

BUDHA DAL PUBLIC SCHOOL, PATIALA
PRE BOARD EXAMINATION Class : XII
Subject : CHEMISTRY (043)

Time: 3 hrs.

MM: 70

General Instructions:

- (1) There are 33 questions in all. All questions are compulsory.
- (2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
- (3) All the sections are compulsory.
- (4) **Section A** contains 16 questions, 12 MCQ and 4 Assertion Reasoning based of 1 mark each, **Section B** contains 5 questions of two marks each, **Section C** contains 7 questions of three marks each, **Section D** contains two case study based questions of four marks each and **Section E** contains three long answer questions of five marks each.
- (5) Use of calculators is not allowed.

SECTION-A

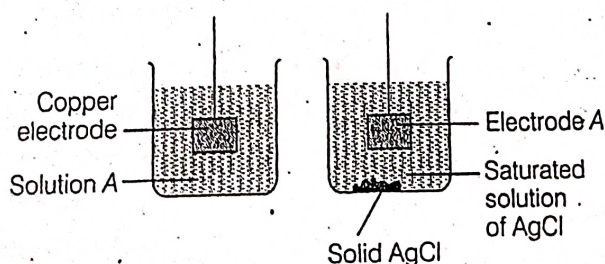
The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. The major product of oxidation of secondary alcohol is
(a) aldehyde (b) ketone (c) carboxylic acid (d) ether

2. The reason of lanthanoid contraction is
(a) negligible screening effect of *f*-orbitals (b) increasing nuclear charge
(c) decreasing nuclear charge (d) decreasing screening effect

3. In which case, Raoult's law is not applicable?
(a) 1 M NaCl (b) 1 M urea (c) 1 M glucose (d) 1 M sucrose

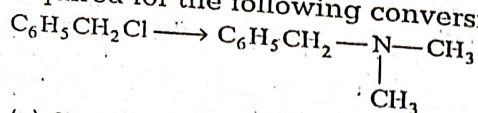
4. The diagram below shows an incomplete experimental set-up needed to measure the E_{cell} of a cell composed of the standard $\text{Cu}^{2+} / \text{Cu}$ electrode and an Ag^+ / Ag electrode.



What is the chemical composition of solution A?

- (a) CuSO_4 (b) AgSO_4
- (c) CuCl_2 (d) AgCl

5. Which of the following reagent is required for the following conversion?

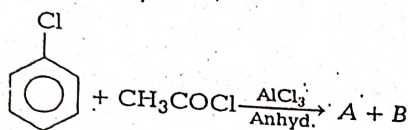


- (a) $\text{CH}_3\text{NH}_2, \text{CH}_3\text{Cl}$ (b) $\text{CH}_3\text{Cl}, \text{RNH}_2$
 (c) $\text{NH}_3, \text{CH}_3\text{Cl}$ (d) $\text{CH}_3\text{CH}_2\text{NH}_2$

6. When 1 mole of $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ is treated with excess of AgNO_3 , 3 moles of AgCl are obtained. The formula of the complex is

- (a) $[\text{CrCl}_3(\text{H}_2\text{O})_3] \cdot 3\text{H}_2\text{O}$
 (b) $[\text{CrCl}_2(\text{H}_2\text{O})_4]\text{Cl} \cdot 2\text{H}_2\text{O}$
 (c) $[\text{CrCl}(\text{H}_2\text{O})_5]\text{Cl}_2 \cdot \text{H}_2\text{O}$
 (d) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$

7. In the reaction,



A and B are

- (a) *o*-chloroacetophenone, methyl chloride
 (b) *p*-chloroacetophenone, acetophenone
 (c) *o*-chloroacetophenone, *p*-chloroacetophenone
 (d) None of the above

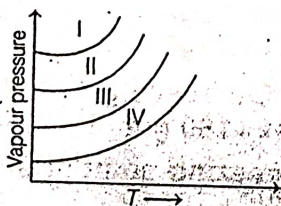
8. Which of the following statements is not correct for carboxylic acids?

- (a) Aromatic carboxylic acids undergo electrophilic substitution reactions.
 (b) Carboxylic acids are stronger acids than alcohols.
 (c) Carboxylic acids does not undergo any reaction with Na_2CO_3 gas.
 (d) Hell-Volhard Zelinsky reaction is given by carboxylic acids.

9. Which of the following will show a negative deviation from Raoult's law?

- (a) Acetone-benzene
 (b) Acetone-ethanol
 (c) Benzene-methanol
 (d) Acetone-chloroform

10. The following diagram shows the vapour pressure curves for CH_3F , CH_3OH , CH_3COOH and HCHO



Curves I, II, III and IV respectively are for

- (a) CH_3F ; HCHO ; CH_3OH ; CH_3COOH
 (b) CH_3COOH ; CH_3OH ; CH_3F ; HCHO
 (c) HCHO ; CH_3F ; CH_3OH ; CH_3COOH
 (d) CH_3OH ; CH_3COOH ; HCHO ; CH_3F

11. In $[\text{CoF}_6]^{3-}$, Co^{3+} uses outer *d*-orbitals (4*d*) in sp^3d^2 -hybridisation. The number of unpaired electrons present in complex ion is

- (a) 0 (b) 4
 (c) 2 (d) 3

12. Which of the following reactions convert acetone into hydrocarbon having same number of carbon atoms?

- (a) Wolff-Kishner reaction
 (b) Hofmann reaction
 (c) Grignard reaction
 (d) Reduction with LiAlH_4

Direction (Q. Nos. 15-18) In the following questions as Assertion (A) is followed by a corresponding Reason (R). Use the following keys to choice the appropriate answer.

- (a) Both A and R are correct, 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, R is false.
 (d) A is incorrect, R is correct.

13. Assertion (A) *o*-nitrophenol is less soluble in water than the *m* and *p*-isomers.

Reason (R) *m* and *p*-nitrophenols exist as associated molecules.

14. Assertion (A) Glucose does not form the hydrogen bisulphite addition product.

Reason (R) Glucose is not so reactive to form the product with NaHSO_3 .

15. Assertion (A) In order to convert $\text{R}-\text{Cl}$ to pure $\text{R}-\text{NH}_2$, Gabriel phthalimide synthesis can be used.

Reason (R) With proper choice of alkyl halides, phthalimide synthesis can be used to prepare 1°, 2° or 3° amines.

16. Assertion (A) Chromium is a typical hard metal, while mercury is a liquid.

Reason (R) In Cr, there are six unpaired electrons, whereas in Hg, there is no unpaired electron.

SECTION-B

This section contains questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

Q.17. Calculate molality of 2.5g of ethanoic acid (CH_3COOH) in 75g benzene.

Q.20 Name the following complexes and draw the structure of one possible isomer of each $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$ and $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ complex.

Q.18. Write the following reactions

- Clemmensen Reduction
- Rosenmund's Reduction

Q.21 Give reason for the following.

- Denaturation of proteins results in the loss of biological activity of the proteins.
- Vitamins B and C cannot be stored in our body.

Or

- Name the deficiency diseases resulting from lack of vitamin A and E in the diet.
- Out of the four bases, name those which are common to both DNA and RNA and why DNA and RNA are called acids?

OR

What happens when formaldehyde is treated with

- conc. KOH
- ammonia

Q.19. Calculate the equilibrium constant for the reaction,



The standard reduction potential in acidic condition is 0.78 V and 0.54 V, respectively, for $\text{Fe}^{3+}/\text{Fe}^{2+}$ and I_3^-/I^- couples.

SECTION-C

This section contains 5 questions with internal choice in one questions. The following questions are short answer type and carry 3 marks each.

Q.22 State Henry's Law. Write its one application. What is the effect of temperature on solubility of gases in liquid?

Q.23 Which compound in each of the following pairs will react faster in $\text{S}_{\text{N}}2$ reaction with OH^- ?

(i) CH_3Br or CH_3I (ii) $(\text{CH}_3)_3\text{CCl}$ or CH_3Cl

(b) What is an ambident nucleophile? Give example.

Q.24 Write the equations for the following reaction.

- Benzyl chloride is treated with aqueous KOH followed by hydrolysis.
- Cumene hydroperoxide undergoes acid hydrolysis.
- Benzene diazonium chloride is treated with water.

Q.25 For the complex $[\text{FeF}_6]^{3-}$ explain the following.

- Type of hybridisation
- Magnetic behaviour

(c) Spin of complex.

Q.26 (a) A first order reaction takes 40 min for 30% decomposition. Calculate $t_{1/2}$ for this reaction. (Given, $\log 1.428 = 0.1548$) (2)

(b) State rate law of a reaction and explain why does the rate of a reaction not remain constant throughout the reaction? (1)

Q.27 Give reason for any three of the following observations.

- Chloroform is stored in dark coloured bottles.
- Racemisation occurs in $\text{S}_{\text{N}}1$ reactions.
- Alkyl halides though polar are immiscible in water.
- In the pair of $(\text{CH}_3)_3\text{C}-\text{Cl}$ and CH_3Cl will react faster in $\text{S}_{\text{N}}2$ reaction with OH^- .

Q.28 (a) Identify the products when D-glucose is treated with Br_2 water. (1)

- (b) Why does the amino acids behave like salts rather than simple amines or carboxylic acids? (2)

Or

What are essential and non-essential amino acids? Give two examples of each type.

SECTION-D

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

Q. 29 Amines constitute one of the most important class of organic compounds. Amines are alkyl or aryl derivatives of ammonia formed by replacement of one or more hydrogen atoms. Alkyl derivatives are called aliphatic amines and aryl derivatives are known as aromatic amines. Both aliphatic and aromatic primary amines can be prepared by the reduction of nitro compounds catalytically with H_2 in the presence of active metal in acidic medium. 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 electron density. Thus, $-NH_2$ group is *ortho* and *para*-directing powerful activating group. Answer the following questions.

(a) Give one chemical test to distinguish between the following pairs of compounds.

- i) Secondary and tertiary amines
- ii) Ethylamine and aniline

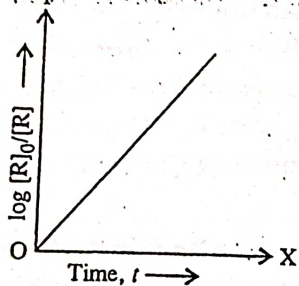
(b) Account for the following:

- i) pK_b of aniline is more than that of methylamine.
- ii) Ethylamine is soluble in water whereas aniline is not.

Q. 30. Consider a hypothetical reaction



where R represents reactant and P represents product. For this reaction a plot of $\log [R]_0/R$ vs time, t is a straight line as shown here. Study the given plot and answer the following questions :



1. What is the order of the reaction ?
2. Write the integrated rate law (exponential form) for the reaction.
3. What is the half life period, $t_{1/2}$ of the reaction ?
What are the units of rate constant of the reaction ?

Or

Find the half life of reaction if the rate constant is $1.7 \times 10^{-5} s^{-1}$?

SECTION-E

The following questions are long answer type and carry 5 marks each. Two questions have an internal choice.

- Q.31. (a) Why does the conductivity of a solution decreases with dilution? (1)
- (b) Write the reaction involved in the working of H_2-O_2 fuel cell. (2)
- (c) What is the potential of hydrogen electrode which is in contact of a solution whose pH is 10? (2)
- [OR]
- (a) If the E_{cell}° for a given reaction has a negative value, then what would be the relationship between ΔG° and K_{eq} ? (1)
- (b) How many electrons flow through a metallic wire, if a current of 0.5 A is passed for 2 hours? (2)
- (c) For a cell, $Ag(s) | AgNO_3(0.01 M) || AgNO_3(1.0 M) | Ag(s)$
What is the emf of the cell at $25^\circ C$? (2)

- Q.32. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid also produced (B). On dehydration (C) gives but-1-ene. Write the equations for the reactions involved.
- (a) Identify A, B and C. (2)
- (b) Write all the chemical reactions involved. (1)
- (c) Write the reaction of B with ethanol. (1)
- (d) Write down the test to check degree of the alcohol B formed. (1)

Or

- a) Explain the following named reactions:
- i) Kolbe's reaction
 - ii) Reimer - Tiemann reaction
 - iii) Williamson ether synthesis
- b) Account for the following:
- i) Phenol is a stronger acid than an alcohol
 - ii) Why ortho-nitrophenol is steam volatile while para-nitrophenol is not?

- Q.33. Answer the following.
- (a) Why Cu^+ ion is not known in aqueous solution?
 - (b) Why Mn^{3+} is a good oxidising agent?
 - (c) Why Ni^{2+} is more stable than Pt^{2+} whereas Pt^{4+} is more stable than Ni^{4+} ?
 - (d) Explain the observation, Zn, Cd and Hg are quite soft and have low melting point.
 - (e) What is meant by 'disproportionation'?