

ELECTROLYSIS

Syllabus reference 9.6.3

- 1 Complete the following. Factors that determine the products of an electrolysis reaction are the:
- chemical nature of the electrolyte in the solution
 - Concentration of the ions present
 - Nature of the electrodes.

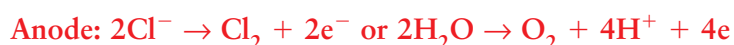
For questions 2–8 circle the letter corresponding to the most correct answer.

- 2 Which of the following best identifies the anode in an electrolytic cell? It is the electrode at which:
- anions are discharged
 - no gas can be evolved
 - hydroxide ions are produced
 - oxidation occurs**
- 3 Consider the electrolysis of a concentrated aqueous solution of sodium chloride using inert electrodes. Which of the following equations represents the reaction at the positive electrode?
- $2\text{H}_2\text{O} + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{OH}^-$
 - $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$
 - $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$**
 - $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
- 4 When a dilute solution of hydrochloric acid undergoes electrolysis using inert electrodes:
- oxygen is produced at the anode and chloride ions are oxidised
 - oxygen is produced at the cathode and chloride ions are oxidised
 - oxygen is produced at the anode and hydrogen ions are reduced**
 - hydrogen is produced at the anode and chloride ions are oxidised
- 5 The production of pure copper in commercial quantities involves electrolysis of a copper sulfate solution using copper electrodes. During this process:
- copper metal is deposited on the positive electrode
 - hydrogen gas is given off at the negative electrode
 - copper ions migrate towards the anode
 - the mass of the anode decreases**
- 6 For an electrolytic cell the cathode is:
- negative and the site of oxidation
 - positive and the site of oxidation
 - negative and the site of reduction**
 - positive and the site of reduction

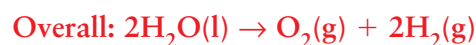
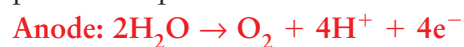
- 7 Which of the following does *not* affect the rate of an electrolytic reaction?
- A inert electrodes
 - B voltage applied
 - C concentration of ions in the electrolyte
 - D distance between electrodes
- 8 If 500 electrons per second are being released at one electrode of an electrolytic cell, the number of electrons per second being used up at the other electrode is:
- A at least 500
 - B exactly 500
 - C greater than 500
 - D dependent on the chemicals used

- 9 For the electrolysis of a neutral nickel(II) chloride aqueous solution using inert platinum electrodes, predict the electrode reactions. Give the electrode half-reactions and the overall cell reaction.

Depending on concentration:



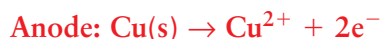
- 10 For the electrolysis of a 1.00 mol/L aqueous solution of potassium sulfate using inert electrodes, predict the products at the anode and cathode and write the overall equation.



- 11 Predict the anode and cathode reactions for the electrolysis of copper bromide solution with copper electrodes.



- 12 A neutral solution of $\text{Pb}(\text{NO}_3)_2$ is electrolysed using copper electrodes. Referring to the table of electrode potentials in your textbook, write the half-cell and overall cell reactions.



- 13 Write a statement explaining the relationship between the rate of product formation and the current that passes through an electrolysis cell.

The higher the current, the greater the rate of product formation.

- 14 Classify each of the following statements as true or false. For those statements that are false rewrite them so they are true.

- a The higher the voltage the lower the current.

FALSE The higher the voltage the HIGHER the current.

- b The higher the conductance, the lower the resistance and the greater the current.

TRUE

- c Increasing the concentration of ions in solution increases the conductance.

TRUE

- d The greater the surface area of the electrodes, the lower the electrical conductance.

FALSE The greater surface area of the electrodes the GREATER the electrical conductance.

- e Changing the distance between electrodes has no effect on conductance.

FALSE Changing the distance between electrodes AFFECTS THE conductance.
