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

Question Paper Code: 51004

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2022

First Semester

Mechanical Engineering

15UCY104 - ENGINEERING CHEMISTRY

(Common to Chemical Engineering)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Bond order is related to dissociation energy by which of the following? CO1- R

   (a) Directly proportional (b) Inversely proportional

   (c) Constant (d) none of these

2. Linear geometry is seen with which of the following CO1- R

   (a) H_2S (b) H_2O (c) CH_4 (d) C_2H_2

3. Daniel cell is an example of CO2- R

   (a) primary cell (b) secondary cell

   (c) Constant cell (d) fuel cell

4. Which of the following does not promote the differential aeration corrosion? CO2- R

   (a) Accumulation of dirt (b) Partially covering metals

   (c) Wire fence kind of structures (d) Accumulation of oxygen

5. If the cyclic integral of dQ/T is zero then the cycle is CO3- R

   (a) irreversible but not possible (b) irreversible but possible (c) impossible (d) reversible

6. The entropy of an isolated system can never ____ CO3- R

   (a) Increase (b) Decrease (c) Be zero (d) None of the above

7. Water gas is CO4- R

(a) $CO + H_2O$ (b) $CO + H_2$ (c) $CO_2 + N_2$ (d) $CO_2 + N_2O$

8. The raw material used for synthesizing petrol in Fischer-Tropsch process is CO4-R

(a) kerosene (b) Diesel (c) coal (d) LPG

9. Brass alloy containing mainly CO5- R

(a) Cu and Zn (b) Cu and Sn (c) Zn and Pb (d) Cu and Fe

10. Which of the following is an example of ferrous alloy CO5- R

(a) alnico (b) bronze (c) brass (d) billon

PART – B (5 x 2= 10 Marks)

11. How do bonding and anti - bonding molecular orbitals differ with respect to energies the spatial distribution of electron-density? CO1- R

12. Suggest the most suitable methods for protecting the following metals from corrosion a) iron rod used in concrete b)bolt CO2- R

13. Write Gibb's-Helmholtz equation CO3- R

14. What is a flue gas? CO4- R

15. What are composites? Give the advantageous characteristics of composites. CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) (i) Compare the stability and bond order of CO^+, CO, NO, NO^+, N_2^+ CO1- App (8)

(ii) Predict the hybridization of S in SF_6, Xe in XeF_4, N in NO_3, Be in BeF_2 CO1- App (8)

Or

(b) (i) Explain the lattice enthalpy of NaCl using Born-Haber cycle CO1- App (8)

(ii) What is Pauli's exclusion principle? Explain in detail. CO1- App (8)

17. (a) (i) What are the factors influencing the rate of corrosion? CO2- U (8)

(ii) What is paint? Give their constituents and functions with suitable examples CO2- U (8)

Or

(b) (i) Calculate the EMF of a cell CO2- Ana (8)
$Pt/Br_2(g)(0.1\ atm)/Br^-(0.5\ M)/Br_2(g)(1\ atm)/Pt$ at 298 K

(ii) Describe the electroplating process of gold. CO2- Ana (8)

18.	(a)	(i) Derive the Gibbs-Helmholtz equation and mention its significance. .	CO3- Ana	(8)
		(ii) State the phase rule. Explain the terms involved in it with suitable examples	CO3- Ana	(8)
		Or		
	(b)	(i) Derive an expression for the entropy change for an ideal gas.	CO3- U	(8)
		(ii) Gibbs free energy of a reaction at 300 K and 310 K are -29kcal and -29.5 kcal respectively. Determine its ΔH and ΔS at 300 K.	CO3- U	(8)
19.	(a)	(i) Describe the manufacture of Petrol by Bergius process.	CO4- U	(8)
		(ii) Describe the manufacture of water gas with neat diagram.	CO4- U	(8)
		Or		
	(b)	(i) How can you analyze flue gas by Orsat apparatus?	CO4- U	(8)
		(ii) Differentiate between NCV and GCV	CO4- U	(8)
20.	(a)	(i) What are non-ferrous alloys? Explain the compositions, properties and uses of any two alloys in detail.	CO5- U	(8)
		(ii) Explain fibre reinforced composites	CO5- U	(8)
		Or		
	(b)	(i) State classification of composite and the need for composite.	CO5- U	(8)
		(ii) Categorize the different heat treatment of steels.	CO5- U	(8)

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