Directorate of Education, GNCT of Delhi

Mid Term Examination Practice Paper

Session: 2025-26

CLASS – XI

CHEMISTRY (CODE :043)

Time: 3 Hours **Maximum Marks: 70**

General Instructions:

Read the following instructions carefully.

(a) There are 33 questions in this question paper with internal choice.

(b) **SECTION A** consists of 16 multiple-choice questions carrying 1 mark each.

(c) **SECTION B** consists of 5 short answer questions carrying 2 marks each.

(d) **SECTION C** consists of 7 short answer questions carrying 3 marks each.

(e) **SECTION D** consists of 2 case - based questions carrying 4 marks each.

(f) **SECTION E** consists of 3 long answer questions carrying 5 marks each.

(g) All questions are compulsory.

(h) Use of log tables and calculators is not allowed.

SECTION-A

Directions (Q. No. 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. What will be molarity of a solution containing 4g of sodium hydroxide dissolved in 500 mL of water?
   [Given: Atomic mass of Na = 23u, O = 16u, H = 1u]

a) 0.08 M
b) 0.1 M
c) 0.2 M
d) 8.0 M

2. The number of significant figures in value of Avogadro number (6.022×10^{23}) is/are:
   a) 1
   b) 3
   c) 4
   d) 23

3. The number of angular nodes and radial nodes in *4d* orbital respectively are:
   a) 0, 3
   b) 2, 0
   c) 3, 2
   d) 2, 1

4. Consider the following molecules:
   (I) CO_2 (II) H_2O (III) BF_3 (IV) NH_3
   Out of these, molecule(s) polar molecule(s) is/are-
   a) I, II, III, IV
   b) I, II
   c) II, IV
   d) IV only

5. Which of the following molecule is paramagnetic having bond order two?
   a) C_2
   b) N_2
   c) O_2
   d) F_2

6. Given reaction may be classified as:
   $H_2O(l) + Cl_2(g) \rightarrow HCl(aq) + HClO(aq)$

a) combination reaction
b) precipitation reaction
c) displacement reaction
d) disproportionation reaction

7. Which of the following element forms acidic oxide?
   a) Li
   b) C
   c) Al
   d) Ca

8. If following are moving with the same velocity, highest wavelength will be associated with:
   a) Electron
   b) Proton
   c) α-particle
   d) Cricket ball

9. Which of the following molecule is polar having sp^3 hybridization?
   a) Water
   b) Carbon dioxide
   c) Methane
   d) Sulphur difluoride

10. Which of the following molecule is polar?
    a) $BeCl_2$
    b) BF_3
    c) NF_3
    d) CH_4

11. Oxidation state of **Cr** in $Cr_2O_7^{2-}$ is:
    a) 2
    b) 5
    c) 6

d) 7

12. The sum of radial nodes and angular nodes associated with 4d orbitals is:

a) 1

b) 2

c) 3

d) 4

For Question no. 13 to 16, a statement of Assertion followed by Reason are given. Choose the options out of following choices:

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

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

(c) Assertion is true but Reason is false.

(d) Assertion is false but Reason is true.

13. **Assertion:** NH_3 has higher dipole moment than NF_3.

Reason: Both NH_3 and NF_3 are trigonal pyramidal.

14. **Assertion:** Electrons in an atom occupy the lowest available energy levels first.

Reason: Electrons follow the Aufbau principle while filling atomic orbitals.

15. **Assertion:** Halogens exhibits negative E° values.

Reason: Halogens have high electronegativity.

16. **Assertion:** Chlorine has higher ionization enthalpy than fluorine.

Reason: Chlorine has larger size than fluorine.

SECTION-B

Directions (Q. Nos. 17-21) : This section contains 7 questions with internal choice in two questions. The following questions are very short answer type and carry 2 marks each.

17. a) State law of multiple proportions.

b) How 0.5 mol Na_2CO_3 and 0.5 M Na_2CO_3 are different?

18. a) What do you understand by isoelectronic species?

    b) Write a cation and anion which is isoelectronic with Ar?

19. Identify the oxidising agent and reducing agent in following redox reaction:

    $2\ MnO_4^-\ (aq) + 5\ C_2O_4^{2-}\ (aq) + 16\ H^+\ (aq) \rightarrow 2\ Mn^{2+}\ (aq) + 10\ CO_2\ (g) + 8\ H_2O\ (l)$

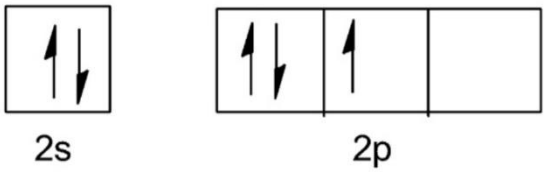
    OR

    Explain the difference between oxidation state and valency giving appropriate example.

20. a) Mention two examples of electron deficient molecules.

    b) How many lone pair(s) are present on chlorine atom in ClF_3 molecule.

21. Valence electrons in nitrogen atom are represented as following:



    Name and state the law/rule which is being violated by filling of electrons as shown above.

SECTION-C

Directions (Q. Nos. 22-28) : This section contains 5 questions with internal choice in two questions. The following questions are short answer type and carry 3 marks each.

22. A golf ball has a mass of 40g, and a speed of 45 m/s. If the speed can be measured within accuracy of 2 %, calculate the uncertainty in the position.

    (Given: $h = 6.6 \times 10^{-34}$ J s)

23. a) To which group and period element with Z = 26 belongs?

    b) Why beryllium shows anomalous behaviour from rest of the members of the group?

24. Calculate the energy associated with the first orbit of He^+ . What is the radius of this orbit?

25. Following are the period-2 element are:

    Li, Be, B, C, N, O, F

Out of these elements, which has:

a) lowest ionization enthalpy

b) largest atomic radius

c) highest electronegativity

26. A compound contains 4.07 % hydrogen, 24.27 % carbon and 71.65 % chlorine. Its molar mass is 98.96 g. What are its empirical and molecular formulas ?

OR

Calcium carbonate reacts with aqueous HCl to give $CaCl_2$ and CO_2 according to the reaction,

$CaCO_3$ (s) + 2 HCl (aq) → $CaCl_2$ (aq) + CO_2(g) + $H_2O(l)$

What mass of $CaCO_3$ is required to react completely with 25 mL of 0.75 M HCl?

(Given molar masses: Ca = 40 g mol^{-1}, C = 12 g mol^{-1}, O = 16 g mol^{-1}, Cl = 35.5 g mol^{-1})

27. Balance the following redox reaction in acidic medium:

$Cr_2O_7^{2-}(aq)$ + $Fe^{2+}(aq)$ → $Cr^{3+}(aq)$ + $Fe^{3+}(aq)$

Mention the steps involved in balancing the reaction.

28. Define hydrogen bonding. Explain intermolecular and intramolecular hydrogen bonding with appropriate examples.

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.

29. To find the concentration of a given ammonium hydroxide (NH_4OH) solution, it was titrated using 0.1 M hydrochloric acid (HCl). A fixed volume of 10 mL of HCl was taken, and methyl orange was used as the indicator. Two students, Anika and Rahul, performed the titration, and their burette readings are shown below:

Set	Burette Readings / mL	
	Anika	Rahul
I	10.3	10.4

II	10.2	10.0
III	10.3	10.2
IV	10.3	10.1

After the experiment, the teacher informed the class that the correct volume of NH_4OH required to neutralize 10 mL of 0.1 M HCl was 10.0 mL. Using this value, students were asked to calculate the molarity of the ammonium hydroxide solution.

a) Who has more precision in measurements- Anika or Rahul?

b) Define molarity.

c) Calculate the molarity of ammonium hydroxide solution using above information.

OR

The density of 3 M solution of NaCl is 1.25 g mL^{-1}. Calculate molality of the solution.

30. VSEPR (Valence Shell Electron Pair Repulsion) theory is a model used in chemistry to predict the three-dimensional shapes of molecules. It is based on the principle that electron pairs around a central atom (whether bonding or nonbonding) repel each other and therefore arrange themselves as far apart as possible to minimize repulsion. By counting the regions of electron density around a central atom, one can determine the molecule's electron geometry (such as linear, trigonal planar, or tetrahedral) and then refine this to its molecular geometry, which accounts for lone pairs. This theory is essential because molecular shape influences physical and chemical properties, including polarity, reactivity, and intermolecular interactions.

a) Predict the shape and bond angle of BF_3.

b) Why does NH_3 have a trigonal pyramidal shape instead of tetrahedral?

c) Both CO_2 and H_2O are triatomic but CO_2 is linear but H_2O is bent. Explain with their structures.

OR

Explain shape of XeF_4 molecule on the basis of VSEPR theory.

SECTION-E

Directions (Q. No. 31-33) : The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31.a) Account for the following:

i) Radius of anions are larger than their parent atoms.

ii) Noble gases have positive electron gain enthalpy.

iii) Zinc (Z = 30) is not regarded as a transition element.

b) Write IUPAC name and symbol of element having Z = 108.

c) Write general electronic configuration of d-block elements.

OR

a) Define electron gain enthalpy. Arrange halogens (F, Cl, Br, I) in increasing order of electron gain enthalpy.

b) Explain following:

i) Ionic radius of K^+ is 138 pm while atomic radius of potassium is 227 pm.

ii) Chlorine (Z = 17) has more negative first electron gain enthalpy enthalpy than fluorine (Z = 9).

iii) Noble gases have highest ionization enthalpies in respective periods.

32. a) Write molecular orbital electronic configurations of N_2 molecule. Calculate its bond order and comment on its magnetic behaviour.

b) Explain hybridisation of phosphorus in PCl_5 molecule. Why axial bonds are longer than equatorial bonds.

OR

a) Explain following:

i) NH_3 has higher boiling point than PH_3.

ii) He_2 molecule does not exist.

iii) BF_3 molecule is non-polar.

b) Differentiate sigma(σ) bonds from pi(π) bonds.

33. a) Draw the shape of that d_{xy} orbital.

b) How many subshells are associated with n = 3?

c) Write the electronic configuration of Cr (Z=24). Why is it different from the expected configuration?

d) What will be the wavelength of a ball of mass 100 g moving with a velocity of 10 m s^{-1} ?

OR

a) State Pauli's exclusion principle.

b) Write one difference between principal quantum number and azimuthal quantum number.

c) A golf ball has a mass of 40g, and a speed of 45 m/s. If the speed can be measured within accuracy of 2%, calculate the uncertainty in the position.