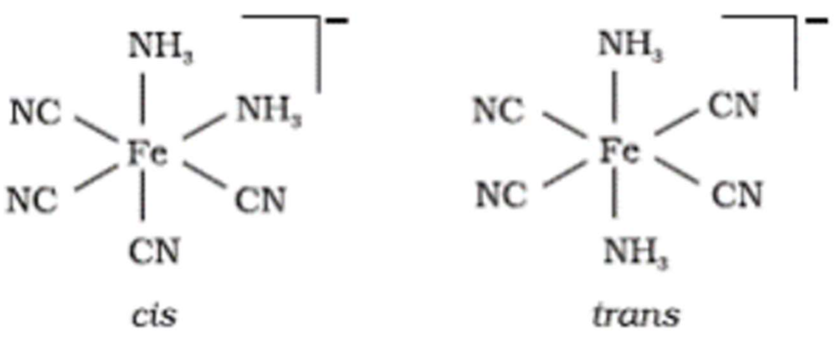
BSEH MARKING SCHEME

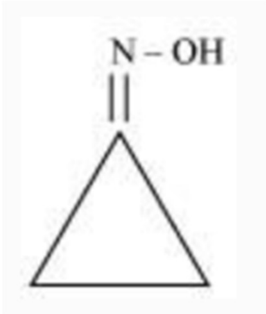
CLASS- XII **Chemistry (March-2024)** **Code: D**

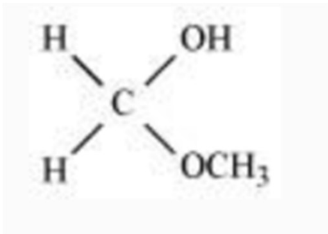
- **The answer points given in the marking scheme are not final. These are suggestive and indicative. If the examinee has given different, but appropriate answers, then he should be given appropriate marks.**

Q. No.	Answers	Marks
1.	d) Benzene and Toluene	1
2.	b) Gibbs energy	1
3.	c) 0	1
4.	c) MnO_4^-	1
5.	c) Cr^{2+}	1
6.	a) 0	1
7.	b) Bromoform	1
8.	a) tert-Butyl bromide	1
9.	c) Both of the above	1
10.	b) Conc. HNO_3	1
11.	c) Benzaldehyde	1
12.	d) None of the above	1
13.	c) Insulin and Glucagon	1
14.	a) 0	1
15.	a) Both A and R are true, and R is the correct explanation of A.	1

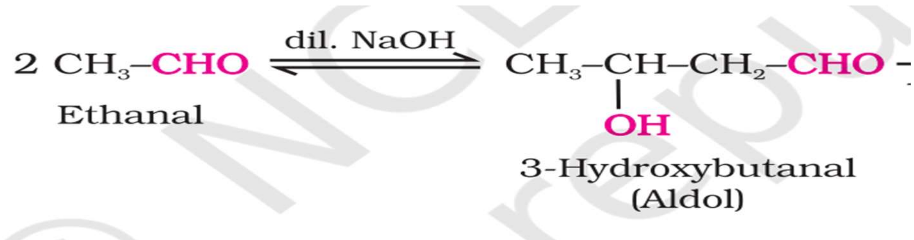
16.	c) A is true but R is false.	1
17.	d) A is false but R is true	1
18.	c) A is true but R is false.	1
19.	The partial pressure of the gas in vapour phase (p) is proportional to the mole fraction of the gas (x) in the solution. (1 mark) i) To increase the solubility of CO2 in soft drinks and soda water, the bottle is sealed under high pressure. ii) To avoid bends the tanks used by scuba divers are filled with air diluted with helium. iii) At high altitudes the partial pressure of oxygen is less than that at the ground level. This leads to low concentrations of oxygen in the blood and tissues of people living at high altitudes or climbers. (Any two, ½ mark each) Or Given: Mass of solute (w_1) = 1 g Mass of solvent (w_2) = 50 g K_f = 5.12 K kg mol^{-1} ΔT_f = 0.40 $\because\ \Delta T_f = K_f \times \frac{w_2 \times 1000}{M_2 \times w_1}$ (½ mark) So $M_2 = K_f \times \frac{w_2 \times 1000}{\Delta T_f \times w_1}$	2

	$= 5.12 \times \frac{1 \times 1000}{0.40 \times 50}\ g\ mol^{-1}$ (½ mark) $= 256\ g\ mol^{-1}$ (½ mark for answer, ½ mark for unit)	
20.	The law states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte. (1 mark) i) to calculate limiting molar conductivity of any electrolyte. ii) to calculate the degree of dissociation of weak electrolyte. iii) to calculate dissociation constant of weak electrolyte. (Any two, ½ mark each)	2
21.		2

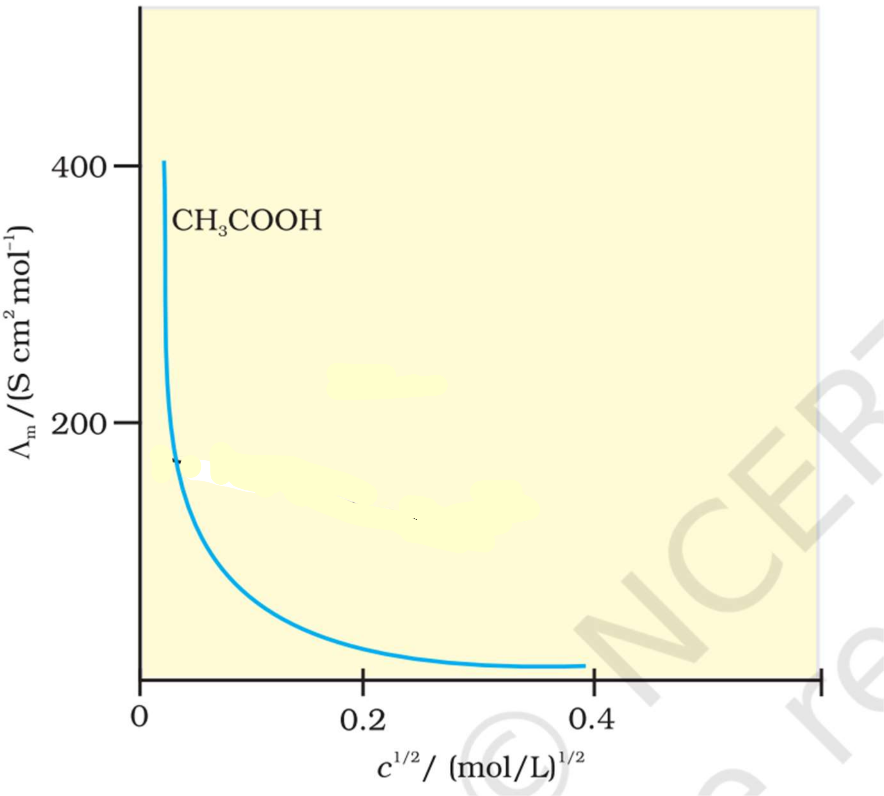
<table>
<tr><td>22.</td><td>i)


(1 mark)
ii)


(1 mark)</td><td>2</td></tr>
<tr><td>23.</td><td>i) In 2,2,6 trimethyl cyclohexanone, three methyl groups are presents at α−position with respect to the ketonic (>C=O) group. Therefore, these groups cause steric hindrance during the nucleophilic attack of CN^- ion so cyanohydrin is not formed. Due to the absence of methyl groups in cyclohexanone, there is no steric hindrance and cyanohydrin is formed.
(1 mark)
ii) Semicarbazide has two amino (NH_2) groups, out of which one is involved in resonance. Electron-density on this (NH_2) decreases and it does not act as a nucleophile. But the other (NH_2) group (attached o NH) has a lone pair of electrons which are not</td><td>2</td></tr>
</table>

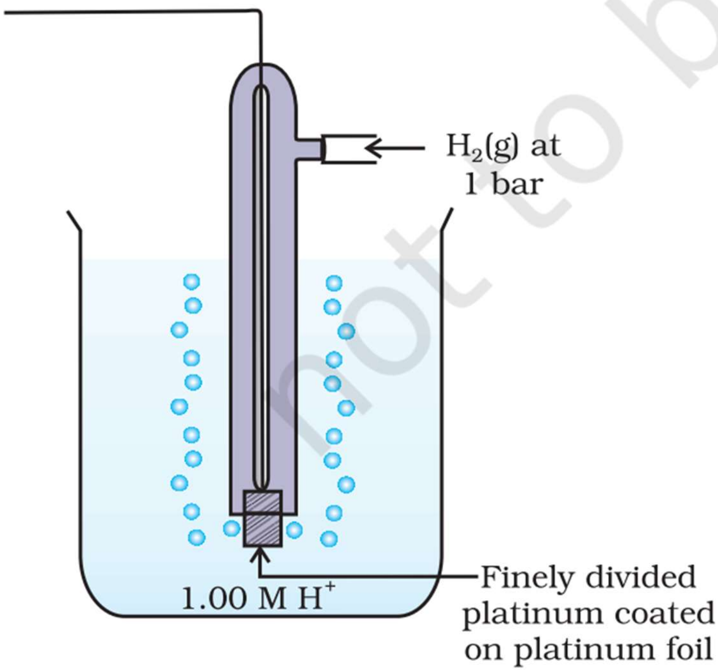
	involved in resonance. So, this pair is available for the nucleophilic attack on the carbonyl group (>C=O) of aldehydes and/or ketones. (1 mark)	
24.	Aldehydes and having at least one α-hydrogen undergo a reaction in the presence of dilute alkali as catalyst to form β-hydroxy aldehydes, this is known as Aldol. (1 mark)  (1 mark) Or i) Tollen's test / Fehling's test; (½ mark) Ethanal gives the test while propanone does not. (½ mark) ii) Fehling's test; (½ mark) Propanal gives the test while benzaldehyde does not. (½ mark)	2
25.	Quaternary structure of proteins: Some of the proteins are composed of two or more polypeptide chains referred to as sub-units. The spatial arrangement of	2

	these subunits with respect to each other is known as quaternary structure. (1 mark) Example: Haemoglobin (½ mark) which has four polypeptide chains around a haeme group. (½ mark)	
26.	Molar conductivity of a solution at a given concentration is the conductance of volume V of a solution containing one mole of electrolyte kept between two electrodes with an area of cross-section A and distance of unit length. (1 mark) Molar conductivity increases with a decrease in concentration. This is because the total volume V of the solution containing mole of the electrolyte increases on dilution. (½ mark) For weak electrolytes, molar conductivity increases steeply on dilution, especially near lower concentrations as shown in graph. (½ mark)	3

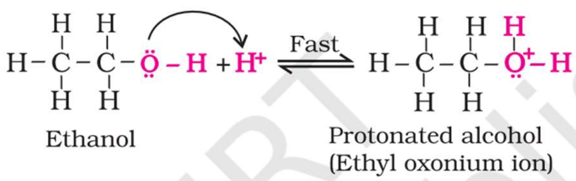


(1 mark)

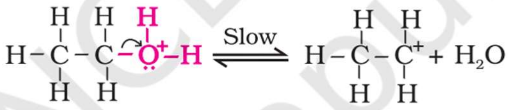
Or



Standard Hydrogen Electrode (SHE).

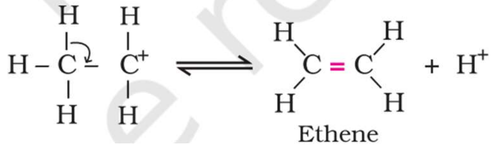
	(1½ mark for proper diagram, ½ mark for each of 3 labeling)	
27.	Given: $$E^{\circ}_{cell} = 0.236\,V$$ Number of electrons involved in cell reaction (n) = 2 (½ mark) $$\Delta G^{\circ} = -nFE^{\circ}_{cell}$$ (½ mark) $$\Delta G^{\circ} = -2 \times 96500 \times 0.236$$ $$\Delta G^{\circ} = -45548\,J\,mol^{-1}$$ (½ mark for answer, ½ mark for unit) $$log\,K_c = \frac{n \times E^{\circ}_{cell}}{0.059}$$ (½ mark) $$K_c = 10^8$$ (½ mark)	3
28.	i) Diamminechloridonitrito-N-platinum (II) ii) Potassium trioxalatochromate (III) iii) Pentaamminecarbonatocobalt (III) chloride (1 mark each)	3
29.	*Step 1:* Formation of protonated alcohol.  (1 mark)	3

Step 2: Formation of carbocation: It is the slowest step and hence, the rate determining step of the reaction.



(1 mark)

Step 3: Formation of ethene by elimination of a proton.



(1 mark)

Or

Lucas test can be used to distinguish between primary, secondary and tertiary alcohols.

(½ mark)

For this Lucas reagent (conc. HCl and $ZnCl_2$) is used.

(½ mark)

Alcohols are soluble in Lucas reagent while their halides are immiscible and produce turbidity in solution.

(½ mark)

In case of tertiary alcohols, turbidity is produced immediately as they form the halides easily.

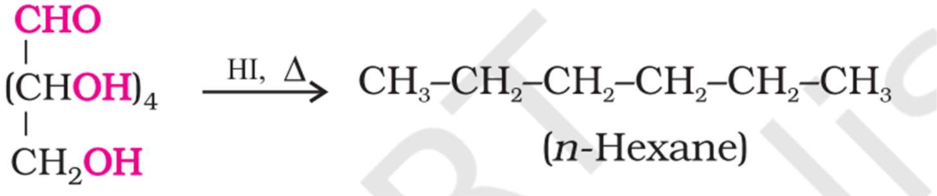
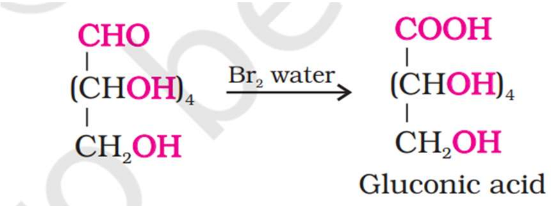
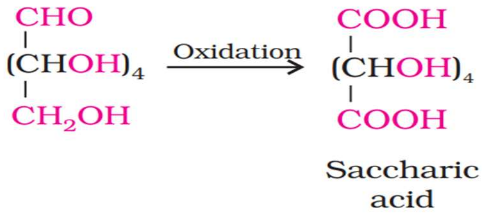
(½ mark)

Secondary alcohols produce turbidity after some time.

(½ mark)

Primary alcohols do not produce turbidity at room temperature.

(½ mark)

30.	i)  (1 mark) ii)  (1 mark) iii)  (1 mark)	3
31.	i) if a pressure larger than the osmotic pressure is applied to the solution side, the pure solvent flows out of the solution through the semi permeable membrane. This phenomenon is called reverse osmosis. (1 mark) ii) Red blood corpuscles will swell up (1 mark) or	4

	Two solutions having the same osmotic pressure at a given temperature are called isotonic solutions. (1 mark) iii) The preservation of meat by salting or the preservation of fruits by adding sugar (any one, 1 mark) iv) 1 M KCl (1 mark)	
32.	i) Position isomerism (1 mark) ii) 2,5-Dimethylhexane (1 mark) iii) $(CH_3)_2C{=}CH_2$ (1 mark) iv) $(CH_3)_2C{=}CH_2 + HBr \xrightarrow{peroxide} (CH_3)_2CHCH_2Br$ (1 mark) or Wurtz reaction (1 mark)	
33.	Given: $t_{1/2} = 28.1\ years$ $[R]_o = 1\ \mu g$ $\because k = \frac{0.693}{t_{1/2}}$ (½ mark)	5

$$\Rightarrow k = \frac{0.693}{28.1} = 0.0247\ years^{-1}$$

(½ mark)

For Case I

t = 10 years

[R] = ?

$$k = \frac{2.303}{t} log \frac{[R]_o}{[R]}$$

$$\Rightarrow log \frac{[R]_o}{[R]} = \frac{kt}{2.303}$$

(½ mark)

$$\Rightarrow log \frac{1}{[R]} = \frac{0.0247 \times 10}{2.303}$$

$$\Rightarrow \frac{1}{[R]} = Antilog \frac{0.0247 \times 10}{2.303}$$

(½ mark)

$$\Rightarrow [R] = 0.78\ \mu g$$

(½ mark for answer, ½ mark for unit)

(1 mark each)

For Case II

t = 60 years

[R] = ?

$$k = \frac{2.303}{t} log \frac{[R]_o}{[R]}$$

$$\Rightarrow log\frac{[R]_o}{[R]} = \frac{kt}{2.303}$$

(½ mark)

$$\Rightarrow log\frac{1}{[R]} = \frac{0.0247 \times 60}{2.303}$$

$$\Rightarrow \frac{1}{[R]} = Antilog\frac{0.0247 \times 60}{2.303}$$

(½ mark)

$$\Rightarrow [R] = 0.227\,\mu g$$

(½ mark for answer, ½ mark for unit)

Or

Given for same time period:

T_1 = 298 K, reaction completed is 10 %

T_2 = 308 K, reaction completed is 25 %

A = 4 × $10^{10}s^{-1}$

For a first order reaction:

$$k_1 = \frac{2.303}{t}log\frac{100}{90}$$

$$\Rightarrow k_1 = \frac{0.1055}{t}$$

(½ mark)

And

$$k_2 = \frac{2.303}{t}log\frac{100}{75}$$

$$\Rightarrow k_2 = \frac{0.2879}{t}$$

(½ mark)

According to Arrhenius equation:

$$log\frac{k_2}{k_1} = \frac{E_a}{2.303 \times R}\left[\frac{T_2 - T_1}{T_1 \times T_2}\right]$$

(½ mark)

$$\Rightarrow log\frac{\frac{0.2879}{t}}{\frac{0.1055}{t}} = \frac{E_a}{2.303 \times 8.314}\left[\frac{308 - 298}{298 \times 308}\right]$$

(½ mark)

$$\Rightarrow E_a = 76622.7\, J\, mol^{-1}$$

(½ mark for answer, ½ mark for unit)

For k at 318 K:

According to Arrhenius equation

$$\log k = \log A - \frac{E_a}{2.303 \times RT}$$

(½ mark)

$$\Rightarrow \log k = \log(4 \times 10^{10}) - \frac{76622.7}{2.303 \times 8.314 \times 318}$$

$$\Rightarrow k = \text{antilog}\,(-1.9822)$$

(½ mark)

$$\Rightarrow k = 1.042 \times 10^{-2}\, s^{-1}$$

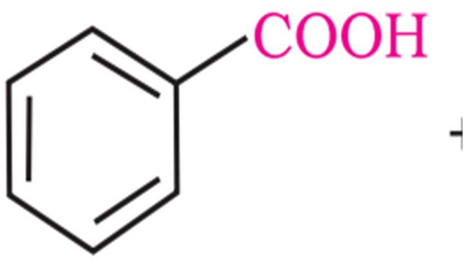
(½ mark for answer, ½ mark for unit)

34.	The elements of the first series of the inner transition metals; 4f (Ce to Lu) are known as lanthanoids. (1 mark) General electronic configuration for lanthanoids is: $(n-2)f^{1-14}(n-1)d^{0-1}ns^2$ where n = 6. (1 mark) The steady decrease in the atomic and ionic radii of lanthanide elements with increasing atomic number is called Lanthanide contraction. (1 mark) Consequences: i) The size of the atom of the third transition series is closely the same as that of the atom of the second transition series. (1 mark) ii) As there is only a minute change in the ionic radii of lanthanides, their chemical properties are the same. This makes the separation very difficult. (1 mark) Or Potassium permanganate is prepared by fusion of MnO_2 with an alkali metal hydroxide and an oxidising agent like KNO_3. (½ mark)	5

	$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$ (½ mark) This produces the dark green K_2MnO_4 which disproportionate in a neutral or acidic solution to give permanganate. (½ mark) $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$ (½ mark) a) $5Fe^{2+} + MnO_4^- + 8H^+ \rightarrow Mn^{2+} + 4H_2O + 5Fe^{3+}$ (1 mark) b) $5SO_2 + 2MnO_4^- + 2H_2O \rightarrow 2Mn^{2+} + 4H^+ + 5SO_4^{2-}$ (1 mark) c) $5C_2O_4^{2-} + 2MnO_4^- + 16H^+ \longrightarrow 2Mn^{2+} + 8H_2O + 10CO_2$ (1 mark)	
35.	It is given that compound 'C' having the molecular formula, C_6H_7N is formed by heating compound 'B' with Br_2 and KOH. This is a Hoffmann bromamide degradation reaction. Therefore, compound 'B' is an amide and compound 'C' is an amine. (½ mark)	5

Compound A is Benzoic acid.

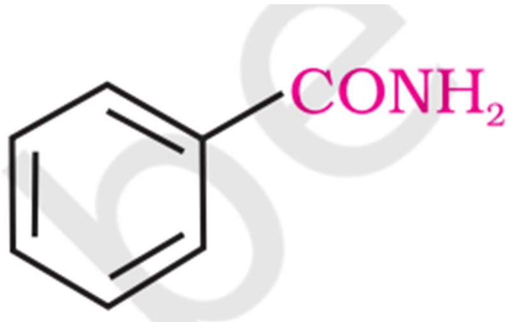
(½ mark)



(1 mark)

Compound B is Benzamide.

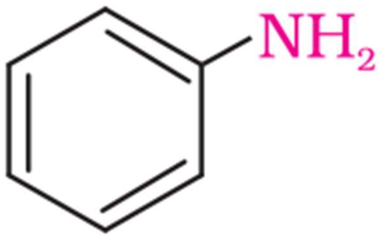
(½ mark)



(1 mark)

Compound C is Aniline.

(½ mark)



(1 mark)

Or

i) C_6H_6

(1 mark)

	ii) $C_6H_5NHCOCH_3$ (1 mark) iii) $C_6H_5SO_2NHCH_3$ (1 mark) iv) C_6H_5NC (1 mark) v) $C_6H_5N^+H_3HSO^-_4$ (1 mark)	