BOARD QUESTION PAPER : JULY 2024

CHEMISTRY

Time: 3 Hrs. **Max. Marks: 70**

General Instructions:

*The question paper is divided into **four** sections:*

(1) ***Section A:*** *Q. No. **1** contains **Ten multiple choice type** of questions carrying **One mark** each.*
*Q. No. **2** contains **Eight very short answer type** of questions carrying **One mark** each.*

(2) ***Section B:*** *Q. No. **3** to Q. No. **14** contain **Twelve short answer** type of questions carrying **Two marks** each. (Attempt **any Eight**).*

(3) ***Section C:*** *Q. No. **15** to Q. No. **26** contain **Twelve short answer** type of questions carrying **Three marks** each. (Attempt **any Eight**).*

(4) ***Section D:*** *Q. No. **27** to Q. No. **31** contain **Five long answer** type of questions carrying **Four marks** each. (Attempt **any Three**).*

*(5) Use of the log table is allowed. Use of calculator is **not** allowed.*

(6) Figures to the right indicate full marks.

(7) For each multiple choice type of question, it is mandatory to write the correct answer along with its alphabet e.g. (a))...../ (b)..... / (c)...../ (d) etc.
Only the first attempt will be considered for evaluation.

(8) Physical Constants:
Given: $R = 8.314\ J\ K^{-1}\ mol^{-1}$
$N_A = 6.022 \times 10^{23}$
$F = 96500C$

SECTION – A

Q.1. Select and write the correct answer for the following multiple choice type of questions: **[10]**

i. Integrated rate law equation for a zero order reaction is –

(A) $K_t = [A]_0 - [A]_t$ (B) $K_t = 2.303 \log_{10} \frac{[A]_0}{[A]_t}$

(C) $K = \frac{[A]_t - [A]_0}{t}$ (D) $K_t = 2.303 \log_{10} \frac{[A]_t}{[A]_0}$

ii. The spin only magnetic moment of Fe^{+2} ion is _____.
(A) 3.806 BM (B) 4.899 BM
(C) 5.796 BM (D) 6.817 BM

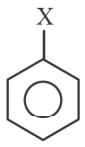
iii. The relation between radius of sphere and edge length in simple cubic lattice is _____.
(A) $\sqrt{3}\,r = 4a$ (B) $\sqrt{3}a = 4r$
(C) $r = \frac{a}{2}$ (D) $\sqrt{2}a = 4r$

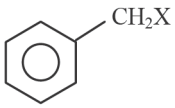
iv. The monomer used in the preparation of thermocol is _____.
(A) vinyl chloride (B) acrylamide
(C) butadiene and acrylonitrile (D) styrene

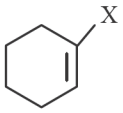
v. The pH of 0.01M solution of HCl is –
(A) 4 (B) 3
(C) 2 (D) 1

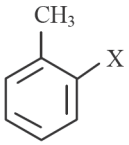
vi. Which of the following α-amino acids do not contain chiral centre?
(A) alanine (B) valine
(C) leucine (D) glycine

vii. Among the following benzylic halide is _____ .

(A) 

(B) 

(C) 

(D) 

viii. Neutral complex in the following is _____

(A) $[Co(NO_2)_3(NH_3)_3]$ (B) $[Co(NH_3)_5CO_3]Cl$

(C) $Na_3[Co(NO_2)_6]$ (D) $[Co(C_2O_4)_3]^{3-}$

ix. The reaction used to convert toluene to benzaldehyde is known as:

(A) Etard's reaction
(B) Gatterman-Koch formylation reaction
(C) Friedel-Crafts reaction
(D) Swartz reaction

x. A better reagent to convert primary alcohol to aldehyde is

(A) chromic anhydride
(B) pyridinium chlorochromate
(C) potassium permanganate
(D) potassium dichromate

Q.2. Answer the following questions: **[8]**

i. Write the name of insecticide which is effectively used instead of DDT.

ii. Write the name or formula of hydrocarbon formed when methyl magnesium iodide is treated with ammonia.

iii. Calculate the standard potential of the following cell at 25°C:
$Zn_{(s)} \mid Zn^{2+}(0.08\ M) \parallel Cr^{3+}(0.1\ M) \mid Cr_{(s)}$
$E^{\circ}_{Zn} = -0.76V, \quad E^{\circ}_{Cr} = -0.74V.$

iv. Write the IUPAC name of $Na_3[AlF_6]$.

v. Write the electronic configuration of Zn^{2+} ion. (Atomic number of zinc is 30).

vi. Write the IUPAC name of amine formed when acetamide undergoes Hofmann bromamide degradation.

vii. Write the condition for spontaneity of reaction with respect to entropy.

viii. Write the relation between van't Hoff factor and degree of dissociation of an electrolyte.

SECTION – B

Attempt any EIGHT of the following questions: **[16]**

Q.3. The normal boiling point of ethyl acetate is 77.06 °C. A solution of 50 g of non-volatile solute in 150 g ethyl acetate boils at 82.60 °C. Calculate molar mass of solute. [$K_b = 2.77$ °C kg mol^{-1}]

Q.4. Deduce first law of thermodynamics for:

(a) isothermal process
(b) isochoric process

Q.5. Complete the following equations:

(i) $XeF_2 + H_2O \longrightarrow ?$

(ii) $Xe + F_2 \xrightarrow[\text{Low temperature}]{\text{Electric discharge}} ?$

Q.6. Differentiate between ionic crystals and covalent crystals.

Q.7. What is the mass of Cu metal produced at the cathode during the passage of 5 ampere of current through $CuSO_4$ solution for 100 minutes? [Molar mass of Cu = 63.5 g mol^{-1}].

Q.8. Define Buffer solution. Write the Henderson Hasselbalch equation for acidic buffer.

Q.9. Write two principles of green chemistry.

Q.10. Write the preparation of Nylon-6 polymer and its two uses.

Q.11. Define:
(a) Pyrometallurgy
(b) Roasting

Q.12. Write salient features of S_N1 mechanism.

Q.13. What is the denaturation of proteins? Write the name of only pyrimidine base in RNA.

Q.14. Write the reaction when ethylamine is treated with:
(a) excess of ethyl bromide
(b) Hinsberg's reagent

SECTION – C

Attempt any EIGHT of the following questions: **[24]**

Q.15. Construct a cell using standard hydrogen electrode and zinc electrode. Write its cell reaction and cell representation.
Calculate cell potential of a cell with 0.01 M Zn^{2+} ions. Standard potential of a cell is + 0.76 V.

Q.16. State Henry's Law.
Write four conditions for ideal solutions.

Q.17. Write one example of each of ionisation, linkage and hydrated isomerism.

Q.18. Calculate the standard enthalpy of the reaction:
$SiO_{2(s)} + 3C_{(graphite)} \longrightarrow SiC_{(s)} + 2CO_{(g)}$ from the following reactions:
(i) $Si_{(s)} + O_{2(g)} \longrightarrow SiO_{2(s)}$, $\Delta_rH° = 911$ kJ
(ii) $2C_{(graphite)} + O_{2(g)} \longrightarrow 2CO_{(g)}$, $\Delta_rH° = -221$kJ
(iii) $Si_{(s)} + C_{(graphite)} \longrightarrow SiC_{(s)}$, $\Delta_rH° = -65.3$ kJ

Q.19. Derive Ostwald's dilution law for weak acid. Obtain relation between solubility product and its solubility for $Al(OH)_3$.

Q.20. 60% of the reactant decomposes in 45 minutes in a first order reaction. Calculate the half life period of the reaction.
Write the relation between half life period and initial concentration for zero order reaction.

Q.21. Write the conditions of colour of transition metal ion.
Write the alloy used in Fischer Tropsch process.

Q.22. Explain anomalous behaviour of oxygen with respect to atomicity, magnetic property and oxidation state.

Q.23. Explain Cross Cannizzaro reaction. Draw structure of Zwitter ion of sulfanilic acid.

Q.24. Identify A, B, C and rewrite the chemical reactions:

$$H_3C - CH_2Cl + KOH_{(aq)} \xrightarrow{\Delta} \text{'A'} \xrightarrow[\text{powder}]{\text{hot Cu}} \text{'B'} \xrightarrow[\text{dil } H_2SO_4]{K_2Cr_2O_7} \text{'C'}$$

Q.25. Explain optical isomerism in 2-chlorobutane.

Q.26. Write Clemmenson's reduction reaction of propanone. Write Fehling solution test for ethanal.

SECTION – D

Attempt any THREE of the following questions: **[12]**

Q.27. How is dioxygen prepared in laboratory from $KClO_3$? Write the chemical reaction to convert:
(a) phenol to benzoquinone
(b) phenol to cyclohexanol

Q.28. Define:
(a) Standard enthalpy of combustion.
(b) Enthalpy of atomization.
Draw the structure of D-ribose sugar.
Write the uses of bronze alloy.

Q.29. Distinguish between order and molecularity of a reaction.
Write gases liberated at cathode and anode during electrolysis of aqueous NaCl solution.
Write two uses of neon.

Q.30. When gold crystallizes, it forms face-centred cubic cell. The unit cell edge length is 408 pm. Calculate the density of gold. [Molar mass of gold = 197 g $mole^{-1}$]
Which flower is an example of self cleaning?
Write the monomer used for preparation of PVC.

Q.31. Explain the formation of $[Co(NH_3)_6]^{3+}$ ion on the basis of Valence bond theory.
Convert the following:
(a) acetic acid to ethyl acetate
(b) acetic acid to ethyl alcohol