Class XII Session 2026-27
Subject - Chemistry
Sample Question Paper - 5

Time Allowed: 3 hours **Maximum Marks: 70**

General Instructions:

Read the following instructions carefully.

1. There are **33** questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 very short answer questions carrying 2 marks each.
4. SECTION C consists of 7 short answer questions carrying 3 marks each.
5. SECTION D consists of 2 case-based questions carrying 4 marks each.
6. SECTION E consists of 3 long answer questions carrying 5 marks each.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed.**

Section A

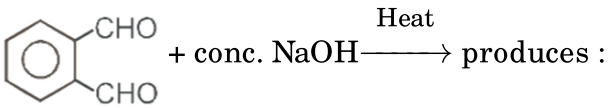
1. The best method for the conversion of an alcohol into an alkyl chloride is by treating the alcohol with: **[1]**

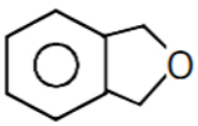
   a) $SOCl_2$ in presence of pyridine
   b) PCl_3
   c) Dry HCl in the presence of anhydrous $ZnCl_2$
   d) PCl_5

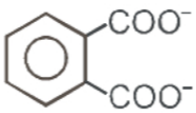
2. The vitamin that cannot be stored in our body is **[1]**

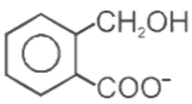
   a) vitamin D
   b) vitamin C
   c) vitamin E
   d) vitamin K

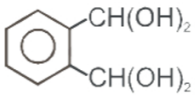
3. The reaction **[1]**



   a) 

   b) 

   c) 

d) 

4. Nucleophilic addition of Grignard reagent to ketones followed by hydrolysis with dilute acids forms: **[1]**

a) Tertiary alcohol
b) Alkene
c) Secondary alcohol
d) Primary alcohol

5. Why is the minimum energy needed for an effective collision? **[1]**

a) A minimum energy is needed, so that the particles will collide many times per second.
b) Energy is needed to break bonds.
c) Energy is needed to orient the particles correctly.
d) Enough energy is needed to give off heat in a reaction.

6. Match the items of column I with appropriate entries of column II: **[1]**

Column I	Column II
(a) Volt	(i) Current
(b) Joule	(ii) Resistance
(c) ohms	(iii) Gibb's free energy
(d) Ampere	(iv) Cell Potential

a) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
b) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
c) (a) - (i), (b) - (iii), (c) - (iv), (d) - (ii)
d) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

7. Polyhalogen compounds have wide application in industries and agriculture. DDT is also a very important polyhalogen compound. It is a: **[1]**

a) greenhouse gas
b) non-biodegradable insecticide
c) biodegradable insecticide
d) fertilizer

8. When a nucleoside is linked to phosphoric acid which of the following may be obtained? **[1]**

a) Ribonucleic acid
b) Nucleotide
c) Deoxyribonucleic acid
d) An amino acid

9. Rate of ionic reactions are generally **[1]**

a) Very slow
b) Moderate
c) Slow
d) Very fast

10. Which of the following aldehydes will undergo Cannizzaro reaction? **[1]**

a) $(CH_3)_3CCHO$
b) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - CHO$

c) $CH_3 - CH_2 - CHO$

d) $CH_3 - \underset{\underset{CH_3}{|}}{CH} - \underset{\underset{CH_3}{|}}{CH} - CHO$

11. Phenol reacts with Bromine (Br_2) water to form: **[1]**

a) 4-bromophenol

b) 2, 4-dibromophenol

c) 2-bromophenol

d) 2, 4, 6-tribromophenol

12. In a set of reactions propionic acid yielded a compound (D) : **[1]**

$CH_3CH_2COOH(\ A) \xrightarrow{SOCl_2} (\ B) \xrightarrow[\Delta]{NH_3} (C) \xrightarrow[Br_2]{KOH} (D)$, What is the structure of (D)

a) $CH_3CH_2NH_2$

b) $CH_3CH_2CONH_2$

c) $CH_3CH_2CH_2NH_2$

d) $CH_3CH_2NHCH_3$

13. **Assertion (A)**: Mg is not present in the enamel of human teeth. **[1]**

Reason (R): Mg is an essential element for the biological functions of humans.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion (A):** Hydroxyketones are not directly used in the Grignard reaction. **[1]**

Reason (R): Grignard reagents react with the hydroxyl group.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion (A):** Hydrolysis of (–)-2-bromooctane proceeds with inversion of configuration. **[1]**

Reason (R): This reaction proceeds through the formation of a carbocation to give (+)-octan-2-ol as a product. In S_N2 reaction of optically active halides are accompanied by inversion of configuration.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** p-methoxyphenol is a stronger acid than p-nitrophenol. **[1]**

Reason (R): Methoxy group is electron-donating group whereas nitro group is electron-withdrawing.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

17. Calculate emf of the following cell at 298 K : Mg (s) + $2Ag^+$ (0.0001M) $\longrightarrow$ Mg^{2+} (0.130 M) + 2Ag (s) **[2]**

[Given : $\mathbf{E}^{\theta}_{\text{cell}} = 3.17\mathbf{V}$]

OR

Define molar conductivity for the solution of an electrolyte. How does it vary with concentration?

18. What do you mean by azeotropic mixture? **[2]**

19. How is the magnetic moment of a species related to the number of unpaired electrons? **[2]**

20. **Answer the following:** **[2]**

    i. Write the slope value obtained in the plot of ln[R] vs. time for a first order reaction. **[1]**

    ii. The reaction between $H_2(g)$ and $O_2(g)$ is highly feasible yet allowing the gases to stand at room temperature in the same vessel does not lead to the formation of water. Explain **[1]**

21. Draw the structures of the following compounds. **[2]**

    i. p,p-Dihydroxybenzophenone

    ii. Hex-2-en-4-ynoic acid

Section C

22. What is an electrochemical series? How does it help in calculating the e.m.f of a standard cell? **[3]**

23. What is the coordination entity formed when excess of aqueous KCN is added to an aqueous solution of copper sulphate? Why is it that no precipitate of copper sulphide is obtained when $H_2S(g)$ is passed through this solution? **[3]**

24. Write the structures of the major products expected from the following reactions: **[3]**

    a. Mononitration of 3-methylphenoI

    b. Dinitration of 3-methylphenol

    c. Mononitration of phenyl methanoate

25. Draw the structure of a carboxyl group and indicate clearly **[3]**

    i. The hybridized state of carbon,

    ii. The σ and π bonds present and

    iii. The electrophilic and nucleophilic centres in it

26. a. Write the formulation for the galvanic cell in which the reaction $Cu(s) + 2Ag^{+}(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ takes place. Identify the cathode and the anode reactions in it. **[3]**

    b. Write Nernst equation and calculate the emf of the following cell: Sn(s) | Sn^{2+} (0.04M) | | H^{+}(0.02M) | $H_2(g)$|Pt(s)

    $\left(Given\ \ E^{\ominus}{}_{Sn^{2+}/Sn} = -0.14V\right)$

27. An organic compound A on heating with NH_3 and cuprous oxide at high pressure gives compound B. The compound B on treatment with ice-cold solution of $NaNO_2$ **[3]**

and HCl gives C, which on heating with copper turning and HCl gives A again. Identify A, B & C. compound.

28. Hydrolysis of ethyl ethanoate takes place by the chemical reaction: **[3]**

$$CH_3COOC_2H_5 + H_2O \text{ (excess)} \xrightarrow{H^+} CH_3COOH + C_2H_5OH$$

Based on the above reaction, write:

a. What do you call such reactions?

b. Rate law equation

c. Molecularity and order of reaction

Section D

29. **Read the following text carefully and answer the questions that follow:** **[4]**

Carbohydrates are essential for life in both plants and animals. Carbohydrates are used as storage molecules as starch in plants and glycogen in animals. Chemically they are polyhydroxy aldehydes or ketones. On the basis of their behaviour on hydrolysis, carbohydrates are classified as monosaccharides, oligosaccharides and polysaccharides. All monosaccharides are reducing sugars, i.e., they are oxidized by Tollens' reagent and Fehling's solution. A monosaccharide like glucose is aldohexose and its molecular formula was found to be $C_6H_{12}O_6$. After reacting with different reagents like HI, H_2N - OH, Bromine water, $(CH_3CO)_2O$, etc. its structure was found to contain one aldehyde group, one primary alcoholic group, (-CH_2OH) and four secondary alcoholic

groups (> CHOH). Despite having the aldehyde group, glucose does not give some of the reactions of aldehyde group like Schiff's test, $NaHSO_3$ addition. This explains the existence of glucose in two cyclic hemiacetal forms which differ only in the configuration of the hydroxyl group at C-1.

Answer the following questions:

a. What are reducing sugars? **(1)**

b. Classify the following into monosaccharide and disaccharide:
Fructose, Sucrose, Lactose, Galactose **(1)**

c. Name the polysaccharide which is known as 'animal starch'. Why is it called 'animal starch'? **(2)**

OR

i. Name the isomers of glucose which in the cyclic form differ only in the configuration of the -OH group at C-1.

ii. Presence of which functional group was detected when glucose reacted with Br_2 water? **(2×1 = 2)**

30. **Read the following text carefully and answer the questions that follow:** **[4]**

Alfred Werner (1866-1919), a Swiss chemist was the first to formulate his ideas about the structures of coordination compounds. Werner proposed the concept of a primary valence and a secondary valence for a metal. The coordination entity constitutes a central metal atom or ion bonded to a fixed number of ions or molecules. In a coordination entity, the atom/ion to which a fixed number of ions/groups are bound in

a definite geometrical arrangement around it is called the central atom or ion. The ions or molecules bound to the central atom/ion in the coordination entity are called ligands. Ligands may be simple ions such as Cl^-, small molecules such as H_2O or NH_3, larger molecules such as $H_2NCH_2CH_2NH_2$ or $N(CH_2CH_2NH_2)_3$ or even macromolecules, such as protein. Ligands are unidentate, bidentate and polydentate. The coordination number (CN) of a metal ion in a complex is the number of ligand donor atoms to which the metal is directly bonded.

i. Why ethylenediaminetetraacetate ion ($EDTA^{4-}$) is hexadentate ligand? (1)

ii. Amongst $[Fe(C_2O_4)_3]^{3-}$ and $[Fe(NH_3)_6]^{3+}$ which is more stable and why? (1)

iii. SCN^- ion can coordinate through the sulphur or nitrogen atom. Justify. (2)

OR

Find the oxidation state of Pt in $[PtCl_6]^{2-}$. (2)

Section E

31. **Attempt either A or B** **[5]**

i. **Answer the following questions:** **[1]**

i. Cu^+ is not stable in aqueous solution. Comment.

ii. The lower oxides of transition metals are basic whereas the highest are amphoteric/acidic. Give reason.

iii. Write the outer electronic configuration of Cr atom(Z= 24).

iv. Out of Al, Zn, Mg and Fe which is the maximum density element?

v. Actionoid contraction is more than lanthanoid contraction. Give reason.

ii. **Answer the following questions:** **[1]**

i. Why is E^o for Mn^{3+}/Mn^{2+} redox couple more positive?

ii. Ce (III) is easily oxidised to Ce (IV). Comment.

iii. Actinoid contraction is greater from element to element than lanthanoid contraction, why?

iv. Write the preparation of sodium dichromate from chromite ore.

v. Give reasons for the following:

i. Transition metals form alloys.

ii. Mn_2O_3 is basic whereas Mn_2O_7 is acidic.

32. **Attempt either A or B** **[5]**

i. **Answer the following questions:** **[1]**

i. Write IUPAC name of the following compound and classify it into primary secondary and tertiary amine.
$CH_3(CH_2)_2NH_2$

ii. Methyl amine is stronger base than ammonia. Give reason.

iii. Draw the structure of prop-2-en-1-amine.

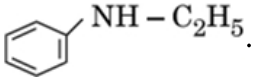
iv. Why Amines are basic substances while amides are neutral?

v. An alkyl halide (A) of molecular formula $C_6H_{13}Cl$ on treatment with alcoholic KOH gives two isomeric alkenes (B) and (C) of molecular formula C_6H_{12}. Both alkenes on hydrogenation give 2,3-dimethylbutane. Write the structures of (A), (B) and (C).

ii. **Answer the following questions:** **[1]**

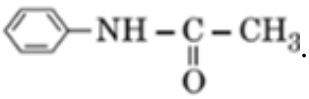
i. Out of CH_3 - NH_2 and $(CH_3)_3N$, which one has higher boiling point?

ii. Write an isomer of C_3H_9N which gives foul smell of isocyanide when treated with chloroform and ethanolic NaOH.

iii. Write the IUPAC name of .

iv. Write the IUPAC name of the following compound:

$$CH_3C - \underset{\underset{CH_3}{|}}{N} - CH_2 - CH_2 - CH_3$$

v. Write the IUPAC name of .

33. i. At the same temperature, CO_2 gas is more soluble in water than O_2 gas. Which one of them will have higher value of K_H and why? **(1)** **[5]**

ii. How does the size of blood cells change when placed in an aqueous solution containing more than 0.9% (mass/volume) sodium chloride? **(1)**

iii. 1 molal aqueous solution of an electrolyte A_2B_3 is 60% ionized. Calculate the boiling point of the solution. **(3)**

(Given: K_b for H_2O = 0.52 K kg mol^{-1})

OR

4.0 g of NaOH are contained in one decilitre of solution. Calculate the following:

i. Molality fraction of NaOH

ii. Molarity of NaOH

iii. Molality of NaOH Density of solution = 1.038 g/cm^3

Solution

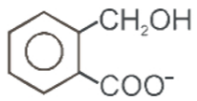
Section A

1. **(a)** $SOCl_2$ in presence of pyridine

   Explanation:
   The hydroxyl group of an alcohol is replaced by halogen on reaction with concentrated halogen acids, phosphorus halides, or thionyl chloride. Thionyl chloride ($SOCl_2$) is preferred because the other two products SO_2 and HCl are escapable gases. Hence, the reaction gives pure alkyl halides.
   $ROH + SOCl_2 \rightarrow RCl + SO_2\,(g) + HCl\,(g)$

2. **(b)** vitamin C

   Explanation:
   B group vitamins and vitamin C are soluble in water so they are grouped together as water soluble vitamins, these must be supplied regularly in diet because they are readily excreted in urine and cannot be stored (except vitamin B_{12}) in our body.

3. **(c)** 

   Explanation:
   The reaction involves the heating of sodium hydroxide (NaOH) with a specific organic compound, which typically leads to the formation of a product through a dehydration or condensation process. In this case, the correct product is identified as option, which represents the expected outcome of the reaction. The reasoning is based on the chemical behavior of NaOH when heated with certain substrates, often resulting in the formation of an alkene or an ether, depending on the reactants involved. The structure of option aligns with the anticipated product from this reaction, confirming its correctness.

4. **(a)** Tertiary alcohol

   Explanation:
   Tertiary alcohol

5. **(b)** Energy is needed to break bonds.

   Explanation:
   Energy is needed to break bonds. This energy, used to initiate the reaction, is called the activation energy.

6. **(a)** (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

   Explanation:
   (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)

7.

(b) non-biodegradable insecticide
Explanation:
non-biodegradable insecticide

8.

(b) Nucleotide
Explanation:
When nucleoside is linked to phosphoric acid at 5' – position of sugar moiety, we get a nucleotide.

9.

(d) Very fast
Explanation:
Ionic reactions occur instantaneously. Therefore, ionic reactions are very fast reactions.

10. **(a)** $(CH_3)_3CCHO$
Explanation:
$(CH_3)_3CCHO$

11.

(d) 2, 4, 6-tribromophenol
Explanation:
2, 4, 6-tribromophenol

12. **(a)** $CH_3CH_2NH_2$
Explanation:
The reaction involves propionic acid, which is a carboxylic acid. When treated with bromine (Br_2) and potassium hydroxide (KOH), a common reaction is the formation of an amine through the substitution of the carboxylic acid group. In this case, the propionic acid (CH_3CH_2COOH) can undergo a reaction where the carboxylic acid group is replaced by an amine group, resulting in the formation of propylamine ($CH_3CH_2CH_2NH_2$). Among the options provided, $CH_3CH_2NH_2$ is the correct structure for propylamine, which matches the expected product of the reaction. The other options do not represent the correct amine structure derived from propionic acid under the given reaction conditions.

13.

(b) Both A and R are true but R is not the correct explanation of A.
Explanation:
Enamel is the hardest substance in the human body and contains the highest percentage of minerals, with water and organic material composing the rest. The primary mineral is hydroxyapatite, which is crystalline calcium phosphate. Magnesium is not present in human enamel. However, magnesium is an essential mineral for human health. Magnesium is a cofactor for more than 300 enzyme systems and is involved in both aerobic and anaerobic energy generation and in glycolysis, either directly as an enzyme activator or as part of the magnesium-ATP complex. Magnesium is required for mitochondria to carry out oxidative phosphorylation. It plays a role in regulating potassium fluxes and in the metabolism of calcium.

14. **(a)** Both A and R are true and R is the correct explanation of A.
Explanation:

Hydroxy acetones are not directly used in the Grignard reaction because Grignard reagents are highly reactive so react with a hydroxyl group.

15. **(c)** A is true but R is false.
Explanation:
Hydrolysis of alkyl halides with inversion of configuration is an example of S_N2 mechanism. This mechanism is a one-step process and does not involve the formation of a carbocation.

16. **(d)** A is false but R is true.
Explanation:
A is false but R is true.

Section B

17. n = 2
The Nernst equation for the cell is :
$E = E^{\theta} - \frac{0.059}{2}\log\frac{[Mg^{2+}]}{[Ag^{+}]^2}$
$= 3.17 - \frac{0.059}{2}\log\frac{.130}{(.0001)^2}$
= 3.17 - 0.21 = 2.96V

OR

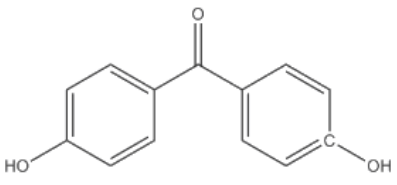
Molar conductivity is the conductivity of solution observed in 1 M solution.
Molar conductivity decreases with increase in concentration or molar conductivity increases with dilution.

18. The solutions (liquid mixtures) which boil at constant temperature and remains unchanged in composition are called azeotropes or azeotropic mixtures. Example: ethanol and water

19. **Magnetic moment:** Magnetic moment is determined by the number of unpaired electrons and it is calculated by using the spin-only formula.
$\mu = \sqrt{n(n+2)}$
Where n = no. of unpaired electrons
μ = magnetic moment
Its SI unit is Bohr Magneton(μ_B), BM.

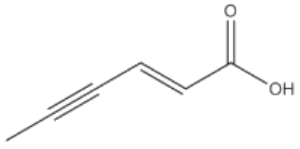
20. Answer the following:
(a) Slope = -k
(b) $2\ H_2(g) + O_2(g) \rightarrow 2\ H_2O(l)$
This reaction does not take place at the room temperature because the activation energy of the reaction is very high.

21. i.



p,p-Dihydroxybenzophenone

ii.



Hex-2-en-4-ynoic acid

Section C

22. The series of elements which have been arranged on the basis of their electrode potential is called electrochemical series or activity series.

Standard EMF of the cell = [standard reduction potential of the right hand side electrode] - [Standard reduction potential of the left hand side electrode]

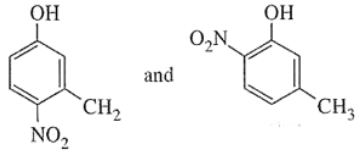
$emf = E^0_{cathode} - E^0_{anode}$

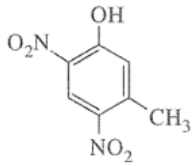
23. $2CuSO_4 + 10KCN \rightarrow 2K_3[Cu(CN)_4] + 2K_2SO_4 + (CN)_2$

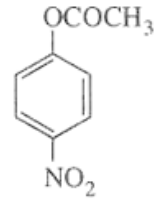
Thus, coordination entity formed = $[Cu(CN)_4]^{3-}$

As CN^- is a strong ligand, the complexion is highly stable and does not dissociate to give Cu^{2+} ions. Hence, no precipitate with H_2S is formed.

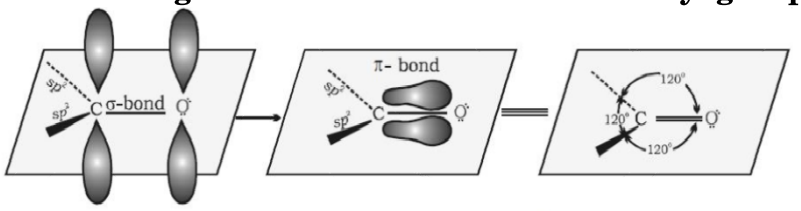
24. The combined influence of -OH and $-CH_3$ groups determine the position of the incoming group. Keeping in view that both -OH and $-CH_3$ are o- and p-directing groups, the following products are obtained:

a. 

b. 

c. 

25. **Orbital diagram for the formation of carbonyl group:**

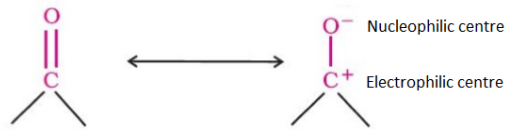


Orbital diagram for the formation of carbonyl group

i. **and**

ii. The carbonyl carbon atom is sp^2-hybridised and forms three sigma bonds. The fourth valence electron of carbon remains in its p-orbital and forms a pi-bond with oxygen by overlap with p-orbital of an oxygen. In addition, the oxygen atom also has two non bonding electron pairs. Thus the carbonyl carbon and the three atoms attached to it lie in the same plane and the pi-electron cloud is above and below this plane.

iii. The carbon-oxygen double bond is polarised due to higher electronegativity of oxygen relative to carbon. Hence, the carbonyl carbon is an electrophilic (Lewis acid) centre and carbonyl oxygen, a nucleophilic (Lewis base) centre.



26. a. We have

$E^{\Theta}_{(Cu^{2+}/Cu)} = 0.34V$ and $E^{\Theta}_{(Ag^{+}/Ag)} = 0.80V$

Standard emf of Cu is less than Ag, therefore it is strong reducing agent and is oxidised. Therefore Cu acts as Anode and Ag acts as Cathode.

Half cell reactions are:

At Cathode (Reduction):

$2Ag^+(aq) + 2e^- \rightarrow 2Ag(s)$

At Anode (Oxidation):

$Cu(s) \rightarrow Cu^{2+}(aq) + 2e^-$

b. The reactions are :

At Anode:

$Sn(s) \rightarrow Sn^{2+}(aq) + 2e^-$

At Cathode:

$2H^+(aq) + 2e^- \rightarrow H_2(g)$

Full cell reaction:

$Sn(s) + 2H^+(aq) \rightarrow Sn^{2+}(aq) + H_2(g)$

Standard emf of the cell is:

$E^0_{cell} = E^0_{H^+/H_2} - E^0_{Sn^{2+}/Sn}$

= 0 - (-0.14)V

= + 0.14V

For this reaction n=2 moles of electrons. Using Nernst equation,

$E_{cell} = 0.14 - \frac{0.0591}{2}\log\frac{[Sn^2+]}{[H^+]^2}$

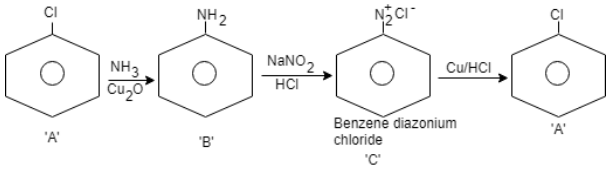
$= 0.14 - \frac{0.0591}{2}\log\frac{0.04}{(0.02)^2}$

$= 0.14 - \frac{0.0591}{2}\log\frac{4}{100} \times \frac{100}{2} \times \frac{100}{2}$

= 0.14 V - 0.0591 V

= 0.0809 V

27. $A \xrightarrow[Cu_2O]{NH_3} B \xrightarrow[0-5^\circ C]{NaNo_2 \atop HCl} C \xrightarrow{Cu/HCl} A$



28. a. Pseudo first order reaction.

b. Rate $= k[CH_3COOC_2H_5]$

c. Molecularity = 2 and order = 1

Section D

29. a. Sugars which reduce Tollens' reagent or Fehling's solution.

b. Monosaccharides:- Fructose, Galactose
Disaccharides:- Sucrose, lactose

c. Glycogen, because its structure is similar to amylopectin.

OR

i. Anomers / α-D-Glucose and β-D-Glucose

ii. Aldehyde /-CHO group

30. i. Ethylenediaminetetraacetate ion ($EDTA^{4-}$) is an important hexadentate ligand. It can bind through two nitrogen and four oxygen atoms to a central metal ion.

ii. $[Fe(C_2O_4)_3]^{3-}$ is more stable because it is a chelate. $C_2O_4^{2-}$ is a didentate ligand.

iii. SCN^- is an example of an ambidentate ligand. This is because it can bond to a coordination centre through nitrogen as well as sulphur.

OR

Let X be the oxidation number of Pt in $[PtCl_6]^{2-}$.

The Cl atoms have oxidation number of -1.

X + 6(-1) = -2

X - 6 = -2

X = +4

The oxidation number of Pt in $[PtCl_6]^{2-}$ is +4.

Section E

31. Attempt either A or B

(a) Answer the following questions:

i. Cu^{+} in aqueous solution undergoes disproportionation to Cu and Cu^{2+}.

ii. Lower oxides of transition metals are ionic & ionic character decreases or covalent character increase with increase in oxidation state.

iii. Cr (Z=24) : $[Ar]3d^5 4s^1$

iv. Fe

v. Decrease or contraction in atomic size due to increase in the effective nuclear charge on the outermost shell and poor shielding by 5f electrons. This is referred to as actinoid contractions.
The actinoid contraction is more than Lanthanoid contraction as the shielding power of 5f orbitals is poorer than 4f orbitals.

(b) Answer the following questions:

i. Mn^{3+} can be easily reduced to Mn^{2+} due to stable d^5 configuration / Much larger third ionization enthalpy of Mn.

ii. Ce (IV) ion has more stable configuration $(4f^{\circ})$ than $Ce(\text{III})$ion.

iii. It is because of poor shielding of 4f and 5f electrons in actinoids whereas in lanthanoids there is poor shielding effect of 4f electrons only, that is why effective nuclear charge increases more from element to element in actinoids than lanthanoids.

iv. Fusion of chromite ore ($FeCr_2O_4$) with sodium or potassium carbonate in free access of air to form sodium chromate

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

On acidification of Sodium chromate with sulphuric acid to form sodium dichromate

$2\ Na_2CrO_4 + 2\ H^+ \rightarrow Na_2Cr_2O_7 + 2\ Na^+ + H_2O$

v. i. Due to comparable radii/comparable size.

ii. In Mn_2O_3, Mn is in +3 (lower) oxidation state while in Mn_2O_7, Mn is in higher oxidation state (+7)

32. Attempt either A or B

(a) Answer the following questions:

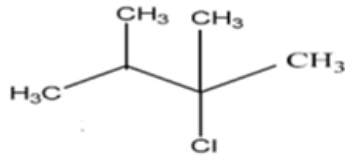
i. Propane-1-amine (1°),

ii. It is because the methyl group is electron releasing and increases electron density on nitrogen.

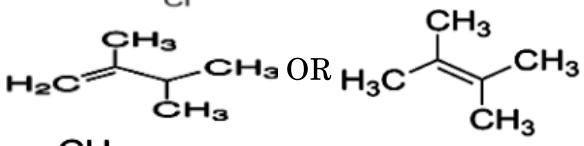
iii. $\overset{3}{C}H_3 = \overset{2}{C}H_2 - \overset{1}{C}H_2NH_2$
$Prop-2-en-1-amine$

iv. In amines, alkyl group is electron releasing which increases electron density on nitrogen and making them basic whereas in amides carbonyl group is electron withdrawing, therefore they are neutral.

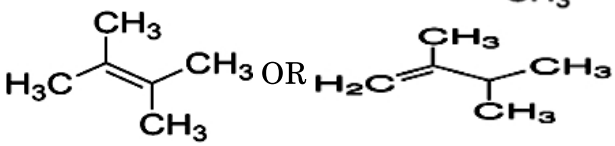
v. A =



B=



C=



(b) Answer the following questions:

i. Methylamine has hydrogen atoms bonded to nitrogen atom. Tertiary amines have no hydrogen atom bonded to the nitrogen atom.
So, Methylamine is capable of forming H-bonding with water molecules and tertiary amines cannot participate in intermolecular H-bonding.
Hence, CH_3-NH_2 has higher boiling point than $(CH_3)_3N$.

ii. $CH_3 - CH_2 - CH_2 - NH_2$

iii. N-Ethyl aniline

iv. N,N-Dimethylpropan-1-amine

v. N-Phenylethanamide

33. i. As $K_H \propto \frac{1}{\text{Solubility}}$ of Gas

$\therefore$ O_2 gas has higher K_H; because higher the K_H value, lower the solubility of gas in liquid.

ii. Blood cells shrink.

iii. $\Delta T_b = iK_b\, m$

$T_b - T_b^0 = i \times 0.52\ K\ Kg\ mol^{-1} \times 1\ mol\ Kg^{-1}$

$\alpha = \frac{i-1}{n-1}$

n = 5

$0.6 = \frac{i-1}{5-1}$

i = 3.4

$T_b - 373\ K = 3.4 \times 0.52 \times 1$

$T_b = 1.768 + 373\ K$

$T_b = 374.768K$ (If boiling point of water is 373.15K then $T_b = 374.918K$)

OR

i. Density of solution = 1.038 cm^3

Mass of 100 cm^3 of solution = $1.038 \times 100 = 103.8$ g

Mass of NaOH in 100 cm^3 solution = 4g

Mass of water = 103.8 - 4.0 = 99.8 g

Number of moles of NaOH $(n_A) = \frac{4.0}{40} = 1.0$ mol

Number of moles of water $(n_B) = \frac{99.8}{18} = 5.54$ mol

$\therefore$ Mole fraction of NaOH $X_A = \frac{n_A}{n_A + n_B}$

$= \frac{0.1}{0.1+5.54} = 0.018$

ii. Molarity of NaOH solution

$= \frac{\text{Mass of NaOH per litre of solution}}{\text{Molecular mass of NaOH}} = \frac{40}{40} = 1\ M$

iii. Mass of NaOH in 99.8 g of water = 4.0 g

$\therefore$ Mass of NaOH in 1000 g of water

$= \frac{4.0}{99.8} \times 1000$

= 40.08 g

Molality of NaOH solution

$= \frac{\text{Mass of NaOH per 100 g of water}}{\text{Molecular mass of NaOH}}$

$= \frac{40.08}{40}$

= 1.002 mol kg^{-1}