

CHEMISTRY THEORY

CLASS 12 (2023-24)

Max.Mark. 70

Time 3hours

General Instruction

Read following instruction carefully

- (a) There are 33 questions in this question paper with internal choice.
 - (b) SECTION –A consists of 16 multiple choice question carrying one mark each.
 - (c) SECTION-B consists of 5 short answer question carrying two mark each.
 - (d)SECTION-C consists of 7 short answer question carrying three mark each.
 - (e) SECTION-D consists of 2 case based question carrying four mark each.
 - (f) SECTION -E consists of 3long answer question carrying five mark each.
 - (g) All question are compulsory.
 - (h) Use of log table and calculators is not allowed.
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SECTION –A

The following questions are multiple choice question with one correct answer. Each question carries 1 mark. There are no internal choice in this section.

Q1. 184 g of ethanol is mixed in 72 g of water. The ratio of mole fraction of alcohol to water is –

- (a) 3:4 (b) 1:2 (c) 1:1 (d) 1:4

Q2. Which of the following statement is correct ?

- (a) E_{cell} and ΔG of cell reaction both are extensive properties
- (b) E_{cell} and ΔG of cell reaction both are intensive properties
- (c) E_{cell} is an intensive property while ΔG of cell is extensive property
- (d) E_{cell} is an extensive property while ΔG of cell is intensive property

Q3. In the electrorefining of copper.

- (a) Crude copper is attached to negative terminal
- (b) copper is deposited at cathode
- (c) copper dissolves into electrolyte at anode

(d) copper deposits at anode.

Q4. The half life for zero order reaction

(a) $2K/R$ (b) $K/2R^2$ (c) $R^2/2k$ (d) $R/2K$.

Q5. Rate law for the reaction $A + 2B = C$ is found to be

Rate = $k[A][B]$ The concentration of reactant B is doubled, keeping the concentration of A constant, the value of rate constant will be

(a) the same (b) doubled (c) Quadrupled (d) halved

Q6. Electronic configuration of a transition element X in +3 oxidation state is $[Ar] 3d^5$. What is its atomic number.

a) 25 b) 26 c) 27 d) 24

Q7. Which of the following is a diamagnetic ion-

(a) V^{2+} (b) Sc^{3+} (c) Cu^{2+} (d) Mn^{3+}

8). The IUPAC name of iso butyl Bromide is-

a) 1-Bromo-3-Methyl Butane b) 3-Bromo-2-Methyl Propane c) 2-Bromo-2-Methyl Propane d) 1-Bromo-2-Methyl Propane

9) Which of the following agents will not convert ethyl alcohol into ethyl chloride.

a) PCl_5 b) $NaCl$ c) $SOCl_2$ d) $HCl/ZnCl_2$

10. Salicylic acid and phenol can be distinguished by the use of –

a) bromine water b) neutral $FeCl_3$ c) 5% NaOH solution d) $NaHCO_3$ solution.

Directions : In the following question an Assertion(A) is followed by corresponding Reason(R). Use the following keys to choose the appropriate answer.

a) both (A) and (R) is the correct and (R) is the correct explanation of (A)

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

c) (A) is correct and (R) is incorrect.

d) both (A) and (R) are incorrect.

11) Assertion(A): Addition reaction of water to but-1-ene in acidic medium yields butan-2-ol

Reason(R): Addition of water in acidic medium proceeds through the formation of primary carbanion.

12) Assertion(A): Aldehydes and ketones, both react with Tollen's reagent to form silver mirror.

Reason(R): Both aldehydes and ketones contain a carbonyl group.

13. Assertion(A) : all naturally occurring α -amino acids except glycine are optically active.

Reason(R) : Most naturally occurring amino acids have L-configuration.

14)What is common name of dimethyl ketone?

a) Ether b) Acetone c) Acetophenone d) benzophenone.

15) Which of the following compounds will give butanone on oxidation with alkaline KMnO_4 .

a) Butan-1-ol b) Butan-2-ol c) both (a) and (b) d) none

16)A α –helix is a structural feature of –

a)Sucrose b) polypeptides c) nucleotides d) starch

SECTION-B

This section contains five questions with internal choice in one question. The following questions are very short answer type and carry two mark each.

17. Why the rate of a chemical reaction do not remain uniform throughout the reaction?Which type of reaction have uniform rate.

18. When water and Nitric acid are mixed together, a rise in temperature is observed. Which type of deviation shown by this solution and what type of azeotropic mixture is obtained from the solution.

19. Do following conversion(write equation only)

a) Ethanol to Ethylfluoride

b) Benzene to Biphenyl

20) out of following which is more reactive toward the Nucleophilic addition reaction and why?

CH_3CHO and CH_3COCH_3

21)What is “Peptide linkage” and Anomers.

Or

Write Chemical reaction to show that glucose contains Aldehyde as Carbonyl Group.

SECTION-C

This section contains seven questions with internal choice in one question . the following questions are short answer type and carry three marks each.

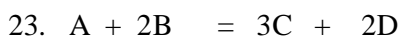
22).a) Consider following reaction which occur at cathode during electrolysis of $\text{AgCl}(\text{aq})$

$\text{Ag}^+(\text{aq}) + \text{e} = \text{Ag}(\text{s}) \quad E^0 = +0.80\text{V}$

$\text{H}^+(\text{aq}) + \text{e} = \frac{1}{2} \text{H}_2(\text{g}) \quad E^0 = 0.0\text{V}$

Which reaction is feasible at Cathode and why?

b) Why resistance of electrolytic conductor increases with increase of temperature.



The rate of disappearance of B is $0.5 \times 10^{-3} \text{ mol l}^{-1} \text{ s}^{-1}$.

What will be –

a) Rate of the reaction b) Rate of change in concentration of A and C

24) For the complex ion $[\text{Fe}(\text{en})_2\text{Cl}_2]^+$, write the type of hybridization and magnetic behavior and draw one of the geometrical isomer of the complex sign which is optical active.

25. (i) How will you convert 1-Chlorobutane to 1-Iodobutane.

(ii) Which one of the following in each pair is more reactive toward $\text{S}_\text{N}2$ reaction and why.

a) $\text{CH}_3\text{CH}_2\text{I}$ or $\text{CH}_3\text{CH}_2\text{Cl}$

b) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$ or $\text{CH}_3\text{CH}(\text{Cl})\text{CH}_3$

or

i) Why racemisation occurs in $\text{S}_\text{N}1$ mechanism.

ii) Why aryl halide are less reactive towards a nucleophilic substitution reaction. Give two reasons for the same.

26. Give the reason for the following.

i) Aromatic carboxylic acid do not undergo Friedel Craft reaction.

ii) α -Hydrogen atom of aldehyde and ketone is acidic in nature.

iii) $\text{P}K_\text{a}$ value of 4-Nitrobenzoic acid is lower than that of Benzoic acid.

27. Molecular formula of compound (A) C_5H_{10} on Ozonolysis A gives a mixture of two compound B and C.

Compound B gives positive Fehling test and also Iodoforms, Compound C does not give Fehling test but form Iodoform on treatment with I_2 and NaOH . Identify compound A, B, and C and write the reaction of Ozonolysis and formation of Iodoform.

28) Explain following.

i) Peptide Bond and Glycosidic bond.

ii) Nucleoside and Nucleotide.

SECTION-D

29. The following questions are case based. Each question has an internal choice and carries 4(1+1+2) marks each. Read the passage carefully and answer the question that follow.

The f-block elements are those in which the differentiating electrons enter in the (n-2) f orbital. There are two series of f-block elements corresponding to filling of 4f and 5f orbital. The series of 4f orbital is called lanthanides. Lanthanides show different oxidation states depending upon stability of f^0 , f^7 and f^{14} configurations, though the most common oxidation states is +3. There is a regular decrease in the size of Lanthanides ion with increase in atomic number which is known as lanthanide contraction. Misch metal, a pyrophoric alloy, contain cerium 40%, Lanthanum and neodymium 44% , Fe 5% and traces of S, C, Ca & Al.

(i) Atomic numbers of Gd and Lu are 64 and 71 respectively. Write the electronic configuration of Gd^{3+} and Lu^{3+}

(ii) Which member of lanthanide series show +4 oxidation state.

OR

Which of the following is not the electronic configuration of lanthanide

(a) $[Xe] 4f^{10}6s^2$ (b) $[Xe] 4f^{14}5d^16s^2$ (c) $[Xe] 4f^{14}6s^2$ (d) $[Xe]4f^{14}5d^{10}6s^2$

(iii) Write the percentage of of the lanthanide in Misch metal and uses of Misch metal.

30. The standard electrode potential (E^0), which is its standard reduction potential for any electrode dipping in an appropriate solution is defined with respect to standard electrode potential of standard hydrogen electrode taken as zero. The standard potential of cell can be obtained by taking the difference of the standard potential of cathode and anode. The standard potential of the cell are related to standard Gibbs energy ($\Delta G = -nEF$) and equilibrium constant ($\Delta G = -2.303RT \log K$) of the reaction taking place in the cell. Concentration dependence of electrode potential as well as cell potential is given by Nernst equation.

(i) Calculate standard electrode potential of Ag-electrode, if E^0_{cell} for the following cell is 0.80V.

$H_2(g)$ pt, 1bar / $H^+(1M)$ || $Ag^+(1M)$ / $Ag(s)$

ii) Write the value of $E^0_{H_2/H^+}$ or $E^0_{H^+/H_2}$

iii) Calculate ΔG for the following cell

$Mg(s)/Mg^{2+}(1M)$ || $Al^{3+}(1M)$ / $Al(s)$ (Standard reduction potential of Mg and Al are -2.37V and -1.67V respectively)

SECTION-E

This Section contains three question . All questions have internal choice. The following questions are long answer type and carry five mark each.

31. i) Why does a solution of Chloroform and acetone show negative deviation from Raoult's Law.

ii) State how vapour pressure of a solvent is affected, when a non volatile solute is dissolved in it.

iii) A solution of glucose in water is labeled as 10% by mass. What would be the molality of solution.

Or

Two liquid X and Y boil at 100°C and 120°C respectively. Which of them has higher vapor pressure at 50°C and Why?

ii) Calculate the boiling point of solution prepared by adding 15g of NaCl to 250g of water (K_b for water = $0.512\text{K}\cdot\text{kg}\cdot\text{mol}^{-1}$)

iii) Why elevation of boiling point of 1M KCl solution is nearly doubled than that of 1M Sugar solution.

32. Why does the Scandium not exhibit variable oxidation state.

ii) Why transition metal form a large number of interstitial compound.

iii) Out of $\text{La}(\text{OH})_3$ and $\text{Lu}(\text{OH})_3$ which is more basic and why.

iv) Cu^+ ion is unstable in aqueous solution.

v) Why the paramagnetic characteristic in 3d series increases up to Cr and then decreases.

Or

When Chromite ore is fused with sodium carbonate in free access of air and product is dissolved in water, a yellow solution (A) is obtained. On acidifying the yellow solution with H_2SO_4 , compound B is crystallized out when compound (B) is treated with KCl orange crystal of compound (C) is crystallized out. Identify A, B, and C and write the reaction involved.

33) (a) What happens when

i) N-Ethyl-ethanamine reacts with Benzene Sulphonyl Chloride.

ii) Aniline reacts with chloroform in the presence of Alcoholic KOH.

B) Give the structure of A, B and C in following.

i) $\text{CH}_3\text{CH}_2\text{Br} + \text{KCN} \rightarrow \text{A} + \text{LiAlH}_4 \rightarrow \text{B} + \text{HNO}_2$ (at 0°C) $\rightarrow \text{C}$

ii) $\text{C}_6\text{H}_5\text{NO}_2 + \text{Sn} + \text{HCl} \rightarrow \text{A} + \text{Br}_2/\text{H}_2\text{O} \rightarrow \text{B} + \text{NaNO}_2 + \text{HCl}$ (273K -283K) $\rightarrow \text{C}$

iii) $\text{C}_6\text{H}_5\text{COOH} + \text{NH}_3 \rightarrow \text{A} + \text{Br}_2/\text{NaOH} \rightarrow \text{B} + \text{NaNO}_2 + \text{HCl}$ (273K -283K) $\rightarrow \text{C}$

or

Write the equation of reaction involved in following.

i) Carbylamine reaction

ii) Hoffmann bromide degradation reaction

iii) Gabriel Phthalamide synthesis

iv) Diazotisation

v) Coupling reaction.

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