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**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **15CH3001** | **Duration :** | **3hrs** |
| **Sub. Name :** | **CHEMICAL KINETICS & PHOTOCHEMISTRY** | **Max. marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | Marks |
| 1. | a. | Differentiate between order and molecularity. | CO1 | 5 |
| b. | Deduce an expression for a second order kinetics, where two reactants are same. | CO1 | 10 |
| c. | The decomposition of H2O2 is a first order reaction. If the initial concentration of H2O2 is 0.05 mol/L, what will be its concentration after 30 minutes, if the rate constant of the reaction is 1.5 × 10-4 s-1? | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | Define rate and give the factors influencing rate of a reaction. | CO1 | 5 |
| b. | Derive a rate expression for zero order reaction with examples. Determine the rate constant for a zero order reaction when the initial concentration of reactant is 2.0 M and after one minute, the concentration is reduced to 1.0 M. | CO1 | 10 |
| c. | The half-life of the homogeneous gaseous reaction SO2Cl2  SO2 + Cl2 which obeys first order kinetics is 8.0 minutes. How long it take for the concentration of SO2Cl2 to be reduced to 1 % of the initial value. | CO1 | 5 |
| 3. | a. | Give the kinetics of branched chain reactions. Explain the criteria for stationary and non-stationary chain reactions. | CO2 | 10 |
| b. | What is meant by fast reactions? Give the block diagram and working principle involved in studying fast reaction using flash photolysis. | CO2 | 10 |
| (OR) | | | | |
| 4. | a. | Write a note on parallel and reversible reactions with examples. | CO2 | 10 |
| b. | Give the different steps involved and kinetics of Rice-Herzfeld Chain reaction using H2(g) + Br2(g) HBr(g) | CO2 | 10 |
| 5. | a. | Give the Lindamann-Hinshelwood expression for unimolecular collision theory. | CO3 | 10 |
| b. | Write a brief note on primary and secondary kinetic isotopic effects. | CO3 | 5 |
| c. | The rate constant for a reaction is 5.7 x 10-5 dm3 mol-1 s-1 at25 °C and 1.64 x 10-4 dm3 mol-1 s-1 at40 °C. Calculate the activation energy and Arrhenius pre-exponential factor. | CO3 | 5 |
| (OR) | | | | |
| 6. | a. | Deduce an expression for Absolute reaction rate theory. | CO3 | 10 |
| b. | The rate of a chemical reaction doubles with rise in temperature of 10 °C from 25 °C. Calculate the activation energy for the reaction. What will be the Arrhenius pre-exponential factor if the rate constant of a second-order reaction is 4.5 x 10-5 dm3 mol-1 s-1. | CO3 | 5 |
| c. | Give the postulates for unimolecular collision theory. | CO3 | 5 |
| 7. | a. | What is the limitation of Hammett equation and need for Taft equation. | CO4 | 5 |
| b. | Deduce an equation for the adsorption of gases using Langmuir adsorption isotherm. | CO4 | 10 |
| c. | The mass of a solute (x) adsorbed per gram of a solid absorbent is given by the Freundlich isotherm as x = kcn, where k and n are 0.341 and 0.398, respectively. Calculate the amount of acetic acid (Mm = 60.05 g/mol) that 1 kg of charcoal would adsorb from a 0.854 M vinegar solution. | CO4 | 5 |
| (OR) | | | | |
| 8. | a. | At 25 °C in 90 % methanol, the second order rate constants for m-cyanoethyl benzoate and p-hydroxyethyl benzoate are 0.923 and 0.0199, respectively. Given that σ values of m-CN and p-OH are +0.56 and -0.37, respectively. Calculate (i) the reaction constant (ρ) and (ii) rate constants for the alkaline hydrolysis of ethylbenzoate and p-amino ethyl benzoate (σp for –NH2 = -0.66) | CO4 | 5 |
| b. | Derive Michaelis-Menten equation to study the mechanism and kinetics of enzyme catalyzed reactions. | CO4 | 10 |
| c. | Differentiate between physisorption and chemisorptions. | CO4 | 5 |
|  | | **Compulsory:** |  |  |
| 9. | a. | What is meant by delayed fluorescence? Discuss its types. | CO5 | 10 |
| b. | Explain the terms photosensitization and chemiluminescence with examples. | CO5 | 10 |

ALL THE BEST