

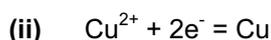
1 (a)

	copper	iron	sulphur
composition by mass/g	(4.80)		4.8 [1]
number of moles of atoms	0.075		0.15 [1]
simplest mole ratio of atoms	1		2 [1]

The empirical formula is CuFeS_2

[3]
[1]

- (b) impure copper/blister copper/boulder copper etc [1]
 (pure) copper [1]
 copper sulphate **or** nitrate **or** chloride **or** contains Cu^{2+}aq [1]



[1]

(iii) Zinc

[1]

- (c) Copper has delocalised electrons [1]
 In sulphur the electrons are localised **or** cannot move in the piece of sulphur [1]

In copper there are layers of copper atoms/ions

Which can slip

In sulphur there are no layers

[1]
[1]

[TOTAL = 13]

- 2 (a) (i) Correct equation with a more reactive metal [1]

(ii) Electron loss

[1]

(iii) Because they can accept electrons or take electrons away from.....

[1]

(iv) Silver or silver(I)

[1]

- (b) increase

[1]

(ii) zinc

COND and a correct reason - such as it loses electrons more easily **or** it is more reactive

[1]

Need both zinc and reason for the mark.

(iii) from the more reactive to the less reactive **NOT** just from zinc to lead

[1]

TOTAL = 7

- 3 (a) A correct equation either CO or CO₂ as product
If not balanced but otherwise correct [1] ONLY [2]
- (b) (i) C + O₂ → CO₂ NOT word equation [1]
(ii) (higher in furnace) no oxygen left [1]
carbon dioxide reacts with carbon (to give carbon monoxide) [1]
- OR** incomplete combustion of carbon [2]
- OR** either equation gains both marks
CO₂ + C = 2CO or 2C + O₂ = 2CO
- OR** carbon dioxide reacts [1]
with carbon [1]
- (c) limestone + sand → slag [2]
OR calcium carbonate + silicon (IV) oxide → calcium silicate (+ carbon dioxide)
- For knowing that impurity is sand [1] ONLY
- Accept calcium oxide and silicon oxide
Accept lime
- (d) (i) Cutlery **or** chemical plant **or** watches **or** utensils **or** surgical instruments **or**
cars **or** sinks **or** aircraft **or** garden tools [1]
(ii) nickel **or** chromium **or** molybdenum **or** niobium **or** titanium [1]
(iii) blow air/oxygen through
carbon becomes carbon dioxide
carbon dioxide escapes as gas
silicon and phosphorus become oxides
calcium oxide or calcium carbonate
forms slag
Any FOUR NOT blast furnace [4]
- (e) anode tin NOT impure time [1]
cathode iron or steel [1]
tin salt **or** tin ions as electrolyte [1]
NOT oxide or hydroxide or carbonate

TOTAL = 16

- 4 (a) (i) heat **or** roast [1]
in air [1]
- (ii) Either correct equation [2]
 $ZnO + C = Zn + CO$
 $2ZnO + C = 2Zn + CO_2$
Not balanced **ONLY** [1]
NOT carbon monoxide as a reductant
- (iii) bp of lead above 1400 °C it remains
bp of zinc below 1400 °C
boils away **or** forms vapour
Any TWO [2]
- OR** lead does not boil [1]
zinc boils [1]
- (b) (i) making brass **or** any zinc containing alloy **or** galvanising [1]
or sacrificial protection **or** batteries **or** roofs
- (ii) lattice **or** layers of (positive) ions
delocalised **or** free **or** mobile electrons
layers/atoms/particles can slip [3]
- (iii) different size atom **NOT** shape [1]
prevents layers from moving [1]
- (c) (i) one involving lead change 2 [1]
cond because electrons are gained [1]
or oxidation number less
- (ii) correct equation [2]
 $Zn + 2Ag^+ = 2Ag + Zn^{2+}$
not balanced **ONLY** [1]

TOTAL = 16

- 5 (a) (i) wiring **NOT** good conductor
 pipes
 utensils
 roofs
 electroplating
 lightning conductor
 bi-metallic strips
NOT coinage metal or any other use than involves an alloy
TWO from above [2]
- (ii) regular array [1]
 different sizes [1]
 delocalised **or** mobile **or** free electrons [1]
- (b) (i) copper deposited **or** mass increases [1]
- (ii) copper goes into solution **or** mass decreases [1]
- (iii) $\text{Cu}^{2+} + 2\text{e} \rightleftharpoons \text{Cu}$ [1]
- (iv) oxygen [1]
 sulphuric acid accept hydrogen sulphate [1]
- (c) (ii) cells produce electricity **or** exothermic **or** change
 chemical energy into electrical energy [1]
- electrolysis uses it **or** endothermic **or** change
 electrical energy into chemical energy [1]
- (d) (i) $\text{CuO} + \text{C} \rightleftharpoons \text{Cu} + \text{CO}$
or $2\text{CuO} + \text{C} \rightleftharpoons 2\text{Cu} + \text{CO}_2$
or any other correct reductant – hydrogen or metal [1]
- (ii) Copper(II) hydroxide = copper oxide + water [1]
 accept symbols
- (iii) $2\text{Cu}(\text{NO}_3)_2 \rightleftharpoons 2\text{CuO} + 4\text{NO}_2 + \text{O}_2$ [2]
 unbalanced ONLY [1]
NOT word equation
- TOT = 16)