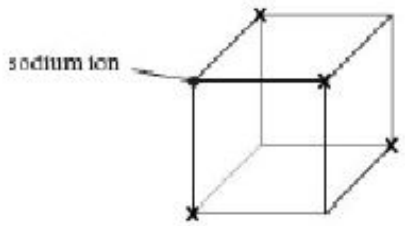
Mark Scheme - 1.5 Solid Structures

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 $AgNO_3$ / Ag^+ ions (assume aqueous) (1) [2]
White precipitate (1)

(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]

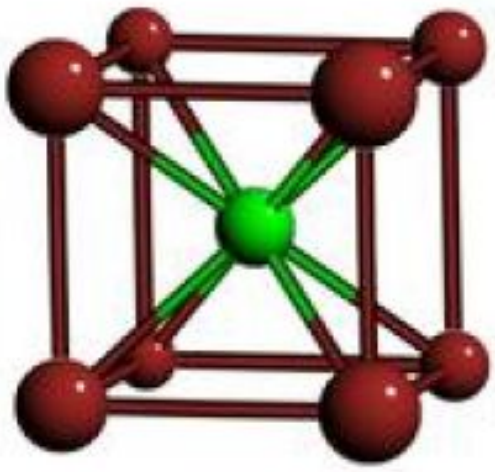
(e) (i) The C–Cl bond (present in 1,1,1-trichloroethane) is **weaker** than the C–H bond (in methylcyclohexane) (1) and is broken by UV light / radicals present (that damage the ozone layer) (1) [2]

(ii) Reagent(s) Bromine (aqueous) (1)
Observation red/ brown → colourless / decolourised (1) [2]

Total [14]

2.

(a) (i)



Clear 8 coordination number (1)
Labels of both Cl^- and Cs^+ (either way round) (1) [2]

(ii) Cs^+ ion larger than 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]

3.

(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^+ and Cl^- (or names caesium and chlor**id**e) with Cl^- at each corner and Cs^+ in centre of cube [1]

(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]

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^+ and I^- 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]