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

Question Paper Code: 51004

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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. Which of the following is expected to have maximum bond strength CO1- R

   (a) ClF (b) Cl_2 (c) $BaCl_2$ (d) BaS

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. Corrosion of a screw in the clamp of the door is an example for CO2- R

   (a) pitting (b) crevice

   (c) wirefence (d) differential aeration

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. All spontaneous process are accompanied by _____in entropy. CO3- R

   (a) Decrease (b) Increase (c) Same (d) No change

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. Usage of highly preheated secondary air in pulverized fuel firing helps in _____ CO4-R

(a) Heats fuel at pace (b) Takes less time to finish the process

(c) Rapid flame propagation (d) Reduces the troubles and problems caused in the system

9. Brass alloy containing mainly CO5- R

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

10. Flue gas is a mixture of_____ CO5- R

(a) CO,CO_2 & O_2 (b) CO,CO_2 & N_2 (c) CO,CO_2 & S_2 (d) CO,CO_2 & Ash

PART – B (5 x 2= 10 Marks)

11. what is meant by bond order? 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. At what temperature will water boil when the atmospheric pressure is 528 mm Hg? Latent heat of vapourisation of water is 545.5 cal/g. CO3- R

14. What is a flue gas? CO4- R

15. Differentiate the composition between Nichrome & Stainless steel. 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) Use the molecular orbital energy level diagram to show that N_2 would be expected to have a triple bond, H_2, a single bond. CO1- App (8)

(ii) Explain Fajan's rule in detail. CO1- App (8)

17. (a) (i) Derive the Nernst equation for electrode potential. CO2- App (8)

(ii) Show what do you understand by hybridization. Demonstrate the hybridized structure of methane molecule. CO2- App (8)

Or

	(b)	(i) Calculate the EMF of a cell $Pt/Br_2(g)(0.1\ atm)/Br^-(0.5\ M)/Br_2(g)(1\ atm)/Pt$ at 298 K	CO2- Ana	(8)
		(ii) Describe the electroplating process of gold.	CO2- Ana	(8)
18.	(a)	(i) Derive Clausius-Clapeyron equation.	CO3- Ana	(8)
		(ii) What is meant by eutectic point? Describe the reduced phase rule with one example.	CO3- Ana	(8)
		Or		
	(b)	(i) Derive an expression for the entropy change for an ideal gas.	CO3- Ana	(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- Ana	(8)
19.	(a)	(i) Describe the manufacture of metallurgical coke by Otto-Haffman's oven method.	CO4- U	(8)
		(ii) A Explain the proximate and ultimate analysis of coal.	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) Discuss the composition, characteristics and uses of non ferrous alloy.	CO5- U	(8)
		(ii) Write a note on ceramic matrix composites.	CO5- U	(8)
		Or		
	(b)	(i) State classification of composite and the need for composite.	CO5- U	(8)
		(ii) Describe in detail about surface treatment methods.	CO5- U	(8)

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