

# MARK SCHEME

# GCSE

## CHEMISTRY

## AQA - COMBINED SCIENCE

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### C2 - TEST 3

BONDING, STRUCTURE AND PROPERTIES OF MATTER

Intermediate

## Mark schemes

<b>1.</b>	8 electrons in outer shell <i>accept anywhere in outer shell</i> <i>accept dots or crosses</i>	1	
	negative sign outside bracket	1	
			<b>[2]</b>
<b>2.</b>	(a) (i) correct number of electrons (18) <i>accept any combination of dots and crosses</i>	1	
	2, 8, 8 <i>2, 8, 8 written on rings = 1 mark</i>	1	
	(ii) loses 2 electrons <b>or</b> loses <u>both</u> electrons <i>loses electrons = 1 mark</i> <i>any answers about gaining electrons = 0 marks</i>	2	
	(b) (i) 5 <i>accept multiples if all correct</i>	1	
	(ii) 6 <i>accept multiples if all correct</i>	1	
			<b>[6]</b>
<b>3.</b>	(a) Group 2 / Alkaline Earth Metals <i>for 1 mark</i>	1	
	(b) (i) $\text{MgCl}_2/\text{Mg}^{2+}(\text{Cl}^-)_2$ (or equation with correct answer) <i>for 1 mark</i>	1	
	(ii) ionic / electrovalent <i>for 1 mark</i>	1	
			<b>[3]</b>

<b>4.</b>	(i) B or 2, 8, 1 <i>for one mark</i>	1	
	(ii) A or 2, 8 <i>for one mark</i>	1	<b>[2]</b>
<b>5.</b>	(i) electrons <i>for 1 mark</i>	1	
	(ii) covalent <i>for 1 mark</i>	1	
	(iii) made of small molecules: usually gas or liquid ) dependent on have low melting points ) having first have low boiling points ) point above forces between molecules are weak <i>any 1 for 1 mark</i>	3	<b>[5]</b>
<b>6.</b>	(a) C <sub>16</sub> H <sub>34</sub> <i>for 1 mark</i>	1	
	(b) electron <i>gains 1 mark</i>		
	<b>but</b> shared electrons <i>gains 2 marks</i>	2	<b>[3]</b>

7.

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]

- 8.** (a) (i)  $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$   
*both 2s needed*
- allow O<sub>2</sub> **or** any correct multiple  $\frac{1}{2}$*
- 1
- (ii) solid
- 1
- gas
- 1
- (b)  $\text{MgCl}_2 / \text{C1}_2\text{Mg}$   
*do **not** accept MG mg mG CL cl cL*  
*ignore charges*
- 1
- [4]**

- 9.** (a) carbon
- 1
- (b) diamond has a giant structure
- 1
- each atom is joined to four other atoms
- 1
- (c) contains layers
- 1
- no covalent / strong bonds between layers  
*allow which have weak forces between them*
- 1
- so (the layers) can slide over each other
- 1
- (d) 3
- 1
- (e) has delocalised electrons  
*allow each (carbon) atom has one free electron*
- 1
- which can move through the whole structure  
**or**  
 which carry the current
- 1
- [9]**

10.

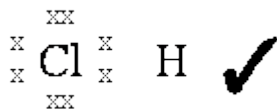
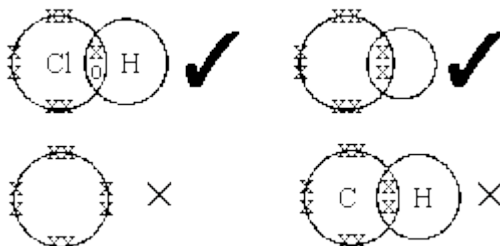
any **four** points from:

- high melting point *owtte*  
*ignore boiling point*
- many **or** all atoms joined together
- each silicon (atom) joined to four oxygen (atoms) **or** each oxygen joined to two silicon
- covalent (bonds)
- many bonds would need to be broken
- strong bonds  
*allow hard to break bonds*
- lot of energy / heat needed to break bonds  
*allow high temperature needed to break bonds*
- giant / macromolecular / lattice / diamond structure
- unreactive  
*allow doesn't react with materials within furnace = 1 mark*
- rigid / hard structure
- no free electrons
- poor conductor of heat  
*giant covalent structure = 2 marks*  
*max 3 if ionic / metallic bonding mentioned*  
*ignore electrostatic*  
*ignore molecules / intermolecular forces*

[4]

**11.**

- (a) bonding pair in the overlap
- and**
- 6 other electrons arranged around the chlorine

*must have either circles or symbols**need not be pairs but must not be in the overlap region**accept without H and Cl if clear**accept all x's or all o's*

1

- (b)
- $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$

*accept multiples or fractions**accept correct formulae but not balanced for 1 mark**correctly balanced equation containing**'correct' lower / upper case symbols gets 1 mark*

2

- (c)
- $\text{MgCl}_2$

*accept  $\text{Mg}^{2+}(\text{Cl}^-)_2$* 

1

- (d) because magnesium chloride is made of ions
- or**
- is ionic

*accept there are strong forces of attraction between the ions / particles in  $\text{MgCl}_2$  or strong electrostatic attractions**accept more energy to separate particles in  $\text{MgCl}_2$* *do **not** accept  $\text{MgCl}_2$  molecules**do **not** accept reference to breaking bonds*

1

hydrogen chloride is made of molecules **or** is covalent*accept there are only weak forces of attraction (between the particles / molecules) in HCl**do **not** accept weak covalent bonds**do **not** accept reference to breaking bonds**do **not** accept  $\text{MgCl}_2$  is a solid and HCl is a gas*

1

**[6]****12.**

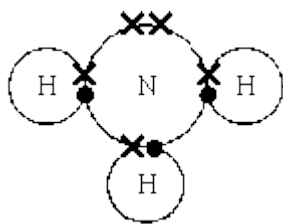
- (i) reversible (reaction)

1

- (ii) (yield of ammonia) increases

1

(iii)



1

[3]

13.

- (a) three from:  
high mp/melts above 60 °C  
conducts (electricity)  
basic oxide /alkaline oxide  
chloride has high mp  
molten chloride conducts electricity  
form positive ions/form ionic compound with non-metals  
solid at room temperature

*any 3 for 1 mark each*

3

- (b) group 2  
formula of oxide is XO/ion is X<sup>2+</sup>/  
oxide forms alkaline solution

*for 1 mark each*

2

- (c) XCl<sub>2</sub>/ X<sup>2+</sup>(Cl<sup>-</sup>)<sub>2</sub>(X<sup>2+</sup>)(Cl<sup>-</sup>)<sub>2</sub>  
Symbol of any group 2 element instead of X  
(b) → (c) error carried forward accepted.

e.g. Group 1 → XCl

Group 3 → XCl<sub>3</sub>

*for 1 mark*

1

[6]

14.

- (a) elements: aluminium, copper,  
compounds: pure water, sodium chloride,  
mixture: beer, milk

*2/3 correct gains 1 mark*

*4/5 correct gains 2 marks*

*all correct gains 3 marks*

3



- (b) metals: can be hammered into shape,  
good conductor of electricity, shiny  
non metals: brittle, dull, poor conductors of electricity  
*2/3 correct gains 1 mark*  
*4/5 correct gains 2 marks*  
*all correct gains 3 marks*

3

[6]

15.

- (a) X – (metal) atom / ion

1

Y – electron

1

- (b) free electrons or electrons move

1

(allow metal) atoms / ions to slide over each other

**OR**

bonding non - directional for 2 marks

1

[4]