Electrochemistry – 2021 O Level

1. Nov/2021/Paper_11/No.14

Which statement about electrolysis reactions is correct?

A Bromine is formed at the anode when molten lead bromide is electrolysed.

B Positive ions are discharged at the positive electrode.

C Sodium is formed at the cathode when aqueous sodium chloride is electrolysed.

D Sulfur dioxide is formed as a gas when dilute sulfuric acid is electrolysed.

2. Nov/2021/Paper_11/No.15

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3. Nov/2021/Paper_12/No.14

Which statement about the electrolysis of solutions is correct?

A During the electrolysis of concentrated aqueous sodium chloride solution, hydrogen is produced at the cathode.

B During the electrolysis of dilute sulfuric acid, oxygen is produced at the cathode.

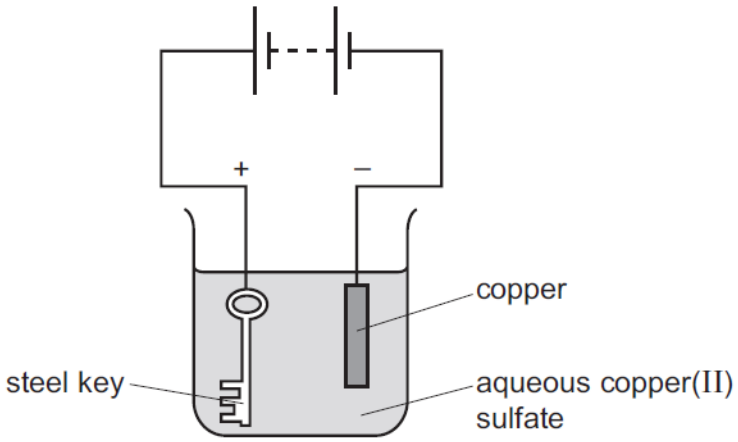
C When aqueous copper(II) sulfate is electrolysed, the reaction taking place at the cathode is

$$Cu^{+}(aq) + e^{-} \rightarrow Cu(s).$$

D When aqueous copper(II) sulfate is electrolysed using copper electrodes, the mass of the anode at the end of the reaction will be greater than at the beginning.

4. Nov/2021/Paper_12/No.15

The apparatus shown is set up to plate a steel key with copper.



The key does not get coated with copper.

Which change needs to be made to plate the key?

A Increase the concentration of the aqueous copper(II) sulfate.

B Increase the voltage.

C Replace the solution with dilute sulfuric acid.

D Reverse the electrical connections.

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5. Nov/2021/Paper_22/No.5

Lithium reacts with aqueous zinc iodide.

$$2Li + ZnI_2 \rightarrow 2LiI + Zn$$

(a) Explain, by referring to the equation, why this reaction involves both oxidation and reduction.

.....

.....

..... [2]

(b) Acidified aqueous silver nitrate is added to aqueous zinc iodide.
State the observations made.

..... [1]

(c) **(i)** When aqueous bromine reacts with aqueous zinc iodide a brown solution is formed.

Name the products of this reaction.

..... and ..... [1]

(ii) Explain why aqueous bromine does not react with aqueous zinc chloride.

..... [1]

[Total: 5]

6. Jun/2021/Paper_11/No.13

An aqueous mixture of copper(II) nitrate and silver nitrate is electrolysed with pure copper electrodes.

Which half-equation correctly describes the change occurring at the anode?

A $Cu \rightarrow Cu^{2+} + 2e^-$

B $Cu^{2+} + 2e^- \rightarrow Cu$

C $Ag \rightarrow Ag^+ + e^-$

D $Ag^+ + e^- \rightarrow Ag$

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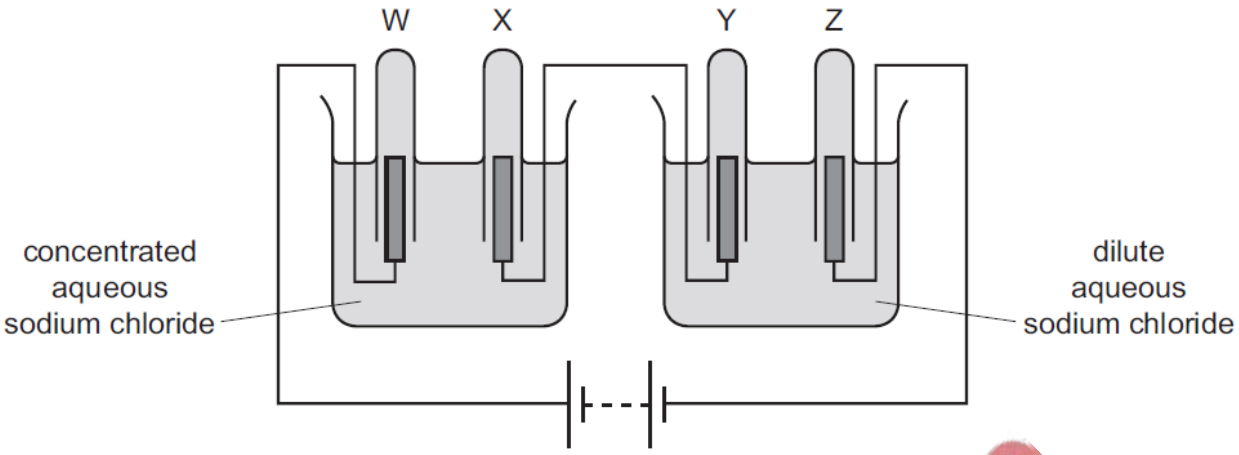
7. Jun/2021/Paper_11/No.14

The diagram shows the electrolysis of concentrated and dilute aqueous sodium chloride using inert electrodes. Gases are produced and collected in each of the test-tubes W, X, Y and Z.



Which statements are correct?

1 Approximately equal volumes of gas are produced and collected in test-tubes W and X.

2 Approximately equal volumes of gas are produced and collected in test-tubes Y and Z.

3 Three different gases are produced in the experiment.

A 1, 2 and 3 **B** 1 and 2 only **C** 2 and 3 only **D** 1 and 3 only

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8. Jun/2021/Paper_11/No.15

Which positive ions are present in aqueous copper(II) sulfate?

A copper(II) ions only

B copper(II) ions and hydrogen ions

C sulfate ions only

D sulfate ions and hydroxide ions

9. Jun/2021/Paper_11/No.20

In which equations is the change in the underlined species correct?

1 $\underline{C}H_4 + 2O_2 \rightarrow \underline{C}O_2 + 2H_2O$ (oxidation)

2 $2H_2\underline{S} + SO_2 \rightarrow 3\underline{S} + 2H_2O$ (reduction)

3 $BrO_3^- + 5\underline{Br}^- + 6H^+ \rightarrow 3\underline{Br}_2 + 3H_2O$ (reduction)

A 1 only **B** 2 only **C** 1 and 3 **D** 2 and 3

10. Jun/2021/Paper_12/No.14

Molten sodium chloride is electrolysed.

Which change occurs at the cathode?

A Sodium ions are oxidised.

B Sodium ions are reduced.

C Chloride ions are oxidised.

D Chloride ions are reduced.

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11. Jun/2021/Paper_12/No.15

Which positive ions are present in aqueous copper(II) sulfate?

A copper(II) ions only

B copper(II) ions and hydrogen ions

C sulfate ions only

D sulfate ions and hydroxide ions

12. Jun/2021/Paper_21/No.8e

(e) Aqueous silver nitrate, $AgNO_3(aq)$, is electrolysed using inert electrodes.

The products of the electrolysis are silver and oxygen.

(i) Silver ions are reduced at the cathode to make silver atoms.

Construct the ionic equation for this reduction.

..... [1]

(ii) Hydroxide ions are oxidised at the anode to make both oxygen molecules and water molecules.

Construct the ionic equation for this oxidation.

..... [1]

(iii) Explain why solid silver nitrate cannot be electrolysed.

.....

..... [1]

(f) Acidified aqueous silver nitrate reacts with aqueous sodium iodide.

State the observations for this reaction.

..... [1]

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13. Jun/2021/Paper_22/No.4

Zinc bromide and zinc carbonate are both ionic compounds.

(a) Predict two physical properties, other than electrical conductivity, of zinc bromide.

1. .....

2. .....

[2]

(b) Zinc reacts with bromine to make zinc bromide.

$$Zn + Br_2 \rightarrow ZnBr_2$$

Zinc bromide contains Zn^{2+} and Br^- ions.

Explain, in terms of the movement of electrons, how $ZnBr_2$ is formed from zinc atoms and bromine molecules.

.....

.....

..... [2]

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(c) Aqueous zinc bromide reacts with magnesium as shown.

$$Zn^{2+} + Mg \longrightarrow Mg^{2+} + Zn$$

(i) Use the equation to explain that oxidation takes place.

.....

..... [1]

(ii) Use the equation to explain that reduction takes place.

.....

..... [1]

(d) Zinc carbonate is insoluble in water.

(i) Zinc carbonate can be prepared by reacting aqueous zinc bromide with CO_3^{2-}(aq) ions in a precipitation reaction.

Name a suitable aqueous solution that can provide CO_3^{2-}(aq) ions.

..... [1]

(ii) A sample of zinc carbonate is heated strongly.

Name the products of this reaction.

..... [1]

[Total: 8]

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