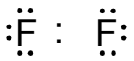
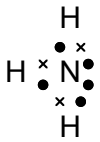
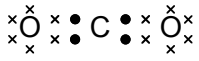
Assessment Schedule – 2005

Chemistry: Describe atomic structure and bonding (90172)

Evidence Statement

Q	Evidence	Evidence contributing to Achievement	Evidence contributing to Achievement with Merit	Evidence contributing to Achievement with Excellence
1(a)	^{37}Cl 17p, 20n, 17e ^{35}Cl 17p, 18n, 17e $^{35}Cl^-$ 17p, 18n, 18e	Any **TWO** rows correct.		
1(b)	^{37}Cl has **two more neutrons** in its nucleus compared to ^{35}Cl.	Correct.		
2(a)	(i) Be 2,2 (ii) Ar 2,8,8 (iii) Mg^{2+} 2,8 (iv) F^- 2,8	**THREE** correct.		
2(b)	The neon atom has an electron arrangement of 2,8. The sodium atom has an electron arrangement of 2,8,1. When it becomes an ion it loses its valence electron to become Na^+ 2,8. A complete outer shell is stable and unreactive. The neon atom already has a complete outer shell, so it is unreactive. The sodium atom has only one electron in its outer shell, it loses this easily to form a complete outer shell, Na^+ 2,8. It is very reactive.	Describes the **electron arrangement** for each atom: Ne – complete/full shell Na – 1 valence electron	Gives reasons, based upon their electron arrangements, for the chemical reactivity of **either** Neon **or** Sodium	**Links** the electron arrangements of **BOTH** the neon atom and sodium atom to their chemical reactivity.
3(a) 3(b) 3(c) 3(d)	P  F_2  NH_3  CO_2  Bonds can be expressed as lines or pairs of electrons.	**TWO** of (a), (b), (c) or (d) correct.	**TWO** of (a), (b) or (c) correct **PLUS** (d).	
4(a)(i)	**Substance** / **Bonding** magnesium oxide, MgO / ionic carbon dioxide, CO_2 / covalent	**BOTH bonding** types correctly identified.		

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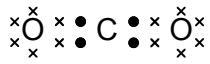
4(a)(ii)	An ionic bond forms between a metal and a non-metal. Electrons are transferred from one atom to another to form ions. Eg Mg atom loses 2 electrons to form Mg^{2+}. O atom gains 2 electrons to form O^{2-}. A covalent bond forms between non-metal atoms. Electrons are shared between the atoms. Eg carbon shared 2 electrons with each oxygen atom. 	Describes ionic bonding in terms of **electron transfer** or the **attraction of oppositely charged ions/particles** **AND** Covalent bonding is the **sharing** of electrons between atoms.	Link the bonding/atomic structure (**molecules or ions**) of the atoms for the **TWO** substances.	
4(b)	CO_2 A substance will sublime when weak forces occur between its molecules. Magnesium oxide is an ionic substance and will form a strong lattice of ionic bonds. There are no weak attractive forces in this structure. This substance will not sublime. Carbon dioxide forms molecules that contain covalent bonds. Between the molecules, only weak attractive forces hold them together. This substance will sublime.	Correct answer is circled **with** a supporting comment on CO_2 subliming / MgO not subliming.	Justify choice by **EITHER** explaining the **bonding** and **attractive forces** of magnesium oxide **or** carbon dioxide. **OR** comparing the **attractive forces** of **both** magnesium oxide and carbon dioxide.	Justify choice by explaining **bonding** and **attractive forces** of **BOTH** magnesium oxide and carbon dioxide.
5	Chlorine is a gas at room temperature because it is made up of molecules that contain two covalently bonded atoms. These molecules only have weak attractive forces between them. These weak forces can be broken with relatively little energy. At room temperature the molecules will have sufficient energy to have broken the force of attraction holding them together and will exist as a gas. Sodium chloride is an ionic compound, so it is made up of positively charged sodium ions and negatively charged chloride ions. The attractive forces between these particles are very strong, and require larger amounts of energy to break. At room temperature the particles will not have sufficient energy to have broken the bonds holding them together and so will exist as a solid.	Correctly identifies that chlorine is made up of covalent **molecules.** **AND** Sodium chloride is made up of **ions**.	Links Cl_2 molecules to the **weak attractive forces** between molecules so that Cl_2 is a gas. **OR** Links Na^+ and Cl^- ions to **strong ionic bonding**, so that NaCl is a solid.	Links Cl_2 molecules to the **weak attractive forces** between the molecules, and the small amount of **energy/heat** required to separate them means Cl_2 is a gas at room temperature. **AND** Links Na^+ and Cl^- ions to **strong ionic bonding**, and the larger amount of **energy/heat** required to separate the ions means NaCl is a solid at room temperature.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
FIVE opportunities answered at Achievement level or higher. 5 × A	SIX opportunities answered with THREE at Merit level or higher. 3 × M *plus* 3 × A	SEVEN opportunities answered with TWO at Excellence level and TWO at Merit level or higher. 2 × E *plus* 2 × M *plus* 3 × A