Sample Paper 16

Class XII 2023-24

Chemistry

Time: 3 Hours **Max. Marks: 70**

General Instructions:

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

Directions (Q. Nos. 1-16) : The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. For the reaction $2N_2O_5 \longrightarrow 4NO_2 + O_2$, rate and rate constant are $1.02 \times 10^{-4} mol\, L^{-1} s^{-1}$ and $3.4 \times 10^{-5}\, sec^{-1}$ respectively then concentration of N_2O_5 at that time will be

(a) 1.732 M (b) 3 M

(c) 3.4×10^5 M (d) 1.02×10^{-4} M

2. If A contains 2% NaCl and is separated by a semi-permeable membrane from B Which contains 10% NaCl, then which event will occur ?

(a) NaCl will flow from A to B

(b) NaCl will flow from B to A

(c) Water will net flow from A to B

(d) Water will net flow from B to A

3. The standard reduction potential at 25°C of $Li^+/Li, Ba^{2+}/Ba, Na^+/Na$ and Mg^{2+}/Mg are $-3.03, -2.73, -2.71$ and -2.37 volt respectively. Which one of the following is the strongest oxidising agent?

(a) Na^+ (b) Li^+

(c) Ba^{2+} (d) Mg^{2+}

4. Chloroform is used as

(a) Fire extinguisher (b) Industrial solvent

(c) Refrigerant (d) Insecticide

5. Faraday's law of electrolysis is related to :

(a) Atomic number of cation (b) Speed of cation

(c) Speed of anion (d) Equivalent weight of element

6. Which of the following organometallic compound is σ and π bonded?

(a) $[Fe(\eta^5 - C_5H_5)_2]$ (b) $Fe(CH_3)_3$

(c) $K[PtCl_3(\eta^2 - C_2H_4)]$ (d) $[Co(CO)_5NH_3]^{2+}$

7. On distilling phenol with Zn dust, one gets :

(a) Toluene (b) Benzaldehyde + ZnO

(c) ZnO + benzene (d) Benzoic acid

8. A reaction involving two different reactants can never be

(a) bimolecular reaction (b) second order reaction

(c) first order reaction (d) unimolecular reaction

9. Photographic films and plates have an essential ingredient of:

(a) Silver nitrate (b) Silver bromide

(c) Sodium Chloride (d) Oleic acid

10. In the diazotization of arylamines with sodium nitrite and hydrochloric acid, an excess of hydrochloric acid is used primarily to:

(a) Suppress the concentration of free aniline available for coupling

(b) Suppress hydrolysis of phenol

(c) Ensure a stoichiometric amount of nitrous acid

(d) Neutralise the base liberated

11. If formaldehyde and KOH are heated, then we get

(a) Methane (b) Methyl alcohol

(c) Ethyl formate (d) Acetylene

12. Which of the following protein destroy the antigen when it enters in body cell?

(a) Antibodies (b) Insulin

(c) Chromoprotein (d) Phosphoprotein

Directions (Q. No. 13-16) : Each of the following questions consists of two statements, one is Assertion and the other is Reason. Give answer :

13. **Assertion :** Acetaldehyde on treatment with alkali gives aldol.
Reason : Acetaldehyde molecule contains α-hydrogen atom.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

14. **Assertion :** Alpha (α)- amino acids exist as internal salt in solution as they have amino and carboxylic acid groups in near vicinity.
Reason : H^+ ion given by carboxylic group ($-COOH$) is captured by amino group ($-NH_2$) having lone pair of electrons.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

15. **Assertion :** Nucleophilic substitution reaction on an optically active alkyl halide gives a mixture of enantiomers.
Reason : The reaction occurs by S_N1 mechanism.

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

16. **Assertion :** Acetamide has more polar $>C=O$ group than ethyl acetoacetate.
Reason : $\ddot{N}H_2$ is more electron donating than $\ddot{O}C_2H_5$

(a) Both Assertion and Reason are correct and Reason is a correct explanation of the Assertion.

(b) Both Assertion and Reason are correct but Reason is not the a correct explanation of the Assertion.

(c) Assertion is correct but Reason is incorrect.

(d) Both the Assertion and Reason are incorrect.

SECTION-B

Directions (Q. Nos. 17-21) : This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. Define Vapour pressure.

18. Draw the structure of
1. hex-1-en-3 ol
2. 3-aminopentan-2-ol

or

What is 'Wood spirit'?

19. Explain with one example each the terms weak and strong electrolytes.

20. Write the use of formaldehyde (HCHO).

or

Write the IUPAC names of :
1. $CH_3 - CH_2Br - COOH$
2. $COOH - CH_2 - CH_2 - COOH$

21. Suggest a way to determine the Λ_m^o value of water.

SECTION-C

Directions (Q. Nos. 22-28) : This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. What is the difference between inner orbital or low spin complex and outer orbital or high spin complex?

23. Which one of the following has the highest dipole moment?
(i) CH_2Cl_2
(ii) $CHCl_3$
(iii) CCl_4

24. Give the representation of a galvanic cell.

25. Write the IUPAC names of the following coordinate compounds:

1. $[Pt(NH_3)_2Cl_2]Cl_2$
2. $[Cr(NH_3)_4Cl_2]^+$

26. The treatment of alkyl chloride with aqueous KOH leads to the formation of alcohols but in presence of alcoholic KOH, alkenes are the major products. Explain why ?

27. Give the dissimilarities between $>C=O$ bond and $-\overset{|}{C}=\overset{|}{C}-$ Bond.

or

Arrange the following compounds in increasing order of boiling points ?

1. Pentan-1-ol, butan-1-ol, butan-2-ol, propan-1-ol, methanol.
2. Pentan-1-ol, *n*-butane, pentanal, ethoxyethane.

28. Write main series of transition metals.

SECTION-D

Directions (Q. Nos. 29-30) : The following questions are case-based questions. Each question has an internal choice and carries 4 marks each. Read the passage carefully and answer the questions that follow.

29. Colour may arise from a entirely different cause in ions with incomplete *d* or *f* shells. This source of colours very important in most of the transition metal ions. In free isolated gaseous ion the five *d* orbitals are degenerate, i.e. they are identical in energy. In real life situations, the ion will be surrounded by solvent molecules if it is in solution; by other ligands if it is in a complex; or by other ions if it is in crystal lattice. The surrounding groups affect the energy of some orbitals more than others. Thus the *d* orbitals are no longer degenerate, and they form two groups of orbitals of different energies. Thus in transition element ions with a partly filled d shell, it is possible to promote electrons from *d* level to another *d* level of higher energy. The corresponds to a fairly small energy difference and so light is absorbed in the visible region. The colour of a transition meltal complex is dependent on how big the energy difference is between the two *d* levels. This in turn depends on the nature of the ligand, and on the type of complex formed. Thus the octahedral complex $[Ni(NH_3)_6]^{2+}$ is blue, $[Ni(H_2O)_6]^{2+}$ is green and $[Ni(NO_2)_6]^{4-}$ is brown-red. The colour changes with the ligand,used the colour also depends on the Number of ligands and the shape of the complex formed.

Answer the following questions :

(a) Account for the following : Copper(I) compounds are white whereas copper(II) compounds are coloured.

(b) Cu^{2+} salts are coloured, while Zn^{2+} salts ire white.

(c) Which of following cations are coloured in aqueous solutions and why ?
Sc^{3+}, V^{3+}, Ti^{4+}, Mn^{2+}
(At. nos..Sc = 21, V = 23, Ti = 22, Mn = 25)

or

(d) How would you account for the following : Transition metals form coloured compounds ?

30. Amines are alkyl or aryl derivatives of ammonia formed by replacement of one or more hydrogen atoms. Allcyl derivatives are called aliphatic amines and aryl derivatives are known as aromatic amines. The presence of aromatic amines can be identified by performing dye test. Aniline is the simplest example of aromatic amine. It undergoes electrophilic substitution reactions in which-NH_2, group strongly activates the aromatic ring through delocalisation of lone pair of electrons of N-atom. Aniline undergoes electrophilic substitution reactions. Ortho and para positions to the-NH_2 group become centres of high electrons density. Thus,-NH_2 group is ortho and para-directing and powerful activating group.

Read the above passage and answer the following question:

(a) What does oxidation of aniline in presence of MnO_2, and, H_2SO_4 produce ?

(b) How will you distinguish cyclohexylamine and aniline ?

(c) What is the major product obtained by acetylation of aniline followed by nitration (conc. HNO_3 + conc. H_2SO_4) and then alkaline hydrolysis ?

or

(d) What does aniline produce in carbylamine reaction? Write chemical equation of the reaction involved.

SECTION-E

Directions (Q. Nos. 31-33) : The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

31. What are carbohydrates ? How are they classified ?

32. Describe the kinetics of a first order reaction. Why is a first order reaction never completed?

or

What do you mean by first order reaction ? Find the expression for first order reaction.

33. Describe the general characteristics of transition elements with special reference to the following :

(i) Formation of colour salt

(ii) Variable oxidation state

or

(a) Account for the following;

1. Mn shows the highest oxidation state of +7 with oxygen but with fluorine, it shows the oxidation sate of +4.
2. Cr^{2+} is a strong reducing agent.
3. Cu^{2+} salts are coloured, while Zn^{+2} salts are white.

(b) Complete the following equations:

1. $2MnO_2 + 4KOH + O_2 \xrightarrow{\Delta}$
2. $Cr_2O_7^{2-} + 14H^+ + 6I^- \longrightarrow$

□□□□□□□