Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **14PH2012** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Spectroscopy** | **Max. marks :** | **100** |

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

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | What is spectroscopy? | CO1 | 3 |
| b. | What is the difference between absorption and emission spectra? | CO1 | 3 |
| c. | Explain the different regions of an electromagnetic spectra and discuss its applications in different types of spectroscopy. | CO1 | 14 |
| (OR) | | | | |
| 2. | a. | Define an unit cell. | CO2 | 3 |
| b. | Give an example of a material for each type of crystal system. | CO2 | 3 |
| c. | Explain the seven types of crystal systems and fourteen Bravais lattices with a neat sketch. | CO2 | 14 |
| 3. | a. | Explain the different types of vibrations in H2O molecule with a neat sketch. | CO3 | 14 |
|  | b. | Will the H2O molecule obey the mutual exclusion principle? Justify. | CO3 | 6 |
| (OR) | | | | |
| 4. | a. | How does the vibrating diatomic molecule HCl behaves like a simple harmonic oscillator? Explain using Schroedinger Equation. | CO3 | 18 |
|  | b. | Which type of spectroscopy could be used to study a HCl molecule? | CO3 | 2 |
| 5. | a. | Discuss the basic working principle behind FTIR spectrocscopy. | CO3 | 10 |
|  | b. | Write a note on instrumentation part of FTIR spectroscopy. | CO3 | 5 |
|  | c. | Write a note on applications of FTIR spectroscopy | CO3 | 5 |
| (OR) | | | | |
| 6. | a. | Draw the common planes of a cubic unit cell, (100) (110) and (111). | CO2 | 6 |
|  | b. | [Explain the Debye-Scherrer method](http://physics.usask.ca/~bzulkosk/modphyslab/phys381manual/xray_diffraction_2004.pdf) of X-ray diffraction. | CO2 | 14 |
| 7. | a. | A substance shows Raman line at 4568 Å when the exciting line is 4332 Å.  Find the stokes and antistokes line when the exciting line is 4036 Å. | CO4 | 10 |
|  | b. | When the photons of wavelength 4358 Å is incident on a molecule, it gives Raman lines at 4447 Å. Find out the Raman Shift in cm-1. | CO4 | 4 |
|  | c. | What you meant by (i) Stokes line (ii) Anti-stokes line and (iii) Raman Shift | CO4 | 6 |
| (OR) | | | | |
| 8. | a. | Give the difference between Raman and Rayleigh Scattering. | CO4 | 3 |
|  | b. | Explain the classical theory of Raman Effect. | CO4 | 14 |
|  | c. | What are the drawbacks of classical theory? | CO4 | 3 |
|  | | **Compulsory:** |  |  |
| 9. | a. | Discuss the different types of energy levels in a diatomic molecule. | CO4 | 8 |
|  | b. | What is RRS? Explain its working principle. | CO4 | 6 |
|  | c. | Give the advantage of RRS over conventional raman spectroscopy and discuss its applications. | CO4 | 6 |

ALL THE BEST