

**M1.(a)** electrons transferred from potassium to sulfur 1

two potassium atoms each lose one electron 1

forming  $K^+$  / 1+ ions 1

sulfur atoms gain 2 electrons 1

forming  $S^{2-}$  / 2- ions 1

(b) there are no gaps / sticks between the potassium ions and sulfide ions 1

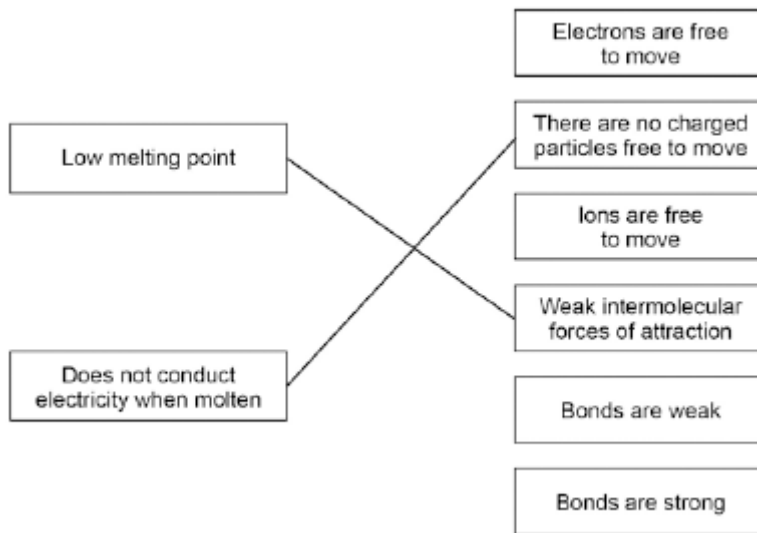
(c) (two) shared pairs between H and S 1

rest correct - no additional hydrogen electrons and two non-bonding pairs on sulfur  
*second mark dependent on first* 1

(d) 342 2

*allow 1 mark for evidence of  $(2 \times 27) + 3[32 + (16 \times 4)]$*

(e) **Property** **Explanation of property**



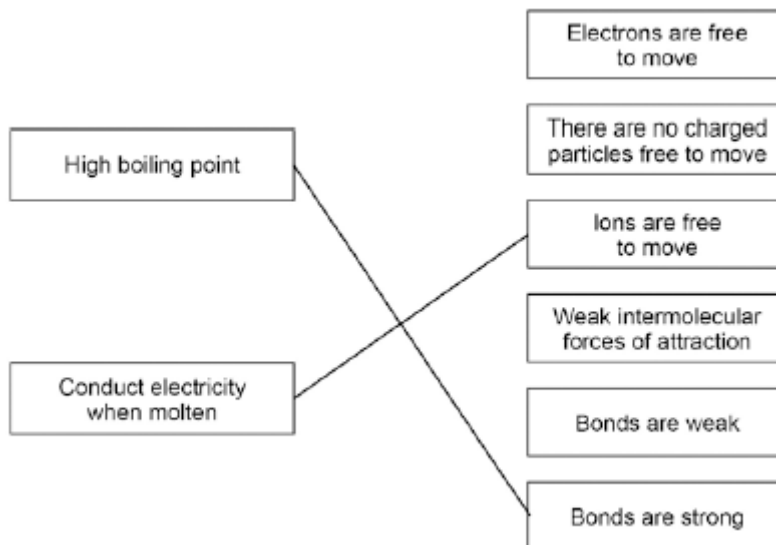
more than one line drawn from a variable negates the mark

2

(f)

**Property**

**Explanation of property**



more than one line drawn from a variable negates the mark

2

[14]

M2.(a) (i) neutrons

*this order only*

1

electrons

1

protons

1

(ii) box on the left ticked

1

(b) (i) effervescence / bubbling / fizzing / bubbles of gas

*do not accept just gas alone*

1

magnesium gets smaller / disappears

*allow magnesium dissolves*

*allow gets hotter or steam produced*

*ignore references to magnesium moving and floating / sinking and incorrectly named gases.*

1

(ii) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content

**Level 1 (1–2 marks)**

There are simple statements of some of the steps in a procedure for obtaining magnesium chloride.

**Level 2 (3–4 marks)**

There is a description of a laboratory procedure for obtaining magnesium chloride from dilute hydrochloric acid and magnesium.

The answer must include a way of ensuring the hydrochloric acid is fully reacted **or** a method of obtaining magnesium chloride crystals.

**Level 3 (5–6 marks)**

There is a well organised description of a laboratory procedure for obtaining

magnesium chloride that can be followed by another person.

The answer must include a way of ensuring the hydrochloric acid is fully reacted **and** a method of obtaining magnesium chloride crystals.

**examples of the points made in the response:**

- hydrochloric acid in beaker (or similar)
- add small pieces of magnesium ribbon
- until magnesium is in excess or until no more effervescence occurs \*
- filter using filter paper and funnel
- filter excess magnesium
- pour solution into evaporating basin / dish
- heat using Bunsen burner
- leave to crystallise / leave for water to evaporate / boil off water
- decant solution
- pat dry (using filter paper).

\*Student may choose to use a named indicator until it turns a neutral colour, record the number of pieces of magnesium added then repeat without the indicator.

6

[12]

- M3.(a)** giant structure / lattice / layers / close packed  
*first 3 marks can be obtained from a suitably labelled diagram*  
*incorrect structure or bonding or particle = max 3* 1
- made up of atoms / positive ions 1
- with delocalized / free electrons 1
- so electrons can move / flow through the metal  
*accept so electrons can carry charge through the metal*  
*accept so electrons can form a current* 1
- (b) an alloy (is a metal which) has different types / sizes of atoms  
*accept converse for pure metal throughout*  
*both marks can be obtained from suitable diagrams*  
*allow made of different metals*  
*allow mixture of metals / atoms / elements*  
*ignore particles*  
*ignore properties*  
*do **not** accept compound* 1
- alloy has distorted layers  
*allow layers are unable to slide* 1
- (c) (i) can return to its original shape  
*accept shape memory alloy*  
*accept smart alloy*  
*ignore other properties* 1
- (ii) (pure copper is too) soft  
*accept converse*  
*accept malleable or bends*  
*accept copper is running out*  
*ignore references to strength and weakness* 1

(iii) aluminium oxide

*accept alumina*

*accept  $Al_2O_3$*

*ignore bauxite / aluminium ore*

1

(iv) any **one** from:

- different conditions

- different catalyst

- different pressure

*allow different concentration*

- different temperature.

*do **not** accept different monomers*

1

(d) any **two** from:

- accurate

- sensitive

- rapid

- small sample.

*both needed for 1 mark*

1

[11]

- M4.(a) (i) points correctly plotted ( $\pm \frac{1}{2}$  small square)  
*four points = 2 marks*  
*three points = 1 mark*

Max 2

straight line of best fit using full range of points from 0,0

1

- (ii) any **one** from:

*must explain why the point is below the line*

- the solution may not have been properly stirred
- the electrodes may have been a larger distance apart
- the drop of sodium chloride may have been a smaller volume / smaller

*allow not enough sodium chloride added*

*allow smaller amount of sodium chloride*

*do **not** allow too few drops added*

*ignore the student may have misread the conductivity meter*

1

- (iii) any **one** from:

- the volume of pure water  
*allow amount*
- the concentration (of the solutions added)
- the volume (of the drops) of solution added  
*ignore number of drops*
- the distance between the electrodes
- the same electrodes **or** electrodes made of the same material
- same depth **or** surface area of electrodes in the water
- constant power supply  
*ignore current*
- stirred

1

- (b) (i) because (pure) water is covalent / molecular (simple) **or** contains molecules

1

therefore (pure) water has no free / mobile electrons **or** ions  
*molecules do not have a charge or molecules do not contain ions*  
*gains 2 marks*

1

(ii) because there are ions in sodium chloride  
*allow Na<sup>+</sup> and / or Cl<sup>-</sup>(ions) or ionic bonding.*  
*Ignore particles other than ions for MP1.*

1

which can move **or** carry the current / charge  
*MP2 must be linked to ions only.*

1

(iii) Hydrogen  
*allow H<sub>2</sub> / H*

1

[10]



**M5.** Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

**0 marks**

No relevant content

**Level 1 (1–2 marks)**

*There is a statement about the bonding and / or structure **or** melting / boiling point of chlorine **or** sodium chloride.*

**Level 2 (3–4 marks)**

*There are statements about the bonding and / or structure of chlorine **or** sodium chloride.*

**Level 3 (5–6 marks)**

*There are statements about the bonding and / or structure of chlorine **and** sodium chloride.*

*There is an explanation of why chlorine is a gas **or** sodium chloride is a solid.*

**Examples of chemistry points made in response:**

**Chlorine:**

covalent bonds between atoms

forming (simple) molecules

*no / weak attraction / bonds between molecules*

low boiling point

**Sodium chloride:**

*ionic bonds **or** electrostatic attraction*

strong bonds

in all directions

between oppositely charged ions

forming giant lattice

*large amounts of energy needed to break bonds*

*high melting point*

[6]