. | CO3 | An | 10 |
|  | b. | Write a note on management of acute poisoning. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write a note on opium poisoning. | CO6 | A | 10 |
|  | b. | Write a note on oleander poisoning. | CO6 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Write a note on factors influencing the action of poisons. | CO6 | A | 10 |
|  | b. | Write a note on Dhatura poisoning. | CO2 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the various types of poisoning. |
| CO2 | Understand the principles of toxicology. |
| CO3 | Summarize the methods involved in toxicological analysis. |
| CO4 | Understand the methods involved in elimination of poisons. |
| CO5 | Know the pathways of drug metabolism. |
| CO6 | Summarize the types of vegetable poison. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 |  |  |  |  | 20 |
| CO2 | 10 | 20 | 10 |  |  |  | 40 |
| CO3 |  | 30 | 10 | 10 |  |  | 50 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 |  | 10 | 10 |  |  |  | 20 |
| CO6 |  |  | 30 |  |  |  | 30 |
| 10 80 80 102 | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20CH3048** | **Duration** | **3hrs** |
| **Course Name** | **INSTRUMENTAL METHODS OF ANALYSIS - II** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the following with illustration   1. Chromatogram 2. Retention factor 3. Mobile phase and stationary phase 4. Gradient elution 5. Isocratic elution | CO1 | A | 10 |
|  | b. | Explain the principle, instrumentation and forensic applications of Gas Chromatography. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Review on the forensic identification and comparison of drugs and inks using thin layer Chromatography. | CO1 | R | 10 |
|  | b. | Discuss the principle, instrumentation and forensic applications of HPLC. | CO1 | A | 10 |
| 3. | a. | (i) Distinguish gas-solid and gas-liquid chromatography.  (ii) What is partition chromatography? | CO2 | A | 10 |
|  | b. | Discuss on the principle and forensic applications of supercritical Fluid Chromatography. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the working principle and forensic applications of Capillary Electrophoresis technique. | CO2 | A | 10 |
|  | b. | How chromatography techniques used forensic evidence analysis? Explain with case studies. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Clarify the principle and forensic applications of the following   1. ICP-MS 2. GC-FTIR | CO3 | A | 10 |
|  | b. | Discuss on the principle and forensic significance of Mass spectrometry with case study. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss salient features of the following in analytical measurement systems   1. Detection Limit 2. Signal to Noise Ratio 3. Calibration of instrument 4. Accuracy | CO3 | U | 10 |
|  | b. | Explain the principle any two hyphenated techniques and their application in forensic toxicology. | CO4 | A | 10 |
| 7. | a. | Clarify the principle, instrumentation and forensic applications of Scanning Electron Microscopy. | CO5 | A | 10 |
|  | b. | Discuss the following with application in question document and latent fingerprint analysis   1. Stereo-zoom microscope 2. fluorescence microscope | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | How electron microscopy used in identification and comparison of trace evidences for forensic investigation? Explain**.** | CO5 | An | 10 |
|  | b. | Discuss the principle, instrumentation and forensic applications of Transmission Electron Microscope | CO5 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Pronounce the principle and forensic application of TGA and DSC. | CO6 | U | 10 |
|  | b. | Explain the principle and forensic scienceapplication of X-ray diffraction techniques. Provide a case study. | CO6 | E | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize the types of chromatographic techniques. |
| CO2 | Realize the importance of High Performance Liquid Chromatography. |
| CO3 | Apply the principles of mass spectrometry in forensic science. |
| CO4 | Realize the importance of hyphenated techniques. |
| CO5 | Realize the use of microscopic techniques in forensic science. |
| CO6 | Utilize the role of X-ray diffraction techniques in forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | - | 20 | 10 | - | - | 40 |
| CO2 | - | 10 | 20 | 10 | - | - | 40 |
| CO3 | - | 10 | 20 | - | - | - | 30 |
| CO4 | - | - | 10 | - | - | - | 10 |
| CO5 | - | - | 20 | 20 | - | - | 40 |
| CO6 | - | 10 | - | - | 10 | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3054** | **Duration** | **3hrs** |
| **Course Name** | **BIOCHEMISTRY AND BIOCHEMICAL APPLICATIONS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Illustrate the process of Denaturation and Renaturation with examples and its significance in Forensic Science. | CO1 | R | 10 |
|  | b. | Describe the shape and the structure of the proteins with examples and pictorial illustrations. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the various procedures involved in the Quantitative Estimation of proteins. | CO1 | U | 10 |
|  | b. | Some tissue samples are obtained from the finger nails of a victim in crime scene and are sent to your Forensic Lab. As a forensic Scientist, enlighten the significance of these evidence in forensic science? | CO1 | E | 10 |
|  |  |  |  |  |  |
| 3. | a. | List out the forensic significance of amino acids. | CO2 | A | 10 |
|  | b. | Categorize the natural amino acids with examples. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the important methods of identification of N-terminal and C-terminal residues of peptides. | CO2 | R | 10 |
|  | b. | Review the physicochemical properties of amino acids. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Recall enzyme inhibition? Discuss the various types of enzyme inhibition? | CO4 | R | 10 |
|  | b. | Distinguish the “Lock and Key” and the “Induced Fit” models of the enzyme substrate complexes with pictorial representation? | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explicate the significance of ELISA in Forensic science. Briefly discuss the steps involved in completing an ELISA immunoassay. | CO3 | U | 10 |
|  | b. | Illustrate the steps involved in Protein purification and their major roles in the field of Forensics. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Distinguish between RNA and DNA. Describe how they helps with forensic case resolution. | CO5 | An | 10 |
|  | b. | Establish the general structures of nucleotides and nucleic acids. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | b. | Discuss the DNA sequencing – PCR technique. | CO5 | U | 10 |
|  | b. | Provide an overview on the enzymatic hydrolysis and hydrolysis of nucleic acids by acids and bases. | CO5 | An | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Recommend some of the forensic application of electrophoresis with examples. | CO6 | A | 10 |
|  | b. | Demonstrate the principle and classification of electrophoresis. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the various types of biomolecules. |
| CO2 | Understand the importance of Amino acids. |
| CO3 | Summarize the composition of proteins. |
| CO4 | Understand the enzyme action. |
| CO5 | Know the role of nucleic acids. |
| CO6 | Summarize the principles of electrophoresis. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 20 |  |  | 10 |  | 40 |
| CO2 | 20 |  | 10 | 10 |  |  | 40 |
| CO3 |  | 10 | 10 |  |  |  | 20 |
| CO4 | 10 | 10 |  |  |  |  | 20 |
| CO5 |  | 20 |  | 20 |  |  | 40 |
| CO6 |  | 10 | 10 |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code:** | **20CH3057** | **Duration :** | **3hrs** |
| **Course Name :** | **FORENSIC ANALYSIS OF DRUGS** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **Course Outcome / Pattern** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | |
| 1. | a. | How do you relate chemistry of drug with the brain? | CO1 / A | 5 |
|  | b. | Drugs are good or bad, explain in terms of drug receptors. | CO1/ An | 5 |
|  | c. | List out the various schedules of drugs with their effects. | CO1 / E | 10 |
| **(OR)** | | | | |
| 2. | a. | Discuss the various forms of drug abuse and its classifications. | CO1 / E | 10 |
|  | b. | Narrate the concept of drug dependence and chemistry of addition. | CO1 / An | 10 |
|  |  |  |  |  |
| 3. | a. | Discuss the various diluents and adulterants for the storage of drugs. | CO2 / A | 10 |
|  | b. | Describe the method of storage and sample handlings of drugs. | CO2/ An | 10 |
| **(OR)** | | | | |
| 4. | a. | Discuss the drugs in sex assault. | CO2 / E | 10 |
|  | b. | Discuss the legal implications of Inhalants and Depressants. | CO2 / A | 10 |
|  |  |  |  |  |
| 5. | a. | Illustrate the harms caused by Clandestine Drug Labs. | CO3/ An | 5 |
|  | b. | Describe the fast facts of Amphetamines. | CO3 / A | 5 |
|  | c. | Give an account of various equipments in Clandestine Labs. | CO3 / E | 10 |
| **(OR)** | | | | |
| 6. | a. | Explain Designers drug and the causes of Phencyclidine (PCP). | CO3 / E | 10 |
|  | b. | Discuss the pharmacodynamics and fast facts of synthetic opioids. | CO3 / An | 10 |
|  |  |  |  |  |
| 7. | a. | Discuss the concept of polarity in TLC and GC. | CO4 / E | 10 |
|  | b. | How is a drug isolated from the natural resources? | CO4 / A | 10 |
| **(OR)** | | | | |
| 8. | a. | Summarize the various chemical extraction techniques. | CO6/ An | 10 |
|  | b. | How the spectroscopic techniques are used to identify the drugs? | CO5 / E | 10 |
|  | | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** |  |  |
| 9. | a. | Give an account of Stack and Pyramid methods. | CO6 / E | 10 |
|  | b. | What do you mean Dope test and Blood Doping? | CO5 / E | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand about drug. |
| CO2 | Summarize the illegal drugs. |
| CO3 | Realize the problems of Clandestine laboratory. |
| CO4 | Understand the methods of analysis of drugs. |
| CO5 | Understand the chemistry of drugs. |
| CO6 | Summarize the drug abuse in sports. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 5 | 15 | 20 | - | 40 |
| CO2 |  |  | 20 | 10 | 10 |  | 40 |
| CO3 | - | - | 5 | 15 | 20 | - | 40 |
| CO4 | - | - | 10 | - | 10 |  | 20 |
| CO5 | - | - | - | - | 20 | - | 20 |
| CO6 | - | - | - | 10 | 10 | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3061** | **Duration** | **3hrs** |
| **Course Name** | **ENTREPRENEURSHIP AND BUSINESS PLAN** | **Max. Marks** | **100** |

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| **ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)** |

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| **Q. No.** | **Sub Div.** | **Questions** | **CO/BL** | **Marks** |
| 1. | a. | Give a short notes on reference standards. | CO1 / A | 5 |
|  | b. | What do you mean by Biochemical standards and its uses? | CO1/ An | 5 |
|  | c. | Summarize the process for microbial cell line culture developments. | CO1 / E | 10 |
| **(OR)** | | | | |
| 2. | a. | Describe the concept of primary and secondary standards. | CO1 / E | 10 |
|  | b. | Explain matrix effects in standards and biological standards. | CO1 / An | 10 |
|  |  |  |  |  |
| 3. | a. | Give an account of the concept of inspection and testing. | CO2 / A | 10 |
|  | b. | Describe the five steps of template for making quality plan | CO2/ An | 10 |
| **(OR)** | | | | |
| 4. | a. | Illustrate the four basic principles of quality management systems. | CO2 / E | 10 |
|  | b. | Discuss how we can manage the quality – three process. | CO2 / A | 10 |
|  |  |  |  |  |
| 5. | a. | Describe the importance of ISO 17000. | CO3/ An | 5 |
|  | b. | What do you mean by confidentiality. | CO3 / A | 5 |
|  | c. | Discuss the NABL guidelines for Accreditations. | CO3 / E | 10 |
| **(OR)** | | | | |
| 6. | a. | Summarize the concept of ISO 9000 for laboratory accreditation | CO3 / E | 10 |
|  | b. | List out the advantages of accreditation. | CO3 / An | 10 |
|  |  |  |  |  |
| 7. | a. | Explain the various types of startups. | CO4 / E | 10 |
|  | b. | What is your opinion on the factors of the successful business? | CO4 / A | 10 |
| **(OR)** | | | | |
| 8. | a. | Discuss the seven steps of product planning and developments. | CO6/ An | 10 |
|  | b. | Describe the various role of project manager. | CO5 / E | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Explain the factors of project identification and formulations. | CO6 / E | 10 |
|  | b. | Summarize the basic challenges of entrepreneurships. | CO5 / E | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize various chemical standards |
| CO2 | Summarize various biological standards |
| CO3 | Understand about the quality management systems |
| CO4 | Realize the importance of various accreditation |
| CO5 | Understand the basics of entrepreneurship |
| CO6 | Apply the steps used for project management |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 5 | 15 | 20 | - | 40 |
| CO2 |  |  | 20 | 10 | 10 |  | 40 |
| CO3 | - | - | 5 | 15 | 20 | - | 40 |
| CO4 | - | - | 10 | - | 10 |  | 20 |
| CO5 | - | - | - | - | 20 | - | 20 |
| CO6 | - | - | - | 10 | 10 | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20CH3061** | **Duration :** | **3hrs** |
| **Course Name** | **ENTREPRENEURSHIP AND BUSINESS PLAN** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **CO/BL** | **Marks** |
|  |  | **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** |  |  |
| 1. | a. | Justify how standards for analysis will lead to Quality. | CO1 / A | 5 |
|  | b. | Describe how the biological standard is required for quantifications. | CO1/ An | 5 |
|  | c. | Illustrate the requirement of Primary Standards. | CO1 / E | 10 |
| **(OR)** | | | | |
| 2. | a. | Demonstrate the procedure for developing the microbial cell line culture. | CO1 / E | 10 |
|  | b. | Narrate the concept of Analytical Standards and Secondary Standards. | CO1 / An | 10 |
|  |  |  |  |  |
| 3. | a. | Explain the various components in the quality standard. | CO2 / A | 10 |
|  | b. | Discuss the different stages of the development of Quality Plan template. | CO2/ An | 10 |
| **(OR)** | | | | |
| 4. | a. | List out the importance of control of quality records. | CO2 / E | 10 |
|  | b. | Discuss the evolution of ISO 9000 and its importance. | CO2 / A | 10 |
|  |  |  |  |  |
| 5. | a. | List out the requirements for accreditations. | CO3/ An | 5 |
|  | b. | Give a short notes on ISO 17000. | CO3 / A | 5 |
|  | c. | Illustrate the various descriptions of the quality management system. | CO3 / E | 10 |
| **(OR)** | | | | |
| 6. | a. | Demonstrate the advantages of accreditations. | CO3 / E | 10 |
|  | b. | Illustrate the guidelines of NABL accreditations. | CO3 / An | 10 |
|  |  |  |  |  |
| 7. | a. | Illustrate the various concepts of Entrepreneurships. | CO4 / E | 10 |
|  | b. | List out the five structures of Entrepreneurship. | CO4 / A | 10 |
| **(OR)** | | | | |
| 8. | a. | What do you mean by startups and explain its types? | CO6/ An | 10 |
|  | b. | Narrate the significant steps of product planning and developments. | CO5 / E | 10 |
|  | | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** |  |  |
| 9. | a. | Describe the concept of a project and how to formulate it? | CO6 / E | 10 |
|  | b. | Describe your opinion to become a successful entrepreneur. Explain with various strategies. | CO5 / E | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Summarize various chemical standards. |
| CO2 | Summarize various biological standards. |
| CO3 | Understand about the quality management systems. |
| CO4 | Realize the importance of various accreditation. |
| CO5 | Understand the basics of entrepreneurship. |
| CO6 | Apply the steps used for project management. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | - | 5 | 15 | 20 | - | 40 |
| CO2 |  |  | 20 | 10 | 10 |  | 40 |
| CO3 | - | - | 5 | 15 | 20 | - | 40 |
| CO4 | - | - | 10 | - | 10 |  | 20 |
| CO5 | - | - | - | - | 20 | - | 20 |
| CO6 | - | - | - | 10 | 10 | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2002** | **Duration** | **3hrs** |
| **Course Name** | **CRIME AND SOCIETY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Crime. Explain the Marxist perspective about crime. | CO1 | R | 10 |
|  | b. | Explain the theories of crime given by Emile Durkheim and Robert Merton. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the different causes of crime in detail. | CO2 | U | 10 |
|  | b. | Explain different types of cyber crime | CO2 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Describe different types of crime happening against women. | CO3 | An | 10 |
|  | b. | Describe environmental crimes and enlist different acts related to environment. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the different types of alternative imprisonment. | CO4 | U | 10 |
|  | b. | Explain the role of media in crime and prevention. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the deterrent theory and preventive of crime in detail. | CO5 | U | 10 |
|  | b. | Explain the role of police. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Describe Crime against children. | CO2 | R | 10 |
|  | b. | Explain the section related to offences related to religion. | CO2 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Differentiate between parole and probation. | CO3 | U | 10 |
|  | b. | Explain the reformative theory of punishment along with criticism. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the role of Police. | CO6 | An | 10 |
|  | b. | Give the hierarchical setup of Indian judiciary system. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the offences related to Marriage given in the Indian Penal Code. | CO6 | U | 10 |
|  | b. | Give a brief introduction about Indian penal code and Criminal procedure code. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know the recent trends in criminology, changing profile of crime and criminals. |
| CO2 | Understand the forms and recent trends in crime. |
| CO3 | Learn the theories of Punishment and Prevention of crime. |
| CO4 | Take up the professional roles of correctional agents in agencies of criminal justice administration. |
| CO5 | Understand the social and governmental regulations with regard to crime. |
| CO6 | Understand about Indian judicial system. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 | 10 | 10 |  | 20 |  |  | 40 |
| CO3 |  | 10 |  | 30 |  |  | 40 |
| CO4 |  | 10 | 10 |  |  |  | 20 |
| CO5 |  | 10 | 10 |  |  |  | 20 |
| CO6 |  | 30 |  | 10 |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2005** | **Duration** | **3hrs** |
| **Course Name** | **INDIAN CONSTITUTION, FUNDAMENTAL LAWS AND PROCEDURE** | **Max. Marks** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **CO** | **BL** | **Marks** |
|  |  | **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** |  |  |  |
| 1. | a. | Define crime and explain the essential elements of crime with examples. | CO1 | U | 10 |
|  | b. | Explain the Constitution of Criminal Courts under the Code of Criminal Procedure. | CO1 | U | 10 |
|  | | **(OR)** | | | |
| 2. | a. | Discuss the meaning of bailable offenses, and compare bailable and non-bailable offenses with an example. | CO1 | R | 10 |
|  | b. | With examples, explain the exceptions under culpable homicide not amounting to murder under the Indian Penal Code. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | With the help of illustrations explain different types of grievous hurt. | CO2 | U | 10 |
|  | b. | Explain the offense of kidnapping under the Indian Penal Code, and illustrate with an example the difference between kidnapping and abduction | CO2 | U | 10 |
|  | | **(OR)** | | | |
| 4. | a. | Define the following offenses against property with an illustration under the Indian Penal Code:   1. Criminal Breach of trust 2. Cheating 3. Criminal Trespass 4. Forgery | CO2 | R | 10 |
|  | b. | Brief the principles of relevancy and admissibility under the Indian Evidence Act with examples. | CO3 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Crime scene investigators are highly skilled in the investigation and collection of evidence. Brief the types of evidence usually used for conviction of a crime. | CO3 | U | 10 |
|  | b. | The Indian Evidence Act explains the order of examination of a witness in a court of law. | CO3 | U | 10 |
|  | | **(OR)** | | | |
| 6. | a. | Explain the fundamental right of every citizen, and list the rights that Article 21 covers based on court judgements. Is Right to Life an absolute right? | CO4 | U | 10 |
|  | b. | The Constitution guarantees that all citizens will be equal before law. Do you agree that there is equality before law for all the citizens in the real sense of the term?  Do you think that reservation of posts for Scheduled Castes, Scheduled Tribes and Other Backward Classes is necessary? Analyze | CO4 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Under Article 48A of the constitution, the State should protect the wildlife and forest of our country. Towards achieving it what are the legal reforms laid down by the government? | CO5 | U | 10 |
|  | b. | The Dowry Prohibition (Amendment) Act prescribespunishment for making any agreement regarding giving or taking dowry. Summarize the legal provisions of the Dowry Prohibition Act in controlling dowry deaths in India. | CO5 | U | 10 |
|  | | **(OR)** | | | |
| 8. | a. | Summarize the punishable offenses committed against untouchability and the punishment imposed under the Untouchability Offences Act. | CO5 | U | 10 |
|  | b. | A national-level survey carried out by the Food Safety and Standards Authority of India (FSSAI) has found that adulteration, and higher than the permissible level of antibiotic residues in milk remain a problem in the country. Brief the measures are taken by the government to control such food adulteration under the Food Adulteration Act with examples. | CO5 | U | 10 |
|  | | **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** |  |  |  |
| 9. | a. | The Constitution makers gave the **preamble** "the place of pride". Explain the ideals and aspirations in the Constitution for which the country had struggled during the British period. | CO4 | R | 10 |
|  | b. | Swaran Singh Committee in 1976 recommended Fundamental Duties, the necessity of which was felt during the internal emergency of 1975-77. List all the **fundamental duties** of every citizen under the Indian Constitution. | CO4 | R | 10 |

CO – COURSE OUTCOME BL – BLOOMS’ LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand various types of crime laws. |
| CO2 | Understand section laws. |
| CO3 | Understand witness related laws. |
| CO4 | Know the principles and basics of the Indian constitution. |
| CO5 | Recognize social crimes. |
| CO6 | Recognize environmental crimes. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 20 | - | - | - | - | 30 |
| CO2 | 10 | 30 | - | - | - | - | 40 |
| CO3 |  | 30 | - | - | - | - | 30 |
| CO4 | 20 | 10 | - | 10 | - | - | 40 |
| CO5 |  | 40 | - | - | - | - | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2006** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC DERMATOGLYPHICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the History of fingerprints in detail. | CO1 | R | 10 |
|  | b. | Describe the fundamental principles of fingerprints. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Give the forensic significance of Poroscopy and Edgeoscopy. | CO2 | U | 10 |
|  | b. | Explain the Automated Fingerprint Identification System. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the method of recording fingerprints from suspects and from the crime scene. | CO3 | A | 10 |
|  | b. | Explain the process of recording fingerprints from the deceased person. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the primary classification of fingerprints. | CO4 | U | 10 |
|  | b. | Explain the final, key and major classification of fingerprints. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the different physical methods for the development of latent fingerprints. | CO5 | A | 10 |
|  | b. | Explain the mechanism of detection of fingerprints by different developing reagents. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Give the forensic significance of footprints and ear prints. | CO6 | U | 10 |
|  | b. | Explain the nature, location and collection method for lip prints. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the collection and preservation methods for fingerprint evidence. | CO3 | A | 10 |
|  | b. | Explain the different patterns of fingerprints. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the different types of fingerprints. | CO1 | U | 10 |
|  | b. | Explain the digital imaging process for the enhancement of fingerprints. | CO5 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the classification of lip prints given by Suzuki and Tsuchihashi. | CO6 | U | 10 |
|  | b. | Explain the collection method for footprint evidence. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the fundamental principles on which the science of fingerprinting is based. |
| CO2 | Learn the importance of fingerprints. |
| CO3 | Learn the methods of recording fingerprints. |
| CO4 | Summarize the methods of classifying criminal records by fingerprints. |
| CO5 | Understand the ways of physical and chemical techniques of developing fingerprints on the crime  Scene evidence. |
| CO6 | The significance of foot, palm, ear and lip prints. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 10 |  |  |  |  | 30 |
| CO2 | 10 | 20 |  |  |  |  | 30 |
| CO3 |  |  | 30 |  |  |  | 30 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 |  |  | 30 |  |  |  | 30 |
| CO6 |  | 30 | 10 |  |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2011** | **Duration** | **3hrs** |
| **Course Name** | **QUESTIONED DOCUMENTS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write a note on basic tools used for questioned document examination. | CO1 | A | 10 |
|  | b. | Write a note on preliminary examination of questioned document. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain how IR spectroscopy will be useful in questioned document examination. | CO2 | U | 10 |
|  | b. | Explain how to develop indented writing using Electrostatic Detection Apparatus along with its forensic application. Explain the working and principle. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Elaborate class and individual characteristics of handwriting. | CO3 | E | 10 |
|  | b. | Explain the process of obtaining the formal and informal exemplars and mention the merits and demerits of the same. | CO3 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss types of alterations in documents in details. | CO4 | An | 10 |
|  | b. | Elaborate the restoration and decipherment of handwriting from the charred document. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Write a note on:   * Disguised writing * Anonymous letters | CO5 | R | 10 |
|  | b. | Discuss types of forgeries in detail. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain Video Spectral Comparator with its forensic applications. | CO2 | U | 10 |
|  | b. | Discuss how to determine the age of the document. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Elaborate types of printing processes. | CO4 | R | 10 |
|  | b. | Describe and compare the types of printers with their examples. |  | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the examination of security documents. | CO6 | An | 10 |
|  | b. | Describe the examination of printed document. | CO6 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the security features of currency note Rs. 100. | CO6 | R | 10 |
|  | b. | Explain the security features of currency note Rs. 200. | CO6 | R | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Choose the correct method to examine the questioned documents. |
| CO2 | Apply various method to analyze questioned documents. |
| CO3 | Compare the questioned documents with standards. |
| CO4 | Analyze the questioned documents of various types. |
| CO5 | Identify the different types of forgery in the documents. |
| CO6 | Examine the documents that has forgery. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 20 |  |  |  | 20 |
| CO2 | 10 | 20 | 10 |  |  |  | 40 |
| CO3 |  |  |  |  | 20 |  | 20 |
| CO4 | 10 |  | 10 | 10 | 10 |  | 40 |
| CO5 | 20 |  |  |  |  |  | 20 |
| CO6 | 20 |  | 10 | 10 |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2014** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC BIOLOGY AND SEROLOGY-I** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Give a detailed note on composition and functions of blood. | CO1 | U | 10 |
|  | b. | Distinguish between human and non-human blood. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the collection and tests for identification of semen. | CO2 | U | 10 |
|  | b. | Give a detailed note on composition, functions and morphology of spermatozoa along with a diagram. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the presumptive and confirmatory tests of urine sample. | CO3 | U | 10 |
|  | b. | Explain the presumptive and confirmatory tests of saliva sample. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe ABO blood group system. | CO4 | U | 10 |
|  | b. | Explain the procedure of sexual assault case investigation. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | With the flowchart explain the types of bloodstain patterns. | CO5 | R | 10 |
|  | b. | Explain the presumptive tests for blood sample. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Compare extracellular and intracellular enzymes with examples. | CO4 | U | 10 |
|  | b. | Define the types of impact bloodstain patterns. | CO4 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | What are the different types of antibodies present in human body? | CO4 | R | 10 |
|  | b. | Give the confirmatory tests for blood samples. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the immunochromatographic assay for blood sample with diagrammatic representation. | CO1 | U | 10 |
|  | b. | Explain the immunochromatographic assay for urine sample with diagrammatic representation. | CO3 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the documentation of bloodstain pattern evidence. | CO6 | U | 10 |
|  | b. | Explain the crime scene reconstruction with the aid of bloodstain pattern analysis. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand importance of blood fluids in forensic science. |
| CO2 | Understand the significance of forensic semen. |
| CO3 | Understand the importance of other body fluids in forensic science. |
| CO4 | Analyze genetic markers and fluid stain patterns. |
| CO5 | Document crime scene. |
| CO6 | Document crime scene. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 30 | 10 |  |  |  | 50 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 30 |  |  |  |  | 30 |
| CO4 | 20 | 30 |  |  |  |  | 50 |
| CO5 | 10 |  |  |  |  |  | 10 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **20FS2014** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC BIOLOGY AND SEROLOGY-I** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | State the composition of blood. | CO1 | R | 10 |
|  | b. | Explain the preliminary examination of blood. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Discuss the different forensic tests used for the identification of seminal fluid. | CO2 | U | 10 |
|  | b. | Explain the principles behind forensic tests used to confirm the presence of spermatozoa in a stain. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Apply the relevant tests to confirm if a stain on a cloth piece collected from a crime scene is urine. | CO3 | A | 10 |
|  | b. | Explain the forensic significance of sweat and its examination. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the different types of genetic markers used in forensic investigations and their significance. | CO4 | U | 10 |
|  | b. | Apply the ABO blood group identification test to determine the blood group of a sample. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Describe the different stages involved in crime scene reconstruction. | CO5 | R | 10 |
|  | b. | Apply the appropriate techniques to reconstruct bloodstain patterns at a crime scene. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Apply the appropriate tests to perform the confirmatory examination of blood. | CO1 | A | 10 |
|  | b. | Describe the tests used to differentiate human blood from animal blood. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | State the composition of seminal fluid and the function of each component. | CO2 | R | 10 |
|  | b. | Apply the appropriate techniques to perform the forensic tests for the analysis of seminal fluid. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the composition of saliva and its physiological roles. | CO3 | R | 10 |
|  | b. | Discuss the importance of human milk in forensic investigations and the different components of human milk. | CO3 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the characteristics of blood. | CO4 | R | 10 |
|  | b. | Explain the different steps involved in investigating a sexual assault case, including the collection and analysis of evidence. | CO4 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand importance of blood fluids in forensic science |
| CO2 | Understand the significance of forensic semen |
| CO3 | Understand the importance of other body fluids in forensic science |
| CO4 | Analyze genetic markers and fluid stain patterns. |
| CO5 | Document crime scene |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 20 | 10 |  |  |  | 40 |
| CO2 | 10 | 20 | 10 |  |  |  | 40 |
| CO3 | 20 | 10 | 10 |  |  |  | 40 |
| CO4 | 10 | 20 | 10 |  |  |  | 40 |
| CO5 | 10 |  | 10 |  |  |  | 20 |
| CO6 |  |  |  |  |  |  |  |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **20FS2016** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC BALLISTICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Outline the firearm and explain the function of each parts of a firearm in detail. | CO1 | A | 15 |
|  | b. | Classify firearm actions and expound any two of them. | CO1 | An | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Summarize the internal ballistics of a firearm in depth. | CO1 | U | 15 |
|  | b. | Illustrate the ballistic trajectory in an external ballistics. | CO1 | A | 5 |
|  |  |  |  |  |  |
| 3. | a. | Identify the different part of the ammunition and explain about each component with neat sketch. | CO2 | U | 15 |
|  | b. | Discuss about the gun powders in detail. | CO2 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Categories the bullets based on manufacturing and shape. Illustrate them in detail. | CO3 | An | 15 |
|  | b. | Give a short note on anvil. | CO3 | A | 5 |
|  |  |  |  |  |  |
| 5. | a. | Summarize the investigation procedures for country made firearms. | CO4 | An | 15 |
|  | b. | Categorize the home made firearms and discuss the materials used for its construction. | CO4 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Summarize the firing marks on bullet and cartridges formed during firing process. | CO4 | 15 | An |
|  | b. | Illustrate the following.   1. Riffles 2. Shot guns | CO4 | 5 | R |
|  |  |  |  |  |  |
| 7. | a. | Demonstrate the formation mechanism, compositions and evidence collection of Gunshot residue. | CO5 | A | 15 |
|  | b. | Differentiate electron microscope from optical microscope. | CO5 | E | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Sketch the working mechanism of SEM and discuss the analysis of GSR through SEM images. | CO5 | A | 15 |
|  | b. | Give a short note on working of EDAX. | CO5 | An | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss about wound ballistics in detail. | CO6 | U | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the detailed classification of firearms. |
| CO2 | Learn types of ammunition and headstamp markings on ammunitions. |
| CO3 | Classify various kinds of firing marks. |
| CO4 | Know the types of firearm evidences |
| CO5 | Understand the mechanism of formation of gunshot residues |
| CO6 | Identify the nature of fireman injuries. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 15 | 20 | 5 |  |  | 40 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  |  | 5 | 15 |  |  | 20 |
| CO4 | 10 |  |  | 30 |  |  | 40 |
| CO5 |  |  | 30 | 5 | 5 |  | 40 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2016** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC BALLISTICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Draw the schematic of firearm with its parts and give details about the function of each parts of a firearm. | CO1 | A | 15 |
|  | b. | Discuss any two types of firearm action with diagram. | CO1 | An | 5 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the following in the case of external ballistics   1. Ballistics trajectory 2. Characteristics of vacuum trajectory 3. Factors affecting range in vacuum trajectory | CO1 | U | 15 |
|  | b. | Brief about lock time, ignition time and barrel time of internal ballistics. | CO1 | A | 5 |
|  |  |  |  |  |  |
| 3. | a. | List the components of ammunition and illustrate each of them with neat sketch. | CO2 | U | 15 |
|  | b. | Discuss the primer and priming compounds. | CO2 | U | 5 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Summarize the firing marks on bullet and cartridges formed during firing process. | CO3 | An | 15 |
|  | b. | Classify the bullets based on manufacturing and shape. | CO3 | A | 5 |
|  |  |  |  |  |  |
| 5. | a. | Summarize the characteristics, evidence collection, investigation, evaluation and identification of country made firearms. | CO4 | An | 15 |
|  | b. | Categorize the home made firearms and discuss the materials used for its construction. | CO4 | R | 5 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the comparison of bullets via computer-based method. | CO4 | An | 15 |
|  | b. | Make clear about zip guns and pen guns. | CO4 | R | 5 |
|  |  |  |  |  |  |
| 7. | a. | Describe the following regarding gunshot residues   1. Mechanism of formation 2. Types of GSR 3. Collection of GSR | CO5 | A | 15 |
|  | b. | Differentiate electron microscope and optical microscope. | CO5 | E | 5 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Demonstrate the gunshot residue analysis using scanning electron microscope with neat sketch. | CO5 | A | 15 |
|  | b. | Elucidate the working of EDAX in elemental analysis of GSR. | CO5 | An | 5 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | List the types of firearm injuries and interpret them with a neat report. | CO6 | U | 15 |
|  | b. | Compare smudging ad tattooing. | CO6 | An | 5 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the detailed classification of firearms. |
| CO2 | Learn types of ammunition and headstamp markings on ammunitions. |
| CO3 | Classify various kinds of firing marks. |
| CO4 | Know the types of firearm evidences |
| CO5 | Understand the mechanism of formation of gunshot residues |
| CO6 | Identify the nature of fireman injuries. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 15 | 20 | 5 |  |  | 40 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  |  | 5 | 15 |  |  | 20 |
| CO4 | 10 |  |  | 30 |  |  | 40 |
| CO5 |  |  | 30 | 5 | 5 |  | 40 |
| CO6 |  | 15 |  | 5 |  |  | 20 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20FS2019** | **Duration** | **3hrs** |
| **Course Name** | **CYBER CRIMES AND CYBER FORENSICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Describe the concept of CHS and LBA addressing. | CO1 | R | 10 |
|  | b. | State four functions of an operating system with suitable examples. . | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Design a Manchester encoding pattern for the initial of your name. Mention the encoding type to which the Manchester encoding belongs. | CO1 | C | 10 |
|  | b. | Differentiate between fixed and removable storage devices with suitable examples. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. |  | Define a virus. Examine its parts and phases. Classify it based on the concealment strategy. | CO2 | R | 20 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain Logic Bombs and Super zapping in detail. | CO3 | U | 10 |
|  | b. | Write a suitable case study related to common cybercrime. | CO3 | C | 10 |
|  |  |  |  |  |  |
| 5. |  | Illustrate spamming and computer stalking in detail. | CO3 | U | 20 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Define computer terrorism and hate speech with suitable examples. | CO3 | R | 10 |
|  | b. | Classify the types of cyberattacks. How can these cyberattacks hurt national security? | CO3 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Identify the password-cracking tools that are existing in the Windows and Linux operating systems with an explanation of any five password-cracking techniques. | CO6 | R | 10 |
|  | b. | Illustrate the data forensics process with a suitable explanation. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. |  | Predict the various phases involved in seizing and handling digital evidence. | CO4 | U | 20 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Determine the protocols to be taken at the cybercrime scene. | CO5 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Know the principle of operation of computer hardware and accessories. |
| CO2 | Understand the types of computer crimes. |
| CO3 | Know crimes related to intellectual property rights, computer terrorism and hacking. |
| CO4 | Understand the concept of collecting of magnetic data. |
| CO5 | Know about extraction of information from the hard disk. |
| CO6 | Understand the principle of restoration of deleted files, encryption and decryption methods. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 10 | - | - | - | 10 | 40 |
| CO2 | 20 | - | - | 10 | - | - | 30 |
| CO3 | 10 | 40 | - | - | - | - | 50 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | - | - | 30 | - | - | - | 30 |
| CO6 | 10 | - | - | - | - | - | 10 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS2020** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF FORENSIC PSYCHOLOGY** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define psychology and discuss its major fields. | CO1 | R | 10 |
|  | b. | Describe the historical background and perspectives of psychology. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Critically analyze some of the professional and ethical issues in psychology. | CO1 | An | 10 |
|  | b. | Explain the different methods of research that can be undertaken in psychology. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Elucidate the type theory of personality. | CO1 | U | 10 |
|  | b. | Describe the Big Five Factor Model. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss the psychoanalytic views of human mind, division of personality, and stages of personality development. | CO1 | U | 15 |
|  | b. | Distinguish Introvert and Extrovert with an example. | CO1 | An | 5 |
|  |  |  |  |  |  |
| 5. | a. | Outline the role of forensic psychologist in a Justice System. | CO2 | A | 10 |
|  | b. | Point out the ethical and legal issues in forensic practice. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Elucidate the different types on mental disorders in detail with an example. | CO2 | U | 10 |
|  | b. | Define: Criminal Profiling and Elucidate the need and goals of criminal profiling in the Justice System. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | Critically analyze the psychology behind terrorism. | CO4 | An | 10 |
|  | b. | Contrast organized and disorganized killing with an example. | CO5 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Discuss any two psychological theories of criminal behavior. | CO4 | A | 10 |
|  | b. | Explain the types of personality disorders that fall in the Cluster B. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Inspect how BEOS test is conducted in assessing the guilt. | CO6 | A | 10 |
|  | b. | Defend the need of interviewing in forensic assessment and describe in detail the process of interview technique. | CO5 | E | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Overview of forensic psychology and its applications. |
| CO2 | Explain legal aspects of forensic psychology. |
| CO3 | Describe the significance of criminal profiling. |
| CO4 | Outline the importance of psychological assessment in gauging criminal behaviour. |
| CO5 | Illustrate the tools and techniques required for detection of deception. |
| CO6 | Demonstrate the critical assessment of advanced forensic techniques like polygraph, nacroanalysis and brain electrical oscillation signatures. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 45 |  | 15 |  |  | 80 |
| CO2 |  | 10 | 20 |  |  |  | 30 |
| CO3 |  |  | 10 |  |  |  | 10 |
| CO4 |  | 10 | 10 | 10 |  |  | 30 |
| CO5 |  |  |  | 10 | 10 |  | 20 |
| CO6 |  |  | 10 |  |  |  | 10 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS2020** | **Duration** | **3hrs** |
| **Course Name** | **FUNDAMENTALS OF FORENSIC PSYCHOLOGY** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Critically analyze whether we can consider psychology as science? Support your answer with appropriate justifications. | CO1 | An | 10 |
|  | b. | Enumerate the goals of psychology and characteristics of behaviour. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Elucidate the different type’s psychological professionals in the field of psychology. | CO1 | U | 10 |
|  | b. | Debate on some of the professional and ethical issues in psychology. | CO1 | E | 10 |
|  |  |  |  |  |  |
| 3. | a. | Discuss the psychoanalytic theory of personality of Sigmund Freud in detail. | CO1 | U | 10 |
|  | b. | Explain any five defense mechanisms given by the psychoanalytical theory of personality. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the humanistic approach to personality and explain Maslow’s theory to support your view with a diagram. | CO2 | A | 10 |
|  | b. | Point out the different types of trait theory according to Allport. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Define: Forensic Psychology and Describe the scope of forensic psychology. | CO2 | A | 10 |
|  | b. | Contrast Criminal and Victim behaviors with an example. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Examine the importance of eye witnessing testimony in the court system. | CO4 | A | 10 |
|  | b. | Discuss any two psychological theories of criminal behavior. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Describe the risk factors that contribute to a young person becoming a deviant or a criminal in your opinion. | CO4 | An | 10 |
|  | b. | Detail your understanding in criminal behaviour and describe its characteristics. | CO4 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the following:  a) Antisocial Personality disorder  b) Serial murderers | CO5 | U | 10 |
|  | b. | Examine whether biological, psychological, and social factors influence juvenile offenders' criminal behaviour. | CO5 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Imagine, you have been asked to conduct the polygraph test to find out the truth. Discuss how you would conduct the test. | CO6 | A | 10 |
|  | b. | Critically analyze the physical and psychological symptoms the guilt would be showing while assessing them. | CO5 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Overview of forensic psychology and its applications. |
| CO2 | Explain legal aspects of forensic psychology. |
| CO3 | Describe the significance of criminal profiling. |
| CO4 | Outline the importance of psychological assessment in gauging criminal behaviour. |
| CO5 | Illustrate the tools and techniques required for detection of deception. |
| CO6 | Demonstrate the critical assessment of advanced forensic techniques like polygraph, nacroanalysis and brain electrical oscillation signatures. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 40 | 10 | 10 | 10 |  | 70 |
| CO2 |  |  | 20 |  |  |  | 20 |
| CO3 |  |  |  | 20 |  |  | 20 |
| CO4 |  |  | 20 | 10 |  |  | 30 |
| CO5 |  | 10 | 10 | 10 |  |  | 30 |
| CO6 |  |  | 10 |  |  |  | 10 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20FS2021** | **Duration** | **3hrs** |
| **Course Name** | **CRIME SCENE INVESTIGATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define crime scene. Explain different types of crime scenes. | CO1 | R | 10 |
|  | b. | Enlist the elements of crime and explain the causes of committing the crime. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe different methods for crime scene sketching. | CO2 | U | 10 |
|  | b. | Describe the different methods of documenting a crime scene. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the different methods of searching the evidence at crime scene. | CO3 | U | 10 |
|  | b. | Explain the procedure for documenting statements from victims, witnesses and suspects. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the collection and packaging for impressions. | CO4 | A | 10 |
|  | b. | Explain the collection and packaging method for trace evidences. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Define crime scene reconstruction. Explain how it helps in solving the crime. | CO5 | A | 10 |
|  | b. | Explain the principles of crime scene reconstruction. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the salient features of Indian penal code. | CO1 | R | 10 |
|  | b. | Explain the role of medico-legal experts. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Describe the duties of first responding officer. | CO2 | U | 10 |
|  | b. | Explain the classification of evidence. Give an example of each. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe the measures taken for officer safety, emergency care, secure and control at the crime scene. | CO3 | U | 10 |
|  | b. | Describe the different methods of photography used in crime scene management. | CO3 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the different steps of crime scene reconstruction. | CO6 | U | 10 |
|  | b. | Describe different evidences collected from crime scene for the identification of human with their forensic significance. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Know the reasons for committing crime and types of crime scenes. |
| CO2 | Understand the objectives of documentation and evidence classification. |
| CO3 | Know the methods relevant to crime scene documentation. |
| CO4 | Understand the methodology of collecting, packaging and preservation of evidences. |
| CO5 | Understand the concepts of crime scene reconstruction. |
| CO6 | Know about stages of crime scene reconstruction. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 20 |  |  |  |  | 40 |
| CO2 | 10 | 30 |  |  |  |  | 40 |
| CO3 |  | 30 | 10 |  |  |  | 40 |
| CO4 |  |  | 20 |  |  |  | 20 |
| CO5 | 10 |  | 10 |  |  |  | 20 |
| CO6 |  | 10 | 10 |  |  |  | 20 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20FS2022** | **Duration** | **3hrs** |
| **Course Name** | **DNA TYPING** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain different DNA extraction methods. | CO1 | U | 10 |
|  | b. | Explain slot blot quantitation. | CO2 | U | 10 |
|  |  | **(OR)** |  |  | 10 |
| 2. | a. | Explain the biochemistry of DNA with diagram. | CO1 | U | 10 |
|  | b. | Differentiate between VNTR and STR. | CO3 | U | 10 |
| 3. | a. | Differentiate between mitochondrial and nuclear DNA. | CO4 | U | 10 |
|  | b. | Explain Sanger Sequencing with diagrams. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss single sequence polymorphism and its deleterious effects with an example. | CO3 | U | 10 |
|  | b. | Write a case study on the role of DNA in identifying missing bodies. | CO4 | R | 10 |
| 5. | a. | Analyze and interpret the DNA typing result provided below. Is the result inclusive or exclusive?    **Table1** | CO4 | An | 10 |
|  | b. | Write a report on the basis of the details provided in the Table 1**.** | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the mechanism of DNA analyzer with diagram. | CO5 | U | 10 |
|  | b. | Explain agarose gel electrophoresis. | CO5 | U | 10 |
| 7. | a. | Summarize Polymerase chain reaction with diagram. | CO3 | U | 10 |
|  | b. | List out types of PCR and explain any three types. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Describe STR analysis with diagram. | CO4 | U | 10 |
|  | b. | Differentiate between coding and non- coding DNA. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss the Law of Independent Assortment. | CO6 | U | 10 |
|  | b. | Explain Hardy Weinberg equilibrium. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the basic principle of DNA analysis. |
| CO2 | Apply the forensic significance of DNA typing. |
| CO3 | Understand the importance of short tandem repeats and restriction fragment length polymorphism in DNA technique. |
| CO4 | Comprehend the principles of parentage testing. |
| CO5 | Write a detailed report on DNA typing. |
| CO6 | Analyse the probability determination in a population database. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 |  |  |  |  | 20 |
| CO2 |  | 10 |  |  |  |  | 10 |
| CO3 | 10 | 40 |  |  |  |  | 50 |
| CO4 | 10 | 30 |  | 10 |  |  | 50 |
| CO5 | 10 | 20 |  |  |  |  | 30 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| **Course Code** | **20FS2022** | **Duration** | **3hrs** |
| **Course Name** | **DNA TYPING** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Justify: DNA as biological blueprints of life. | CO1 | U | 10 |
|  | b. | Explain the method of DNA extraction by Phenol-Chloroform. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Extend the collection of DNA specimens from crime scene. | CO2 | U | 10 |
|  | b. | Give a detailed note on magnetic bead DNA extraction method with diagrammatic representation. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain Polymerase Chain Reaction along with its applications. | CO3 | U | 10 |
|  | b. | Describe the procedure of RFLP in detail. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Elaborate “Touch DNA” along with its collection and extraction. | CO4 | U | 10 |
|  | b. | Interpret the role of fluorescent dyes in STR analysis. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Distinguish Short Tandem Repeats from Variable Number of Tandem Repeats. | CO3 | A | 10 |
|  | b. | Recall the principles of heredity. | CO4 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Summarize the case study on “Touch DNA”. | CO5 | U | 10 |
|  | b. | What is the FTA paper method of DNA extraction? | CO1 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | How is sequence analysis of mt-DNA performed? | CO1 | R | 10 |
|  | b. | Give the structure of DNA. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the Single Nucleotide Polymorphisms with a proper example. | CO1 | U | 10 |
|  | b. | How will you quantify the DNA? | CO3 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the role of DNA typing in identifying unrecognizable bodies. | CO6 | U | 10 |
|  | b. | Give a detailed explanation of Allele frequency determination along with Hardy-Weinberg Law. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | recognize the basic principle of DNA analysis. |
| CO2 | apply the forensic significance of DNA typing. |
| CO3 | understand the importance of short tandem repeats and restriction fragment length polymorphism in DNA technique |
| CO4 | comprehend the principles of parentage testing |
| CO5 | write a detailed report on DNA typing |
| CO6 | analyze the probability determination in a population database |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 30 | 30 |  |  |  |  | 60 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 30 | 10 |  |  |  | 40 |
| CO4 | 10 | 20 |  |  |  |  | 30 |
| CO5 |  | 10 |  |  |  |  | 10 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20FS2023** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC MEDICINE** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the steps involved in crime scene management. | CO1 | U | 10 |
|  | b. | Explain dying declaration and its significance in criminal justice system. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the factors affecting the witness testimony. | CO2 | U | 10 |
|  | b. | Summarize the role of forensic team at a crime scene. | CO2 | U | 10 |
| 3. | a. | Classify and define injuries based on the occurrence and origin. | CO3 | A | 10 |
|  | b. | Elaborate the method of exhumation. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give a detailed note on abrasions. | CO4 | R | 10 |
|  | b. | Describe the types of brain death and clinical criteria of brain death. | CO4 | U | 10 |
| 5. | a. | 15-year-old female drowned in sea. Explain the causes of her death as a forensic expert? | CO5 | U | 10 |
|  | b. | How will you distinguish between sea water drowning and freshwater drowning? | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain sexual offences, its types and relevance of section 375 and subsections of 376. | CO3 | U | 10 |
|  | b. | Explain in a systematic manner about the artificial injuries. | CO4 | U | 10 |
| 7. | a. | Explain the stages of decomposition. | CO6 | U | 10 |
|  | b. | Write a case study on dowry death. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Differentiate between ante mortem and post mortem injuries. | CO4 | U | 10 |
|  | b. | Describe the factors affecting the psychological state of a victim. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the late post mortem changes. | CO6 | U | 10 |
|  | b. | Elaborate rigor, livor and algor mortis. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
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|  | **COURSE OUTCOMES** |
| CO1 | Do the duties of the first responding officer who receives a call on homicide or suicide case. |
| CO2 | Practice the steps involved in processing the death scene. |
| CO3 | Explore the crime scene management in death cases. |
| CO4 | Understand the process of collecting and documenting the evidences in death cases. |
| CO5 | Realise the importance of autopsy. |
| CO6 | To understand the changes happening after death. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 |  |  |  |  | 20 |
| CO2 |  | 30 |  |  |  |  | 30 |
| CO3 | 10 | 10 | 10 |  |  |  | 30 |
| CO4 | 10 | 30 |  |  |  |  | 40 |
| CO5 |  | 30 |  |  |  |  | 30 |
| CO6 |  | 30 |  |  |  |  | 30 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS2023** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC MEDICINE** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Discuss the role of a forensic expert at a crime scene. | CO1 | U | 10 |
|  | b. | Explain magistrate innquest and its significance in criminal justice system. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the factors affecting the witness testimony. | CO2 | U | 10 |
|  | b. | Summarize the role of forensic team at a crime scene. | CO2 | U | 10 |
| 3. | a. | Classify and define injuries based on the occurrence and origin. | CO3 | A | 10 |
|  | b. | Elaborate the procedure for digging out buried bodies and second autopsy. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give a detailed note on lacerations. | CO4 | R | 10 |
|  | b. | Describes types of death and clinical criteria of death. | CO4 | U | 10 |
| 5. | a. | Explain causes of death in drowning cases. | CO5 | U | 10 |
|  | b. | How will you distinguish between sea water drowning and freshwater drowning? | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain sexual offences, its types and relevant sections. | CO3 | U | 10 |
|  | b. | Write a note on age of injuries. | CO4 | U | 10 |
| 7. | a. | Explain late post mortem changes. | CO6 | U | 10 |
|  | b. | Write a case study on drowning. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Differentiate between injuries produced before and after death. | CO4 | U | 10 |
|  | b. | Explain Brain death and its types. | CO5 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the role of blow fly in decomposition. | CO6 | U | 10 |
|  | b. | Elaborate the early postmortem changes. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | do the duties of the first responding officer who receives a call on homicide or suicide case |
| CO2 | practice the steps involved in processing the death scene |
| CO3 | explore the crime scene management in death cases |
| CO4 | understand the process of collecting and documenting the evidences in death cases |
| CO5 | realise the importance of autopsy |
| CO6 | to understand the changes happening after death |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 |  |  |  |  | 20 |
| CO2 |  | 30 |  |  |  |  | 30 |
| CO3 | 10 | 10 | 10 |  |  |  | 30 |
| CO4 | 10 | 30 |  |  |  |  | 40 |
| CO5 |  | 30 |  |  |  |  | 30 |
| CO6 |  | 30 |  |  |  |  | 30 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2024** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC ANTHROPOLOGY AND ODONTOLOGY** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | | **BL** | | **Marks** | |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | | | | |
| 1. | a. | Describe the significance of forensic anthropology and explain its key concepts and principles using examples. | | CO1 | | R | | 10 |
|  | b. | Analyze the human skeletal system, including the types of skeletal bones, and compare and contrast their functions and characteristics. | | CO1 | | A | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 2. | a. | Evaluate the process of intramembranous ossification and its significance in the development of the skeletal system. | | CO2 | | E | | 10 |
|  | b. | Evaluate the anatomy of the pelvic girdle and its functions in human movement and support. | | CO2 | | E | | 10 |
|  |  |  | |  | |  | |  |
| 3. | a. | Analyze the chemistry of bones, including the types of cells and structures that make up the skeletal system. | | CO3 | | A | | 10 |
|  | b. | Evaluate the process of race determination from skull bones, including the methods and techniques used in forensic anthropology. | | CO3 | | E | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 4. | a. | Analyze the process of facial reconstruction, including the types of techniques and tools used in forensic anthropology. | | CO4 | | A | | 10 |
|  | b. | Evaluate the process of superimposition, including its types and how it is used in forensic anthropology. | | CO4 | | E | | 10 |
|  |  |  | |  | |  | |  |
| 5. | a. | Analyze forensic odontology and the role of forensic odontologists in investigating crimes and identifying victims. | | CO5 | | A | | 10 |
|  | b. | Evaluate Gustafson's method for determining age from teeth, including its principles. | | CO5 | | E | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 6. | a. | Analyze the process of height determination from skeletal remains, including the techniques and methods used in forensic anthropology. | | CO3 | | A | | 10 |
|  | b. | Analyze the division of skeletal bones, including the types of bones and their functions. | | CO1 | | A | | 10 |
|  |  |  | |  | |  | |  |
| 7. | a. | Evaluate the anatomy of the skull, including its structures and functions. | | CO2 | | E | | 10 |
|  | b. | Analyze the process of facial reconstruction and its types, including the techniques and tools used in forensic anthropology. | | CO4 | | A | | 10 |
|  |  | **(OR)** | |  | |  | |  |
| 8. | a. | Evaluate the process of sex determination from skeletal bones, including the methods and techniques used in forensic anthropology | | CO6 | | E | | 10 |
|  | b. | Analyze the process of determining age from human remains, including the techniques and methods used in forensic anthropology. | | CO6 | | A | | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | | | | |
| 9. | a. | Differentiate between male and female skull bones and pelvic girdles, including their characteristics and functions. | | CO6 | | A | | 10 |
|  | b. | Analyze the forensic significance of bones, including their importance in investigating crimes and identifying victims. | | CO6 | | A | | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Know the importance of skeletal system. |
| CO2 | Understand the anatomy of different bones. |
| CO3 | Understand the chemistry of bones and biological profiling. |
| CO4 | Know the facial anatomy of humans and facial superimposition. |
| CO5 | Know about forensic odontology and recovery of forensic evidences from graves. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 |  | 10 |  |  |  | 30 |
| CO2 |  |  |  |  | 30 |  | 30 |
| CO3 |  |  | 20 |  | 10 |  | 30 |
| CO4 |  |  | 20 |  | 10 |  | 30 |
| CO5 |  |  | 10 |  | 10 |  | 20 |
| CO6 |  |  | 30 |  | 10 |  | 40 |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

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| --- | --- | --- | --- |
| **Course Code** | **20FS2024** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC ANTHROPOLOGY AND ODONTOLOGY** | **Max. Marks** | **100** |

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| **Q.**  **No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain Forensic Anthropology and its significance. | CO1 | U | 10 |
|  | b. | Explain the human skeletal system and types of skeletal bones. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain Intramembranous ossification. | CO2 | U | 10 |
|  | b. | Explain the anatomy of the Skull bone. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the chemistry of bone. | CO3 | U | 10 |
|  | b. | Explain race determination from skull bone. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the process of facial reconstruction. | CO4 | U | 10 |
|  | b. | Explain superimposition and its types. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the anatomy and type of teeth. | CO5 | U | 10 |
|  | b. | Explain the forensic significance of teeth. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the height determination method from skeletal remains. | CO3 | U | 10 |
|  | b. | Explain the division of skeletal bones. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain Endochondrial ossification. | CO2 | U | 10 |
|  | b. | Explain facial reconstruction and its types. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the determination of sex from the skeletal bone. | CO6 | U | 10 |
|  | b. | How will you determine the age from human remains? | CO6 | R | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Distinguish between male and female skull bone and pelvic girdle. | CO6 | An | 10 |
|  | b. | Explain the forensic significance of bones. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Know the importance of skeletal system. |
| CO2 | Understand the anatomy of different bones. |
| CO3 | Understand the chemistry of bones and biological profiling. |
| CO4 | Know the facial anatomy of humans and facial superimposition. |
| CO5 | Know about forensic odontology and recovery of forensic evidences from graves. |
| CO6 | Understand about skeletal variation. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  | 30 |  |  |  |  | 30 |
| CO2 |  | 30 |  |  |  |  | 30 |
| CO3 |  | 20 |  | 10 |  |  | 30 |
| CO4 |  | 30 |  |  |  |  | 30 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 | 10 | 20 |  | 10 |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2025** | **Duration** | **3hrs** |
| **Course Name** | **ACCIDENT INVESTIGATION** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Give a detailed note on sources of forensic information from accident scene. | CO1 | U | 10 |
|  | b. | Distinguish between skid marks and scuff marks. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the maintenance of vehicle. | CO2 | U | 10 |
|  | b. | Give a detailed note on abandoned vehicles and its significance in forensic science. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the collision model in detail. | CO3 | U | 10 |
|  | b. | Explain the post-crash movement with an example. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe the types of injuries in accident cases. | CO4 | U | 10 |
|  | b. | Explain the biomechanics of injuries. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Give the significance of the trace evidences found at the accident cases. | CO5 | R | 10 |
|  | b. | Explain the gauging driver’s reaction. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Compare railway accident injuries with aircraft injuries. | CO4 | U | 10 |
|  | b. | Explain how the skid marks and scuff marks are useful in estimation of speed. | CO4 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain tyre and its markings with diagram. | CO4 | R | 10 |
|  | b. | An accident reconstructionist took measurements from yaw marks left at a scene. Using a 43-foot length chord, she determined that the middle ordinate measured approximately 4 feet. The drag factor for the road surface was determined to be 0.8. Determine the radius of the curved yaw mark to the nearest tenth of the foot. Determine the minimum speed that the car was going when the skid occurred to the nearest tenth. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Give a detailed case study on hit and run investigation. | CO1 | U | 10 |
|  | b. | Explain occupant kinematics in detail. | CO3 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | A car is travelling on an asphalt road with a drag factor of 0.78. The speed limit on this portion of the road is 35m/hr. The driver just had his car in the shop and his mechanic informed him that the brakes were operating at 100% efficiency. The driver must make an emergency stop, when he sees an obstruction in the road ahead of him. His car leaves four distinct skid marks each 80 feet in length.  What is the minimum speed the car was travelling when it entered the skid? Was the driver exceeding the speed limit when entering the skid? Justify. | CO6 | U | 10 |
|  | b. | Find the speed of the vehicle under following cases:  D= 160 feet 36 inches; Surface- Snow; 2 front skid marks are present.  (drag factor-0.10) | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Realize the background of vehicle accident. |
| CO2 | Analyze motor accidents. |
| CO3 | Assess the post-crash movement. |
| CO4 | Do systematic analysis of injuries in accidents. |
| CO5 | Perform the tachographic data analysis. |
| CO6 | Analyse the falsification and diagnostic signals. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 30 | 10 |  |  |  | 50 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 30 |  |  |  |  | 30 |
| CO4 | 20 | 30 |  |  |  |  | 50 |
| CO5 | 10 |  |  |  |  |  | 10 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS2028** | **Duration** | **3hrs** |
| **Course Name** | **FOUNDATION COURSE ON COMPUTER FUNDAMENTALS AND OFFICE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain Microsoft Word. | CO1 | U | 10 |
|  | b. | Explain about spreadsheet software. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Define LAN and list the advantages of using LAN. | CO2 | R | 10 |
|  | b. | Illustrate WAN. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the characteristics of C. | CO3 | U | 10 |
|  | b. | Explain in detail about constants and variables with examples. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain array and its types with suitable example. | CO4 | U | 10 |
|  | b. | Explain Jump statements. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain typedef with an example. | CO5 | U | 10 |
|  | b. | Explain enum datatypes with suitable C program. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain about pointers with arrays. | CO6 | U | 10 |
|  | b. | Summarize malloc() with an example. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the types of functions with examples. | CO3 | U | 10 |
|  | b. | Explain the disadvantages of using Internet. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Write a C program using while and do-while loop. | CO2 | A | 10 |
|  | b. | Describe the usage of if and if-else statements in C with examples. | CO2 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe MAN network and list the advantages and disadvantages of MAN. | CO2 | R | 10 |
|  | b. | Write a C program using string uppercase & string lowercase function. | CO3 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Analyze the fundamentals of MS office. |
| CO2 | Utilize the internet. |
| CO3 | Understand the fundamentals of C programming. |
| CO4 | Know the basic concepts of arrays and functions in C. |
| CO5 | Apply the concept of structures in C programming. |
| CO6 | Understand the concept of pointers. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | - | 20 | - | - | - | - | 20 |
| CO2 | 30 | 20 | 10 | - | - | - | 60 |
| CO3 | - | 30 | 10 | - | - | - | 40 |
| CO4 | - | 20 | - | - | - | - | 20 |
| CO5 | - | 20 | - | - | - | - | 20 |
| CO6 | - | 20 | - | - | - | - | 20 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS3001** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC SCIENCE AND CRIMINAL JUSTICE SYSTEM** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write a note on administration and organizational setup of DFSS. | CO1 | R | 10 |
|  | b. | Write a note on administration and organizational setup on GEQD. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Write a note on reconstruction of crime scene. | CO2 | A | 10 |
|  | b. | Write a note admissibility of expert testimony and relation IEA section*.* | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Write a detailed note on Juvenile Delinquency. | CO3 | R | 10 |
|  | b. | Explain types of crimes and their causes. | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain role of forensic science in crime scene investigation. | CO4 | U | 10 |
|  | b. | Elaborate duties of Forensic Expert. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Elaborate functions and duties of police. | CO5 | R | 10 |
|  | b. | Describe penology and their theories. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss the following sections of CrPC:  45, 46, 57, 135. | CO5 | U | 10 |
|  | b. | Describe the power of High Courts in detail. | CO5 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | What are the recent trends in forensic Science? | CO3 | A | 10 |
|  | b. | Elaborate speaker recognition for personal identification. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain personal identification through fingerprint. | CO6 | An | 10 |
|  | b. | Give the establishment and organization setup of INTERPOL. | CO6 | R | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Discuss Geo-Forensics with case study. | CO6 | A | 10 |
|  | b. | Explain the concept of Retina Geometry. | CO6 | An | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

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|  | **COURSE OUTCOMES** |
| CO1 | Understand the importance of forensic sciences. |
| CO2 | Summarize the organizations in India related to forensic science. |
| CO3 | Understand the importance of collecting physical evidence. |
| CO4 | Know the problems in society and collecting the evidences. |
| CO5 | Understand the importance of criminal justice system. |
| CO6 | Describe the recent advancements in Forensic science. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 | 10 |  | 10 |  |  |  | 20 |
| CO3 | 10 |  | 20 | 10 |  |  | 40 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 | 20 | 10 | 10 |  |  |  | 40 |
| CO6 | 10 |  | 10 | 20 |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **20FS3002** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC PHYSICS AND ADVANCED BALLISTICS** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Expound your knowledge on the need of Forensic engineer. | CO1 | U | 10 |
|  | b. | Demonstrate the causes related to road accidents. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the origin, behavior and the effects of fire. | CO1 | U | 10 |
|  | b. | Give a detailed report on fire scene investigation. | CO1 | An | 10 |
|  |  |  |  |  |  |
| 3. | a. | Paraphrase the basics of formation of bloodstain pattern. | CO2 | U | 10 |
|  | b. | Explain the information revealed by blood pattern analysis. List the steps involved in measuring point of origin. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Categorize glass based on the components that makes up them. | CO3 | U | 10 |
|  | b. | Describe the glass fracture and its analysis in detail. | CO3 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Summarize the soil formation with neat sketch. | CO3 | U | 10 |
|  | b. | As a forensic scientist how will you collect the soil evidences and analyzes them? | CO3 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Survey the characteristics of important textile fibers. | CO3 | A | 10 |
|  | b. | Give a detailed explanation on the investigations of textile fibers. | CO3 | An | 10 |
|  |  |  |  |  |  |
| 7. | a. | Sketch the firearm and explain the function of each parts of a firearm in detail. | CO4 | U | 10 |
|  | b. | Describe the basic parts of ammunition. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Define internal ballistics and explain the phenomenon of internal ballistics with neat sketch. | CO5 | U | 10 |
|  | b. | Summarize the factors affecting internal ballistics. | CO5 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. |  | Elaborate in a systematic manner the terminal ballistics. | CO5 | A | 20 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the examination of road accident. |
| CO2 | Understand the physics of blood. |
| CO3 | Analyze various types of material. |
| CO4 | Classify the various types of fire arms. |
| CO5 | Distinguish between, internal, external and terminal ballistics. |
| CO6 | Summarize the procedure of writing ballistic report. |

|  |  |  |  |  |  |  |  |
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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 |  | 20 | 10 | 10 |  |  | 40 |
| CO2 |  | 10 | 10 |  |  |  | 20 |
| CO3 |  | 20 | 20 | 20 |  |  | 60 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 |  | 10 | 30 |  |  |  | 40 |
| CO6 |  |  |  |  |  |  |  |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3003** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC BIOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Give a detailed note on toxic principles of plants and their forensic significance. | CO1 | U | 10 |
|  | b. | Study the forensic significance of diatoms in drowning cases with a detailed case study. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the collection and tests for identification of semen. | CO2 | U | 10 |
|  | b. | Give a detailed note on composition, functions and morphology of spermatozoa along with a diagram. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the methods for the determination of age from anthropological evidence. | CO3 | U | 10 |
|  | b. | Explain the dentition and dental formula. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe PMI with respect to entomology. | CO4 | U | 10 |
|  | b. | Explain the test procedures for the identification of hair. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Give the salient features of Wildlife Protection Act. | CO5 | R | 10 |
|  | b. | Explain the toxic principle and forensic significance of *Abrus Precatorius*. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Compare types of fibers along with their examples. | CO4 | U | 10 |
|  | b. | What are the common arthropods found on the dead body? | CO4 | R | 10 |
|  |  |  |  |  |  |
| 7. | a. | Give the detailed note on entomological succession in case of buried, drowned and buried bodies. | CO4 | R | 10 |
|  | b. | Explain the toxic principle and forensic significance of Ricinus *Communis.* | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the identification of starch grains, powder and stains of spices. | CO1 | U | 10 |
|  | b. | Explain the determination of personal identity by superimposition techniques. | CO3 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Give the detailed case study on Microbial Forensics. | CO6 | U | 10 |
|  | b. | Explain the Bioterrorism with respect to *Bacillus Anthracis*. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the various forms of biological evidences. |
| CO2 | Know the chemistry of blood and semen. |
| CO3 | Become a forensic anthropologist. |
| CO4 | To perform hair analysis. |
| CO5 | Know the importance of wildlife. |
| CO6 | Identify bacteria and viruses. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 30 | 10 |  |  |  | 50 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 30 |  |  |  |  | 30 |
| CO4 | 20 | 30 |  |  |  |  | 50 |
| CO5 | 10 |  |  |  |  |  | 10 |
| CO6 |  | 20 |  |  |  |  | 20 |
|  | | | | | | | **180** |



|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3003** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC BIOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write a note on toxic principle present in plants and their forensic significance. | CO1 | R | 10 |
|  | b. | Explain the role of saliva in forensic investigations and the methods used for analysis. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the application of forensic palynology and their significance. | CO1 | U | 10 |
|  | b. | Explain the components of blood and their biological as well as forensic significance. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the structure of teeth and types of teeth present in humans. | CO3 | U | 10 |
|  | b. | Differentiate between human hair and animal hair. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give a detailed note on sperm and semen analysis. | CO2 | R | 10 |
|  | b. | Describe wildlife crimes and role of forensics in the investigation of such crimes. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the dental the formulas used in human identification. | CO3 | U | 10 |
|  | b. | Describe the role of forensic odontology in mass disaster victim identification. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss DNA typing of human hair. | CO4 | U | 10 |
|  | b. | Explain the classification of fibers based on their origin. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the lifecycle of blow fly. | CO3 | U | 10 |
|  | b. | Write a case study explaining the application of superimposition technique in forensic facial reconstruction. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | A human skeleton is found while cleaning a water body. How will you differentiate sex based on skeletal remains? | CO6 | U | 10 |
|  | b. | Discuss the case study of Kameido Anthrax incident. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Summarize electron based methods for bioforensic investigations. | CO6 | U | 10 |
|  | b. | Explain the procedure for collection of microbial evidences. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the various forms of biological evidences. |
| CO2 | Know the chemistry of blood and semen. |
| CO3 | Become a forensic anthropologist. |
| CO4 | To perform hair analysis. |
| CO5 | Know the importance of wildlife. |
| CO6 | Identify bacteria and viruses. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 | 20 | 10 |  |  |  |  | 30 |
| CO3 | 10 | 40 |  |  |  |  | 50 |
| CO4 |  | 30 |  |  |  |  | 30 |
| CO5 |  | 10 |  |  |  |  | 10 |
| CO6 |  | 40 |  |  |  |  | 40 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION – JUNE 2023**

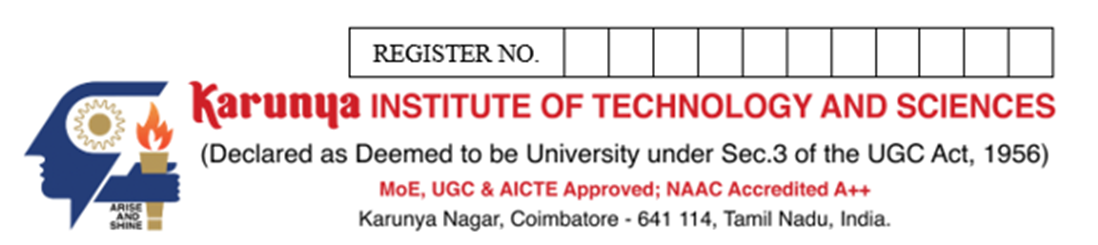
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| --- | --- | --- | --- |
| **Course Code** | **20FS3003** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC BIOLOGY** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Write a note on wood and their forensic significance. | CO1 | R | 10 |
|  | b. | Explain the role of semen in forensic investigations and the methods used for analysis. | CO2 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the application of diatoms in forensics and their significance. | CO1 | U | 10 |
|  | b. | List out the components of blood and their biological as well as forensic significance. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the role of anthropology in forensics. | CO3 | U | 10 |
|  | b. | Differentiate between human hair based on their location in body and race. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give a detailed note on preliminary and confirmatory examination of blood. | CO2 | R | 10 |
|  | b. | Describe Wildlife Protection Act and CITES in the wildlife forensic. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the role of odontology in human identification. | CO3 | U | 10 |
|  | b. | Describe the structure of hair and importance of medullary index | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Discuss analysis of menstrual blood. | CO2 | U | 10 |
|  | b. | Classify fiber based on their origin. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Illustrate the stages of decomposition of body based on entomological evidences. | CO3 | U | 10 |
|  | b. | Write a case study to explain the role of facial reconstruction. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Differentiate between male and female based on skeletal bones. | CO6 | U | 10 |
|  | b. | Discuss the case study on bioterrorism. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Summarize the methods for investigation in microbial forensics. | CO6 | U | 10 |
|  | b. | Discuss the different agents used historically as bioweapons and steps taken to eradicate them. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | understand the various forms of biological evidences |
| CO2 | know the chemistry of blood and semen |
| CO3 | become a forensic anthropologist |
| CO4 | to perform hair analysis |
| CO5 | know the importance of wildlife |
| CO6 | identify bacteria and viruses |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 | 10 | 30 |  |  |  |  | 40 |
| CO3 | 10 | 30 |  |  |  |  | 40 |
| CO4 |  | 30 |  |  |  |  | 30 |
| CO5 |  | 10 |  |  |  |  | 10 |
| CO6 |  | 40 |  |  |  |  | 40 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3004** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED QUESTIONED DOCUMENTS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the procedure of handling and the marking of documents. | CO1 | U | 10 |
|  | b. | Give the preliminary examination of documents. | CO1 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | What are the basic tools for forensic document examination? | CO1 | R | 10 |
|  | b. | Elaborate various types of documents. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the individual characteristics of hand writing. | CO2 | U | 10 |
|  | b. | Give the examination of questioned signatures. | CO4 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Give the forensic examination of passports. | CO5 | U | 10 |
|  | b. | Give the forensic examination of typewritten documents. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain how to determine age of the document. | CO5 | U | 10 |
|  | b. | Explain types of forgeries and their detection. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | What are the types of printers? | CO4 | R | 10 |
|  | b. | Explain Video Spectral Comparator. | CO5 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Give the sections relating to expert testimony. | CO5 | R | 10 |
|  | b. | Elaborate how to decipher charred writing. | CO4 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the procedure to examine printed document. | CO4 | U | 10 |
|  | b. | Give the examination of erasures in questioned documents. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Give the security features of Rs. 500 currency note. | CO5 | U | 10 |
|  | b. | Give the format of the forensic report in questioned document examination. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | understand the various types of documents |
| CO2 | compare the questioned documents with standards |
| CO3 | identify the different types of forgery in the documents |
| CO4 | apply various method to analyze questioned documents |
| CO5 | analyze the questioned documents of various types |
| CO6 | prepare the report |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | 20 |  |  |  |  |  |
| CO2 | 10 | 10 |  |  |  |  |  |
| CO3 |  | 10 |  |  |  |  |  |
| CO4 | 10 | 30 |  | 10 |  |  |  |
| CO5 | 10 | 50 |  |  |  |  |  |
| CO6 |  |  | 10 |  |  |  |  |
|  | | | | | | | **180** |



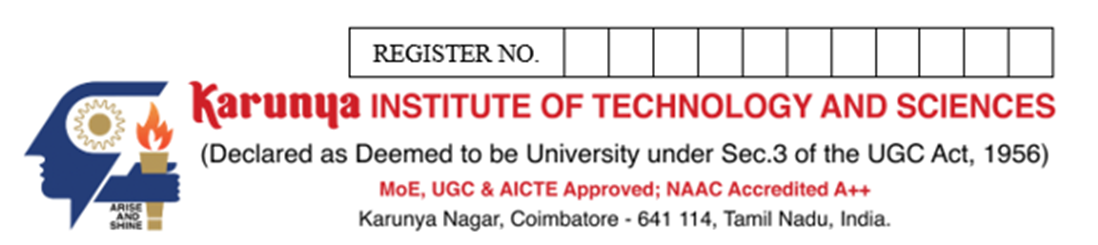
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| --- | --- | --- | --- |
| **Course Code** | **20FS3004** | **Duration** | **3hrs** |
| **Course Name** | **ADVANCED QUESTIONED DOCUMENTS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the procedure of handling and marking of documents. | CO1 | A | 10 |
|  | b. | Write a note on preliminary examination and basic tools used for forensic document examination. | CO1 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the decipherment of indented writing with working and principle. | CO2 | U | 10 |
|  | b. | Compare the characteristics of genuine and forged signature. | CO2 | R | 10 |
|  |  |  |  |  |  |
| 3. | a. | Elaborate types of printing processes along with their examples in detail. | CO3 | E | 10 |
|  | b. | Explain the process of obtaining the formal and informal exemplars and mention the merits and demerits of the same. | CO3 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Discuss types of alterations in documents in details. | CO4 | An | 10 |
|  | b. | Elaborate the restoration and decipherment of handwriting from the charred document. | CO4 | A | 10 |
|  |  |  |  |  |  |
| 5. | a. | Write a note on:   * Disguised writing * Anonymous letters | CO5 | R | 10 |
|  | b. | Explain the features of security document passport. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain Video Spectral Comparator with its forensic applications. | CO2 | U | 10 |
|  | b. | Discuss how to determine the age of the document. | CO2 | A | 10 |
|  |  |  |  |  |  |
| 7. | a. | State and explain important sections of IPC relating to document. | CO4 | R | 10 |
|  | b. | Describe and compare the types of printers with their examples. | CO4 | E | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Elaborate examination of typewritten document in detail. | CO6 | An | 10 |
|  | b. | Describe the examination of photocopied document. | CO6 | A | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the security features of currency note Rs. 100. | CO6 | R | 10 |
|  | b. | Explain the forensic report writing of questioned document case with an example. | CO6 | R | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the various types of documents. |
| CO2 | Compare the questioned documents with standards. |
| CO3 | Identify the different types of forgery in the documents. |
| CO4 | Apply various method to analyze questioned documents. |
| CO5 | Analyze the questioned documents of various types. |
| CO6 | Prepare the report. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 |  |  | 20 |  |  |  | 20 |
| CO2 | 10 | 20 | 10 |  |  |  | 40 |
| CO3 |  |  |  |  | 20 |  | 20 |
| CO4 | 10 |  | 10 | 10 | 10 |  | 40 |
| CO5 | 20 |  |  |  |  |  | 20 |
| CO6 | 20 |  | 10 | 10 |  |  | 40 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3005** | **Duration** | **3hrs** |
| **Course Name** | **FINGER PRINTS AND OTHER IMPRESSIONS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the History and development of fingerprints in detail. | CO1 | R | 10 |
|  | b. | Explain the classification of fingerprint patterns with diagram. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Describe the types of evidentiary fingerprints in detail. | CO2 | R | 10 |
|  | b. | Explain the operation and search technology of AFIS. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the different forms of footwear impressions and their forensic significance. | CO3 | A | 10 |
|  | b. | Explain the various locations where we can find footwear impressions and enhancement methods used for the analysis. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain in detail Tire impressions examination procedure in detail. | CO4 | U | 10 |
|  | b. | Give the forensic significance of tire impressions along with a case study. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain nature, history and scope of lip prints. | CO5 | R | 10 |
|  | b. | Explain the morphology of ear. Give the locations where we can find the ear prints as evidence. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the collection procedure for ear prints from crime scene and suspects. | CO6 | A | 10 |
|  | b. | Give the forensic significance of bite marks and its judicial acceptance. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Describe different physical methods for the development of latent fingerprints. | CO2 | U | 10 |
|  | b. | Explain the procedure for the development of latent fingerprints on adhesive surfaces. | CO2 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain various chemical methods for the development of latent fingerprints. | CO2 | U | 10 |
|  | b. | Describe the procedure for the development of blood and grease contaminated fingerprints. | CO2 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the procedure for identification and comparison of bite marks. | CO6 | U | 10 |
|  | b. | Explain the process of collection of bite marks from suspect and victim. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the various elements of fingerprints |
| CO2 | Understand the types of reprints |
| CO3 | Analyze footwear reprints |
| CO4 | Apply various methods to analyze tire reprints |
| CO5 | Analyze the Lip reprints |
| CO6 | Analyze the bite marks |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 |  |  |  |  |  | 20 |
| CO2 | 10 | 30 | 20 |  |  |  | 60 |
| CO3 |  |  | 20 |  |  |  | 20 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 | 10 | 10 |  |  |  |  | 20 |
| CO6 |  | 20 | 20 |  |  |  | 40 |
|  | | | | | | | **180** |



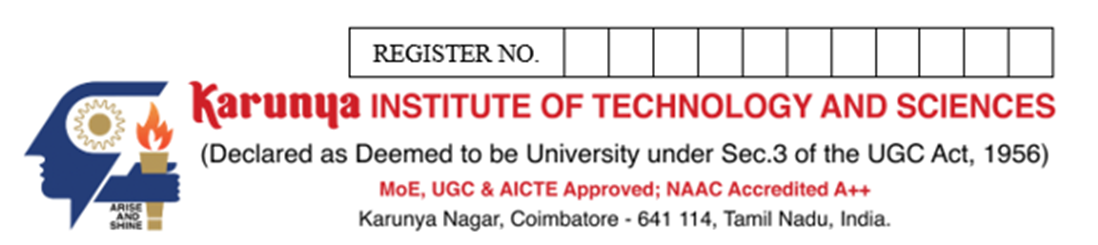
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| --- | --- | --- | --- |
| **Course Code** | **20FS3005** | **Duration** | **3hrs** |
| **Course Name** | **FINGER PRINTS AND OTHER IMPRESSIONS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain the primary classification of fingerprints. | CO1 | R | 10 |
|  | b. | Explain the History of fingerprints in detail. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Give the forensic significance of Poroscopy and Edgeoscopy. | CO2 | U | 10 |
|  | b. | Explain the Automated Fingerprint Identification System. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the method of recording fingerprints from suspects and from the crime scene. | CO3 | A | 10 |
|  | b. | Explain the process of recording fingerprints from the deceased person. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Describe Physical and Chemical methods of Fingerprint Development. | CO4 | U | 10 |
|  | b. | Explain Preservation and lifting of Fingerprints while collecting samples from crime scene. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain collection methods of Footwear impressions and its Forensic importance. | CO5 | A | 10 |
|  | b. | Describe casting and electrostatic lifting of footwear impressions. | CO5 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Give the forensic significance of Tire Marks. | CO6 | U | 10 |
|  | b. | Explain the nature, location and collection method of tire marks. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Explain the collection and preservation methods for Ear and Lip prints evidence. | CO3 | A | 10 |
|  | b. | Explain the different patterns of fingerprints. | CO2 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain different classification of Lip prints and its forensic significance. | CO1 | U | 10 |
|  | b. | Give your opinion upon judicial acceptance of Lip prints and Ear prints as evidence. | CO5 | A | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Describe the silver nitrate and Ninhydrin method. | CO6 | U | 10 |
|  | b. | Define the Minutiae of Fingerprint and its importance. | CO6 | A | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the various elements of reprints. |
| CO2 | Understand the types of reprints. |
| CO3 | Analyze footwear reprints. |
| CO4 | Apply various methods to analyze tire reprints. |
| CO5 | Analyze the Lip reprints. |
| CO6 | Analyze the bite marks. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 20 | 10 |  |  |  |  | 30 |
| CO2 | 10 | 20 |  |  |  |  | 30 |
| CO3 |  |  | 30 |  |  |  | 30 |
| CO4 |  | 20 |  |  |  |  | 20 |
| CO5 |  |  | 30 |  |  |  | 30 |
| CO6 |  | 30 | 10 |  |  |  | 40 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3011** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC SEROLOGY AND MOLECULAR GENETICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain composition of semen and its analysis. | CO1 | U | 10 |
|  | b. | Give a detailed note on methods of blood analysis. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the major types of proteins present in humans with examples. | CO2 | U | 10 |
|  | b. | Elaborate ABO blood grouping. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the structure of nuclear DNA with appropriate diagrams. | CO3 | U | 10 |
|  | b. | Describe the methods of collection of saliva and blood samples. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Compare nuclear DNA with mitochondrial DNA. | CO4 | An | 10 |
|  | b. | Describe methods for detection of DNA from hair. | CO4 | U | 10 |
| 5. | a. | Explain short tandem repeats and its types. | CO5 | U | 10 |
|  | b. | Discuss agarose gel electrophoresis with diagram. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the principle of capillary electrophoresis with diagram. | CO4 | U | 10 |
|  | b. | Discuss the working of genetic analyzer with diagram. | CO4 | U | 10 |
| 7. | a. | Elaborate the polymerase chain reaction with appropriate diagram. | CO3 | U | 10 |
|  | b. | Illustrate Sanger sequencing with a diagram. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Summarize the application of DNA testing in detection of paternity. | CO6 | U | 10 |
|  | b. | Draw the organizational chart of NABL. | CO6 | R | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the need for accreditation in forensic labs. | CO6 | U | 10 |
|  | b. | Discuss the importance of databases. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | recognize the basic principle of Forensic Serology |
| CO2 | classify the biological stains |
| CO3 | understand about serological markers |
| CO4 | summarize about DNA typing and its forensic significance |
| CO5 | interpret the DNA typing results |
| CO6 | understand the basics of bioinformatics |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 40 |  |  |  |  | 40 |
| CO4 |  | 30 |  | 10 |  |  | 40 |
| CO5 |  | 20 |  |  |  |  | 20 |
| CO6 | 10 | 30 |  |  |  |  | 40 |
|  | | | | | | | **180** |



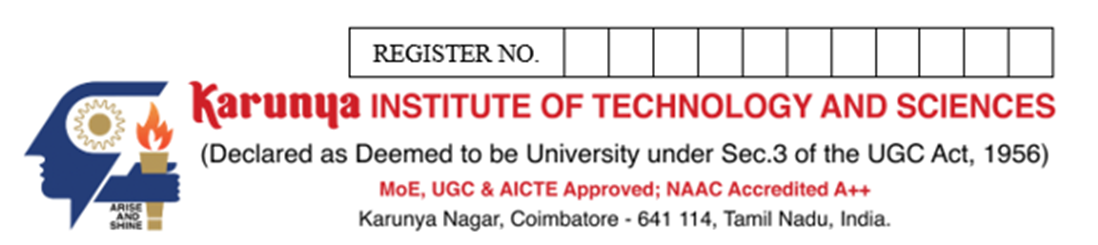
|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3011** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC SEROLOGY AND MOLECULAR GENETICS** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Explain composition of blood. | CO1 | U | 10 |
|  | b. | Give a detailed note on sperm and semen analysis. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain cellular proteins with examples. | CO2 | U | 10 |
|  | b. | Elaborate ABO blood grouping. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the biochemistry of DNA. | CO3 | U | 10 |
|  | b. | Describe the methods of collection of DNA samples. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Differentiate between RFLP and STR. | CO4 | An | 10 |
|  | b. | Describe methods for detection of DNA. | CO4 | U | 10 |
| 5. | a. | PDF] MUTATION OF STR IN PATERNITY TESTING | Semantic Scholar  Analyze and interpret the DNA typing result provided above. Is the result inclusive or exclusive? | CO5 | An | 10 |
|  | b. | Give a detailed note on gels used for DNA separation. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain Likelihood ratio in genetics. | CO4 | U | 10 |
|  | b. | Discuss capillary electrophoresis and its application in genetic analyzer. | CO4 | U | 10 |
| 7. | a. | Elaborate the analysis of PCR products with appropriate diagram. | CO3 | U | 10 |
|  | b. | Illustrate polymerase chain reaction with a diagram. | CO3 | A | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Summarize the peak detection and thresholds with the help of a diagram. | CO6 | C | 10 |
|  | b. | Describe sanger sequencing with appropriate diagram | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain NCBI database. | CO6 | U | 10 |
|  | b. | Discuss the importance of NABL 113. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Recognize the basic principle of Forensic Serology. |
| CO2 | Classify the biological stains. |
| CO3 | Understand about serological markers. |
| CO4 | Summarize about DNA typing and its forensic significance. |
| CO5 | Interpret the DNA typing results. |
| CO6 | Understand the basics of bioinformatics. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 10 | 10 |  |  |  |  | 20 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 30 | 10 |  |  |  | 40 |
| CO4 |  | 30 |  | 10 |  |  | 40 |
| CO5 | 10 |  |  | 10 |  |  | 20 |
| CO6 |  | 30 |  |  |  | 10 | 40 |
|  | | | | | | | **180** |

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**SUPPLEMENTARY EXAMINATION - JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3012** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC PHONETICS, VOICE ANALYSIS AND SPEAKER RECOGNITION** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Forensic Linguistics and articulatory phonetics. | CO1 | U | 20 |
|  | b. | Define voice evidences and its forensic significance. | CO1 | R |  |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the ASR method in detail. | CO2 | R | 20 |
|  | b. | Describe the method of collection of evidence in the case of forensic phonetics. | CO2 | U |  |
|  |  |  |  |  |  |
| 3. | a. | How will you process voice/oral evidence? | CO3 | U | 20 |
|  | b. | Name a few computerized software used for voice analysis and describe author identification in the suicide note. | CO3 | R |  |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the significance of forensic linguistics in Forensic investigation | CO4 | U | 20 |
|  | b. | Illustrate steps of Speaker Recognition identification. | CO4 | U |  |
|  |  |  |  |  |  |
| 5. | a. | Explain the type of evidence encountered in Forensic phonetics cases. Explain each evidence and its Forensic analysis. | CO5 | U | 20 |
|  | b. | Name a few storage media used for the collection of evidence in case of voice evidence also describe the collection of voice evidence in detail. | CO5 | R |  |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the significance of forensic phonetics and voice analysis and define authorship. | CO6 | U | 20 |
|  | b. | Explain types of evidence and types of Psycholinguistics forensic texts. | CO6 | U |  |
|  |  |  |  |  |  |
| 7. | a. | Distinguish between Speaker identification and authentication of tape recording. | CO5 | An | 20 |
|  | b. | Define speech enhancement and speech decoding. | CO1 | R |  |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain the factors affecting voice identification. | CO2 | U | 20 |
|  | b. | Explain Forensic voice comparison and features that are commonly analyzed in forensic phonetics. | CO4 | U |  |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Differentiate between written and voice/oral evidence in detail. List a few examples of written and voice/oral evidence. | CO6 | An | 20 |
|  | b. | Define few Forensic Linguistics evidences and it’s Forensic Value. | CO6 | U |  |

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|  | **COURSE OUTCOMES** |
| CO1 | Recognize the importance of phonetics |
| CO2 | Understand the basics of psycholinguistics |
| CO3 | Understand the methods involved in voice analysis |
| CO4 | Summarize the various types of speaker recognition |
| CO5 | Understand the methods involved in automatic speaker recognition |
| CO6 | Realize the application of voice analysis in forensic science |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 10 |  |  |  |  |  |
| CO2 | 10 | 20 |  |  |  |  |  |
| CO3 | 10 | 10 |  |  |  |  |  |
| CO4 | 00 | 30 |  |  |  |  |  |
| CO5 | 10 | 10 |  | 10 |  |  |  |
| CO6 | 00 | 30 |  | 10 |  |  |  |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20FS3012** | **Duration** | **3hrs** |
| **Course Name** | **FORENSIC PHONETICS, VOICE ANALYSIS AND SPEAKER RECOGNITION** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (4 X 20 = 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Phonetics, articulatory phonetics, and Forensic Linguistics. | CO1 | U | 10 |
|  | b. | Describe Speech Production in humans. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the significance of forensic linguistics in Forensic investigation. | CO2 | R | 10 |
|  | b. | Describe the collection of evidence in the case of forensic phonetics. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the factors affecting voice identification. | CO3 | U | 10 |
|  | b. | Name a few computerized software used for voice analysis and describe author identification in the suicide note. | CO3 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Explain the ASR method in detail. | CO4 | U | 10 |
|  | b. | Illustrate steps of Speaker Recognition identification. | CO4 | U | 10 |
|  |  |  |  |  |  |
| 5. | a. | Explain the type of evidence encountered in Forensic phonetics cases. Explain each evidence and its Forensic analysis. | CO5 | U | 10 |
|  | b. | Name a few storage media used for the collection of evidence in case of voice evidence also describe the collection of voice evidence in detail. | CO5 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Explain the significance of forensic phonetics and voice analysis and define authorship. | CO6 | U | 10 |
|  | b. | Explain the speech production mechanism. | CO6 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Distinguish between Speaker identification and authentication of tape recording. | CO5 | An | 10 |
|  | b. | Define speech enhancement and speech decoding. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain types of evidence and types of Psycholinguistics forensic texts. | CO2 | U | 10 |
|  | b. | Explain Forensic voice comparison and features that are commonly analyzed in forensic phonetics. | CO4 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Differentiate between written and voice/oral evidence in detail. List a few examples of written and voice/oral evidence. | CO6 | An | 10 |
|  | b. | Explain Voice Identification by the Aural/Spectrographic Method. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Recognize the importance of phonetics. |
| CO2 | Understand the basics of psycholinguistics. |
| CO3 | Understand the methods involved in voice analysis. |
| CO4 | Summarize the various types of speaker recognition. |
| CO5 | Understand the methods involved in automatic speaker recognition. |
| CO6 | Realize the application of voice analysis in forensic science. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 10 |  |  |  |  |  |
| CO2 | 10 | 20 |  |  |  |  |  |
| CO3 | 10 | 10 |  |  |  |  |  |
| CO4 | 00 | 30 |  |  |  |  |  |
| CO5 | 10 | 10 |  | 10 |  |  |  |
| CO6 | 00 | 30 |  | 10 |  |  |  |
|  | | | | | | | **180** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **20FS3017** | **Duration** | **3hrs** |
| **Course Name** | **MEDICAL JURISPRUDENCE** | **Max. Marks** | **100** |

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| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Define Inquest and its types. | CO1 | R | 10 |
|  | b. | Distinguish between dying declaration and dying deposition. | CO1 | An | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the medico legal importance of occupational marks and tattoo marks. | CO2 | U | 10 |
|  | b. | Explain the medico legal importance of teeth. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the procedure of post-mortem examination. | CO3 | U | 10 |
|  | b. | Explain autopsy and its types. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Define Injury and explain its types. | CO4 | R | 10 |
|  | b. | Distinguish between Ante mortem and Post Mortem burns | CO4 | An | 10 |
|  |  |  |  |  |  |
| 5. | a. | Define death and explain its types. | CO5 | R | 10 |
|  | b. | Explain modes of death. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Distinguish between Medical Certificates and Medico legal reports. | CO1 | An | 10 |
|  | b. | Explain Examination-in-Chief, Cross Examination and Re-examination. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Give a detailed note on criminal courts and their powers. | CO1 | R | 10 |
|  | b. | Explain exhumation and its procedure. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain Later changes after death | CO6 | U | 10 |
|  | b. | Explain Rigor Mortis in detail. | CO6 | U | 10 |
| **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the significance of entomological evidence in estimating post-mortem interval. | CO6 | U | 10 |
|  | b. | Explain immediate and early changes after death. | CO6 | U | 10 |

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|  | **COURSE OUTCOMES** |
| CO1 | Know about various legal procedures. |
| CO2 | Know about the parameters contributing to personal identity. |
| CO3 | Understand the importance of post-mortem examination. |
| CO4 | Know about wounds. |
| CO5 | Understand the modes of death. |
| CO6 | Acquire knowledge to estimate time since death. |

|  |  |  |  |  |  |  |  |
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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 20 | 10 |  | 20 |  |  | 50 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 30 |  |  |  |  | 30 |
| CO4 | 10 |  |  | 10 |  |  | 20 |
| CO5 | 10 | 10 |  |  |  |  | 20 |
| CO6 |  | 40 |  |  |  |  | 40 |
|  | | | | | | | **180** |



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| --- | --- | --- | --- |
| **Course Code** | **20FS3017** | **Duration** | **3hrs** |
| **Course Name** | **MEDICAL JURISPRUDENCE** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A(4 X 20= 80 MARKS)**  **(Answer all the Questions)** | | | | | |
| 1. | a. | Give a detailed note on criminal courts and their powers. | CO1 | R | 10 |
|  | b. | Define Inquest and its types. | CO1 | R | 10 |
|  |  | **(OR)** |  |  |  |
| 2. | a. | Explain the medico legal importance of occupational marks and tattoo marks. | CO2 | U | 10 |
|  | b. | Explain footprints with their advantages. | CO2 | U | 10 |
|  |  |  |  |  |  |
| 3. | a. | Explain the procedure of post-mortem examination. | CO3 | U | 10 |
|  | b. | Explain autopsy and its types. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 4. | a. | Define Injury and explain its types. | CO4 | R | 10 |
|  | b. | Write a note on – Defence wounds, fabricated wounds and grievous wounds. | CO4 | R | 10 |
|  |  |  |  |  |  |
| 5. | a. | Define death and explain its types. | CO5 | R | 10 |
|  | b. | Explain modes of death. | CO5 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 6. | a. | Distinguish between Medical Certificates and Medico legal reports. | CO1 | An | 10 |
|  | b. | Explain Examination-in-Chief, Cross Examination and Re-examination. | CO1 | U | 10 |
|  |  |  |  |  |  |
| 7. | a. | Give a detailed note on criminal courts and their powers. | CO1 | R | 10 |
|  | b. | Explain exhumation and its procedure. | CO3 | U | 10 |
|  |  | **(OR)** |  |  |  |
| 8. | a. | Explain Later changes after death | CO6 | U | 10 |
|  | b. | Explain Rigor Mortis in detail. | CO6 | U | 10 |
| **PART – B (1 X 20 = 20 MARKS)**  **COMPULSORY QUESTION** | | | | | |
| 9. | a. | Explain the significance of entomological evidence in estimating post-mortem interval. | CO6 | U | 10 |
|  | b. | Explain immediate and early changes after death. | CO6 | U | 10 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Know about various legal procedures. |
| CO2 | Know about the parameters contributing to personal identity. |
| CO3 | Understand the importance of post-mortem examination. |
| CO4 | Know about wounds. |
| CO5 | Understand the modes of death. |
| CO6 | Acquire knowledge to estimate time since death. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| CO / P | **Remember** | **Understand** | **Apply** | **Analyze** | **Evaluate** | **Create** | **Total** |
| CO1 | 30 | 10 |  | 10 |  |  | 50 |
| CO2 |  | 20 |  |  |  |  | 20 |
| CO3 |  | 30 |  |  |  |  | 30 |
| CO4 | 20 |  |  |  |  |  | 20 |
| CO5 | 10 | 10 |  |  |  |  | 20 |
| CO6 |  | 40 |  |  |  |  | 40 |
|  | | | | | | | **180** |



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| **Course Code** | **21CH2068** | **Duration** | **3hrs** |
| **Course Name** | **RECENT TRENDS IN FORENSIC SCIENCE** | **Max. Marks** | **100** |

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| **Q. No.** | **Questions** | | **CO** | | **BL** | | **Marks** | |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | | | | |
| 1. | Which Central Forensic Science Laboratory functioning under CBI? | | CO1 | | R | | 1 | |
| 2. | Define “Forensic Science”. | | CO2 | | R | | 1 | |
| 3. | Give any two security features present in Indian currency notes. | | CO3 | | A | | 1 | |
| 4. | What are the three types of fingerprint pattern? | | CO3 | | R | | 1 | |
| 5. | Define hallucinogens. | | CO4 | | R | | 1 | |
| 6. | The alcoholic beverages contain -------- alcohol. | | CO4 | | U | | 1 | |
| 7. | Give the role of red blood cells in human body. | | CO5 | | U | | 1 | |
| 8. | What are the common body fluids? | | CO5 | | R | | 1 | |
| 9. | Name any two chemicals used as fertilizers. | | CO6 | | U | | 1 | |
| 10. | What is crime scene? | | CO6 | | R | | 1 | |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | | | | |
| 11. | Describe the important role of Forensic Science. | | CO1 | | R | | 3 | |
| 12. | State Locard’s exchange Principle. | | CO2 | | U | | 3 | |
| 13. | Name any two types of questioned document. | | CO3 | | R | | 3 | |
| 14. | Differentiate antigens and antibodies. | | CO4 | | R | | 3 | |
| 15. | Name any three illegal Narcotic drugs. | | CO5 | | A | | 3 | |
| 16. | What is the composition of cement? | | CO6 | | U | | 3 | |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | | | | |
| 17. | a. | Analyse the causes and consequences of crime. | | CO1 | | An | | 6 |
|  | b | Discuss on collection of evidence and crime scene management. | | CO1 | | An | | 6 |
| 18. | a. | Discuss on the basic tools used in the examination of forensic questioned document. | | CO3 | | A | | 6 |
|  | b. | List down the security features present in Indian Passport. | | CO3 | | An | | 6 |
|  |  |  | |  | |  | |  |
| 19. |  | Write a short note on the following  a) Chain of Custody  b) Breath alcohol content  c) Carbon monoxide poisoning  d) Directorate of Forensic Science | | CO4 | | U | | 12 |
|  |  |  | |  | |  | |  |
| 20. | a. | Describe the composition and function of blood. | | CO5 | | R | | 8 |
|  | b. | Explain the techniques used in forensic toxicology. | | CO5 | | A | | 4 |
|  |  |  | |  | |  | |  |
| 21. | a. | Discuss the analysis of chemical fertilizers and consumer items in relevance to forensic science. | | CO6 | | A | | 6 |
|  | b. | Name a few consumer items that are commonly adulterated. Suggest some method to identify and quantify the adulteration. | | CO6 | | A | | 6 |
|  |  |  | |  | |  | |  |
| 22. | a. | Describe the diverse branches of forensic science. | | CO1 | | R | | 6 |
|  | b. | Discuss on the role of crime scene investigator in the investigation of a crime scene. | | CO2 | | U | | 6 |
|  |  |  | |  | |  | |  |
| 23. | a. | Analyze the use of modern instrumentation facilities in forensic science. | | CO5 | | A | | 6 |
| b. | Explain the role of photography and videography in crime scene investigation. | | CO2 | | A | | 6 |
| **COMPULSORY QUESTION** | | | | | | | | |
| 24. | a. | Give the composition of paint and varnish. Explain the forensic significance of paint analysis. | | CO6 | | A | | 6 |
|  | b. | What are computer crimes? How are they classified? | | CO6 | | A | | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic concepts of forensic science. |
| CO2 | Know the procedures involved in Crime scene management. |
| CO3 | Recognize the importance analysis of finger prints and questioned documents. |
| CO4 | Classify the various types of toxins and their analysis. |
| CO5 | Know the importance of forensic serology. |
| CO6 | Understand the importance of forensics for workplace investigation. |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 10 | - | - | 12 | - | - | 22 |
| CO2 | 1 | 9 | 6 | - |  |  | 16 |
| CO3 | 5 | - | 7 | 6 | - | - | 18 |
| CO4 | 4 | 13 | - | - | - |  | 17 |
| CO5 | 9 |  | 13 | - | - | - | 22 |
| CO6 | 1 | 4 | 24 | - | - | - | 29 |
|  | | | | | | | **124** |

**Graphical user interface, application

Description automatically generated with medium confidence**

**SUPPLEMENTARY EXAMINATION – JUNE 2023**

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Code** | **21CH2068** | **Duration** | **3hrs** |
| **Course Name** | **RECENT TRENDS IN FORENSIC SCIENCE** | **Max. Marks** | **100** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Q. No.** | **Questions** | | **CO** | **BL** | **Marks** |
| **PART – A (10 X 1 = 10 MARKS)**  **(Answer all the questions)** | | | | | |
| 1. | The father of modern toxicology is\_\_\_\_\_\_\_\_ | | CO1 | R | 1 |
| 2. | Analysis of any forensic evidence related to dental is called as\_\_\_\_ | | CO1 | U | 1 |
| 3. | Provide an example for white collar crime. | | CO1 | U | 1 |
| 4. | The Central Forensic Science Laboratory-New Delhi comes under \_\_\_\_\_\_ | | CO2 | R | 1 |
| 5. | Give the method that is most commonly used for the identification of a human individual? | | CO3 | U | 1 |
| 6. | What are Erythrocytes? | | CO5 | U | 1 |
| 7. | What is blood plasma? | | CO5 | U | 1 |
| 8. | Define: Criminal Justice system | | CO5 | A | 1 |
| 9. | Define: Forensic biology | | CO3 | R | 1 |
| 10. | The study about the fingerprint evidence is called as\_\_\_\_\_\_ | | CO3 | U | 1 |
| **PART – B (6 X 3 = 18 MARKS)**  **(Answer all the questions)** | | | | | |
| 11. | Write a short note on the importance of biometric systems. | | CO1 | U | 3 |
| 12. | What is “chain of custody”? | | CO2 | A | 3 |
| 13. | Define: Questioned document. | | CO3 | U | 3 |
| 14. | What is Forensic toxicology? | | CO4 | R | 3 |
| 15. | Brief on “dose-response relationship” | | CO4 | A | 3 |
| 16. | Distinguish between antigens and antibodies? | | CO5 | A | 3 |
| **PART – C (6 X 12 = 72 MARKS)**  **(Answer any five Questions from Q. No. 17 to 23, Q. No. 24 is Compulsory)** | | | | | |
| 17. | a. | Explain the different types of crime? | CO6 | U | 6 |
| b. | Discuss the broad concepts of criminal Justice system | CO2 | U | 6 |
|  |  |  |  |  |  |
| 18. | a. | Explain fingerprint patterns and its type with illustration. | CO3 | A | 6 |
|  | b. | Discuss the forensic examination of counterfeit Indian currency note. | CO2 | An | 6 |
|  |  |  |  |  |  |
| 19. | a. | Explain different types of drugs with appropriate example. | CO2 | A | 12 |
|  |  |  |  |  |  |
| 20. | a. | Explain the composition, functions and forensic significance common body fluids. | CO5 | A | 12 |
|  |  |  |  |  |  |
| 21. | a. | What is cyber-crime? Describe the types of computer crimes. | CO6 | U | 12 |
|  |  |  |  |  |  |
| 22. | a. | Describe the different branches of forensic science. | CO1 | R | 12 |
|  |  |  |  |  |  |
| 23. | a. | Describe different tests used for the identification of blood. | CO5 | A | 6 |
|  | b. | Explain the tools using in forensic document examination. | CO3 | A | 6 |
| **COMPULSORY QUESTION** | | | | | |
| 24. | a. | Explain the forensic examination of adulterated and non-adulterated oils and fats. | CO4 | A | 6 |
|  | b. | Discuss on the forensic examination of paint. | CO2 | A | 6 |

**CO** – COURSE OUTCOME **BL** – BLOOM’S LEVEL

|  |  |
| --- | --- |
|  | **COURSE OUTCOMES** |
| CO1 | Understand the basic concepts of forensic science |
| CO2 | Know the procedures involved in Crime scene management |
| CO3 | Recognize the importance analysis of finger prints and questioned documents |
| CO4 | Classify the various types of toxins and their analysis |
| CO5 | Know the importance of forensic serology |
| CO6 | Understand the importance of forensics for workplace investigation |

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| **Assessment Pattern as per Bloom’s Taxonomy** | | | | | | | |
| **CO / P** | **R** | **U** | **A** | **An** | **E** | **C** | **Total** |
| CO1 | 13 | 5 | - | - | - | - | 18 |
| CO2 | 1 | 6 | 21 | 6 |  |  | 34 |
| CO3 | 1 | 5 | 12 | - | - | - | 18 |
| CO4 | 3 | - | 9 | - | - |  | 12 |
| CO5 | - | 5 | 19 | - | - | - | 24 |
| CO6 | - | 18 | - | - | - | - | 18 |
|  | | | | | | | **124** |