

Roll No. _____

D.A.V. INSTITUTIONS, CHHATTISGARH

SAMPLE QUESTION PAPER -2023-24

CLASS –XII

SUBJECT: CHEMISTRY

Time Allowed: 3 Hours

Maximum Marks: ...70

Instructions :

1. There are 33 Questions in this Question paper. All questions are compulsory.
2. Section A: Question no. 1 to 16 are MCQs and Assertion-Reason type questions carrying 1 mark each.
3. Section B: Question no. 17 to 21 are short answer type I questions and carry 2 marks each.
4. Section C: Question no. 22 to 28 are short answer type II questions and carry 3 marks each.
5. Section D: Question no. 29 & 30 are case based questions and carry 4 marks each
6. Section E: Question no. 31 to 33 are long answer type questions and carry 5 marks each.
7. There is no overall choice. However, an internal choice has been provided.
8. Use of calculators and log tables is not permitted.

SECTION – A

The following questions are multiple choice questions with one correct answer. There is no internal choice in this section.

1. Which of the following molecule is chiral in nature.
 - (a) 2 – Bromo butane
 - (b) 1- Bromo butane
 - (c) 2- Bromo propane
 - (d) 2- Bromopropan- 2- ol
2. Which of the following alcohol is most soluble in water)
 - (a) Propanol
 - (b) Hexanol
 - (c) Pentanol
 - (d) Butanol
3. Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following is not the characteristics property of interstitial compound ?
 - (a) They have high melting point in compare to pure metals
 - (b) They are very hard.
 - (c) They retain metallic conductivity.

- (d) They are chemically very reactive.
4. Products of electrolysis of an aqueous solution of AgNO_3 using silver electrode will be :
(Given $E^0_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ V}$)
- Ag at cathode , O_2 at anode.
 - H_2 at cathode , O_2 at anode.
 - Ag at cathode , dissolution of Ag from anode.
 - H_2 at cathode, Ag at anode
5. The order of basic character of amines in aqueous solution is :
- $(\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > \text{NH}_3$
 - $\text{CH}_3\text{NH}_2 > (\text{CH}_3)_2\text{NH} > (\text{CH}_3)_3\text{N} > \text{NH}_3$
 - $\text{NH}_3 > (\text{CH}_3)_3\text{N} > (\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2$
 - $(\text{CH}_3)_2\text{NH} > \text{CH}_3\text{NH}_2 > (\text{CH}_3)_3\text{N} > \text{NH}_3$
6. Rate law for the reaction :
 $\text{A} + 2 \text{B} \longrightarrow \text{C}$ is found to be $\text{Rate} = k [\text{A}] [\text{B}]$. Concentration of reactant "B" is doubled keeping the concentration of "A" constant , the value of the rate constant will be ——
- The same
 - Doubled
 - Quadrupled
 - Halved
7. When the initial concentration of reactant is doubled in a reaction, the half life period is not affected. The order of reaction is :
- Second
 - Zero
 - First
 - More than zero but less than the first.
8. If $\Delta o > P$, then the correct electronic configuration for d^4 system will be?
- $t_2g^4 e_g^0$
 - $t_2g^3 e_g^1$
 - $t_2g^0 e_g^4$
 - $t_2g^2 e_g^2$
9. Which of the following compounds will give butanone on oxidation with alkaline KMnO_4 solution?
- Butan-1-ol
 - Butan-2-ol
 - Both of these
 - None of these
10. 2-Methoxy propane on heating with HI produce :
- Methyl alcohol and sec- propyl iodide
 - Methyl iodide and tertiary butyl alcohol
 - Methyl iodide and isobutene
 - Methyl alcohol and tertiary butyl iodide
11. The best reagent for converting 2-phenylpropanamide into 2-phenylpropanamine is _____.
- Excess H_2
 - Br_2 in aqueous NaOH
 - iodine in the presence of red phosphorus
 - LiAlH_4 in ether
12. If the E^0 cell for a given reaction has a positive value, this means that :
- ΔG^0 is positive, K is greater than 1

- (b) ΔG^0 is positive, K is less than 1
- (c) ΔG^0 is negative, K is greater than 1
- (d) ΔG^0 is negative, K is less than 1

In the following (Qno.12-16) a statement of assertion followed by a statement of reason is given.

Choose the correct answer of the following choices.

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

13. Assertion- Cuprous ion (Cu^+) is colourless whereas cupric ion (Cu^{++}) is blue in the aqueous solution.

Reason : Cuprous ion (Cu^+) has unpaired electrons while cupric ion (Cu^{++}) does not.

14. Assertion- $\text{K}_2\text{Cr}_2\text{O}_7$ crystals are orange in colour whereas KMnO_4 crystals are deep purple in colour

Reason - Colour of the compound is due to d-d transition in the transition metal ions present in them

15. Assertion- Toxic metal ions are removed by the chelating ligands.

Reason- Chelate complexes tend to be more stable.

16. Assertion- Aniline cannot be prepared by Gabriel phthalimide reaction

Reason - Aryl halide do not undergo nucleophilic substitution reaction under laboratory conditions.

SECTION – B

This section contains five questions with internal choice in one question.

17. What Give an example of a fuel cell and write the cathode and anode reaction for it .

18. What do you understand by rate law and rate constant of a reaction. Identify the order of reaction if the units of rate constant are –

- (a) $\text{L}^{-1}\text{mol s}^{-1}$
- (b) $\text{L mol}^{-1} \text{s}^{-1}$

19. State reason for each of the following:

- (a) Using IUPAC norms, write the formula of Hexaammine cobalt (III) sulphate
- (b) On the basis of crystal field theory , write the electronic configuration of d^4 ion if $\Delta_o < P$

20. Arrange the following compounds in increasing order of their property as indicated.

- (a) CH_3CHO , $\text{C}_6\text{H}_5\text{CHO}$, HCHO (reactivity towards nucleophilic addition reaction)
- (b) 2, 4- dinitrobenzoic acid, 4- methoxybenzoic acid , 4-nitrobenzoic acid (acidic character)

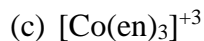
21. Account for the following:

- (a) Arrange each set of compounds in order of increasing boiling points.
 - (i) Bromomethane, (ii) Bromoform, (iii) Chloromethane, (iv) Dibromomethane.
- (b) Write the product formed when n-butyl chloride is treated with alcoholic KOH ?

SECTION C

This section contains seven questions with internal choice in one question

22. Write I.U.P.A.C name of the following complexes :



23. Phenol associates in benzene to a certain extent in dimerisation reaction. A solution containing 0.02 kg of phenol in 1.0 kg of benzene has its freezing point depressed 0.69 K . Calculate the degree of association of phenol .($K_f = 5.12 \text{ k kg/mol}$) 3

OR

2 g of benzoic acid dissolved in 25 g of benzene shows a depression in freezing point equal to 1.62 K. Calculate the % of association of benzoic acid. (Molal depression constant (K_f) for benzene is 4.9 k kg/mol).

24. Complete the following equations :



25. Account for the following

(a) What is the structural difference between a nucleoside and a nucleotide.

(b) Name the type of bonding which stabilizes α helix in proteins.

(c) Why vitamin C cannot be stored in our body

26. Account for the following

(a) Draw the plot of $t_{1/2}$ vs. initial concentration $[\text{A}]_0$ for a first order reaction

(b) A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$ for first order reaction

$$((\log 7 = 0.8451, \log 10 = 1))$$

27. Account for the following

(a) Give the equation of reaction for the preparation of phenol from cumene.

(b) Write the mechanism of hydration of ethane to yield ethanol.

28. Account for the following:

(a) Haloalkanes undergo substitution reactions while haloarenes undergo electrophilic substitution reactions, Explain.

(b) How do polar solvents help in the first step in $\text{S}_\text{N}1$ mechanism?

SECTION D

This section contains two case based questions. Each question has an internal choice.

29. Another class of biomolecules which are essential for living system, are proteins. Proteins are the most abundant biomolecules of the living system. The chief sources of protein are milk, cheese, pulse, fish, meat, peanuts, etc.

They are found in every part of the body and form a fundamental basis of structure and functions of life. These are also required for growth and maintenance of body. Chemically, proteins are the polymers in which the monomeric units are the alpha-amino acids.

Amino acids contain amino and carboxyl functional groups. Depending upon the relative position of the amino group with respect to the carboxyl group, the amino acids can be classified into groups, the amino acids can be classified as alpha, beta, gamma, or delta.

Answers the following questions

(a) Amino acids show amphoteric behaviour. Why?

(b) What type of linkage is responsible for the formation of protein?

(c) What is the difference between α -helix and β -pleated sheets and give an example for each of fibrous protein and globular protein.

Or

What are the common types of secondary structure of protein?

30. The colligative properties of electrolytes require a slightly different approach than the one used for the colligative properties of non-electrolytes. The electrolytes dissociate into ions in a solution. It is the number of solute particles that determines the colligative properties of a solution. The electrolyte solutions therefore, show abnormal colligative properties. To account for this effect we define a quantity called the van't Hoff factor given by

$i = \frac{\text{Actual number of particles in solution after dissociation}}{\text{Number of formula units initially dissolved in solution}}$

$i = 1$ (for non-electrolytes).

$i > 1$ (for electrolytes, undergoing dissociation)

$i < 1$ (for solutes, undergoing association)

van't Hoff factor depends on degree of dissociation or degree of association as the case may be.

Answer the following questions.

(a) Give an example of a solution in which solute molecules undergo association in solution.

Or

A substance trimerises when dissolved in water, what will be its van't Hoff factor?

(b) Which of the following will have the highest van't Hoff factor? (Assume 100% dissociation)

$C_6H_{12}O_6$, NaCl, $CaCl_2$, $Ca_3(PO_4)_2$

(c) 0.1 M $K_4[Fe(CN)_6]$ is 60% dissociated. Calculate its van't Hoff factor.

SECTION- E

This section contains long answer type questions. All questions have an internal choice.

31. Attempt any five of the following.

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(a) Why is the E^0 value for Mn^{3+}/Mn^{2+} couple much more positive than that for Fe^{3+}/Fe^{2+} ?

(b) Why orange colour of $\text{Cr}_2\text{O}_7^{2-}$ ion changes to yellow when treated with an alkali?

(c) Complete the following equation?



(d) Explain why transition elements acts as catalyst?

(e) What is the lanthanoid contraction?

(f) Why Zn^{2+} salts are white, while Cu^{2+} salts are coloured?

(g) Why transition elements show variable oxidation states?

32. A. Account for the following

(a) Give IUPAC name of Salicylic acid.

(b) Arrange the following compounds in the increasing order of acidic strength-

(i) $\text{CH}_3\text{CH}_2\text{CH}(\text{Br})\text{COOH}$

(ii) $\text{CH}_3\text{CH}(\text{Br})\text{CH}_2\text{COOH}$

(iii) $(\text{CH}_3)_2\text{CHCOOH}$

(iv) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$

B. Write the products formed when $(\text{CH}_3)_3\text{C-CHO}$ reacts with the following :-

(i) Zinc amalgam and dilute HCl.

(ii) Concentrated Sodium Hydroxide solution

(iii) Semicarbazide

OR

A. Illustrate the following name reaction giving a suitable example of each.

(i) Cannizzaro reaction

(ii) Rosenmund's reduction

B. A compound A [$\text{C}_2\text{H}_4\text{O}$] on oxidation gives B [$\text{C}_2\text{H}_4\text{O}_2$]. A undergoes Iodoform reaction. On treatment with HCN gives a product C which on Hydrolysis gives 2 hydroxypropanoic acid. Name the product when A react with dilute NaOH. Identify A, B, C, D and write chemical equations involved.

33. Account for the following:

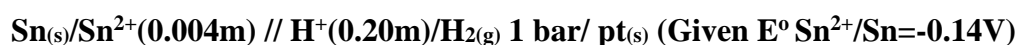
A) Write the cell reaction and calculate the emf of the following cell at 298 K



(B) Apply Kohlrausch law of independent migration of ions, write the expression to determine the limiting molar conductivity of calcium chloride.

OR

(A) Write the cell reaction and calculate the emf of the following cell at 25°C



(B) Define the molar conductivity of a solution and explain how molar conductivity changes with Change in concentration of solution for a weak and strong electrolyte.