How Bond + Structure Relate to Props

Mark Scheme

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	Gold Level
Booklet	Mark Scheme

Time Allowed: **59 minutes**

Score: **/57**

Percentage: **/100**

Grade Boundaries:

M1.(a) small molecules

1

with weak intermolecular forces

1

(so) only a small amount of energy is needed to separate the molecules

any reference to bonds being weak or being broken negates the second and third mark unless they are stated to be intermolecular bonds or bonds between molecules

1

(b) decreases

1

because the equilibrium shifts in the endothermic direction

allow reverse reaction favoured if forward reaction is exothermic

1

(c) increases

1

because there are more molecules of gas on the left-hand side

or converse

1

[7]

M2.(a) because they form hydroxides

1

that give alkaline solutions (in water)

1

(b) the atoms have more electron shells (as move down the group)

1

so the electron in the outer shell is further away from the nucleus

1

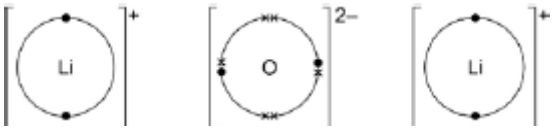
which reduces the attraction to the nucleus

1

so the electron is lost more easily from the atom

1

(c)



electronic structure of lithium drawn correctly

1

electronic structure of oxygen drawn correctly

1

correct charge on ions (Li^+ and O^{2-})

1

correct number of each ion (2 lithium, 1 oxygen)

1

[10]

M3.(a) because sulfur dioxide causes acid rain

1

which kills fish / aquatic life **or** dissolves / damages statues / stonework **or** kills / stunts growth of trees

if no other mark awarded then award 1 mark for sulfur dioxide is toxic or causes breathing difficulties.

1

(b) (i) electrons are lost

1

(ii) $Cu^{2+} + 2e^- \rightarrow Cu$

allow $Cu^{2+} \rightarrow Cu - 2e^-$

ignore state symbols

1

(iii) copper sulfate

allow any ionic copper compound

1

(c) (lattice of) positive ions

1

delocalised electrons

accept sea of electrons

1

(electrostatic) attraction between the positive ions and the electrons

1

electrons can move through the metal / structure **or** can flow

allow electrons can carry charge through the metal / structure

if wrong bonding named or described or attraction between oppositely charged ions then do not award M1 or M3 − MAX 2

1

(d) (copper compounds are absorbed / taken up by) plants

allow crops

1

which are burned

1

the ash contains the copper compounds

do not award M3 if the ash contains copper (metal)

1

(e)

/ A_r	55.6 / 63.5	16.4 / 56	28.0 / 32
moles	0.876	0.293	0.875
ratio	3	1	3
formula	Cu_3FeS_3		

*award **4** marks for Cu_3FeS_3 with some correct working*
*award **3** marks for Cu_3FeS_3 with **no** working*
*if the answer is not Cu_3FeS_3 award up to **3** marks for correct steps from the table apply ecf*
*if the student has inverted the fractions award **3** marks for an answer of $CuFe_3S$*

4

[16]

M4.(a) (i) silver nitrate

allow $AgNO_3$

1

(ii) potassium carbonate **or**

allow K_2CO_3

sodium carbonate

allow Na_2CO_3

1

(b) base

allow ionic
ignore insoluble or soluble
ignore alkali

1

(c) (i) evaporate

or
crystallise

allow heat or boil or leave (to evaporate)
allow cool
ignore filtration unless given as an alternative
*do **not** accept freeze or solidify*

1

(ii) 2 (HNO_3)

accept multiples

1

(iii) 9

accept nine

1

(d) 6.21 / 207 0.72 / 16

***1** mark for dividing mass by A_r*

1

= 0.03 = 0.045

***1** mark for correct proportions (allow multiples)*

1

2 3

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

1

Pb_2O_3

allow O_3Pb_2
***ecf** allowed throughout if sensible attempt at step 1*
*correct formula with no working gains **1** mark*

1

[10]

M5.(a) lattice / giant structure

*max **3** if incorrect structure or bonding or particles*

1

ionic **or** (contains) ions

1

Na^+ **and** Cl^-

accept in words or dot and cross diagram: must include type

and magnitude of charge for each ion

1

electrostatic attraction

allow attraction between opposite charges

1

(b) hydrogen

allow H_2

1

sodium hydroxide

allow NaOH

1

(c) any **one** from, eg:

- people should have the right to choose
- insufficient evidence of effect on individuals
- individuals may need different amounts.

allow too much could be harmful

ignore religious reasons

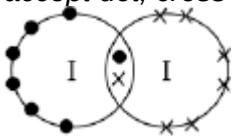
ignore cost

ignore reference to allergies

1

(d) (i) one bonding pair of electrons

accept dot, cross or e or − or any combination, eg



1

6 unbonded electrons on each atom

1

(ii) simple molecules

*max **2** if incorrect structure or bonding or particles*

accept small molecules

accept simple / small molecular structure

1

with intermolecular forces

accept forces between molecules

must be no contradictory particles

1

which are weak **or** which require little energy to overcome − must be linked to second marking point

reference to weak covalent bonds negates second and third marking points

1

(iii) iodine has no delocalised / free / mobile electrons or ions

1

so cannot carry charge

*if no mark awarded iodine molecules have no charge gains **1** mark*

1

[14]