

Total number of printed pages-7

53 (CY 201) ENCH

2016

ENGINEERING CHEMISTRY

Paper : CY 201

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer Q. No. 1 and **any four** from the rest.

1. (a) Fill in the blanks : 1×6=6
- (i) The Monomer Unit of natural rubber is _____ .
 - (ii) The stability of 2° amine is _____ than 3° amine.
 - (iii) Molecular weight related to intrinsic viscosity as _____ .

Contd.

(iv) The catalyst used in the preparation of PP is _____.

(v) The unit of rate constant of 3rd order reaction is _____.

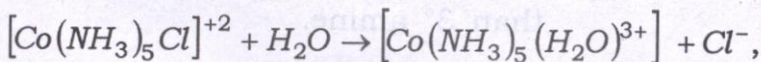
(vi) The rate of wet corrosion is _____ than dry corrosion.

(b) Write a note on types of hydrogen bond with proper examples. 4

(c) What is salt-bridge? Why is KCl generally preferred to construct salt-bridge? 2

(d) Define the terms — Bathochromic, Hypsochromic, Hyperchromic and Hypochromic shifts. 4

(e) For the displacement reaction



the rate constant is given by

$$\ln [K(\text{min}^{-1})] = -10.067 K/T + 4.133;$$

evaluate K , E and A for the reaction at 25°C. 4

2. (a) Describe the instrumentation of mass spectrometer with suitable diagrams.

6

(b) Compare the properties of ionic and covalent compounds.

5

(c) What is the rate value for given 3rd order reaction? Calculate with the help of integration by parts. Find out the half-life for the reaction. The reaction is $A + B + C = P$.

3+2=5

(d) Explain effect of temperature on rate constant of a reaction with Arrhenius equation.

4

3. (a) What are polar and non-polar covalent bonds? Explain with examples.

4

(b) What is the electrochemical series? Mention few characteristics and applications of this series.

2+2+2=6

(c) Why phenol is acidic? Explain with the resonance structures.

2

(d) 50% of a 1st order reaction is completed in 23 mins. Calculate the time required for 90% completion of reaction.

4

- (e) Distinguish between — Octane number and Cetane number. 4
4. (a) What is activation energy? Give the graphical representation of activation energy profile diagram for catalysed and non-catalysed reactions. 2+2=4
- (b) Write the name of the monomer units of — (i) Terylene, (ii) Nylon-6, 6 and (iii) Polypropylene. Draw the structure of monomer units of these polymers. 2+2+1=5
- (c) What do you mean by hybridization of atomic orbitals. Describe the types of hybridization associated with CH_4 , C_2H_4 and C_2H_2 . 2+6=8
- (d) Explain the terms — Parent Ion Peaks, Base Peak and Relative Abundance. 3
5. (a) How the molecular weight of a polymer can be determined by Osmotic Pressure method? Draw the plot of $\lim_{C \rightarrow 0} P/C$ versus concentration. 3+2=5

- (b) Define Inductive effect. Distinguish between +I effect and -I effect. 3
- (c) What do you mean by pseudo-1st order reaction? Give example. 3
- (d) What is a coordinate or dative bond? Explain the formation of NH_4^+ ion. 3
- (e) Taking the H_2O molecule as an example, explain the various types of stretching and bending vibrations associated with infrared spectroscopy. 6
6. (a) Distinguish between — producer gas and natural gas. 5
- (b) Give a proper reaction to explain Hofmann exhaustive methylation. 2
- (c) The intrinsic viscosity of myosin is $217\text{cm}^3\text{g}^{-1}$. Calculate the approximate concentration of myosin in water which have relative viscosity of 1.5. 3

(d) Describe various types of electronic transitions involved in UV-visible spectroscopy with a suitable diagram.

6

(e) Calculate the electrode potential of copper, if the concentration of CuSO_4 is 0.206M at 23.1°C . Given that

$$E^\circ \text{Cu}^{+2}/\text{Cu} = +0.34\text{V}$$

4

7. (a) Write down the cell reactions involved in $\text{H}_2 - \text{O}_2$ fuel cell. Mention the advantages and disadvantages of $\text{H}_2 - \text{O}_2$ fuel cells.

2+4=6

(b) State the points of difference between electroplating and electroless-plating.

4

(c) Distinguish between Snytzeff's rule and Hofmann rule.

3

(d) If a 1st order reaction has

$$E_a = 104500 \text{ J/mol and if}$$

$$A = 5 \times 10^{13} \text{ Sec}^{-1}. \text{ Calculate}$$

temperature at which its half-life is

7 mins.

2

(e) A solution contains equal number of particles with molar masses

$10,000 \text{ gmol}^{-1}$ and $20,000 \text{ gmol}^{-1}$

respectively. Calculate number-average, weight-average, molar weight and PDI.

1+1+3=5