1.

(a) (i) hard

ignore strong

1

(ii) hundred

1

(b) (i) Covalent

1

(ii) 3

1

(iii) Soft and slippery

1

(c) (i) cross-links

allow bonds

ignore links

*do **not** accept intermolecular*

1

(ii) melt

1

(iii) any **two** from:

- temperature

allow heat(ing)

- pressure
- catalyst

2

(d) (i) CH_4

1

(ii) Small molecules

1

[11]

2.

(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]

3. (a) **Graphite:**

because the layers (of carbon atoms) in graphite can move / slide

it = graphite

1

this is because there are only weak intermolecular forces **or** weak forces between layers

accept Van der Waals' forces allow no covalent bonds between layers

1

Diamond:

however, in diamond, each carbon atom is (strongly / covalently) bonded to 4 others

allow diamond has three dimensional / tetrahedral structure

1

so no carbon / atoms able to move / slide

*allow so no layers to slide **or** so diamond is rigid*

1

(b) because graphite has delocalised electrons / sea of electrons

allow free / mobile / roaming electrons

1

which can carry charge / current **or** move <u>through the structure</u> 1

however, diamond has no delocalised electrons

accept however, diamond has all (outer) electrons used in bonding

1

[7]

4. (a) carbon

1

(b) all

1

(c) covalent

1

(d) four

1

(e) hard

1

[5]

5. (a) <u>layers</u>

which have weak forces / attractions / bonds between them

second mark must be linked to layers

1

or

which can slide over each other **or** separate

ignore references to rubbing

1

(b) covalent

1

[3]

6. (a) carbon

1

(b) <u>layers</u>

1

have weak forces / attractions / bonds between them **or** are only held together weakly

second mark must be linked to layers

or

can slide over each other **or** separate (1)

1

(c) covalent

1

7. (a) reduce wear of metal ie don't get damaged

or *other sensible answer*

[4]

or

stop / reduce friction

accept stop metal heating up

accept move more smoothly

ignore make it slippery / rub more smoothly

or

prevent seizing

accept can move freely

1

(b) (i) carbon

1

(ii) layers (of atoms)

1

can slide / slip over each other

allow slip off

or

weak forces of attraction / weak bonds (between layers)

allow no bonds

accept there are weak forces of attraction for ***1*** *mark even when there is no reference to layers*

accept atoms slide over each other (for ***1*** *mark)*

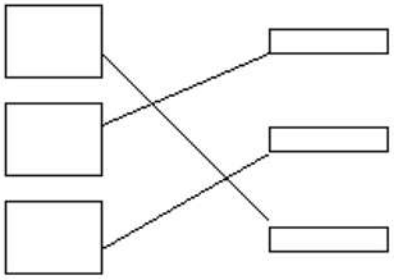
an answer which ***only*** *states there are weak bonds would gain* ***0*** *mark when there is no reference to layers*

weak covalent bonds = ***0*** *marks*

1

[4]

8. (a)



*all three lines correct gains **2** marks*
*one or two correct gains **1** mark*
if there are more than 3 lines then lose mark for each extra line

2

(b) (i) covalent

1

(ii) four

1

(iii) hard

1

(iv) three

1

(v) soft

1

(c) carbon

accept C

1

9. (a) four

1

covalent

1

(b) because it has a high melting point

accept it won't melt
accept it won't decompose or react
allow withstand high temperatures
ignore boiling point

1

(c) thin

1

[4]

10. high melting point

*reference to incorrect bonding **or** incorrect particles **or** incorrect structure = max **3***

accept will not melt (at high temperatures)
ignore withstand high temperatures

1

because a lot of energy needed to break bonds

1

because it is covalent **or** has strong bonds

accept bonds are hard to break

1

and because it is a giant structure **or** a macromolecule **or** a lattice

ignore many bonds

1

[4]