MODEL TEST PAPER-II

Chemistry (Theory)

Time : 3 hours **Total Marks : 70**

General Instruction

(i) *All questions are compulsory.*

(ii) *Question number 1 to 8 are very short answer questions, carrying 1 mark each. Answer these in one word or about one sentence each.*

(iii) *Question number 9 to 18 are short answer questions, carrying 2 marks each. Answer these in about 30 words each.*

(iv) *Question number 19 to 27 are short answer questions, carrying 3 marks each. Answer these in about 40 words each.*

(v) *Question number 28 to 30 are long answer questions, carrying 5 marks each. Answer these in about 70 words each.*

(vi) *Use log table, if necessary.*

(vii) *Use of calculator is not permitted.*

1. 'Crystalline solids are anisotropic in nature.' What does this statement mean?

2. Express the relation between conductivity and molar conductivity of a solution held in a cell.

3. Define 'electrophoresis.'

4. Draw the structure of XeF_2 molecule.

5. Write the IUPAC name of the following compound : $(CH_3)_3\ CCH_2Br$

6. Draw the structure of 3-methylbutanal.

7. Arrange the following compounds in an increasing order of their solubility in water : $C_6H_5NH_2$, $(C_2H_5)_2NH$, $C_2H_5NH_2$

8. What are biodegradable polymers?

9. The chemistry of corrosion of iron is essentially an electrochemical phenomenon. Explain the reactions occurring during the corrosion of iron in the atmosphere.

10. Determine the values of equilibrium constant (K_C) and Go for the following reaction :

$$Ni(s) + 2Ag^+(aq) \longrightarrow Ni^{2}+(aq) + 2Ag(s),\ E^{\theta} = 1.05\ V$$

$(1F = 96500\ C\ mol^{-1})$

11. Distinguish between 'rate expression' and 'rate constant' of a reaction.

12. State reasons for each of the following :

    (i) The N – O bond in NO_2^- is shorter than the N – O bond in NO_3^-.

    (ii) SF_6 is kinetically an inert substance towards hydrolysis.

    OR

    State reasons for each of the following :

    (i) All the P-Cl bonds in PCl_5 molecule are not equivalent.

    (ii) Sulphur has greater tendency for catenation than oxygen.

13. Assign reasons for the following :

    (i) Copper (I) ion is not known in aqueous solution.

    (ii) Actinoids exhibit greater range of oxidation states than lanthanoids.

14. Explain the following giving one example for each :

    (i) Reimer-Tiemann reaction

    (ii) Friedel – Craft's acetylation of anisole.

15. How would you obtain

    (i) Picric acid (2, 4, 6-trinitrophenol) from phenol,

    (ii) 2-Methylpropene from 2-methylpropanol?

16. What is essentially the difference between α form of glucose and β form of glucose? Explain.

17. Describe what you understand by primary structure and secondary structure of proteins.

18. Mention two important uses of each of the following :

    (i) Bakelite (ii) Nylon 6

19. Silver crystallizes in face-centered cubic unit cell. Each side of this unit cell has a length of 400 pm. Calculate the radius of the silver atom. (Assume the atoms just touch each other on the diagonal across the face of the unit cell. That is each, face atom is touching the four corner atoms.)

20. Nitrogen pentoxide decomposes according to equation : $2N_2O_5(g) \longrightarrow 4\ NO_2(g) + O_2(g)$.

    This first order reaction was allowed to proceed at 40 °C and the data below were collected :

$[N_2O_5]$/M	(M) Time/(min)
0.400	0.00
0.289	20.0
0.209	40.0
0.151	60.0
0.109	80.0

(a) Calculate the rate constant. Include units with your answer.

(b) What will be the concentration of N_2O_5 after 100 minutes?

(c) Calculate the initial rate of reaction.

21. Explain how the phenomenon of adsorption finds application in each of the following processes:

(i) Production of vacuum

(ii) Heterogeneous catalysis

(iii) Froth Floatation process

OR

Define each of the following terms :

(i) Micelles

(ii) Peptization

(iii) Desorption

22. Describe the principle behind each of the following processes :

(i) Vapour phase refining of a metal.

(ii) Electrolytic refining of a metal.

(iii) Recovery of silver ore was leached with NaCN.

23. Complete the following chemical equations :

(i) $MnO_4^- + C_2O_4^{2-} + H^+ \longrightarrow$

(ii) $KMnO_4 \xrightarrow{\text{heat}}$

(iii) $Cr_2O_7^{2-} + H_2S + H^+ \longrightarrow$

24. Write the name, stereochemistry and magnetic behaviour of the following: (At.nos. Mn = 25, Co = 27, Ni = 28)

(i) K_4 $[Mn(CN)_6]$

(ii) $[Co(NH_3)_5$ Cl] Cl_2

(iii) K_2 $[Ni(CN)_4]$

25. Answer the following :

(i) Haloalkanes easily dissolve in organic solvents, why?

(ii) What is known as a racemic mixture? Give an example.

(iii) Of the two bromoderivatives,
$C_6H_5CH(CH_3)Br$ and $C_6H_5CH(C_6H_5)$ Br,
which one is more reactive in S_N1 substitution reaction and why?

26. (a) Explain why an alkylamine is more basic than ammonia.

(b) How would you convert

(i) Aniline to nitrobenzene

(ii) Aniline to iodobenzene?

27. Describe the following giving one example for each :

(i) Detergents

(ii) Food preservatives

(iii) Antacids

28. (a) Differentiate between molarity and molality for a solution. How does a change in temperature influence their values?

(b) Calculate the freezing point of an aqueous solution containing 10.50 g of $MgBr_2$ in 200 g of water. (Molar mass of $MgBr_2$ = 184 g mol^{-1}).

K_f for water = 1.86 K kg mol^{-1})

OR

(a) Define the terms osmosis and osmotic pressure. Is the osmotic pressure of a solution a colligative property? Explain.

(b) Calculate the boiling point of a solution prepared by adding 15.00 g of NaCl to 250.0 g of water. (K_b for water = 0.512 K kg mol^{-1},

Molar mass of NaCl = 58.44 g mol^{-1}

29. (a) Given chemical tests to distinguish between

(i) propanal and propanone,

(ii) benzaldehyde and acetophenone.

(b) How would you obtain

(i) but-2-enal from ethanal,

(ii) butanoic acid from butanol,

(iii) benzoic acid from ethylbenzene?

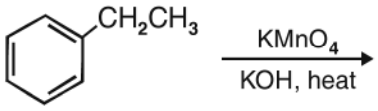
OR

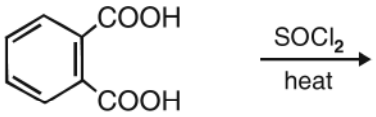
(a) Describe the following giving linked chemical equations :

(i) Cannizzaro reaction

(ii) Decarboxylation

(b) Complete the following chemical equations :

(i) 

(ii) 

(iii) $C_6H_5CONH_2 \xrightarrow[\text{heat}]{H_3O^+}$

30. (a) Explain the following :

(i) NF_3 is an exothermic compound whereas NCl_3 is not.

(ii) F_2 is most reactive of all the four common halogens.

(b) Complete the following chemical equations :

(i) $C + H_2SO_4$ (conc) $\longrightarrow$

(ii) $P_4 + NaOH + H_2O \longrightarrow$

(iii) $Cl_2 + \underset{\text{(excess)}}{F_2} \longrightarrow$

OR

(a) Account for the following :

(i) The acidic strength decreases in the order HCl > H_2S > PH_3

(ii) Tendency to form pentahalides decreases down the group in group 15 of the periodic table.

(b) Complete the following chemical equations :

(i) $P_4 + SO_2Cl_2 \longrightarrow$

(ii) $XeF_2 + H_2O \longrightarrow$

(iii) $I_2 + HNO_3 \longrightarrow$ (conc)