

Chemistry
Standard level
Paper 2

Practice paper

Topic: Chemical Bonding & Structure (Topic 4)

1. The shapes of molecules can be predicted using VSEPR theory.

(a) Draw the Lewis structures for BF_3 and NH_3 .

[2]

(b) State the electron domain geometry and molecular geometry for both species.

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(c) Explain why the bond angle in NH_3 is less than 109.5 degrees.

[2]

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2. Bond polarity and molecular polarity are related but distinct concepts.

(a) Compare the C-Cl bonds in CH_3Cl and CCl_4 in terms of electronegativity and polarity.

[1]

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(b) Deduce, with reasons, which of these two molecules is polar overall.

[2]

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3. The strength of metallic bonding determines many physical properties of metals.

(a) Describe the structure of a metal and outline the factors that affect the strength of a metallic bond.

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(b) Explain why metals are malleable while ionic crystals are brittle.

[3]

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4. Magnesium oxide (MgO) and Sodium chloride (NaCl) both form giant ionic lattices.

(a) State the electronic configurations of the Mg^{2+} and O^{2-} ions.

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(b) Using ionic radius and charge, explain why MgO has a much higher melting point than NaCl.

[3]

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5. Graphite and diamond are two common allotropes of carbon.

(a) Contrast the bonding and structure of graphite and diamond.

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(b) Identify which allotrope can conduct electricity and explain why.

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6. Triple bonds are generally shorter and stronger than single bonds.

(a) Compare the length and strength of the N-N bond in N₂ and N₂H₄.

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(b) Explain this difference in terms of orbital overlap and shared electrons. **[2]**

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7. Consider the substances: He, Ne, and Ar.

(a) Identify the type of intermolecular force present in these substances. **[1]**

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(b) Arrange them in order of increasing boiling point and justify your sequence. **[2]**

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