# Marking scheme for Core Worksheet – Chapter 3

**1** **a** ionic [1]

**b** covalent [1]

**c** ionic [1]

**d** ionic [1]

**e** covalent [1]

**2** **a** $Ca^{2+}$ [1]

**b** $F^{-}$ [1]

**c** $P^{3-}$ [1]

**d** $Br^{-}$ [1]

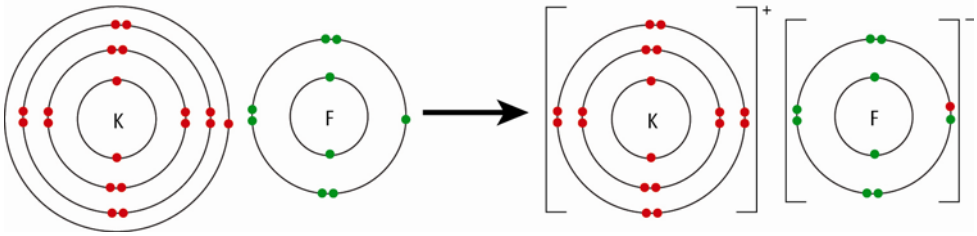
**e** $S^{2-}$ [1]

**f** $Sr^{2+}$ [1]

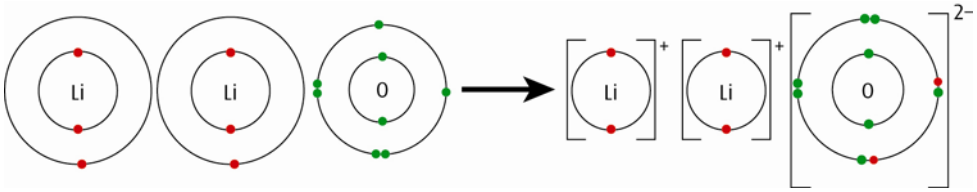
**g** $Rb^{+}$ [1]

**h** $Al^{3+}$ [1]

**3** **a** [2]




**b** [2]




**4** **a** NaBr [1]

**b** $CaI_2$ [1]

**c** $Rb_3PO_4$ [1]

**d** $(NH_4)_2SO_4$ [1]

**e** $AgNO_3$ [1]

**f** $K_2CO_3$ [1]

**5** **a** Strong electrostatic forces between oppositely charged ions must be broken (in the giant lattice structure). [1]

**b** Magnesium oxide and calcium oxide contain 2+ and 2– ions and therefore have stronger forces of attraction between the ions, which are stronger than the attraction between 1+ and 1– ions. [1]

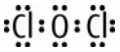
The $Mg^{2+}$ ion is smaller than the $Ca^{2+}$ ion, therefore there is a stronger attraction for the $O^{2-}$ ions and a higher melting point. [1]

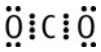
Sodium chloride has a higher melting point than caesium chloride as the $Na^{+}$ ion is smaller than the $Cs^{+}$ ion. [1]

**6** The electrostatic attraction between the nuclei of the atoms making up a bond and the shared pair of electrons. [1]

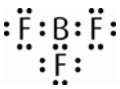
**7** **a**  [1]

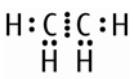
**b**  [1]

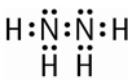
**c**  [1]

**d**  [1]

**e**  [1]

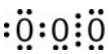
**f**  [1]

**g**  [1]

**h**  [1]

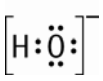
**i**  [1]

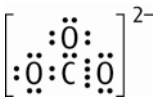
**j**  [1]

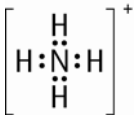
**k**  [1]

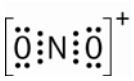
penalise missing lone pairs on outer atoms once only

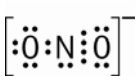
 

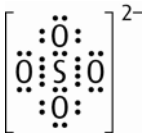
**8** **a**  [1]

**b**  [1]

**c**  [1]

**d**  [1]

**e**  [1]

**f**  [1]

penalise missing lone pairs on outer atoms once only
penalise missing charges once only

**9** **a** bent; 104.5° [2]

**b** trigonal pyramidal; 107° [2]

**c** bent; 100–108° [2]

**d** linear; 180° [2]

**e** trigonal pyramidal; 100–108° [2]

**f** trigonal planar; 120° [2]

**g** trigonal planar about each C; approximately 120° [2]

**h** trigonal pyramidal about each N; 100–108° [2]

**i** bent about each O; 100–108° [2]

**j** bent; 110–119° [2]

**k** bent; 100–108° [2]

**10** **a** trigonal planar; 120° [2]

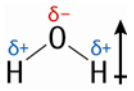
**b** tetrahedral; 109.5° [2]

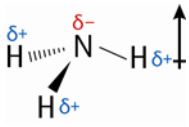
**c** linear; 180° [2]

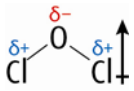
**d** bent; 110–119° [2]

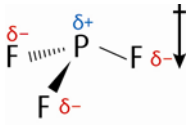
**11** A measure of the attraction of a particular atom for the electron pair in a covalent bond of which it is a part. [1]

**12** $H_2O$  [2]

$NH_3$  [2]

$Cl_2O$  [2]

$PF_3$  [2]

lose one mark for any non-polar molecules classed as polar

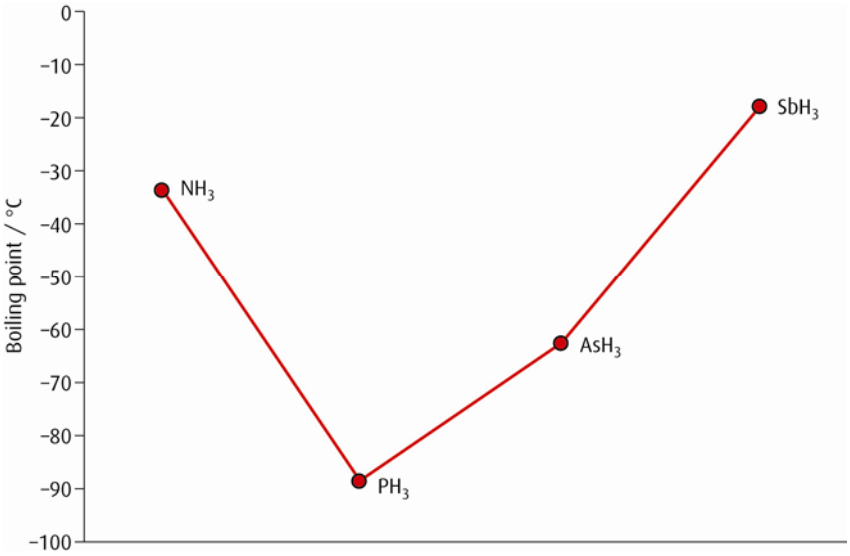
**13** ICl has the higher boiling point. [1]

ICl is polar but $Br_2$ is non-polar. [1]

There are permanent dipole–dipole interactions between ICl molecules as well as van der Waals' forces. [1]

The intermolecular forces are therefore stronger between ICl molecules due to the permanent dipole–dipole interactions. [1]

**14**



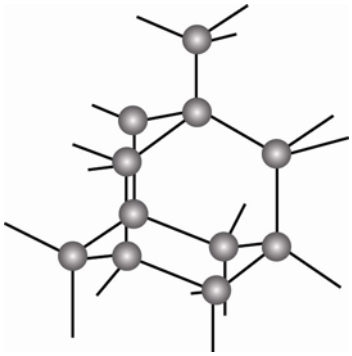

2 marks for all points plotted correctly, lose 1 mark for each mistake [2]

There is an increase in boiling point from $PH_3$ to $AsH_3$ to $SbH_3$ as the relative molecular mass increases and van der Waals' forces get stronger. [1]

$NH_3$ has a much higher boiling point than $PH_3$ as it has hydrogen bonding between molecules [1]

and hydrogen bonding is a stronger intermolecular forces than van der Waals' forces. [1]

**15** **a**  [1]

Diamond has a giant structure with strong covalent bonds between all atoms [1]

covalent bonds must be broken when diamond melts [1]

and this requires a lot of energy. [1]

**b** Silicon has the same structure as diamond so covalent bonds must also be broken [1]

silicon atom is bigger than a carbon atom [1]

covalent bonds between silicon atoms are longer and weaker than between C atoms. [1]

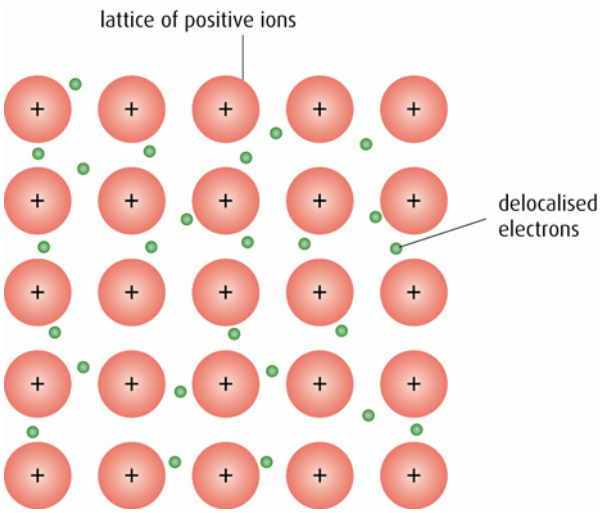
**c** Diamond has a giant structure with strong covalent bonds between all atoms. [1]

Graphite has a layer structure [1]

with covalent bonds within layers but van der Waals' forces between layers. [1]

Graphite has planar hexagons but diamond puckered hexagons. [1]

**16** **a**




Both marks may be gained from the diagram, by showing the regular lattice of positive ions [1]

surrounded by a sea of delocalised electrons. [1]

**b** Magnesium ion has a higher charge than the sodium ion. [1]

Magnesium provides twice as many electrons to the sea of electrons. [1]

$Mg^{2+}$ ion is smaller than $Na^{+}$. [1]

Stronger attraction between magnesium ions and delocalised electrons. [1]