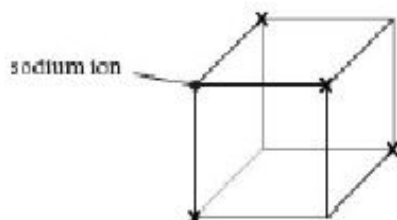


## Mark Scheme - C1.5 Solid Structures

1. (a) (i) [1]



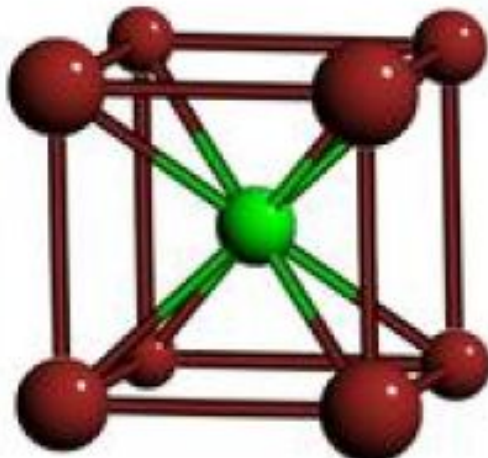
Any of crosses shown

- (ii) 6 (not 6,6) [1]
- (b) Stir the mixture (before filtering) / heat (1)  
Wash the mudstone / residue in the filter paper with water (and add the washings to the filtrate) (1) [2]
- (c) (i) Add  $\text{AgNO}_3$  /  $\text{Ag}^+$  ions (assume aqueous) (1)  
White precipitate (1) [2]
- (ii) Add (aqueous) sodium hydroxide (solution) (1) gives (faint) white precipitate with kainite, no reaction with rock salt (1)
- OR
- Add barium chloride / barium nitrate / barium ions (1) gives white precipitate with kainite, no reaction with rock salt (1)
- OR
- Add potassium carbonate / carbonate ions (1) gives white precipitate with kainite, no reaction with rock salt (1) [2]
- (d) (i) (The gaining of an electron) gives a full / stable (outer) electron shell [1]
- (ii) There is less attraction between the nucleus and the (incoming) electron / oxidising power decreases down the group (increases in size is a neutral answer) [1]
- (e) (i) The C–Cl bond (present in 1,1,1-trichloroethane) is **weaker** than the C–H bond (in methylcyclohexane) (1) and is broken by UV light / radicals present (that damage the ozone layer) (1) [2]
- (ii) Reagent(s) Bromine (aqueous) (1)  
Observation red/ brown  $\rightarrow$  colourless / decolourised (1) [2]

Total [14]

2.

(a) (i)



Clear 8 coordination number (1)

Labels of both  $\text{Cl}^-$  and  $\text{Cs}^+$  (either way round) (1) [2]

(ii)  $\text{Cs}^+$  ion larger than  $\text{Na}^+$  so can have a larger coordination number. [1]

(b) (i) Any three from the following for (1) each up to 3 max – can gain these from labelled diagram

- Layers of carbon atoms.
- Hexagons of carbon atoms / each carbon bonded to three others.
- Weak forces between layers.
- Delocalised electrons above and below plane. [3]

*QWC: organisation of information clearly and coherently; use of specialist vocabulary where appropriate.* [1]

(ii) Delocalised electrons in graphite can move to carry a current (1)  
Diamond has no delocalised electrons (1) [2]

(iii) Van der Waals forces between molecules need to be broken to form iodine gas (1)

Covalent bonds need to be broken to form a gas from diamond/graphite (1)

Van der Waals forces are much weaker than covalent bonds (1) [3]

Total [12]

(a) both contain metallic bonds/ positive ions and delocalised electrons  
labelled on diagram (1)

those in magnesium are stronger/ harder to break/ need more energy  
to break (1)

because 2 electrons are involved in delocalisation/ attraction to the  
positive ions (1) [3]

(b) reaction is hydrolysis of halogenoalkane/ nucleophilic substitution of  
halogenoalkane (1)

$C_4H_9X + OH^- \rightarrow C_4H_9OH + X^-$  X can be Cl or Br (1)

(white precipitate is) silver chloride and (cream precipitate is) silver  
bromide (1)

$Ag^+(aq) + X^-(aq) \rightarrow AgX(s)$  or  $AgNO_3 + X^- \rightarrow AgX + NO_3^-$  (1)

- state symbols ignored [4]

*QWC selection of form and style of writing appropriate to purpose and  
to complexity of subject matter* [1]

(c) caesium ions are bigger than sodium ions – accept 'atoms' (1)

co-ordination number 6 : 6 for sodium and 8 : 8 for caesium (1)

both cubic (1) [3]

(d) reaction is electrophilic addition (1)

two possible products are 1-bromopropane and 2-bromopropane (1)

more 2-bromopropane formed (1)

because of greater stability of intermediate positive ion/ 2° carbocation  
(1)

[4]

*QWC legibility of text; accuracy of spelling, grammar and punctuation,  
clarity of meaning* [1]

Total [16]

4.

Cs<sup>+</sup> and Cl<sup>-</sup> (or names caesium and chloride) with Cl<sup>-</sup> at each corner and Cs<sup>+</sup> in centre of cube [1]

5.

- (a) Iodine contains weak van der Waals forces /  
bonds between each molecule (1)  
Less energy is needed to overcome these weaker forces (1)\*  
Diamond contains strong covalent bonds between each atom (1)  
and more energy is needed to overcome these 'bonds' (1)\*  
\* alternative marks

Neither iodine nor diamond contain free / delocalised electrons to carry the charge (necessary for them to conduct electricity) (1) [4]

*QWC: organise information clearly and coherently, using specialist vocabulary when appropriate* [1]

- (b) K<sup>+</sup> and I<sup>-</sup> correctly given (1) and in their correct places on the diagram (1) [2]

- (c) An excess / stoichiometric / 0.05 mol (1) of potassium sulfate (aq) is added to the barium chloride solution  
Mixture is stirred (1)\* and then filtered (1)  
Precipitated barium sulfate is then washed with distilled water (1) and dried (1)\* [4]  
\* alternative marks

*QWC: Select and use a form and style of writing appropriate to purpose and to complex subject matter* [1]

**Total [12]**

6.

(a) iodine force is Van der Waals/ induced dipole-induced dipole (1)

diamond force is covalent bond/ description of attractive forces in a covalent bond (1) [2]

(b) diamond would have a higher sublimation temperature because it has stronger forces/ forces are harder to break [1]