Answer all the questions below then check your answers.

1. What is electrolysis?

   a) A process that uses electricity to decompose compounds
   b) A process that generates electricity
   c) A process that combines elements into compounds
   d) A process that distills water

2. What happens at the anode during the electrolysis of molten ionic compounds?

   a) Reduction
   b) Oxidation
   c) Neutralization
   d) Sublimation

3. Which of the following is an example of an electrolyte?

   a) Solid sodium chloride
   b) Molten sodium chloride
   c) Solid sulfur
   d) Water

4. Complete the table below to show the products formed at the anode and cathode during the electrolysis of the molten ionic compounds shown:

Molten Ionic Compound	Product at Anode	Product at Cathode
$NaCl$		
$PbBr_2$		
Al_2O_3		

5. Fill in the gaps below to complete the sentences:

a. During electrolysis, cations move towards the _____.

b. Solid ionic compounds do not conduct electricity because the ions are _____ in place.

c. An electrolyte is a substance that conducts electricity when _____ or in aqueous solution.

6. Define an electrolyte.

7. Why do solid ionic compounds not conduct electricity?

8. Write the half-equation for the reaction at the cathode during the electrolysis of molten sodium chloride.

a. Write the half-equation for the reaction at the anode during the electrolysis of molten sodium chloride.

9. Explain the process occurring at the cathode during electrolysis.

10. What is formed at the anode during the electrolysis of molten lead bromide?

a. State the charge of the ions that move towards the anode.

11. During the electrolysis of molten sodium chloride, which element is deposited at the cathode?

12. Explain why molten ionic compounds can conduct electricity but solid ionic compounds cannot.

13. Describe the changes that occur at the anode and cathode during the electrolysis of molten aluminium oxide (Al_2O_3).

14. Describe in detail the electrolysis of molten sodium chloride, including the ions involved, the reactions at the electrodes, and the overall chemical equation.

Answers

1. What is electrolysis?

   a) A process that uses electricity to decompose compounds
   b) A process that generates electricity
   c) A process that combines elements into compounds
   d) A process that distills water

Answer: a) A process that uses electricity to decompose compounds

2. What happens at the anode during the electrolysis of molten ionic compounds?

   a) Reduction
   b) Oxidation
   c) Neutralization
   d) Sublimation

Answer: b) Oxidation

3. Which of the following is an example of an electrolyte?

   a) Solid sodium chloride
   b) Molten sodium chloride
   c) Solid sulfur
   d) Water

Answer: b) Molten sodium chloride

4. Complete the table below to show the products formed at the anode and cathode during the electrolysis of the molten ionic compounds shown:

Molten Ionic Compound	Product at Anode	Product at Cathode
$NaCl$	Chlorine gas (Cl_2)	Sodium metal (Na)
$PbBr_2$	Bromine gas (Br_2)	Lead metal (Pb)
Al_2O_3	Oxygen gas (O_2)	Aluminium metal (Al)

5. Fill in the gaps below to complete the sentences:

a. During electrolysis, cations move towards the _____.

Answer: cathode

b. Solid ionic compounds do not conduct electricity because the ions are _____ in place.

Answer: fixed

c. An electrolyte is a substance that conducts electricity when _____ or in aqueous solution.

Answer: molten

6. Define an electrolyte.

Answer: An electrolyte is a substance that conducts electricity when molten or dissolved in water, due to the presence of free-moving ions.

7. Why do solid ionic compounds not conduct electricity?

Answer: Solid ionic compounds do not conduct electricity because the ions are fixed in place within the lattice structure and cannot move freely to carry the charge.

8. Write the half-equation for the reaction at the cathode during the electrolysis of molten sodium chloride.

Answer: Cathode (reduction): $Na^+ + e \rightarrow Na$

a. Write the half-equation for the reaction at the anode during the electrolysis of molten sodium chloride.

Answer: Anode (oxidation): $2Cl^- \rightarrow Cl_2 + 2e$

9. Explain the process occurring at the cathode during electrolysis.

Answer: At the cathode, reduction occurs. Positively charged ions (cations) gain electrons to form neutral atoms. For example, in the electrolysis of molten sodium chloride, sodium ions (Na^+) gain electrons to form sodium metal (Na).

10. What is formed at the anode during the electrolysis of molten lead bromide?

Answer: Bromine gas (Br_2)

a. State the charge of the ions that move towards the anode.

Answer: Negative

11. During the electrolysis of molten sodium chloride, which element is deposited at the cathode?

Answer: Sodium

12. Explain why molten ionic compounds can conduct electricity but solid ionic compounds cannot.

Answer: Molten ionic compounds can conduct electricity because the ions are free to move and carry the electric charge. In solid ionic compounds, the ions are held in a fixed lattice structure and cannot move, so they cannot conduct electricity.

13. Describe the changes that occur at the anode and cathode during the electrolysis of molten aluminium oxide (Al_2O_3).

Answer:

At the cathode, aluminium ions (Al^{3+}) gain electrons to form aluminium metal:

$Al^{3+} + 3e \rightarrow Al$

At the anode, oxide ions (O^{2-}) lose electrons to form oxygen gas:

$2O^{2-} \rightarrow O_2 + 4e$

14. Describe in detail the electrolysis of molten sodium chloride, including the ions involved, the reactions at the electrodes, and the overall chemical equation.

Answer: In the electrolysis of molten sodium chloride, the electrolyte is molten NaCl. When NaCl is molten, it dissociates into Na^+ and Cl^- ions.

At the cathode (negative electrode), sodium ions (Na^+) gain electrons to form sodium metal: $Na^+ + e \rightarrow Na$

At the anode (positive electrode), chloride ions (Cl^-) lose electrons to form chlorine gas: $2Cl^- \rightarrow Cl_2 + 2e$

The overall chemical equation for the electrolysis of molten sodium chloride is:

$2NaCl \rightarrow 2Na + Cl_2$, the sodium chloride is split up into the elements that make it up.

During this process, sodium metal is deposited at the cathode, and chlorine gas is released at the anode. This demonstrates the decomposition of the compound into its constituent elements through the application of electrical energy.