

1. For each of the following elements, state two common oxidation states, and suggest with reference to electron configurations how each state can occur.
- (a) phosphorus /2
 (b) sulfur /2
 (c) chlorine /2
 (d) iron /2
2. Explain whether each of the following statements is true or false.
- (a) "Molecules of CaS are found in the crystal of calcium sulfide." /2
 (b) "Molten ionic compounds conduct electricity because the ions are mobile and free to move." /2
 (c) "Since P_4O_{10} is soluble in water, it must be an ionic compound." /2

3. The table below shows the melting points of five substances.

	M. pt
MgO	3073
NaCl	1074
Mg	923
CO ₂	216
SiO ₂	1973

- (a) Describe what is meant by the term "electronegativity". /2
 (b) Explain the high melting point of MgO in terms of bonding present, and relate this to the electronegativities of magnesium and oxygen. /3
 (c) Explain why the melting temperature of MgO is much higher than that of NaCl, even though the electronegativity difference is greater between Na and Cl than between Mg and O. /2
 (d) Explain why the electrical conductivity of Mg is good in both solid and molten states, whereas MgO conducts only in the molten state. /2
 (e) Explain why SiO₂ has a much higher melting point than CO₂, even though both C and Si are in group IV. /2
- 4.
- (a) State the meaning of "polar bond". /1
 (b) Explain how CF₄, a molecule with polar bonds, is a non-polar molecule. /2
 (c) Explain why the boiling temperature of CH₄, C₂H₆, C₃H₈ ... increases with increase in molar mass. /2
5. Draw the following species, and name the shape for each.
- (a) NH₄⁺ /2
 (b) H₃O⁺ /2
 (c) SO₃ /2
6. A, B and C represent elements with atomic numbers 9, 19 and 38 respectively.
- (a) State the electron configuration for each. /3
 (b) State the kind of bonding you would expect between:
- (i) A and B /1
 (ii) A and C /1
 (iii) B and C /1
- 7.
- (a) Describe what is meant by the term "hydrogen bonding". /2
 (b) Explain, with reference to electronegativity, which of H₂S or H₂O would exhibit stronger intermolecular forces. /3

TOTAL /47