Ex/Met/BS/B/Chem/T/212/2024 (S)

B.E. METALLURGICAL AND MATERIAL ENGG. SECOND YEAR

FIRST SEMESTER SUPPLEMENTARY EXAMINATION 2024

CHEMISTRY II

Time : Three hours Full Marks : 100

Avswer any ***five*** questions
All questions carry equal marks

1. Define adsorption? Mention any three factors affecting the rate of adsorption. Derive Freundlich Adsorption isotherm. What are the differences between physisorption and chemisorption? What are the differences between cohesion and adhesion? What is absorbent? Write the expression for surface excess in Gibb's Adsorption Isotherm explaining all the terms 2+3+4+4+3+2+2
2. What are primary and secondary valences in Werner's co-ordination theory. Write the formula of
   i)Potassium hexacyanoferrate(III) ii) Hexaamminecobalt(III) chloride, iii) Tetraammine aqua chloro cobalt(III) chloride
   What are geometrical isomers and coordinate isomers? How can you differentiate between cis and trans $Pt(NH_3)_2Cl_2$? Explain. How is CO emitted in the air? Name a neutral ligand. Name three agents causing water pollution.
   3+6+3+2+2+1+3
3. Define a. order of a reaction, b. Half life of a reaction, c. rate of a reaction

Time required to decompose SO_2Cl_2 to half of its initial amount is 60 minutes. If the decomposition is a first order reaction, calculate the rate constant of the reaction.

Derive the rate equation for a zero Order reaction and draw the graph. Define specific rate constant?

What is the effect of temperature on rate constant? What is catalyst?

2+2+2+4+4+2+2+2

4. Green house effect leads to global warming. Which substances are responsible for green house effect? How do they work? Dissolved oxygen in water is very important for aquatic life. What processes are responsible for the reduction of dissolved oxygen in water? On the basis of chemical reactions involved, explain how do chlorofluorocarbons cause thinning of ozone layer in stratosphere. Acid rain is known to contain some acids. Name these acids and where from they come in rain? What is hydrosphere? Mention four reasons that cause water pollution.
2+4+3+3+2+2+4

5. How is BOD different from COD? What is DO? What is denitrification? Write the

detrimental effects of CO, Pb, Cd, cyanide and As. Mention some solid wastes that cause land pollution 4+2+2+10+2

[Turn over

6. Explain Le Chatelier's Principle with example? Mention the factors that can change the equilibrium. What is dynamic equilibrium? Write the equilibrium constant for the following reaction

$H_2(g) + I_2(g) = 2HI\ (g)$

Can catalyst change the position of equilibrium? What is Kc for the following equilibrium when the equilibrium concentration of each substance is: $[SO_2]$= 0.60M, $[O_2]$ = 0.82M and $[SO_3]$ = 1.90M?

$2SO_2 + O_2 = 2SO_3$

4+4+2+3+1+6

7. Why do surface molecules have different properties than bulk molecules? Define CMC? What are surfactant molecules? Mention the different types of surfactant molecules. What is surface tension? Mention one method of determination of surface tension and describe the method. How do some insects move on the surface of the water without sinking? Draw the structure of surfactant and micelle.

3+2+2+3+2+4+2+2

8. How is Grignard Reagent synthesised? How are primary, secondary and tertiary alcohols formed with Grignard Reagents? What is chelate? Write the name of the following complexes

$[Cu(H_2O)_4]^{+2}$, $[Cr(NH_3)_3Cl_3]$, $K_2[Ni(CN)_4]$, $[Co(NH_3)_4SO_4]Cl$, $[Cr(en)_3]Cl_3$ $K_3[Fe(CN)_6]$

Write down the differences between homogeneous and heterogeneous catalysis. What is the geometry of 6 co-ordinated complex?

2+ 6+2+6+3+1