M1.(a) carbon

allow C

1

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

1

because <u>between</u> the layers there are only weak forces

accept because there are no (covalent) bonds <u>between</u> 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 <u>four</u> (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) <u>covalent</u> bonds are strong

accept <u>covalent</u> 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 <u>through the whole structure</u> (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 <u>ionic</u> compound / substance / electrolyte
- passed through molten/aqueous <u>compound</u> / <u>substance</u>

  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^2*

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]