

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 H₂
*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]