M1.(a) The ore is not pure or contains impurities or the ore does not contain 100% of the metal compound

allow to concentrate the metal or metal compound

1

rock / other compounds need to be removed / separated

1

(b) (i) (cast iron is) brittle

allow not strong

ignore weak

1

(ii) the oxygen reacts with carbon

allow carbon burns in oxygen or is oxidised

1

reducing the percentage of carbon in the mixture
or producing carbon dioxide

1

(c) (i) aluminium has a low density

1

(ii) (because copper) is in the central / middle (block of the periodic table)

1

whereas aluminium is in Group 3 (of the periodic table)

1

(iii) iron is more reactive (than copper)

ignore cost

1

so copper is displaced / reduced

1

[10]

M2.(a) because atoms / ions / particles in alloy are different (sizes)

*do **not** allow reference to molecules*

ignore reference to compounds

1

so layers distorted

(and layers / atoms / ions / particles) don't slide **or** slide less easily

accept all marking points in a suitably labelled or annotated diagram

1

*if no other mark awarded accept an alloy is a mixture **or** contains different metals / elements for **1** mark*

1

(b) giant structure **or** lattice **or** macromolecule

*max **3** marks if incorrect bonding*

1

strong bonds (between carbon / atoms)

1

covalent (bonds)

1

each carbon / atom forms 4 bonds

accept tetrahedral

*if no other marks awarded, allow carbon (atoms) for **1** mark*

1

(c) *reference to incorrect bonding = max **3** reference to 'weak covalent bonds' = max **2** allow correctly drawn diagram for first two marking points eg. (tangled) lines with no cross-links*

chains **or** large molecules

ignore layers

1

with intermolecular forces **or** forces between chains

allow bonds for forces accept no cross-links

1

that are weak

must relate to 2 nd marking point

1

and are easily overcome/ broken (when heated)

accept molecules / chains can flow / move

1

[11]

M3. (a) (i) many ethene / molecules / monomers

accept double bonds open / break

1

join to form a long hydrocarbon / chain / large molecule

accept addition polymerisation

ignore references to ethane

*correct equation gains **2** marks*

1

(ii) (can be deformed but) return to their original shape (when heated or cooled)

ignore 'it remembers its shape'

1

(iii) cross links / extra bonds in PEX

accept inter-molecular bonds

ignore inter-molecular forces

1

molecules / chains in PEX are held in position

accept rigid structure

1

molecules / chains in PEX unable to slide past each other / move

it = PEX throughout

1

(b) any **four** from:

- less (hydrocarbon) fuels used

  allow less energy

- less / no electrical energy used

  allow no electrolysis

- reduce carbon / carbon dioxide emissions

  allow less global warming

- reduce / no pollution by sulfur dioxide / acid rain

- continuous process
  allow less / no transportation
- conserve copper which is running out or only low-grade ores available
- reduce the amount of solid waste rock that needs to be disposed
  allow less waste
- reduce the need to dig large holes (to extract copper ores)
  allow less mining
  ignore costs / sustainability / non-renewable

4

[10]