

Name of the Student: _____

Max. Marks : 15 Marks

Time : 15 Minutes

Mark Schemes

Q1.

- (a) **M1** The yield of zinc oxide increases/greater
If M1 is given as "decrease" OR "no effect" then CE= 0

M2 Removal of the carbon dioxide results in the equilibrium

Either

Shifting/moving/goes to the right

shifting/moving/goes L to R

favours the forward reaction/towards the products

M3 (By Le Chatelier's principle) the reaction/equilibrium will respond so as to replace the CO₂/lost product
OR to make more CO₂
OR to increase concentration of CO₂

For M3, not simply "to oppose the change/to oppose the loss of CO₂/to oppose the removal of carbon dioxide."

3

- (b) **M1** Process 2 produces/releases SO₂
OR Process 2 produces/releases CO

M2 It/Process 3 avoids the release of SO₂ OR CO
OR It/Process 3 (captures and) converts SO₂ to H₂SO₄

M3 SO₂ causes acid rain OR is toxic/poisonous
OR CO is toxic/poisonous

3

Ignore "global warming" and "greenhouse gases" and "the ozone layer"
If both CO and SO₂ claimed to form acid rain, treat as contradiction

- (c) **M1** Process 3 (is expensive because it) uses electrolysis
OR due to high electricity/electrical consumption

M2 this is justified because the product/zinc is pure
Ignore "energy"
Penalise "purer"

2

- (d) **M1** $\text{Zn}^{2+} + 2\text{e}^{-} \longrightarrow \text{Zn}$
Ignore state symbols

M2 the negative electrode OR the cathode
Ignore absence of negative charge on electron

- (e) **M1** The reaction of ZnO with sulfuric acid
OR the second reaction in Extraction process 3

M2 neutralisation or acid-base

OR alternatively

M1 The reaction of zinc carbonate in Extraction process 1
M1 could be the equation written out in both cases

M2 (thermal) decomposition
M2 depends on correct M1

M3 It/carbon is oxidised/gains oxygen/changes oxidation state/number
from 0 to +2/increase in oxidation state/number in Process 2

Do not forget to award this mark

Ignore reference to electron loss but penalise electron gain

Ignore "carbon is a reducing agent"

3

- (f) **M1** $\text{Zn} + \text{H}_2\text{O} \longrightarrow \text{ZnO} + \text{H}_2$

M2 Zinc oxide and hydrogen

OR as an alternative

- M1** $\text{Zn} + 2\text{H}_2\text{O} \longrightarrow \text{Zn(OH)}_2 + \text{H}_2$

M2 Zinc hydroxide and hydrogen

Mark independently

If ZnO_2 is given for zinc oxide in the equation, penalise M1 and mark on

If ZnOH is given for zinc hydroxide in the equation, penalise M1 and mark on

Ignore state symbols

Credit multiples of the equation

If M1 is blank, either of the M2 answers could score

To gain both marks, the names must match the correct equation given.

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[15]