

Chemical Bonding and Molecular Structure — CBSE Pattern Test 1

Class 11 Chemistry · 90 minutes · 40 marks · Sections A–D with answer key · Narayan Gurukul Academy

Test 1 — CBSE Pattern (90 minutes, 40 marks)

Class 11 Chemistry · Chemical Bonding and Molecular Structure · Narayan Gurukul Academy (ClassApna)

General Instructions: (1) This paper has four sections — Section A (1×10), Section B (2×4), Section C (3×4) and Section D (5×2) — total 40 marks. Time allowed: 90 minutes.

(2) All questions are compulsory. No overall choice is given; internal choice, where allowed, is clearly marked.

(3) For MCQ questions choose the single correct option; for VSA answers write a single line.

(4) Take $g = 10 \text{ m/s}^2$. All symbols carry their usual meaning. Use of a calculator is not permitted.

Section A — MCQ & VSA ($10 \times 1 = 10$ marks)

1. According to the octet rule, an atom tends to have

- (A) eight electrons in its outermost shell
- (B) two electrons in its outermost shell
- (C) no electrons
- (D) eighteen electrons

2. An ionic bond is formed by

- (A) the transfer of electrons
- (B) the sharing of electrons
- (C) overlap of orbitals
- (D) resonance

3. A covalent bond is formed by

- (A) the sharing of a pair of electrons
- (B) the transfer of electrons
- (C) the attraction of opposite charges
- (D) metallic bonding

4. VSEPR theory is used to predict

- (A) the shape of a molecule
- (B) the bond order
- (C) the lattice energy
- (D) the magnetic moment

5. The shape of the methane (CH_4) molecule is

- (A) tetrahedral
- (B) square planar
- (C) trigonal planar
- (D) linear

6. The hybridisation in the methane (CH_4) molecule is

- (A) sp^3
- (B) sp^2
- (C) sp
- (D) sp^3d

7. The hybridisation of carbon in ethyne (C_2H_2) is

- (A) sp

- (B) sp^2
- (C) sp^3
- (D) sp^3d

8. Bond order is defined as

- (A) half the difference between the number of bonding and antibonding electrons
- (B) the number of bonds
- (C) the bond length
- (D) the bond enthalpy

9. State the octet rule.

10. Define bond order.

Section B — Short Answer I ($4 \times 2 = 8$ marks)

11. Draw the Lewis structure of the water molecule showing lone pairs.
12. Why do ionic compounds conduct electricity in the molten state but not in the solid state?
13. Predict the shape of the BF_3 molecule and state its hybridisation.
14. How are bond order and bond length related?

Section C — Short Answer II ($4 \times 3 = 12$ marks)

15. Explain the formation of an ionic bond between sodium and chlorine giving the Lewis structures.
16. State VSEPR theory and use it to predict and explain the shapes of CH_4 , NH_3 and H_2O .
17. Explain the concept of hybridisation and describe sp , sp^2 and sp^3 hybridisation with examples.
18. Explain the concepts of bond length, bond enthalpy, bond order and resonance and show how they are related.

Section D — Long Answers ($2 \times 5 = 10$ marks)

19. Define hybridisation. Explain sp^3 , sp^2 and sp hybridisation with suitable examples, and state the shape and bond angle associated with each.
20. Explain VSEPR theory and the order of repulsion between electron pairs. Use it to predict and explain the shapes of BF_3 , CH_4 , NH_3 and H_2O .

Answer Key (Marking Scheme)

- Q1 — (A) eight electrons in its outermost shell. Q2 — (A) the transfer of electrons. Q3 — (A) the sharing of a pair of electrons. Q4 — (A) the shape of a molecule.
- Q5 — (A) tetrahedral. Q6 — (A) sp^3 . Q7 — (A) sp . Q8 — (A) half the difference between the number of bonding and antibonding electrons.
- Q9 — Atoms tend to attain eight electrons in the valence shell.
- Q10 — Half the difference between bonding and antibonding electrons.
- Q11 — O with two O–H bonds and two lone pairs.
- Q12 — Ions are free to move only when molten or in solution.
- Q13 — Trigonal planar, sp^2 .
- Q14 — Higher bond order gives shorter bond length.
- Q15 — $Na \rightarrow Na^+ + e^-$, $Cl + e^- \rightarrow Cl^-$; electrostatic attraction forms NaCl.

Q16 — Shapes tetrahedral, trigonal pyramidal and bent; repulsion order $\text{lp-lp} > \text{lp-bp} > \text{bp-bp}$.

Q17 — sp (C_2H_2), sp^2 (BF_3), sp^3 (CH_4).

Q18 — Relationships as in notes; CO_3^{2-} resonance.

Q19 — sp^3 tetrahedral 109.5° , sp^2 trigonal planar 120° , sp linear 180° .

Q20 — BF_3 trigonal planar, CH_4 tetrahedral, NH_3 trigonal pyramidal, H_2O bent.