

# How Bond + Structure Relate to Props

## Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.2 Bonding Structure + Props Matter
Sub-Topic	How Bond + Structure Relate to Props
Difficulty Level	Silver Level
Booklet	Mark Scheme 1

Time Allowed: 60 minutes

Score: /59

Percentage: /100

Grade Boundaries:

<b>M1.(a)</b>	A base	1
	(b) forces	1
	(c) calcium loses electrons and oxygen gains electrons <i>max 3 for incorrect reference to atom / ion or to oxygen / oxide</i>	1
	two electrons are transferred	1
	calcium has a $2^+$ charge	1
	oxide has a $2^-$ charge	1
		[6]
<b>M2.(a)</b>	408 kg	1
	(b) all points correct <i><math>\pm \frac{1}{2}</math> small square</i>	2
	<i>allow 1 mark if 5 points correct</i>	

best fit line

1

(c) 
$$\frac{1989 \times 100}{36}$$

1

5525 dm<sup>3</sup>

1

(d) relative formula mass of TiCl<sub>4</sub> is 190

1

25.26 %

1

Answer given to 3 significant figures = 25.3 %

1

*25.23% with or without working gains 3 marks*

(e) argon is unreactive

1

water (vapour) would react with sodium

*allow water (vapour) would react with titanium(IV) chloride*

1

and air contains oxygen that would react with reactants

*allow and air contains oxygen that would react with products*

1

(f) (titanium conducts electricity) because electrons in the outer shell of the metal atoms are delocalised

1

and so electrons are free to move

*allow the delocalised electrons in the metal carry electrical charge through the metal*

1

through the whole structure

1

[15]

M3.(a)

Test	Result
Place a glowing splint in the tube of the gas	The splint relights
	The splint goes out
	There is a squeaky pop

*more than one line from test negates the mark*

1

- (b) (i) place a lighted splint at the mouth of the tube

1

there is a squeaky pop

*dependent on correct test*

1

- (ii) hydrogen is less reactive than magnesium

*accept converse*

*accept magnesium is too reactive*

1

(c) (i) any **one** from:

- to improve appearance or make it look nice
- to prevent corrosion
- to make it more durable
- cheaper than solid silver

1

(ii) solution must be silver nitrate **or** contain silver ions

1

otherwise copper will be deposited **or** silver will not be deposited

1

spoon must be the negative electrode / cathode

1

because silver ions have a positive charge **or** go to negative electrode  
**or** are discharged at the negative electrode.

1

(iii) because (plastic is an) insulator **or** does not conduct electricity  
*accept does not contain mobile electrons*

1

[10]

M4. (a) (i) covalent

*two different answers indicated gains 0 marks*

1

(ii) carbon

*two different answers indicated gains 0 marks*

1

(iii) 3

*two different answers indicated gains 0 marks*

1

(b) layers can slide / slip

1

because there are no bonds between layers

*accept because weak forces / bonds between layers*

**or** so (pieces of) graphite rubs / breaks off

**or** graphite left on the paper

1

[5]

**M5.** (a) • made of layers / rows (atoms / ions / particles)

*ignore free / delocalised electrons*

1

• which can slide / slip (over each other)

*reference to incorrect particles / covalency / intermolecular forces = max 1*

**or**

particles / ions / atoms can slide over each other

*ignore malleable / ductile / weak bonds*

1

(b) (i) sulfuric

*accept sulphuric*

*ignore formula*  
*ignore hydrogen sulfate*

1

(ii) any **two** from:

*list principle applies for incorrect observations*

- (hydrogen) gas produced (or any indication of a gas such as bubbles etc.)

*ignore just hydrogen produced*

*ignore cloudiness / colour changes*

- magnesium / solid disappears / goes into solution  
*accept magnesium / magnesium sulfate / solid / it dissolves*  
*accept forms a liquid / solution*

- gets hot  
*allow exothermic*  
*ignore floats*

2

(iii) crystallisation

*accept detailed answers such as: evaporate to half volume*  
*and then allow the solution to crystallise.*

**or**

evaporation / heating / boiling / cooling

*ignore any references to filter*

1

[6]

**M6.** (a) gives out heat / energy

*allow more energy given out in making bonds than is used in*  
*breaking bonds*

**or**

energy / heat transferred to surroundings

*ignore light*

1

(b) activation

*allow phonetic spelling*

1

(c) (i) 2 crosses on inner circle **and**

8 crosses on outer circle

*accepts dots / e / – for electrons*

1

(ii) opposite charges (attract)

*allow electrostatic forces (attract)*

*do **not** accept intermolecular attraction / shared electrons*

1

[4]

**M7.** (a)

$$\frac{6.21}{207}$$

$$\frac{0.64}{16}$$

*1 mark for dividing mass by A<sub>r</sub> max 2 if A<sub>r</sub> divided by mass*

1

$$= 0.03$$

$$= 0.04$$

*1 mark for correct proportions*

1

3

4

*1 mark for correct whole number ratio (allow multiples) can be awarded from correct formula*

1



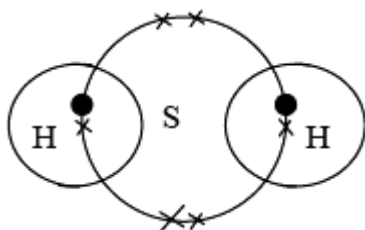


1 mark for correct formula

**ecf** allowed from **step 2 to step 3** and **step 3 to step 4** if sensible attempt at **step 1**

correct formula with no working gains 2 marks

1



(b) (i)

allow all dots **or** all crosses **or** e **or** e<sup>-</sup>

ignore inner shells and any inner electrons

allow 4 non-bonded electrons anywhere on shell as long as not in overlap – need not be paired

1

(ii) forces of attraction / bonds between molecules are weak (owtte)

do **not** accept intramolecular forces / covalent bonds are weak

do **not** accept reference to ions

**or**

intermolecular forces / bonds are weak (owtte)

**or**

it is made of small molecules with weak forces of attraction

if 2 marks not awarded

made of small molecules / simple molecular gains 1 mark

forces of attraction are weak (without specifying between molecules / intermolecular) gains 1 mark

(accept easily broken / not much energy needed to break instead of weak)

bonds are weak without specifying intermolecular would not gain a mark and would be ignored

2

(iii) 4

1

[8]

**M8.** (a) any **three** from:

- resources / aluminium / ores are conserved  
*accept converse argument*
- less / no mining **or** less associated environmental problems  
eg quarrying / eyesore / dust / traffic / noise / loss of land / habitat  
*ignore just pollution*
- less / no waste (rock) / landfill  
*do **not** accept 'wastes 50% of the ore'*
- no purification / separation (of aluminium oxide)
- (aluminium extraction / production) has high energy / electricity / heat / temperature requirements
- less carbon dioxide produced  
*accept no carbon dioxide produced*  
*ignore references to cost*

3

(b) statement

*ignore density*

1

linked reason

*eg*

*(pure) Al / it is weak / soft (1)*

*as layers / rows can slide (over each other) (1)*

**or**

*alloy / other metals / they make it stronger / harder (1)*

*stops layers / rows sliding over each other (1)*

*accept disrupts the structure owtte if no other mark awarded*

*accept to form an alloy **or** to change properties for 1 mark*

1

[5]

