

# Structure + Bonding Carbon

## Mark Scheme

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

Time Allowed: 25 minutes

Score: /25

Percentage: /100

Grade Boundaries:

M1.(a) carbon

*allow C*

1

(b) (i) (atoms are in) layers (that) can slide over each other

1

because between the layers there are only weak forces

*accept because there are no (covalent) bonds between the layers*

*accept Van der Waals forces between the layers*

*do **not** allow intermolecular bonds between the layers*

*if no other marks are awarded allow weak intermolecular forces for **1** mark*

1

(ii) because each atom forms four (covalent) bonds **or** (diamond is a) giant (covalent) structure **or** lattice **or** macromolecular

*any reference to ionic / metallic bonding or intermolecular forces scores a maximum of **1** mark*

*accept carbon forms a tetrahedral shape*

1

(and) covalent bonds are strong

*accept covalent bonds need a lot of energy / difficult to break*

1

(iii) because graphite has delocalised electrons

*allow sea of electrons*

*allow each carbon atom has one free electron*

1

which can move through the whole structure (and carry the current / charge / electricity)

1

[7]

**M2.** (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]

**M3.** (a) 2,4 (drawn as crosses) on shells

*accept dots / e / - etc.*

1

(b) (i) hard

*allow rigid / high melting point*

*do **not** allow references to bonding*

*ignore strong*

*ignore unreactive*

*ignore structure*

1

(ii) any **three** from

*max 2 if ionic / metallic / molecule / intermolecular bonds **or** incorrect number of bonds*

- giant structure / lattice / macromolecular  
*allow many bonds*
- covalent (bonds)
- (covalent) bonds are strong  
*accept needs lots of energy to break bonds (owtte)*
- (each) carbon / atom forms four bonds

**or**

(each) carbon / atom bonded to four other atoms

3

(c) any **three** from:

*max 2 if ionic / ions / metallic / molecule*

*'it' needs to be qualified*

graphite

- has delocalised / free electrons  
*do **not** accept the electrons move unless qualified (around structure etc)*

**or**

electrons that can move through / around the structure

- each carbon is joined to three other carbon atoms  
*allow graphite has three bonds*

**or**

one electron from each atom is free / delocalised

diamond

- has no free / delocalised electrons  
*do **not** accept the electrons do not move*

**or**

no electrons that move around the structure

- all the electrons are used for bonding  
*allow diamond has 4 bonds*

**or**

each carbon joined to four other carbon atoms

3

[8]

**M4.** (a) electric current / electricity

1

plus **one** from:

- is passed through ionic compound / substance / electrolyte
- passed through molten/aqueous compound / substance  
*must be linked to electricity*  
*allow liquid compound / substance*  
*do **not** allow solution / liquid alone*
- causing decomposition  
*accept split up / breakdown / breaking up owtte*  
*ignore separated*  
*accept elements are formed*  
*ignore new substances form*

1

(b) hydrogen

*accept  $H_2$*   
*do **not** accept  $H$  /  $H^+$*

1

- (c) one electron from each atom

*accept each carbon is bonded to three other carbon atoms  
leaving one (unbonded) electron owtte*

1

is delocalised / free (to move)

*must be linked to electrons*

*answers of delocalised / free electrons only, gains 1 mark*

*accept each carbon is bonded to three other carbon atoms  
leaving delocalised / free electrons = 2 marks*

**maximum 1 mark** if graphite described as a metal / giant ionic lattice

1

[5]