

Chemical Bonding and Molecular Structure — CBSE Pattern Test 2

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

Test 2 — 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)

- A Lewis structure represents
 - the valence electrons of atoms in a molecule
 - only the nucleus
 - the neutrons
 - the mass number
- The compound formed between a metal and a non-metal is usually
 - ionic
 - covalent
 - metallic
 - coordinate
- A bond formed between two identical atoms is
 - non-polar covalent
 - polar covalent
 - ionic
 - coordinate
- Which molecule is non-polar despite having polar bonds?
 - CO_2
 - H_2O
 - NH_3
 - HCl
- The shape of the ammonia (NH_3) molecule is
 - trigonal pyramidal
 - trigonal planar
 - tetrahedral
 - linear
- The shape of the water (H_2O) molecule is
 - bent (V-shaped)
 - linear
 - tetrahedral
 - trigonal planar
- The number of sp^2 hybrid orbitals is
 - 3

(B) 2

(C) 4

(D) 5

8. As bond order increases, bond length

(A) decreases

(B) increases

(C) stays the same

(D) becomes zero

9. Define a coordinate bond.

10. State one property of ionic compounds.

Section B — Short Answer I ($4 \times 2 = 8$ marks)11. Predict the shape of the NH_3 molecule and explain it using VSEPR theory.

12. Distinguish between a polar and a non-polar covalent bond with examples.

13. State the hybridisation of the central atom in BF_3 and PCl_5 .

14. How is bond enthalpy related to bond order?

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

15. Explain the formation of a coordinate bond in the ammonium ion and the formation of a covalent bond in water.

16. Explain VSEPR theory and use it to account for the shapes of NH_3 and H_2O on the basis of electron-pair repulsion.17. Explain sp^2 hybridisation using the BF_3 molecule and sp^3 hybridisation using the methane molecule.

18. Define bond order and explain resonance with the example of the carbonate ion.

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

19. Explain the formation of covalent and coordinate bonds with Lewis structures. Discuss bond polarity and use the electronegativity difference to classify bonds as polar or non-polar.

20. Calculate the bond order of O_2 , O_2^- and O_2^{2-} and arrange them in order of increasing bond length. Explain how bond order relates to bond length and bond enthalpy.**Answer Key (Marking Scheme)**Q1 — (A) the valence electrons of atoms in a molecule. Q2 — (A) ionic. Q3 — (A) non-polar covalent. Q4 — (A) CO_2 .

Q5 — (A) trigonal pyramidal. Q6 — (A) bent (V-shaped). Q7 — (A) 3. Q8 — (A) decreases.

Q9 — A bond in which both electrons of the shared pair come from one atom.

Q10 — They have high melting and boiling points.

Q11 — Trigonal pyramidal due to one lone pair on nitrogen.

Q12 — Polar (HCl) vs non-polar (Cl_2) based on electronegativity difference.Q13 — sp^2 (BF_3) and sp^3 d (PCl_5).

Q14 — Higher bond order corresponds to greater bond enthalpy.

Q15 — NH_4^+ coordinate bond; water has two O–H covalent bonds.Q16 — $\text{lp-lp} > \text{lp-bp} > \text{bp-bp}$ repulsion gives the shapes.Q17 — sp^2 trigonal planar (BF_3); sp^3 tetrahedral (CH_4).

Q18 — Bond order definition and CO_3^{2-} resonance.

Q19 — Lewis structures and polarity as in notes.

Q20 — $\text{O}_2 = 2$, $\text{O}_2^- = 1.5$, $\text{O}_2^{2-} = 1$; bond length $\text{O}_2^{2-} > \text{O}_2^- > \text{O}_2$.