HIGHER

C10H Using Resources: Higher Tier Practice

AQA 8462 · Calculator allowed · about 95 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A student lists four processes: extraction of metal from ore, polymer manufacture, water desalination, and electroplating a coating onto steel.

(a) State which one of these processes is used to produce potable water from seawater, and name the method typically used. **(2)**

(b) State which one of these processes can be used to help prevent corrosion of steel. **(1)**

(Total for Question 1 is 3 marks)

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2 Stainless steel contains iron, chromium and sometimes nickel. State why chromium is added to steel.

(a) State the purpose of adding chromium to steel. **(1)**

(Total for Question 2 is 1 mark)

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3 A sample of impure copper ore contains 2.50 g of copper metal. After purification by electrolysis the student obtained 2.10 g of pure copper. Calculate the percentage yield of copper.

(a) Calculate the percentage yield. Give your answer to two significant figures. **(3)**

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(Total for Question 3 is 3 marks)

4 Ammonium nitrate, NH_4NO_3, is a common nitrogen-based fertiliser made industrially using ammonia produced by the Haber process. Relative atomic masses: N = 14, H = 1, O = 16.

(a) Calculate the relative formula mass (Mr) of ammonium nitrate, NH_4NO_3. **(1)**

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(b) Calculate the percentage by mass of nitrogen in ammonium nitrate. Give your answer to the nearest whole number. **(2)**

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(Total for Question 4 is 3 marks)

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5 Recycling aluminium requires only about 5% of the energy needed to extract the same mass of new aluminium from its ore by electrolysis. Extracting 1 tonne of new aluminium from its ore requires approximately 15 000 kWh of energy.

(a) Calculate the energy needed to produce 1 tonne of aluminium by recycling. **(2)**

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(b) Calculate the percentage reduction in energy used when 1 tonne of aluminium is recycled rather than extracted from ore. **(2)**

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(Total for Question 5 is 4 marks)

Mark scheme · C10H Using Resources: Higher Tier Practice

Question 1

- (a) **B1** water desalination cao
- (a) **B1** by distillation (or reverse osmosis) cao
- **(a) Answer: Water desalination, using distillation (or reverse osmosis).**
- (b) **B1** electroplating (coats the steel with an unreactive/protective metal layer to keep out air and water) cao
- **(b) Answer: Electroplating.**

Question 2

- (a) **B1** to make the steel more resistant to corrosion/rusting
- **(a) Answer: To make the steel more resistant to corrosion.**

Question 3

- (a) **M1** substitutes into yield = (actual / theoretical) x 100: (2.10 / 2.50) x 100
- (a) **M1** evaluates the division or shows 2.10 / 2.50 = 0.84 (evidence of calculation)
- (a) **A1** 84 % cao
- **(a) Answer: 84 %**

Question 4

- (a) **B1** 14 + (4 x 1) + 14 + (3 x 16) = 80 cao
- **(a) Answer: 80**
- (b) **M1** substitutes total mass of N = 2 x 14 = 28 into %N = (28 / 80) x 100
- (b) **A1** 35% cao
- **(b) Answer: 35%**

Question 5

- (a) **M1** substitutes: 15 000 x 0.05
- (a) **A1** 750 kWh cao
- **(a) Answer: 750 kWh**
- (b) **M1** substitutes: ((15 000 - 750) / 15 000) x 100
- (b) **A1** 95% cao
- **(b) Answer: 95%**