COMMON PRE-BOARD EXAMINATION

CHEMISTRY-Code No. 043

Class-XII-(2025-26)

SET: 2

MARKING SCHEME

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

General Instructions:

Read the following instructions carefully.
(a) There are 33 questions in this question paper with internal choice.
(b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
(c) SECTION B consists of 5 very short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 short answer questions carrying 3 marks each.
(e) SECTION D consists of 2 case-based questions carrying 4 marks each.
(f) SECTION E consists of 3 long answer questions carrying 5 marks each.
(g) All questions are compulsory.
(h) Use of log tables and calculators is not allowed

Section-A

Question No.1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

1.	D. Glycine	1
2.	B. 1-Methoxy -2-methylpropane	1
3.	A. 91.2%	1
4.	B. Formation of Carbocation	1
5.	D. - E_a / R	1
6.	A. (i)	1
7.	D. 2,3-Dimethylbutane	1
8.	B. 4-Methylpent-3-en-2-one.	1

9. C. $C_6H_5NH_2 < C_6H_5CH_2NH_2 < (CH_3)_3N < CH_3NH_2 < (CH_3)_2NH$ **1**

10. A. $2Cl^- \rightarrow Cl_2 + 2e^-$ **1**

11. C. Availability of vacant d orbitals and variable oxidation states. **1**

12. A. $[Co(en)_3]^{3+}$ **1**

13. A. Both A and R are true, and R is the correct explanation of A. **1**

14. B. Both A and R are true, and R is not the correct explanation of A. **1**

15. D. A is false but R is true. **1**

16. D. A is false but R is true**.** **1**

Section - B

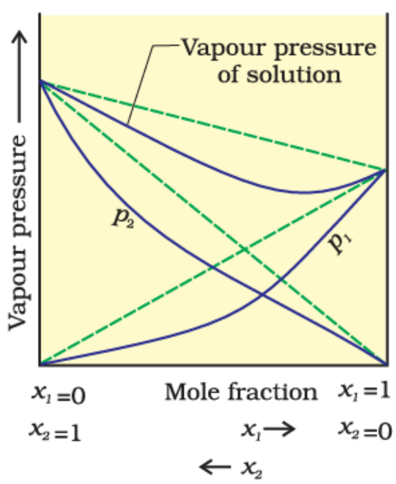
Question No. 17 to 21 are very short answer questions carrying 2 marks each.

17. **½ x 4**

A- CH_3CH_2COOH B- $CH_3CH_2CONH_2$ C- $CH_3CH_2NH_2$ D-CH_3CH_2OH

Attempt either option A or B

18. A. Negative deviation. The net volume of the mixture will decrease due to stronger intermolecular interaction. **½ + ½**



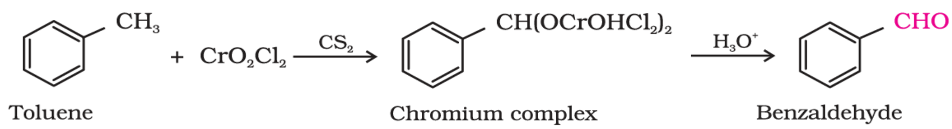
1

OR

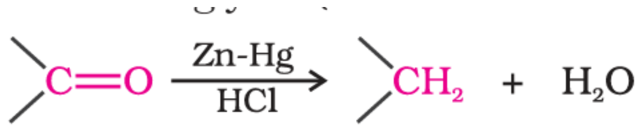
B. Azeotropes are binary mixture of liquids that boil at a constant temperature and have same composition in the liquid and vapour phase. **1**
Minimum boiling azeotrope. Eg. 95% ethanol and 5% water by volume. **½ + ½**

19. (a) $Fe_4[Fe(CN)_6]_3$ **1**
(b) $d^2 sp^3$, Magnetic moment - $\sqrt{15}$ **1**

20. (i) Etard reaction **1**

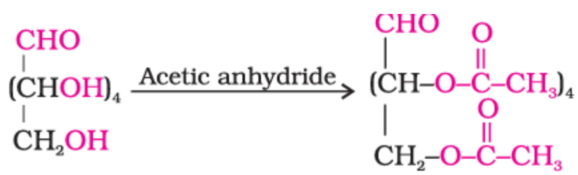


(ii) Clemmensen reduction



21. **1**

(a)



Inference: Presence of 5 – OH groups.

(b) (i)Despite having the aldehyde group, glucose does not give 2,4-DNP test, Schiff's test and it does not form the hydrogensulphite addition product with NaHSO3. **1**

(ii)The pentaacetate of glucose does not react with hydroxylamine indicating the absence of free —CHO group.

Section - C

Question No. 22 to 28 are short answer questions carrying 3 marks each.

22. (a)(i) Zero order , molecularity -2 ½ + ½

(ii)Rate of production of N_2 = 2.5 x10^{-4}mol$L^{-1}s^{-1}$ ½ + ½

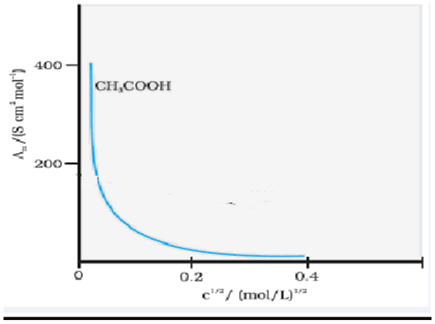
Rate of production of H_2 = 7.5 x10^{-4}mol$L^{-1}s^{-1}$

(b)Catalyst provides an alternate pathway by reducing the activation energy between reactants and products and hence lowering the potential energy barrier. **1**

23. (a)Molar conductivity of a solution at a given concentration is the conductance of the volume V of solution containing one mole of electrolyte kept between two electrodes with area of cross section A and distance of unit length. **1**

½ + ½

* A weak electrolyte is one which ionizes partially in solution and thus have low value of molar conductivity. On dilution the degree of ionization of weak electrolyte increases and the number of ions furnished by the electrolyte increases. Hence molar conductivity if weak electrolyte increases largely on dilution.



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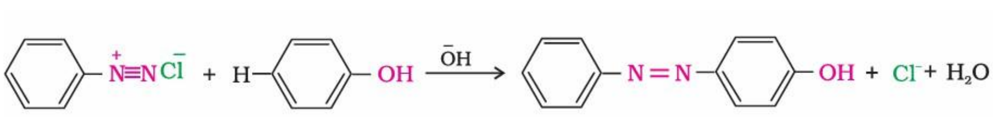
(b) Kohlrausch law: The law states that limiting molar conductivity of an electrolyte can be represented as the sum of the individual contributions of the anion and cation of the electrolyte.

24. (a) Carbylamine test: Ethylamine reacts with chloroform and ethanolic KOH to give a foul smelling isocyanide whereas Diethylamine does not answer for this test. **1**

(b) Methylamine is more basic than water and therefore accepts a proton from water forming OH^- ions. These OH^- ions combine with Fe^{3+} ions to form brown precipitate of hydrated ferric oxide. **1**

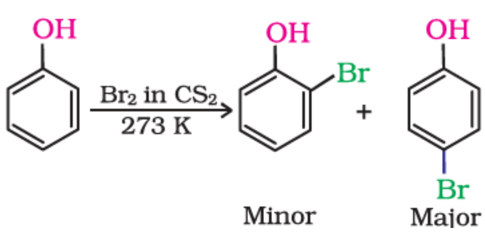
1

(c)



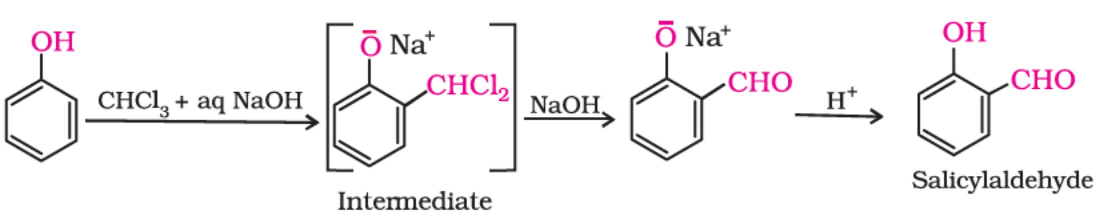
25. (i) $C_6H_5CH_2OC_2H_5 + HI \rightarrow C_6H_5CH_2I + C_2H_5OH$ **1 x3**

(ii)



(iii) $CH_3CH_2CH_2OH \xrightarrow{alkaline\ KMnO_4} CH_3CH_2COOK$

(iv)



26. $K_1 = 0.693/t1/2 = 0.693/20 = 0.0346$ ½ + ½

$K_2 = 0.693/t1/2 = 0.693/5 = 0.1386$

$\log \frac{K_2}{K_1} = \frac{E_a}{2.303\,R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$ ½

$\text{Log } \frac{0.1386}{0.0346} = \frac{E_a \times [350-300]}{2.303 \times 8.314 \times 300 \times 350}$ ½

$\text{Log } 4 = \frac{E_a \times 50}{2.303 \times 8.314 \times 300 \times 350}$ ½

$E_a = \frac{0.6021 \times 2.303 \times 8.314 \times 300 \times 350}{50}$

$E_a = 24209.8$ J ½

27. (a) HgI_2 forms a complex with KI and therefore the number of particles in solution decreases. As a result, the depression in freezing point is less and hence the freezing point increases. **1**

(b) Osmotic pressure $= \frac{i \times w_b \times 1 \times R \times T}{M_b \times V}$ ½

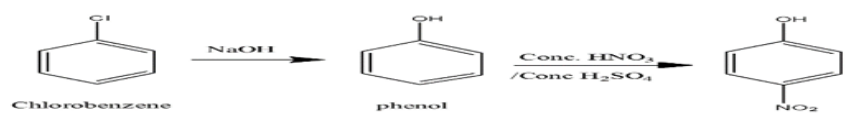
$= \frac{3 \times 2.32 \times 10^{-2} \times 0.0821 \times 298}{174 \times 2}$ **1**

$= 4.8 \times 10^{-3}$ atm ½

28. **1X3**

(i) $C_2H_5OH \xrightarrow{SOCl_2} C_2H_5Cl \xrightarrow{KCN} CH_3CH_2CN$

(ii)



(iii) $C_6H_5CH_3 \xrightarrow{Cl_2} C_6H_5CH_2Cl \xrightarrow{aq.KOH} C_6H_5CH_2OH$

Section - D

Question No. 29 and 30 are case-based/data-based questions carrying 4 marks each.

29. (a)The energy difference between the lower and higher orbitals obtained due to the splitting of d orbitals is called as Crystal field splitting energy. **1**

(b) t2g4 eg0 **1**

(c) ((i) $\Delta t = 4/9\ \Delta o$ **1**

$= 4/9 \times 18{,}000$

$= 8000\text{cm}^{-1}$

(ii)CO has empty π orbitals which overlap with filled d -orbitals of transition metals and form π bonds by back bonding. As ammonia cannot form π binds by back bonding, CO is a stronger ligand than NH_3.. **1**

OR

(c) (i) Titanium is in +3 state having d^1 configuration. This single electron is in t_2g of the complex. It absorbs energy corresponding to blue –green region from visible light and gets excited to eg level. The complimentary violet colour is shown by the complex due to the d-d transition. **1**

(ii) $[Ni(NO_2)_6]^{4-} < [Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+}$ **1**

30. (a) Uracil **1**

(b) Phosphodiester linkage **1**

(c) (i)The secondary structure of protein refers to the shape in which a long polypeptide chain can exist. These structures arise due to the folding of polypeptide chain due to hydrogen bonding between CO and NH groups of peptide bonds. **1**

(ii) Fibrous protein – Keratin, Myosin, Globular protein- Insulin, Albumin. **½ + ½**

OR

(c) (i) Vitamin C is water soluble and hence it is readily excreted in urine and thus cannot be stored in the body. **1**

(ii) Vitamin K. **1**

Section - E

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

31. **Attempt either A or B**

A. (a) A- MnO_2 B- K_2MnO_4 C- $KMnO_4$ **½ + ½**

Pyrolusite is treated with KOH and an oxidizing agent like KNO_3 to form dark green K_2MnO_4.

$$2\ MnO_2 + 4\ KOH + O_2 \rightarrow 2\ K_2MnO_4 + 2\ H_2O$$ **1**

Potassium manganate is subjected to electrolytic oxidation.

$$MnO_4^{2-} \xrightarrow[\text{In alkaline solution}]{\text{Electrolytic oxidation}} MnO_4^-$$ **1**

(b) $8MnO_4^- + 3S_2O_3^{2-} + H_2O \rightarrow 8MnO_2 + 6SO_4^{2-} + 2OH^-$ **1**

(c) Cu^{2+} ions undergo hydration to a greater extent than Cu^+ ions, in aqueous medium. So Cu^{2+} ions are more stabilized than Cu^+ in aqueous medium. So Cu^+ ions disproportionate to Cu^{2+} ion and Cu in aqueous medium. **1**

OR

B. (a)(i) $5NO_2^- + 2MnO_4^- + 6H^+ \longrightarrow 2Mn^2+ + 5NO_3^- + 3H_2O$ **1+1**

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

(b)(i) Due to the ability of oxygen to form multiple bonds and due to comparatively large electronegativity

(ii)The transition metals are capable of entrapping smaller atoms of other elements such as H,C, and N in the interstitial sites in their crystal lattices. These atoms get bonded to the atoms of transition elements. **1+1**

(c) Lanthanoids show +2, +3 and +4 oxidation states, out of which +3 is most common oxidation state. On the other hand, actinoids show +3, +4, +5< +6 and +7 oxidation states and +3 oxidation state is preferred. 1

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

A. (a) At a particular spot of an object made of iron, oxidation takes place and that spot behaves anode and the reaction is as follows **2**

$2\,Fe_{(s)} \rightarrow 2Fe^{2+} + 4e^-$

Electrons released at anodic spot move through the metal and go to another spot on the metal and reduce oxygen in presence of H^+ (obtained from the dissolution of CO_2 from air and other acidic oxides into water.). This spot behaves as cathode and the reaction is

$O_{2\,(g)} + 4H^+_{(aq)} + 4e^- \rightarrow 2H_2O\,(l)$

The overall reaction being:

$2Fe\,(s) + O_{2(g)} + 4H^+\,(aq) \rightarrow 2Fe^{2+}\,(aq) + 2H_2O(l)$

The ferrous ions are further oxidized by atmospheric oxygen to ferric ions which come out as rust in the form of hydrated ferric oxide ($Fe_2O_3.xH_2O$) and with further production of hydrogen ions.

$2Fe^{2+} + \frac{1}{2}\,O_2 + 2H_2O \rightarrow Fe_2O_3 + 4H^+$

$Fe_2O_3 + xH_2O \rightarrow Fe_2O_3.xH_2O$. (Rust)

(b) $E^0_{cell} = 0.80 + 2.37 = 3.17V$ ½

$E_{cell} = E^0_{ell} - \frac{0.059}{n} \log \frac{[Mg^{2+}]}{[Ag^+]^2}$ ½

$= 3.17 - \frac{0.059}{n} \log \frac{1 \times 10^{-2}}{(1 \times 10^{-4})^2}$ ½

$= 3.17 - 0.0295 \log 10^6$

$= 3.17 - 0.0295 \times 6$ ½

$= 3.17 - 0.177$

$= 2.993\ V$

$\Delta G^0 = -nFE^0_{cell}$ **1**

$= -2 \times 96500 \times 3.17$

$= 611810J$

OR

B. (a) Anode - $2H_2 + 4OH^- \rightarrow 4H_2O + 4e^-$ **2**

Cathode- $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

Overall reaction: $2H_2 + O_2 \rightarrow 2H_2O$

(b) $G^* = RK$

$= 85 \times 1.29 \times 10^{-2}$

$= 109.65 \times 10^{-2}\ cm^{-1}$ **1**

$K = G^*/R = \frac{109.65 \times 10^{-2}}{96}$ **1**

$= 0.0114 Scm^{-1}$

Molar conductivity = $\frac{K \times 1000}{M} = \frac{0.0114 \times 1000}{0.052}$ **1**

$= 219.2\ Scm^2mol^{-1}$

33. **Attempt either A or B** **5**

A. (a) $CH_3CH{=}C(CH_3)_2$ B- CH_3CHO C- CH_3COCH_3 **1**

$CH_3CH{=}C(CH_3)_2 + O_3 \xrightarrow{Zn-H_2O} CH_3CHO + CH_3COCH_3$ **1**

$CH_3COCH_3 \xrightarrow{I_2, NaOH} CH_3COONa + CHI_3$ **1**

(b) $C_6H_5CH{=}NNHCONH_2$ **1**

(c)Due to the presence of lone pair of electrons on the oxygen atom of the OH group the carboxylic acids are stabilized by resonance. As a result , the double bond character of the C= O bond in carboxylic acids is greatly reduced as compared to that in aldehydes and ketones. **1**

OR

B. (a) A -$C_6H_5C\equiv CH$ B- $C_6H_5COCH_3$ C- C_6H_5COOK D- CHI_3 ½ x 4

$C_6H_5C\equiv CH + H_2O \xrightarrow[H_2SO_4]{HgSO_4} C_6H_5COCH_3$

1

$C_6H_5COCH_3 \xrightarrow{I_2, KOH} C_6H_5COOK + CHI_3$

(b) $CH_3C(CH_3){=}NOH$ 1

(c) p-nitrobenzaldehyde is more reactive towards the nucleophilic addition reaction than p-tolualdehyde as nitro group is electron withdrawing in nature, decreases the electron density on the carbonyl carbon, hence facilitates the attack of nucleophile. Presence of CH_3 group reduce the electrophilicity of the carbonyl carbon and thus becomes less reactive. 1