A **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U1Y04

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2024

First Semester

Mechanical Engineering

21UCY104 - ENGINEERING CHEMISTRY

(Common to Chemical Engineering)

(Regulation 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which one of the following pair of atoms most likely to form an ionic bond? CO1-R

   (a) Na & F (b) C & C (c) N & F (d) F & F

2. Which among the following is weakest bond? CO1-R

   (a) Covalent bond (b) Ionic bond (c) Metallic bond (d) Hydrogen bond

3 The electronic configuration of an atom with atomic number 8 is CO1-R

   (a) $1s^2\ 2s^2\ 2p^3\ 3s^1$ (b) $1s^2\ 2s^2\ 2p^1\ 3s^2\ 3p^1$ (c) $1s^2\ 2s^1\ 2p^6\ 3s^1$ (d) $1s^2\ 2s^2\ 2p^4$

4. The unit of rate constant for a second order reaction is CO2-R

   (a) mol / S (b) mol / l^2 / S (c) mol / l / S (d) lit / mole / S

5. What type of reaction takes place when an acid dissolves in water? CO2-R

   (a) Exothermic (b) Endothermic (c) Substitution (d) Displacement Reaction

6. Temporary Hardness of water can be removed by CO3-R

   (a) Boiling (b) Sedimentation (c) Solvent Extraction (d) Filtration

7. Hardness in water expressed in terms of equivalent of CO3-R

   (a) $CaCl_2$ (b) $MgCl_2$ (c) $CaCO_3$ (d) $MgCO_3$

8. During the galvanic corrosion the noble metal act as CO4- R

   (a) Anode (b) Cathode (c) Catalyst (d) Corroding metal

9. Iron corrodes faster in CO4- R

(a) Hard water (b) Soft water (c) Demineralized water (d) Distilled water

10. In electro plating the article to be plated is subjected to pickling, this is to CO4- R

(a) Remove grease (b) Increase the rate of plating

(c) Remove the oxide scale (d) Get a bright deposit

PART – B (5 x 2= 10Marks)

11. State Paulis exclusion principle CO1- R

12. Define Order of reaction CO2- R

13. Calgon conditioning is better than phosphate conditioning - Justify CO3- Ana

14. List out the salts responsible for the hardness of water CO3- R

15. Define Dry corrosion CO4- R

PART – C (5 x 16= 80Marks)

16. (a) (i) Describe the characteristic properties of covalent compounds. CO1- U (8)

(ii) Discuss hydrogen bonding with its consequences. CO1- U (8)

Or

(b) (i) Write the basic postulates and limitations of valance bond theory. CO1- U (8)

(ii) Explain the hybridization involved and predict the shape for the following molecule CO1- U (8)

(a) CH_4

(b) C_2H_4

17. (a) (i) Derive the integrated rate equation for a second order reaction where the reactants are same concentration. CO2- U (8)

(ii) Write a notes on Redox reaction with an example. CO2- U (8)

Or

(b) (i)Deduce the expression for the rate constant of first order reaction. CO2- U (8)

(ii) Define the term rate of reaction, Discuss various factors that affect the rate of reaction. CO2- U (8)

18.	(a)	How is hardness of water determined by the complexomteric method? Write the necessary calculation	CO3- U	(16)
		Or		
	(b)	(i) Explain the process of scale and sludge formation in boilers.	CO3- U	(8)
		(ii) With the help of a neat diagram, explain the reverse osmosis method for desalination of brackish water	CO3- U	(8)
19.	(a)	(i) Calculate the temporary, permanent and total hardness of a sample water containing $Mg(HCO_3)_2$=73mg/lit, $Ca(HCO_3)_2$ = 162 mg/lit, $MgCl_2$ = 95 mg/lit, $CaSO_4$ = 136 mg/lit, Atomic weight: Ca = 40, Mg = 24, C = 12, S = 32, O = 16, H = 1, Cl = 35.5.	CO3- U	(8)
		(ii) Describe the demineralization of water by an ion exchange process in detail.	CO3- U	(8)
		Or		
	(b)	Give Principal of Zeolite process ? Write advantages , disadvantages, and limitation of Zeolite process.	CO3- U	(16)
20.	(a)	(i) Explain the rusting of iron on the basis of electrochemical theory of corrosion	CO4- U	(8)
		(ii) Briefly describe various components of paint and their functions.	CO4- U	(8)
		Or		
	(b)	(i) Write a short notes on (a) Concentration cell corrosion (b) Wire fence corrosion	CO4- U	(8)
		(ii) Discuss the mechanism of dry corrosion	CO4- U	(8)