Structure and bonding – *Mark scheme*

1. (a) reduce wear of metal ie don't get damaged 1

or *other sensible answer*

or stop / reduce <u>friction</u>

accept stop metal heating up

accept move more smoothly

ignore make it slippery / rub more smoothly

or prevent seizing

accept can move freely

(b) (i) carbon 1

(ii) layers (of atoms) 1

can slide / slip over each other 1

allow slip off

or weak forces of attraction / weak bonds (between layers)

allow no bonds

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

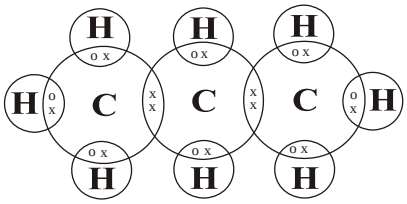
*accept atoms slide over each other (for **1** mark)*

*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*

[4]

2. (a) 1



*allow all dots **or** all crosses **or** combination **or** all e / e^- **or** –*
or *other suitable symbols*

*centre of symbols must be on **or** inside overlapping areas within reason*

(b) (i) any **two** from: 2

- no change initially **or** stays constant at the beginning
- increase
- slowly at first and then more rapidly

accept converse arguments

*allow vapour pressure is 0 at any temperature <–100^{0}C for **1** mark*
accept positive correlation; accept explanation based on kinetic theory eg particles have more kinetic energy
allow reasonable attempt at using numbers

(ii) –44 (using graph) accept –43 to –45 1

(c) intermolecular forces / bonds **or** forces / bonds between molecules 1

- bonds / forces are weak 1

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

if they do not gain either of the marks on the left then allow simple covalent / molecular / made of small molecules for ***1*** *mark*

[6]

3. (a) $2\ Na + Cl_2 \rightarrow 2\ NaCl$ *allow* $2\ Na^+\ Cl^-$ 1

for 1 mark (allow $Na + \frac{1}{2}Cl^2 \rightarrow Na\ Cl$*)*

(b) (i) idea that 1

- it has strong (attractive) forces/bonds between ions / charged particles

for 1 mark

(not '..it has a rigid structure'- this defines a solid or '...particles close together' - they are in a liquid)

(ii) ideas that 2

- there is increased vibration of ions / particles on heating
- ions have sufficient energy to overcome attractive forces / to break out of the
- rigid structure / to move about

(must be in terms of increased energy of particles lions)

each for 1 mark

(iii) ions can go to electrodes / ions are free to move 1

for 1 mark

[do not credit 'ions carry charges']

(c) ideas that 2

- it has stronger attractive forces between atoms/particles *(not 'ions')*
- each carbon atom forms covalent bonds with neighbouring atoms

each for 1 mark

[7]

4. (a) idea that 2

- copper has free electrons / electrons that move throughout the structure

gains 1 mark

but

- in copper, electrons from the highest (occupied) energy level /outer shell, are free / can move throughout the structure

gains 2 marks

(b) idea that 3

- in graphite, only three bonds are formed by each carbon atom *for 1 mark*
- one outer electron (per atom), free to move *for 1 mark*
- an electric current is a flow of (free) electrons* *for 1 mark*

(this mark to be given in* ***either*** *(a)* ***or*** *(b) but not in both)*

[5]

5. (a) nanoparticles / they are small(er) 1

accept 1–100 nm or a few atoms in size

so can easily pass through pores / skin / cell / membranes / arteries / veins / capillaries / into blood stream owtte 1

must be a comparative statement

can be inferred from small<u>er</u> particles

allow absorbed for pass through

(b) any **one** from: 1

- may be toxic (to cells / specific cells)

  *allow may harm / damage / kill cells / organs / tissues **or** may cause cancer*

- to ensure safety **or** reduce risk **or** risk of litigation

  allow may cause allergies / side effects

  ignore harmful / dangerous unqualified eg harmful to body / people

- nanoparticles may have different properties
- to see if they pass into the body

(c) any **two** sensible ideas from eg: 2

- testing is expensive **or** testing costs money

  allow it costs money

  ignore litigation

- testing is time consuming
- don't see any reason to test since normal sized particles (of titanium oxide) do not cause harm

  *accept normal sun cream does **not** cause harm owtte*

- don't want to risk not producing a popular product (owtte)

  *eg if unsafe will have to stop production **or** have to remove product if toxic*

- testing process / unfavourable results might cause alarm / reduce sales / reduce profit (less money)
- do not want to be seen doing animal testing

[5]