CBSE
Class XII Chemistry
Sample Paper 2

Time: 3 Hrs **Total marks: 70**

General Instructions:

- There are 33 questions in this sample paper. All questions are compulsory.
- Section A: Q. Nos. 1 to 2 are case-based questions having four MCQs or Reason Assertion type based on given passage each carrying 1 mark.
- Section A: Question 3 to 16 are MCQs and Reason Assertion type questions carrying 1 mark each.
- Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.
- Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.
- Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.
- Use of calculators and log tables is not permitted.

Section A

1. Read the given passage and answer the questions 1 to 5 that follow:

Leclanche cell is a primary cell. It consists of a cylindrical zinc container which acts as the anode. A graphite rod surrounded by a paste of manganese dioxide acts as the cathode. These are in contact with a thick paste of ammonium chloride and zinc chloride which acts as the electrolyte.

(i) What is the reaction taking place at the anode?

a) $Zn(s) \rightarrow Zn^{+2} + 2e^-$

b) $Zn^{+2} \rightarrow Zn(s) + 2e^-$

c) $MnO_2 + NH_4^+ + e^- \rightarrow MnO(OH) + NH_3$

d) None of these

(ii) How much electricity in terms of faraday is produced by the oxidation of one mole of Zn?

a) 3F

b) 2F

c) 1F

d) 4F

(iii) Leclanche cell is considered as the primary cell because

a) Reaction inside the cell is not reversed.

b) Reaction inside the cell is reversed.

c) It is used in transitor.

d) None of these.

(iv) Lelanche cell is not use in

a) Tape recorder
b) Radio
c) Flashlight
d) None of these.

2. Read the passage given below and answer the following questions:

Potassium permanganate is manufactured on a large scale by the alkaline oxidative fusion of pyrolusite ore followed by electrolytic oxidation in alkaline medium. It is crystalline, deep purple in colour and acts as an oxidizing agent in the neutral, alkaline and acidic media. In acidic medium, it is used in volumetric analysis for estimation of ferrous salts, oxalates, etc. The titrations are carried out in presence of H_2SO_4. For use an oxidizing agent, $KMnO_4$ should be stored in dark bottles and standardized just before use with standard oxalic acid solution or Mohr salt solution. In an experiment on titration, 13.4 g of dry pure sodium oxalate (molar mass=134 g mol^{-1}) was dissolved in 100 mL of distilled water and then 100 mL of 2M H_2SO_4 were added. The solution was cooled to 25-30^oC. Now to this solution, 0.1 M $KMnO_4$ solution was added till a very faint pink colour persisted.

In these questions (Q. No 5-8, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices).

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.
b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.
c) Assertion is correct statement but reason is wrong statement.
d) Assertion is wrong statement but reason is correct statement.

(i) Assertion: When pyrolusite is fused with KOH and KNO_3, we get $KMnO_4$.
Reason: MnO_2 is pyrolusite.

(ii) Assertion: $KMnO_4$ is purple in colour.
Reason: In $KMnO_4$, an electron is momentarily transferred from O to metal.

(iii) Assertion: Mohr salt is preferred over $FeSO_4.7H_2O$ for standardization of $KMnO_4$ solution.
Reason: $FeSO_4.7H_2O$ contains only ferrous ions whereas ferrous sulphate contains some Ferric ions.

(iv) Assertion: If instead of H_2SO_4, HCl or HNO_3 of suitable concentration were used, the volume of $KMnO_4$ solution used would have been more than HCl.
Reason: If instead of H_2SO_4, HCl or HNO_3 of suitable concentration were used, the volume of $KMnO_4$ solution used would have been more than HNO_3.

Questions 3 to 11 are multiple choice questions carrying 1 mark each:

3. In the complex $[Ni(H_2O)_2(NH_3)_4]^{2+}$, the number of unpaired electrons is
A. 0
B. 1
C. 2
D. 3

4. The formation of micelles takes place above a particular temperature called
A. CMC
B. Kraft temperature
C. Critical point
D. Specific temperature

5. The electrolytic process used for the extraction of aluminium from bauxite is
A. Ostwald process
B. Hall-Heroult process
C. Contact process
D. Mond process

6. Buna-S is a copolymer of
A. Butadiene and styrene
B. Adipic acid and hexamethylenediamine
C. Urea and styrene
D. Chloroprene and butadiene

7. Degeneracy of the d-orbital is removed with the approach of the ligand due to
A. Ligand electron-metal electron repulsion
B. Ligand electron-metal nucleus attraction
C. Ligand nucleus-metal electron attraction
D. Ligand nucleus-metal nucleus repulsion

8. How many S-S bonds are present in pyrosulphuric acid (oleum)?
A. 3
B. 1
C. 0
D. 2

9. Pyrolusite is a/an
A. Oxide
B. Sulphide
C. Carbide
D. Carbonate

10. Which property of colloids is applied in rubber plating and sewage disposal?

A. Peptisation
B. Electrophoresis
C. Tyndall effect
D. Brownian movement

11. $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$ are types of

A. Linkage isomer
B. Ionisation isomer
C. Structural isomer
D. Coordinate isomer

OR

Ferrocyanide ion is a type of

A. Octahedral square planar complex
B. Octahedral complex
C. Tetrahedral complex
D. Square planar complex

In the following questions (Question number 12 to 16) a statement of assertion is followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Both assertion and reason are correct, and the reason is the correct explanation of the assertion.
(b) Both assertion and reason are correct, but the reason is not the correct explanation of the assertion.
(c) Assertion is correct, but reason is wrong.
(d) Assertion is wrong, but reason is correct.

12. **Assertion:** $[Fe(H_2O)_5NO]SO_4$ is paramagnetic.
Reason: Fe in $[Fe(H_2O)_5NO]SO_4$ has three unpaired electrons.

13. **Assertion:** In a strongly acidic solution, aniline becomes more reactive towards electrophilic reagents.
Reason: The amino group being completely protonated in strongly acidic solution, the lone pair of electrons on nitrogen is no longer available for resonance.

14. **Assertion:** Micelles are formed by surfactant molecules above the critical micelle concentration (CMC).
Reason: Conductivity of a solution having surfactant molecules decreases sharply at CMC.

15. **Assertion:** Heat absorbed during the isothermal expansion of an ideal gas against vacuum is zero.
Reason: Volume occupied by the molecules of an ideal gas is zero.

16. **Assertion:** Acetic acid does not undergo haloform reaction.
Reason: Acetic acid has no alpha hydrogen.

Section B

The following questions Q. No. 17-25 are short answer type and carry 2 marks each.

17. A solution prepared by dissolving 1.25 g of methyl salicylate in 99.0 g of benzene has a boiling point of 80.31°C. Determine the molar mass of this compound.
(BP of pure benzene = 80.10°C and K_b for benzene = 2.53°C kg mol^{-1})

OR

Calculate the freezing point of an aqueous solution containing 10.50 g of $MgBr_2$ in 200 g of water. (Molar mass of $MgBr_2$ = 84 g) (K_f for water = 1.86 K kg mol^{-1})

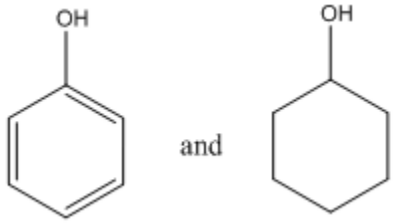
18. Arrange the following in the order of increasing reactivity in S_N1 and S_N2 reactions:
$C_6H_5CH_2Br$, $C_6H_5CH(C_6H_5)Br$, $C_6H_5CH(CH_3)Br$, $C_6H_5C(CH_3)(C_6H_5)Br$

19. How is acetone obtained from ethanol?

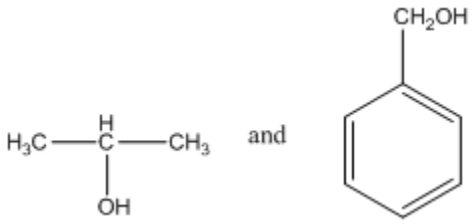
20. Write the electrode reactions taking place in the Ni–Cd cell.

21. Draw the structures of isomers (if any) and write the names of the $[Cr(NH_3)_4Cl_2]^+$ complex.

22. Give a chemical test to distinguish between the following pairs of compounds:
(a)



(b)



23. Write the structure of the major organic product in each of the following reactions:
(a) $CH_3CH_2CH_2OH + SOCl_2 \rightarrow$
(b) $CH_3CH_2CH = CH_2 + HBr \xrightarrow{\text{Peroxide}}$

24.

(a) Give two reasons to support the cyclic structure of glucose.

(b) Why are amino acids soluble in water?

25. Write a note on the Hoffmann bromamide reaction.

Section C

Q. No. 26-30 are short answer type II carrying 3 marks each.

26. 18 g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a saucepan. At what temperature will water boil at 1.013 bar? (K_b for water is 0.52 K kg mol^{-1})

OR

Why is the boiling point of a solution containing a non-volatile solute more than that of a pure solvent? Explain graphically.

27. Complete the equations:

(a) $NaCl + MnO_2 + H_2SO_4 \rightarrow$

(b) $Al + O_2 \rightarrow$

(c) $2Pb(NO_3)_2 \xrightarrow{673\,K}$

28. Complete the equations:

(a) $NH_4Cl(aq) + NaNO_2(aq) \rightarrow$

(b) $P_4 + NaOH + H_2O \rightarrow$

(c) $CaF_2 + H_2SO_4 \rightarrow$

29. Decomposition of a compound follows first order kinetics. It takes 15 min for 20% of the starting compound to react. Calculate

(i) Rate constant for the reaction.

(ii) Time at which 10% of the reactant is left unreacted.

(iii) Time taken for the next 20% of the reactant to react after the first 15 min.

30. Convert:

(i) Acetaldehyde to crotonic acid

(ii) Formaldehyde to chloroethane

(iii) Acetic acid to propanoic acid

Section D

Q. No. 31 to 33 are long answer type carrying 5 marks each.

31.

(a) The rates of a reaction starting with initial concentrations 2.0×10^{-3} M and 1.0×10^{-3} M are equal to 2.40×10^{-4} M s^{-1} and 0.60×10^{-4} M s^{-1}, respectively. Calculate the order of the reaction with respect to the reactant and also the rate constant.

(b) For a reaction A + B $\rightarrow$ C, it is found that

(i) Rate becomes double when concentration of A is doubled.

(ii) Rate becomes 16 times when concentration of both A and B are doubled.

(iii) Write the rate expression and calculate the overall order of the reaction.

32.

(a) Convert:

(i) Acetic acid to ethylamine

(ii) Propionic acid to lactic acid

(b) Identify A, B and C in the following reactions:

$$CH_3COCH_3 \xrightarrow{LiAlH_4} A \xrightarrow{SOCl_2} B \xrightarrow{KOH(alc)} C$$

33. Give reasons:

(a) Cr^{2+} is a strong reducing agent, whereas Mn^{2+} is not. (Cr = 24, Mn = 25)

(b) Transition metal ions such as Cu^{+}, Ag^{+} and Sc^{3+} are colourless.

(c) Enthalpies of atomisation of transition metals of the 3d series do not follow a regular trend throughout the series.

(d) The radius of Fe^{2+} (Z = 26) is less than that of Mn^{2+} (Z = 25).

(e) Chemistry of actinoids is more complicated than that of lanthanoids.

OR

(a) Write the chemical equations involved in the following:

1) $FeCr_2O_4 + 8Na_2CO_3 + O_2 \rightarrow$

2) $2KMnO_4 \xrightarrow[\Delta]{513\ K}$

3) $2CrO_4^{2-} + H^{+} \rightarrow$

(b) Use Hund's rule to derive the electronic configuration of Ce^{3+} ion, and calculate its magnetic moment on the basis of the 'spin only' formula.

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Sample Paper 2 - Solution

Time: 3 Hrs **Maximum Marks: 70**

Section A

1.

(i) (a) $Zn(s) \rightarrow Zn^{+2} + 2e^-$

(ii) (b)Two electrons are released by Zn. So, according to Faraday's law, 1 mole of Zn produces 2F electricity.

(iii) In Leclanche cell, the reaction occurs only once, and after use over a period of time, the battery dies and cannot be used as the reaction is not reversed. So, it is considered a primary cell.

(iv) Leclanche cells are used in a tape recorder, radio, flashlight, transistor etc.

2.

(i) (d) When pyrolusite is fused with KOH and KNO_3, we get K_2MnO_4. MnO_2 is pyrolusite.

(ii) (a) Purple colour of $KMnO_4$ is due to charge transfer.

(iii) (a) Mohr salt is preferred over $FeSO_4.7H_2O$ for standardization of $KMnO_4$ solution.
$FeSO_4.7H_2O$ contains only ferrous ions whereas ferrous sulphate contains some Ferric ions.

(iv) (b) If instead of H_2SO_4, HCl or HNO_3 of suitable concentration were used, the volume of $KMnO_4$ solution used would have been more than HCl.

3. (c) Two unpaired electrons

4. (b) The formation of micelles takes place above a particular temperature called Kraft temperature.

5. (b) The process of extraction of aluminium is known as Hall-Heroult process.

6. (a) Buna-S is a copolymer of butadiene and styrene. It is prepared by copolymerisation of 1,3 butadiene and styrene along with sodium.

7. (a) Degeneracy of the d-orbital is removed with the approach of the ligand due to ligand electron-metal electron repulsion.

8. (c) The number of S-S bonds in pyrosulphuric acid (oleum) is zero.

9. (a) Pyrolusite is an oxide (MnO_2).

10. (b) Electrophoresis movement of colloidal particles towards an electrode when they are subjected to an electrical field.

11. (b) $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$ are types of ionisation isomers.

OR

(b) Ferrocyanide ion, i.e. $[Fe(CN)_6]^{4-}$ is a type of octahedral complex.

12. (a) Both assertion and reason are correct, and the reason is the correct explanation of the assertion.

13. (b) Assertion is wrong, but reason is correct.

14. (b) Both assertion and reason are correct, but the reason is not the correct explanation of the assertion.

15. (b) Both assertion and reason are correct, but the reason is not the correct explanation of the assertion.

16. (c) Assertion is correct, but reason is wrong.

Section B

17. $\Delta T_B = 80.31^\circ C - 80.10^\circ C = 0.21^\circ C$

W_B= 1.25 g, K_b =2.53°C kg mol^{1-}, M_B =? W_A = 99 g

$$M_B = \frac{K_b \times W_B}{\Delta T_b \times W_A} \times 1000$$

$$= \frac{2.53 \times 1.25 \times 1000}{0.21 \times 99}$$

$$M_B = 152\ g/mol$$

OR

Given:

i = 3, K_f = 1.86 K kg mol^{-1}, W_B = 10.5 g, M_B = 184 g mol^{-1}, W_A = 200 g

$$\Delta T_f = \frac{i \times K_f \times W_B \times 1000}{M_B \times W_A}$$

On substituting the values in the above equation, we get

$$\Delta T_f = \frac{3 \times 1.86 \times 10.5 \times 1000}{184 \times 200} = 1.59\ K$$

As we know ΔT_f, lets find freezing point of aqueous solution,

$$T_f = T_f^\circ - \Delta T_f$$

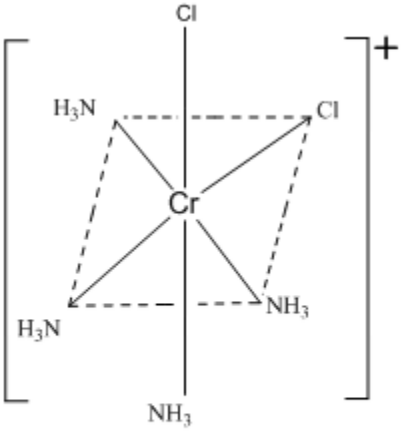
$$T_f = 273.15\ K - 1.59\ K = 271.56\ K$$

18. $C_6H_5CH_2Br < C_6H_5CH(CH_3)Br < C_6H_5CH(C_6H_5)Br < C_6H_5C(CH_3)(C_6H_5)Br$ (S_N1)
$C_6H_5C(CH_3)(C_6H_5)Br < C_6H_5CH(C_6H_5)Br < C_6H_5CH(CH_3)Br < C_6H_5CH_2Br$ (S_N2)

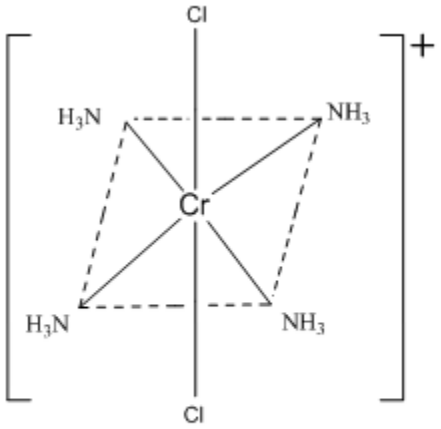
19. $\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[\text{Oxidation}]{K_2Cr_2O_7/H_2SO_4} \underset{\text{Ethanoic acid}}{CH_3COOH} \xrightarrow{CaCO_3} \underset{\text{Ca.Ethanoate}}{(CH_3COO)_2Ca} \longrightarrow \underset{\text{Ethanol}}{CH_3COCH_3}$

20. $Cd_{(s)} + 2OH^-_{(aq)} \longrightarrow Cd(OH)_{2(s)} + 2e^-$
$NiO_{2(s)} + 2H_2O + 2e^- \longrightarrow Ni(OH)_{2(s)} + 2OH^-$

21.



cis-Tetraamminedichlorido chrommium (III) ion

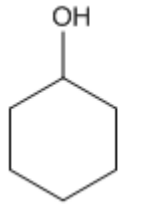


trans-Tetraamminedichlorido chrommium (III) ion

22.

(a) When phenol is treated with $FeCl_3$ solution, it gives violet colouration. Cyclohexanol does not give any colouration.

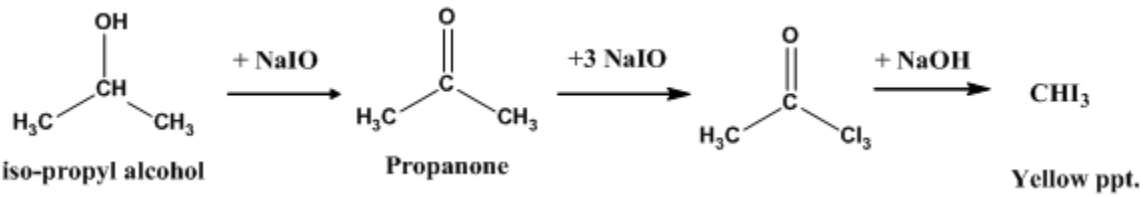
$\underset{\text{Phenol}}{6C_6H_5OH} + FeCl_3 \longrightarrow \underset{\text{Violet colouration}}{[Fe(OC_6H_5)_6]^{3-}} + 3H^+ + 3HCl$



$\xrightarrow{FeCl_3}$ No Violet Colouration

Cyclohexanol

(b) In the iodoform test, isopropyl alcohol is warmed with NaOI (I_2NaOH) to give a yellow precipitate of iodoform, while benzyl alcohol does not give any yellow precipitate.



iso-propyl alcohol Propanone Yellow ppt.

23.

(a) $CH_3CH_2CH_2OH + SOCl_2 \rightarrow CH_3CH_2CH_2Cl$

(b) $CH_3CH_2CH = CH_2 + HBr \xrightarrow{\text{Peroxide}} CH_3CH_2CH_2CH_2Br$

24.

(a) Glucose does not restore the colour of Schiff's reagent and does not react with $NaHSO_3$.

(b) Due to the presence of the acidic –COOH group and basic $–NH_2$ group, amino acids occur in the zwitterion form and are thus water soluble.

25. Hoffmann bromamide reaction: A reaction where amides are made to react with bromine in aqueous or ethanolic NaOH solution to yield primary amines with one carbon less than the corresponding amide. It is used in stepping down the series.

$$R\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH_2 + Br_2 + 4\,NaOH \longrightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$$

Section C

26. Given:

Moles of glucose = 18 g/180 g/mol = 0.1 mol

Mass of the solvent = 1 kg

Hence, molarity of glucose solution = $\frac{0.1\,mol}{1\,Kg} = 0.1\,mol\,kg^{-1}$

Change in boiling point will be

$\Delta T_b = K_b \times m$

$\Delta T_b = 0.52 \times 0.1 = 0.052\,K$

Water boils at 373.15 K at 1.013 bar pressure.

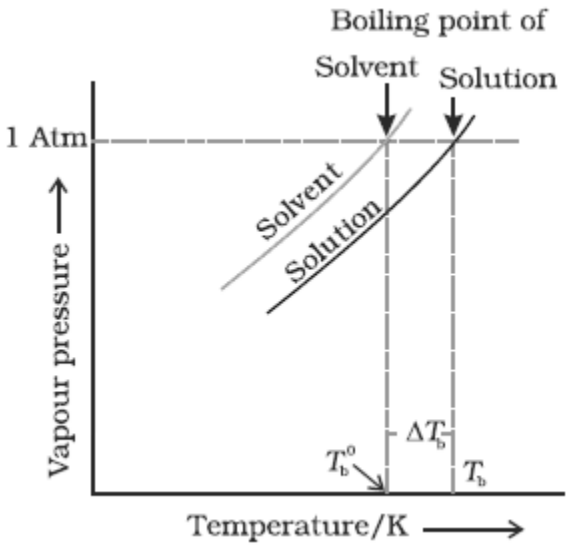
So, the boiling point will be

373.15 + 0.052 = 373.202 K

OR

The boiling point is the temperature at which the vapour pressure of the solution is equal to the atmospheric pressure of the solution. In a solution containing a non-volatile solute, the vapour pressure is lowered as the surface of the liquid is also occupied by some molecules of a non-volatile solute.

Hence, high temperature is required to make the vapour pressure of the solution equal to the atmospheric pressure which eventually increases the boiling point of the solution.



27.

(a) $4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$

(b) $4Al + 3O_2 \rightarrow 2Al_2O_3$

(c) $2Pb(NO_3)_2 \xrightarrow{673\,K} 4NO_2 + 2PbO + O_2$

28.

(a) $NH_4Cl\,(aq) + NaNO_2\,(aq) \rightarrow N_2(g) + 2H_2O(l) + NaCl(aq)$

(b) $P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$

(c) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

29.

(i) For a first-order reaction,

$$k = \frac{2.303}{t} \log \frac{a}{a - x}$$

$$k = \frac{2.303}{15} \log \frac{a}{a - 0.2a}$$

$$= 0.0149\ min^{-1}$$

(ii)

$$t = \frac{2.303}{k} \log \frac{a}{0.1a}$$

Substituting the values,

$$= 154.6\ min$$

(iii) In the first 15 min, 80% is left unreacted. Now the initial conc. is 0.80a.

x = 20% of 0.8a = 0.16a

$$t = \frac{2.303}{k} \log \frac{0.8a}{0.8a - 0.16a}$$

$$= 15\ min$$

30.

(i) $\underset{\text{Acetaldehyde}}{CH_3CHO} \xrightarrow{\text{dil. NaOH}} CH_3CH(OH)CH_2CHO \xrightarrow{\text{Heat}} CH_3CH=CHCHO \xrightarrow[NH_4OH]{AgNO_3} \underset{\text{Crotonic acid}}{CH_3CH=CHCOOH}$

(ii) $HCHO \xrightarrow{H_2, Ni} CH_3OH \xrightarrow{PCl_5} CH_3Cl \xrightarrow{Na, \text{ether}} CH_3CH_3 \xrightarrow{Cl_2, \text{light}} CH_3CH_2Cl$

(iii) $CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH \xrightarrow{P, I_2} CH_3CH_2I \xrightarrow{KCN} CH_3CH_2CN \xrightarrow{H_3O^+} CH_3CH_2COOH$

Section D

31.

(a)

Suppose $r = k[A]^x$ where x = order of the reaction.

Given is that

$2.40 \times 10^{-4} = k[2.0 \times 10^{-3}]^x$ (Eq.1)

and

$(0.60 \times 10^{-4}) = k[1.0 \times 10^{-3}]^x$ (Eq.2)

Dividing equation (1) by (2) gives

$(2.40 \times 10^{-4}) / (0.60 \times 10^{-4}) = [(2.0 \times 10^{-3}) / (1.0 \times 10^{-3})]^x$

Or

$2^x = 4 = 2^2$

Therefore,

$x = 2$

The rate law is

$R = k[A]^2$ and order of reaction = 2

The rate constant

$$k = \frac{r}{[A]^2}$$

$$= \frac{2.40 \times 10^{-4}}{(2.0 \times 10^{-3})^2}$$

$= 60 \text{ mol}^{-1} \text{ L s}^{-1}$

(b)

Suppose the order w.r.t A is x and w.r.t B is y, then the rate expression is

$r = k[A]^x [B]^y$

The rate becomes double when [A] is doubled, then the rate law is

$2r = k[2A]^x [B]^y$

$2r = 2^x k[A]^x [B]^y$

$2r = 2^x r$

or

$2^x = 2$

$x = 1$

The rate becomes 16 times when both [A] and [B] are doubled then we have

$16r = k[2A]^x [2B]^y$

$16r = 2^x \times 2^y r$

$16 = 2^x 2^y$

$16 = 2^x 2^y$

$2^y = 8 = 2^3$ (Since x = 1)

$y = 3$

Therefore, the rate law is

$r = k[A][B]^3$

Overall order of reaction = 1 + 3 = 4

32.

(a)

(i) $CH_3COOH \xrightarrow{LiAlH_4} CH_3CH_2OH \xrightarrow{PCl_5} CH_3CH_2Cl \xrightarrow{NH_3} CH_3CH_2NH_2$

(ii) $CH_3CH_2COOH \xrightarrow{P/Br_2} CH_3CH(Br)COOH \xrightarrow{aq.KOH} CH_3CH(OH)COOH$

(b) A is $CH_3CH(OH)CH_3$, B is $CH_3CH(Cl)CH_3$, C is $CH_3CH{=}CH_2$

33.

(a) Cr^{2+} is less stable than Cr^{3+}; therefore, it is a good reducing agent, whereas Mn^{2+} is stable due to half-filled d-orbital; therefore, it is not a reducing agent.

(b) Cu^+, Ag^+ and Sc^{3+} are colourless because they do not have unpaired electrons and cannot undergo d–d transitions.

(c) It is due to an irregular trend of atomic size that the number of unpaired electrons first increase and then decrease.

(d) It is because the effective nuclear charge is more in Fe^{2+} than in Mn^{2+}.

(e) In actinoids, energy of 5f, 6d and 7s is comparable, and therefore, they show high oxidation states and their chemistry is more complicated. All of them are radioactive.

OR

(a)

1) $4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$

2) $2KMnO_4 \xrightarrow[\Delta]{513\,K} K_2MnO_4 + MnO_2 + O_2$

3) $2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$

(b) Electronic configuration of Ce and Ce^{3+} ions:

Ce (Z = 58) = [Xe] $4f^1\ 5d^1\ 6s^2$

Ce^{3+} = [Xe] $4f^1$

It has one unpaired electron.

'Spin only' formula for magnetic moment of a species is

$$\mu = \sqrt{n(n+2)}\ \text{B.M.}$$

where n = no. of unpaired electrons

Magnetic moment of Ce^{3+}

$$\mu = \sqrt{1(1+2)} = \sqrt{3}\ \text{B.M.} = 1.732\ \text{B.M.}$$