2.8 Electrolysis of Molten and Aqueous Compounds: Test Pack

Total Marks

EDEXCEL 4CH1 · Calculator allowed · about 15 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Define the term 'electrolyte' as used when discussing molten or aqueous electrolysis.

(Total for Question 1 is 1 mark)

2 A school uses platinum rods to electrolyse an aqueous ionic solution. State one reason platinum is suitable as an electrode material for this purpose.

(Total for Question 2 is 1 mark)

3 A learner electrolyses aqueous copper(II) sulfate using graphite electrodes. Give one visible change at the cathode and one visible change at the anode.

(Total for Question 3 is 2 marks)

4 Molten zinc chloride is electrolysed using inert carbon (graphite) electrodes. State what happens to Zn^{2+} ions at the cathode and describe one observation that would show zinc chloride is being electrolysed.

(Total for Question 4 is 2 marks)

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5 Predict the products at the electrodes when aqueous copper(II) sulfate is electrolysed using inert electrodes, and state the colour change if any in the solution.

(Total for Question 5 is 2 marks)

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6 Describe briefly how electroplating is carried out using copper electrodes and a copper(II) sulfate solution, and explain why using a copper anode is important in this reactive-electrode method.

(Total for Question 6 is 4 marks)

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Mark scheme · 2.8 Electrolysis of Molten and Aqueous Compounds: Test Pack

Question 1

a substance that contains ions and conducts electricity when molten or in solution **B1**

Answer: A substance that contains ions and conducts electricity when molten or dissolved in water.

Question 2

platinum is inert and does not react with the electrolyte or products, or it conducts electricity **B1**

Answer: Platinum is inert and does not react with the electrolyte or products.

Question 3

a pink-brown copper coating forms on the cathode **B1**

bubbles of oxygen form at the anode **B1**

Answer: A pink-brown copper coating forms at the cathode, and oxygen bubbles form at the anode.

Question 4

Zn^{2+} ions gain electrons and form zinc metal at the cathode **B1**

a visible change such as zinc depositing at the cathode or bubbles of chlorine at the anode **B1**

Answer: Zn^{2+} ions gain electrons and form zinc metal; zinc appears as a deposit at the cathode (chlorine bubbles at the anode would also be observed).

Question 5

at the cathode: copper metal is deposited from reduction of Cu^{2+} **B1**

at the anode: oxygen gas is produced from oxidation of water/ OH^-; solution becomes paler as Cu^{2+} is removed **B1**

Answer: Cathode: copper metal deposited. Anode: oxygen gas produced. The blue colour of Cu^{2+} in solution becomes paler as copper ions are removed.

Question 6

description: the object to be plated is the cathode and a copper block is the anode, both immersed in $CuSO_4$ solution **B1**

copper ions are reduced at the cathode to coat the object with copper **B1**

the copper anode dissolves producing Cu^{2+} ions to replace those removed from the solution **B1**

explanation: using a copper anode keeps the Cu^{2+} concentration steady so plating is even and the solution does not become depleted **B1**

Answer: The item to be plated is the cathode, a copper block is the anode, and both sit in $CuSO_4$ solution. Cu^{2+} is reduced at the cathode to form a copper coating; the copper anode dissolves to supply more Cu^{2+}, keeping the solution concentration steady for even plating.

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