

- 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 2nd 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]