MODEL QUESTION PAPER - 1

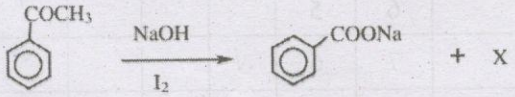
Time: 3 hours 15 min. **Max Marks: 70**

Instructions:

1) *The question paper has four parts: A, B, C and D. All parts are compulsory.*
2) *Write balanced chemical equations and draw labeled diagrams whenever required.*
3) *Use log tables and simple calculator if necessary. (Use of Scientific calculators is not allowed).*

PART - A

I Answer ALL of the following. **[Each question carries 1 mark]** **10x1=10**
(Answer each question in one word or in one sentence)

1. Name a colligative property.
2. What does the van't Hoff factor 'i' for a solute in a solvent account for?
3. What is a secondary cell?
4. By how many times does the $t_{½}$ of zero order reaction increase if the initial concentration of the reactant is doubled?
5. What is heterogeneous catalysis?
6. Give the composition of 'copper matte'.
7. $XeF_6 + 3H_2O \rightarrow P + 6HF$. What is P?
8. A racemic mixture is optically inactive. Why?
9. 

Give the IUPAC name of X
10. Name a nitrogen base present both in DNA and in RNA.

PART - B

II Answer any FIVE of the following. **[each question carries 2 marks]** **5x2=10**

11. Give two differences between Schottky and Frenkel defects in ionic solids.

12. Name the gases liberated at anode and cathode respectively when an aqueous solution of sodium chloride is electrolysed.

13. Given $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$; $rate = k[NO]^2\ [O_2]^1$. By how many times does the rate of the reaction change when the volume of the reaction vessel is reduced to $1/3^{rd}$ of its original volume? Will there be any change in the order of the reaction?

14. Give reasons: i) actionoids show variable oxidation states.

    ii) Zr and Hf have almost identical radii.

15. What is Lucas reagent? Between primary and tertiary alcohols, which one of these will react faster with Lucas reagent?

16. A carboxylic acid is treated with alcohol in presence of conc. H_2SO_4. Name the reaction. Give its general equation.

17. What are food preservatives? Give an example.

18. Give one example each for i) antiseptic ii) synthetic detergent

PART-C

III Answer any FIVE of the following. **[each question carries 3 marks]** **5x3=15**

19. Describe the three steps involved in the leaching of bauxite to get pure alumina (equations not expected).

20. White phosphorus is heated with excess of dry chlorine to get X. X on hydrolysis finally forms an oxoacid of phosphorous Y. What are X and Y? What is the basicity of the acid Y?

21. Describe the preparation of ozonised oxygen with an equation. Name the oxidized product obtained when ozone reacts with lead sulphide.

22. Complete the following equations:

    i) $2F_2 + 2H_2O \rightarrow$

    ii) $H_2S + Cl_2 \rightarrow$

    iii) $8NH_3\,(\text{excess}) + 3Cl_2 \rightarrow$

23. Name the metal of the 1^{st} row transition series that

    i) has maximum number of unpaired electrons in its ground state.

    ii) Has zero spin only magnetic moment in its +2 oxidation state.

    iii) Exhibits maximum number of oxidation states.

24. Write ionic equations for the reaction of dichromate ions with i) hydroxyl ions ii) Fe^{+2} ions in acidic medium.

    In which one of the above two reactions will the oxidation number of chromium remains unchanged.

25. Using VBT account for the geometry and magnetic property of $[Ni(CN)_4]^{2-}$. Given: Outer electronic configuration of Ni^{2+} ; $3d^8 4s^0$.

26. Give the IUPAC name of $[Co\ Cl_2(NH_3)_4]Cl$. Draw cis and trans isomer of $[Co\ Cl_2(NH_3)_4]^+$ ion.

PART - D

IV Answer any <u>THREE</u> of the following [Each question carries 5 marks] 3x5=15

27. What is packing efficiency in a crystal? Draw the unit cell of a simple cubic lattice and calculate the packing efficiency in a simple cubic lattice. (5)

28. a) Vapour pressure of liquids A and B at 298k is 300mm of Hg and 450 mm of Hg, calculate the mole fraction of A in the mixture. Given total vapour pressure of solution = 405 mm Hg.

    b) What happens to the solubility of a gas in a liquid with increase in temperature? Give reason. (3+2)

29. a) Calculate the equilibrium constant of the reaction at 298 K.

$$Mg_{(s)} + 2Ag^{+}_{(aq)} \rightarrow Mg^{++}_{(aq)} + 2Ag_{(s)} \; ; \; E^{0}_{cell} = +3.16\,V$$

    b) How is molar conductivity related to the conductivity of a solution? Which one of these has higher molar conductivity : 0.1 M KCl or 0.01 M KCl? (3+2)

30. a) The rate of a reaction increases by 4 times when the temperature of the reaction is raised from 340 K to 360 K. Calculate the energy of activation of the reaction. Given R = 8.314 J / K/mol.

    b) Draw a graph of potential energy versus reaction coordinate to show the effect of catalyst on activation energy. (3+2)

31. a) What is coagulation of a sol? Name two methods by which a lyophobic sol can be coagulated?

    b) What is the change in enthalpy and entropy during adsorption of gas on a solid? (3+2)

V Answer any FOUR of the following questions.[Each question carries 5 marks] 4x5=20

32. a) Mention the major product formed in the following reactions.

i) 2 - bromopentane $\xrightarrow[\Delta]{\text{alc. KOH}}$

ii)  + $CH_3 - CO - Cl \xrightarrow{\text{anhyd. } AlCl_3}$

iii) $C_2H_5Br + AgCN \xrightarrow[\Delta]{}$

b) Write the equations for the steps in S_N1 mechanism of the conversion of *tert*-butyl bromide into *tert*-butyl alcohol. (3+2)

33. a) Explain with equations:

i) Kolbe's reaction ii) Williamson's ether synthesis

b) A Corbonyl compound (P) with the formula C_2H_4O reacts with CH_3MgX followed by hydrolysis to form an alcohol (Q). Name the alcohol Q (4+1)

34. a) Write equations for:

i) Gatterman-Koch reaction to convert benzene into benzaldehyde.

ii) The formation of oxime from carbonyl compounds.

iii) The reaction between carboxylic acid and PCl_5.

b) Give reasons:

i) α-hydrogen atoms of aldehydes and ketones are acidic.

ii) An electron donating group decreases the acidic strength of carboxylic acids. (3+2)

35. a) i) $C_6H_5CONH_2 \xrightarrow{Br_2/NaOH} X$. ii) $X \xrightarrow[0^0C]{NaNO_2 + HCl} Y$. What are X and Y? Name the raction occurring in step (i).

b) Arrange the following in the increasing order of their base strengths in the aqueous medium: $(CH_3)_3N$, CH_3NH_2, $(CH_3)_2NH$. Give one reason for the trend observed. (3+2)

36. a) Mention two differences in the structure of starch and cellulose. Write the Haworth's structure of the monomer in cellouse.

b) Give an example each for i) acidic α - amino acid ii) fibrous protein. (3+2)

37. a) What is condensation polymerization? Give an example with an equation.

b) With respect to natural rubber:

i) name its monomer.

ii) name the element used for vulcanization.