



Strive for Perfection

ANGEL'S PUBLIC SCHOOL

SAMPLE PAPER

PRE-BOARD – II

SESSION 2020 – 21

CLASS – XII

SUBJECT : CHEMISTRY

TIME : 3 HOURS

M.M = 70

General Instructions:

- There are 33 questions in this question paper. All questions are compulsory.
- Section A: Q. No. 1 to 16 are objective type questions. Q. No. 1 and 2 are passage based questions carrying 4 marks each while Q. No. 3 to 16 carry 1 mark each.
- Section B: Q. No. 17 to 25 are short answer questions and carry 2 marks each.
- Section C: Q. No. 26 to 30 are short answer questions and carry 3 marks each.
- Section D: Q. No. 31 to 33 are long answer questions carrying 5 marks each.
- There is no overall choice. However, internal choices have been provided.
- Use of calculators and log tables is not permitted.

Section A

- Read the passage given below and answer any four out of the following questions:

Nitrogen differs from the rest of the members of group 15 due to its smaller size, high electronegativity, high ionisation enthalpy, and non-availability of d orbitals. Nitrogen has a unique ability to form $p\pi-p\pi$ multiple bonds with itself. Nitrogen exists as a diatomic molecule with a triple bond one s and two p between the two atoms.

Phosphorus, arsenic and antimony form single bonds as P-P, As-As and Sb-Sb while bismuth forms metallic bonds in an elemental state. Dinitrogen is produced commercially by the liquefaction and fractional distillation of air. Liquid dinitrogen (b.p. 77.2 K) distils out first leaving behind liquid oxygen (b.p. 90 K). In the laboratory, dinitrogen is prepared by treating an aqueous solution of ammonium chloride with sodium nitrite. Dinitrogen is a colourless, odourless, tasteless and non-toxic gas. It has two stable isotopes ^{14}N and ^{15}N . It has very low solubility in water. The main use of dinitrogen is in the manufacture of ammonia and other industrial chemicals containing nitrogen.

The following questions are multiple-choice questions. choose the most appropriate answer

- i. N–N bond is weaker than the single P–P bond because
 - a. high interelectronic repulsion of the bonding electrons
 - b. high interelectronic repulsion of the non-bonding electrons
 - c. no repulsion between bonding electrons
 - d. no repulsion between non-bonding electrons
- ii. Very pure nitrogen can be obtained by the
 - a. thermal decomposition of sodium
 - b. thermal decomposition of barium azide
 - c. thermal decomposition of ammonium dichromate
 - d. both (a) and (b)
- iii. Dinitrogen is rather inert at room temperature because of
 - a. low bond enthalpy of $\text{N}\equiv\text{N}$ bond
 - b. high bond enthalpy of $\text{N}\equiv\text{N}$ bond
 - c. low freezing point
 - d. low boiling point
- iv. Dinitrogen combines with dioxygen only at very high temperature (at about 2000 K) to form
 - a. nitric oxide
 - b. nitrate
 - c. nitrites
 - d. nitric acid
- v. Liquid dinitrogen is used as a refrigerant to
 - a. preserve biological materials
 - b. preserve food items
 - c. in cryosurgery
 - d. all of these

2. Read the passage and answer any four out of the following questions:

Colloidal particles always carry an electric charge. The nature of this charge is the same on all the particles in a given colloidal solution and may be either positive or negative. The charge on the sol particles is due to one or more reasons, viz., due to electron capture by sol particles during electrodispersion of metals. When two or more ions are present in the dispersion medium, preferential adsorption of the ion common to the colloidal particle usually takes place. When silver nitrate solution is added to the potassium iodide

solution, the precipitated silver iodide adsorbs iodide ions from the dispersion medium, and negatively charged colloidal solution results. acquired a positive or a negative charge by selective adsorption on the surface of a colloidal particle The combination of the two layers of opposite charges around the colloidal particle is called Helmholtz electrical double layer. The presence of equal and similar charges on colloidal particles is largely responsible for providing stability to the colloidal solution.

In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

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

i. **Assertion:** The presence of equal and similar charges on colloidal particles is largely responsible in providing stability to the colloidal solution.

Reason: The repulsive forces between charged particles having the same charge prevent them from aggregating and provide stability.

ii. **Assertion:** The first layer is mobile in Helmholtz electrical double layer.

Reason: The potential difference between the fixed layer and the diffused layer of opposite charges is called zeta potential.

iii. **Assertion:** The sol particle in colloid has a charge.

Reason: The charge in sol is due to electron capture by sol particles during the electrodispersion of metals.

iv. **Assertion:** Methylene blue sol is a negatively charged sol.

Reason: When KI solution is added to AgNO_3 solution, positively charged sol formed.

v. **Assertion:** If FeCl_3 is added to an excess of hot water, a positively charged sol of hydrated ferric oxide is formed.

Reason: When ferric chloride is added to NaOH a negatively charged sol is obtained with adsorption of OH^- ions.

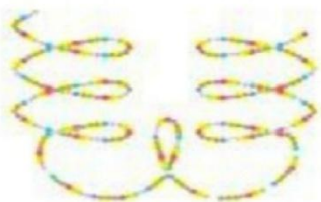
3. Methylamine reacts with HNO_2 to form _____.

- a. $\text{CH}_3\text{-O-N=O}$

- b. CH_3CHO
 - c. $\text{CH}_3\text{-O-CH}_3$
 - d. CH_3OH
4. Insulin is a protein which contains _____ amino acids
- a. 70
 - b. 51
 - c. >100
 - d. 120

OR

The following structure of protein is called



- a. quaternary structure
 - b. Secondary structure
 - c. Tertiary structure
 - d. primary structure
5. The osmotic pressure of a solution containing 0.02 mole of solute at 300 K will be:
- a. $0.02 \times 0.0821 \times 300 \text{ atm}$
 - b. $\frac{0.02 \times 300}{0.0821} \text{ atm}$
 - c. $0.02 \times 0.821 \times 300 \text{ atm}$
 - d. $\frac{0.02 \times 0.0821}{300} \text{ atm}$
6. A mixture containing two enantiomers in equal proportions:
- a. will be called a racemic mixture
 - b. will be called a racemic mixture and will have a zero optical rotation.
 - c. will have inverted configuration
 - d. will have zero optical rotation

OR

Ethyl benzene cannot be prepared by _____.

- a. Clemmensen reduction

- b. Wurtz – Fittig reaction
 - c. Friedel – Crafts reaction
 - d. Wurtz reaction
7. Hoffmann Bromamide Degradation reaction is shown by _____.
- a. ArNH_2
 - b. ArCONH_2
 - c. ArNO_2
 - d. ArCH_2NH_2

OR

Which of the following respond to the isocyanide test?

- a. Primary amines
 - b. Tertiary amines
 - c. Primary and secondary amines
 - d. Secondary amines
8. Which complex gives three chloride ions per formula unit?
- a. $\text{CrCl}_3 \cdot 5\text{H}_2\text{O}$
 - b. $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$
 - c. $\text{CrCl}_3 \cdot 4\text{H}_2\text{O}$
 - d. All of these

OR

Which of the following complexes can form d and l isomers?

- a. Trans - $[\text{Co}(\text{en})_2\text{Cl}_2]^+$
 - b. $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
 - c. Cis - $[\text{Co}(\text{en})_2\text{Cl}_2]^+$
 - d. $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$
9. In which of the following compounds, the central metal atom/ion is in the lowest oxidation state?
- a. $[\text{Co}(\text{NH}_3)_5\text{Br}]_2\text{SO}_4$

- b. $\text{Mn}_2(\text{CO})_{10}$
 - c. $\text{Fe}_3[\text{Fe}(\text{CN})_6]_2$
 - d. $\text{K}[\text{PtCl}_3(\text{C}_2\text{H}_4)]$
10. Which of the following is an example of vic-dihalide?
- a. 1, 2-dichloroethane
 - b. Dichloromethane
 - c. Ethylidene chloride
 - d. Allyl chloride
11. What type of interaction hold the molecules together in a polar molecular solid?
- a. London forces
 - b. Hydrogen bonding
 - c. Dipole - dipole interaction
 - d. Metallic bonding

12. **Assertion:** $[\text{Ni}(\text{CO})_4]$ is diamagnetic complex.

Reason: It involves sp^3 hybridisation and there is no unpaired electron.

- a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
 - b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
 - c. Assertion is CORRECT but, reason is INCORRECT.
 - d. Assertion is INCORRECT but, reason is CORRECT.
13. **Assertion:** Insulin is a globular protein.

Reason: Gum is a polymer of more than one type of monosaccharides.

- a. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
- b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
- c. Assertion is CORRECT but, reason is INCORRECT.
- d. Assertion is INCORRECT but, reason is CORRECT.

14. **Assertion:** Molarity of a solution in liquid state changes with temperature.

Reason: The volume of a solution changes with a change in temperature.

- a. Assertion and reason both are correct statements and reason is the correct

- explanation for the assertion.
- Assertion and reason both are correct statements but the reason is not the correct explanation for the assertion.
 - Assertion is correct statement but reason is wrong statement.
 - Assertion and reason both are incorrect statements.

OR

Assertion: ΔH_{mix} and ΔV_{mix} are zero for the ideal solution.

Reason: The interactions between the particles of the components of a solution are almost identical as between particles in the liquids.

- Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
 - Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
 - Assertion is CORRECT but, reason is INCORRECT.
 - Assertion is INCORRECT but, reason is CORRECT.
15. **Assertion:** Boiling points of alcohols and ethers are high.
Reason: They can form intermolecular hydrogen-bonding.
- Assertion and reason both are correct and the reason is the correct explanation of assertion.
 - Assertion and reason both are wrong statements.
 - The assertion is a correct statement but the reason is the wrong statement.
 - The assertion is a wrong statement but the reason is the correct statement.
16. **Assertion:** 1-Iodopropane and 2-iodopropane are chain isomers.
Reason: These differ in the position of I in the carbon chains.
- Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
 - Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
 - Assertion is CORRECT but, reason is INCORRECT.
 - Assertion is INCORRECT but, reason is CORRECT.

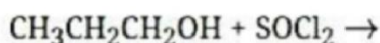
Section B

17. Suggest a possible reason for the following observations:

- i. The order of reactivity of haloalkanes is $\text{RI} > \text{RBr} > \text{RCl}$.
- ii. neo-pentyl chloride, $(\text{CH}_3)_3\text{C}-\text{CH}_2\text{Cl}$ does not follow $\text{S}_{\text{N}}2$ mechanism.

OR

Write the structure of the major organic product in the following reaction:



- 18. A 5% solution (by mass) of cane sugar ($M \cdot W 342$) is isotonic with 0.877% solution of substance X. Find the molecular weight of X.
- 19. Give IUPAC name of linkage isomer of $[(\text{NH}_3)_3\text{Pt}(\text{NO}_2)]\text{Cl}$.

OR

What is crystal field splitting energy?

- 20. Calculate the half life of first order reaction whose rate constant is 200s^{-1} .
- 21. At 298K, the rate of the chemical reaction doubles on increase of temperature by 10 K. Calculate E_a of this reaction.
- 22. Arrange the following compounds in increasing order of their acid strength.
Propane - 1-ol, 2, 4, 6 - trinitrophenol, 3-nitrophenol, 3, 5-dinitrophenol, 4-methyl, phenol.
- 23. Although Cr^{3+} and Co^{2+} ions have same number of unpaired electrons but the magnetic moment of Cr^{3+} is 3.87 B.M. and that of Co^{2+} is 4.87 B.M. Why?
- 24. Complete the following reaction equation:
 - i. $\text{C}_6\text{H}_5\text{N}_2^+\text{Cl}^- + \text{KI} \rightarrow \dots\dots\dots$
 - ii. $\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} & \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array} + \text{Br}_2 \xrightarrow{\text{CCl}_4} \dots\dots\dots$
- 25. What is the two dimensional coordination number of a molecule in square close-packed layer?

Section C

- 26. Draw the structure of H_3PO_2 .

OR

Draw the structural formulae of the following:

1. BF_3
2. Peroxodisulphate ion (S_2O_9^-)
3. XeF_4

27. Give one chemical test to distinguish between primary, secondary and tertiary amines.

OR

Write structures of different isomers corresponding to the molecular formula $\text{C}_3\text{H}_9\text{N}$.

Write IUPAC names of the isomers which will liberate nitrogen gas on treatment with nitrous acid.

28. Silver crystallizes in fcc lattice. If edge length of the cell is $4.077 \times 10^{-8} \text{cm}$ and density is 10.5 g cm^{-3} . Calculate the atomic mass of silver.
29. Define having an aldehyde group:
- i. Glucose does not give 2, 4-DNP test. What does this indicate?
 - ii. Draw the Haworth structure of α -D-(+)-Glucopyranose.
 - iii. What is the significance of D and (+) here?
30. How the following conversions can be carried out?
- i. 2-Bromopropane to 1-bromopropane
 - ii. Chloroethane to butane
 - iii. Benzene to diphenyl

Section D

31. i. Give reasons for the following observations.
- a. Cu^+ ion is not stable in aqueous solution.
 - b. Mn(II) ion shows maximum paramagnetic character amongst the bivalent ions of first transition series.
 - c. Scandium ($Z = 21$) salts are white.
- ii. Describe the reactions involved in the preparation of $\text{K}_2\text{Cr}_2\text{O}_7$ from chromite ore.

OR

On the basis of Lanthanoid contraction, explain the following:

- i. Nature of bonding in La_2O_3 and Lu_2O_3 .
- ii. Trends in the stability of oxo salts of lanthanoids from La to Lu.
- iii. Stability of the complexes of lanthanoids.

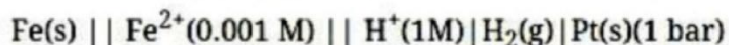
- iv. Radii of 4d and 5d block elements.
 - v. Trends in the acidic character of lanthanoid oxides.
32. Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions.
- i. Ethanal, Propanal, Propanone, Butanone.
 - ii. Benzaldehyde, p-Tolualdehyde, p-Nitrobenzaldehyde, Acetophenone.
- Hint: Consider steric effect and electronic effect.

OR

- i. Write the products formed when CH_3CHO reacts with the following reagents:
 - a. HCN
 - b. $\text{H}_2\text{N-OH}$
 - c. CH_3CHO in the presence of dilute NaOH
 - ii. Give simple chemical tests to distinguish between the following pairs of compounds:
 - a. Benzoic acid and phenol
 - b. Propanal and propanone
33. Define conductivity and molar conductivity for the solution of an electrolyte. Discuss their variation with concentration.

OR

- a. Explain with one example each the terms weak and strong electrolytes.
- b. Write the Nernst equation and calculate the emf of the following cell.



$$E^0(\text{Fe}^{2+}/\text{Fe}) = -0.44\text{V}$$