

PRACTICE PAPER-2

CLASS: XII

SUBJECT : CHEMISTRY

Time Allowed : 3 hours

Maximum Marks : 70

General Instructions :

1. There are **35** questions in this question paper with internal choice.
2. **SECTION A** consists of **18 multiple-choice questions** carrying **1 mark** each.
3. **SECTION B** consists of **7 very short answer questions** carrying **2 marks** each.
4. **SECTION C** consists of **5 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

1. Which of the following tests/ reactions is given by aldehydes as well as ketones?
 (a) Fehling's test (b) Tollen's test
 (c) 2,4 DNP test (d) Cannizzaro reaction
2. Using the data given below find out the strongest reducing agent.
 $E^\ominus_{\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}} = 1.33 \text{ V}$; $E^\ominus_{\text{Cl}_2/\text{Cl}^-} = 1.36 \text{ V}$; $E^\ominus_{\text{MnO}_4^-/\text{Mn}^{2+}} = 1.51 \text{ V}$; $E^\ominus_{\text{Cr}^{3+}/\text{Cr}} = -0.74 \text{ V}$
 (a) Cl^- (b) Cr (c) Cr^{3+} (d) Mn^{2+}
3. For the reaction, $\text{A} + 2\text{B} \rightarrow \text{AB}_2$, the order w.r.t. reactant A is 2 and w.r.t. reactant B is zero. What will be change in rate of reaction if the concentration of A is doubled and B is halved?
 (a) increases four times (b) decreases four times (c) increases two times (d) no change
4. Which set of ions exhibit specific colours?
 (Atomic number of Sc = 21, Ti = 22, V = 23, Mn = 25, Fe = 26, Ni = 28 Cu = 29 and Zn = 30)
 (a) Sc^{3+} , Ti^{4+} , Mn^{3+} (b) Sc^{3+} , Zn^{2+} , Ni^{2+}
 (c) V^{3+} , V^{2+} , Fe^{3+} (d) Ti^{3+} , Ti^{4+} , Ni^{2+}
5. When one mole of $\text{CoCl}_3 \cdot 5\text{NH}_3$ was with excess of silver nitrate solution, 2 mol of AgCl was precipitated. The formula of the compound is :
 (a) $[\text{Co}(\text{NH}_3)_5\text{Cl}_2]\text{Cl}$ (b) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
 (c) $[\text{Co}(\text{NH}_3)_4\text{Cl}_2] (\text{NH}_3) \text{Cl}$ (d) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3] (\text{NH}_3)_2$

6. The absorption maxima of several octahedral complex ions are as follows :

S.No.	Compound	λ_{\max} nm
1	$[\text{Co}(\text{NH}_3)_6]^{3+}$	475
2	$[\text{Co}(\text{CN})_6]^{3-}$	310
3	$[\text{Co}(\text{H}_2\text{O})_6]^{3+}$	490

The crystal field splitting is maximum for :

- (a) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$ (b) $[\text{Co}(\text{CN})_6]^{3-}$
 (c) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (d) All the complex ions have the same splitting, Δ_0 .
7. Ambidentate ligands like NO_2^- and SCN^- are :
 (a) unidentate (b) didentate (c) polydentate (d) has variable denticity
8. Arrange the following in the increasing order of their boiling points:
 A : Butanamine B: N,N-Dimethylethanamine C: N-Ethylethanamine
 (a) $C < B < A$ (b) $A < B < C$ (c) $A < C < B$ (d) $B < C < A$
9. How much ethyl alcohol must be added to 1 litre of water so that the solution will freeze at -14°C ? (K_f for water = 1.86°C/mol)
 (a) 7.5 mol (b) 8.5 mol (c) 9.5 mol (d) 10.5 mol
10. The major product of acid catalysed dehydration of 1-methylcyclohexanol is:
 (a) 1-methylcyclohexane (b) 1-methylcyclohexene
 (c) 1-cyclohexylmethanol (d) 1-methylenecyclohexane
11. The boiling points of alcohols are higher than those of hydrocarbons of comparable masses due to:
 (a) Hydrogen bonding (b) Ion – dipole interaction
 (c) Dipole-dipole interaction (d) Van der Waal's forces.
12. Phenol does not undergo nucleophilic substitution reaction easily due to:
 (a) acidic nature of phenol
 (b) partial double bond character of C-OH bond
 (c) partial double bond character of C-C bond
 (d) instability of phenoxide ion
13. Amino acids are :
 (a) Liquids (b) Volatile solids
 (c) Non-volatile crystalline compounds (d) Mixture of amines and acids
14. Which one of the following reactions is not explained by the open chain Structure of glucose:
 (a) Formation of pentaacetate of glucose with acetic anhydride.
 (b) formation of addition product with 2,4 DNP reagent
 (c) Silver mirror formation with Tollen's reagent
 (d) existence of alpha and beta forms of glucose.

(15-18) Given below are two statements labelled as Assertion (A) and Reason (R)

- (a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
- (b) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
- (c) Assertion (A) is correct, but Reason (R) is wrong statement.
- (d) Assertion (A) is wrong, but Reason (R) is correct statement.

15. **Assertion:** Aquatic species are more comfortable in cold waters rather than in warm waters.

Reason: Different gases have different K_H values at the same temperature.

16. **Assertion:** Carboxylic acids are more acidic than phenols.

Reason: Phenols are ortho and para directing.

17. **Assertion :-** Aryl halides undergo nucleophilic substitution reactions with ease.

Reason:- The carbon halogen bond in aryl halides has partial double bonds character.

18. **Assertion (A) :** Proteins are found to have two different types of secondary structures viz alpha-helix and beta-pleated sheet structure.

Reason (R) : The secondary structure of proteins is stabilized by hydrogen bonding.

SECTION-B

19. The C-14 content of an ancient piece of wood was found to have three tenths of that in living trees. How old is that piece of wood?

($\log 3 = 0.4771$, $\log 7 = 0.8540$, Half-life of C-14 = 5730 years)

20. Carry out the following conversions in not more than 2 steps:

- (a) Aniline to chlorobenzene
- (b) 2-bromopropane to 1-bromopropane

OR

The following haloalkanes are hydrolysed in presence of aq KOH.

- (a) 1-Chlorobutane
- (b) 2-chloro-2-methylpropane

Which of the above is most likely to give (a) an inverted product (b) a racemic mixture: Justify your answer.

21. (a) Name the unit formed by the attachment of a base to 1' position sugar in a nucleoside.

(b) Name the species formed when an aqueous solution of amino acid is dissolved in water?

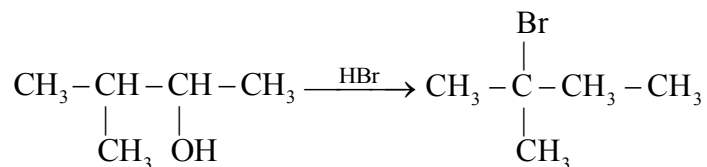
OR

Three amino acids are given below:

Alanine $\text{CH}_3\text{CH}(\text{COOH})(\text{NH}_2)$ Aspartic acid $\text{HOOC}-\text{CH}_2\text{CH}(\text{COOH})(\text{NH}_2)$ and Lysine $\text{H}_2\text{N}-(\text{CH}_2)_4-\text{CH}(\text{COOH})(\text{NH}_2)$

- (a) Make two tripeptides using these amino acids and mark the peptide linkage in both cases.
- (b) Represent Alanine in the zwitter ionic form.

22. Define proteins and classify them on the basis of their molecular shape.
23. When 3-methylbutan-2-ol is treated with HBr, the following reaction takes place:



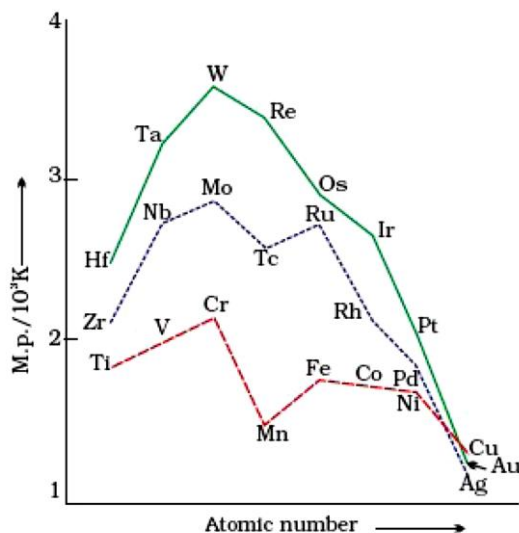
Give a mechanism for this reaction.

24. Answer the following questions:

- (a) $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ (aq) is green in colour whereas $[\text{Ni}(\text{H}_2\text{O})_4(\text{en})]^{2+}$ (aq) is blue in colour, give reason in support of your answer.
- (b) Write the formula and hybridization of the following compound:
tris(ethane-1,2-diamine) cobalt(III) sulphate
25. The formula $\text{Co}(\text{NH}_3)_5\text{CO}_3\text{Cl}$ could represent a carbonate or a chloride. Write the structures and names of possible isomers.

SECTION-C

26. On the basis of the figure given below, answer the following questions:



- (a) Why Manganese has lower melting point than Chromium?
- (b) Why do transition metals of 3d series have lower melting points as compared to 4d series?
- (c) In the third transition series, identify and name the metal with the highest melting point.
27. Answer the following questions :
- (a) Grignard reagent should be prepared under anhydrous conditions,
- (b) Chloroform is stored in dark coloured bottles filled up to the brim.
- (c) Out of $\text{C}_6\text{H}_5\text{CH}_2\text{Cl}$ and $\text{C}_6\text{H}_5\text{CHClC}_6\text{H}_5$, which is more easily hydrolysed by aqueous KOH ?

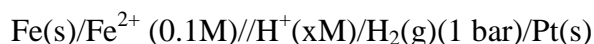
28. Give reasons for the following:

- Transition elements act as catalysts
- It is difficult to obtain oxidation state greater than two for Copper.

29. Attempt any three.

- Phenol is treated with conc. HNO_3 .
- Propene is treated with B_2H_6 followed by $\text{H}_2\text{O}_2/\text{OH}^-$.
- Sodium t-butoxide is treated with CH_3Cl .
- Arrange the following in increasing order of acidity :
Phenol, ethanol, water

30. (a) The e.m.f. of the following cell at 298 K is 0.1745 V



$$\text{Given : } E_{\text{Fe}^{2+}/\text{Fe}}^0 = -0.44\text{V}$$

Calculate the H^+ ions concentration of the solution at the electrode where hydrogen is being produced.

- Aqueous solution of copper sulphate and silver nitrate are electrolysed by 1 ampere current for 10 minutes in separate electrolytic cells. Will the mass of copper and silver deposited on the cathode be same or different ? Explain your answer.

OR

- Calculate the degree of dissociation of 0.0024 M acetic acid if conductivity of this solution is $8.0 \times 10^{-5} \text{ S cm}^{-1}$.

$$\text{Given ; } \lambda_{\text{H}^+}^0 = 349.6 \text{ S cm}^2 \text{ mol}^{-1} ; \lambda_{\text{CH}_3\text{COO}^-}^0 = 40.9 \text{ S cm}^2 \text{ mol}^{-1}$$

- Solutions of two electrolytes 'A' and 'B' are diluted. The limiting molar conductivity of 'B' increase to a smaller extent while that of 'A' increases to a much larger extent comparatively. Which of the two is a strong electrolyte ? Justify your answer.

SECTION-D

31. Read the given passage and answer the questions that follow :

A lead storage battery is the most important type of secondary cell having a lead anode and a grid of lead packed with PbO_2 as cathode. A 38% solution of sulphuric acid is used as electrolyte. (Density = 1.294 g mL^{-1}) The battery holds 3.5 L of the acid. During the discharge of the battery, the density of H_2SO_4 falls to 1.139 g mL^{-1} (20% H_2SO_4 by mass)

- How much electricity in terms of Faraday is required to carry out the reduction of one mole of PbO_2 ?
- What is the molarity of sulphuric acid before discharge?
- Write the reaction taking place at the anode and cathode when the battery is in use.

OR

- Write the products of electrolysis when dilute sulphuric acid is electrolysed using Platinum electrodes.

32. Read the passage given below and answer the questions that follow.

Are there nuclear reactions going on in our bodies?

There are nuclear reactions constantly occurring in our bodies, but there are very few of them compared to the chemical reactions, and they do not affect our bodies much. All of the physical processes that take place to keep a human body running are chemical processes. Nuclear reactions can lead to chemical damage, which the body may notice and try to fix.

The nuclear reaction occurring in our bodies is radioactive decay. This is the change of a less stable nucleus to a more stable nucleus. Every atom has either a stable nucleus or an unstable nucleus, depending on how big it is and on the ratio of protons to neutrons. The ratio of neutrons to protons in a stable nucleus is thus around 1:1 for small nuclei ($Z < 20$). Nuclei with too many neutrons, too few neutrons, or that are simply too big are unstable. They eventually transform to a stable form through radioactive decay. Wherever there are atoms with unstable nuclei (radioactive atoms), there are nuclear reactions occurring naturally. The interesting thing is that there are small amounts of radioactive atoms everywhere: in your chair, in the ground, in the food you eat, and yes, in your body.

The most common natural radioactive isotopes in humans are carbon-14 and potassium-40. Chemically, these isotopes behave exactly like stable carbon and potassium. For this reason, the body uses carbon-14 and potassium-40 just like it does normal carbon and potassium; building them into the different parts of the cells, without knowing that they are radioactive. In time, carbon-14 atoms decay to stable nitrogen atoms and potassium-40 atoms decay to stable calcium atoms. Chemicals in the body that relied on having a carbon-14 atom or potassium-40 atom in a certain spot will suddenly have a nitrogen or calcium atom. Such a change damages the chemical. Normally, such changes are so rare, that the body can repair the damage or filter away the damaged chemicals.

The natural occurrence of carbon-14 decay in the body is the core principle behind carbon dating. As long as a person is alive and still eating, every carbon-14 atom that decays into a nitrogen atom is replaced on average with a new carbon-14 atom. But once a person dies, he stops replacing the decaying carbon-14 atoms. Slowly the carbon-14 atoms decay to nitrogen without being replaced, so that there is less and less carbon-14 in a dead body. The rate at which carbon-14 decays is constant and follows first order kinetics. It has a half - life of nearly 6000 years, so by measuring the relative amount of carbon-14 in a bone, archeologists can calculate when the person died. All living organisms consume carbon, so carbon dating can be used to date any living organism, and any object made from a living organism. Bones, wood, leather, and even paper can be accurately dated, as long as they first existed within the last 60,000 years. This is all because of the fact that nuclear reactions naturally occur in living organisms.

- (a) Researchers have uncovered the youngest known dinosaur bone, dating around 65 million years ago. How was the age of this fossil estimated?
- (b) Which are the two most common radioactive decays happening in human body?
- (c) Suppose an organism has 20 g of Carbon -14 at its time of death. Approximately how much Carbon -14 remains after 10,320 years? (Given $\text{antilog } 0.517 = 3.289$)

OR

Approximately how old is a fossil with 12 g of Carbon -14 if it initially possessed 32 g of Carbon - 14? (Given $\log 2.667 = 0.4260$)

SECTION-E

33. (a) Measurement of osmotic pressure method is preferred for the determination of molar masses of macromolecules such as proteins and polymers.
- (b) Aquatic animals are more comfortable in cold water than in warm water.
- (c) Elevation of boiling point of 1 M KCl solution is nearly double than that of 1M sugar solution.

OR

- (a) How many gram of NaCl is required to make 200 mL aqueous solution of 5% (w/v) NaCl.
- (b) 30 gm of ethanoic acid present in 100 gm of water, determine molality of ethanoic acid in water.
- (c) Due to low concentration of oxygen in blood, climber become weak and unable to think clear-
- (i) Write specific name of above condition.
- (ii) Explain the reason of such condition.
34. A hydrocarbon (A) with molecular formula C_5H_{10} on ozonolysis gives two products (B) and (C). Both (B) and (C) give a yellow precipitate when heated with iodine in presence of NaOH while only (B) give a silver mirror on reaction with Tollen's reagent.
- (a) Identify (A), (B) and (C).
- (b) Write the reaction of B with Tollen's reagent.
- (c) Write the equation for iodoform test for C.
- (d) Write down the equation for aldol condensation reaction of B and C.

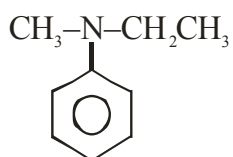
OR

An organic compound (A) with molecular formula $C_2Cl_3O_2H$ is obtained when (B) reacts with Red P and Cl_2 . The organic compound (B) can be obtained on the reaction of methyl magnesium chloride with dry ice followed by acid hydrolysis.

- (a) Identify A and B
- (b) Write down the reaction for the formation of A from B. What is this reaction called?
- (c) Give any one method by which organic compound B can be prepared from its corresponding acid chloride.
- (d) Which will be the more acidic compound (A) or (B)? Why?
- (e) Write down the reaction to prepare methane from the compound (B).

35. What happens when reactions :

- (a) N-ethylethanamine reacts with benzenesulphonyl chloride.
- (b) Benzylchloride is treated with ammonia followed by the reaction with Chloromethane.
- (c) Aniline reacts with chloroform in the presence of alcoholic potassium hydroxide.
- (d) Write the IUPAC name for the following organic compound :



- (e) Complete the following:

