Molten electrolysis: products and half-equations

Student activity • observation and reasoning

YEAR 11 / LESSON 110 / CHEMISTRY ONLY

The question

How does electron transfer account for the products?

Use recorded evidence for molten lead(II) bromide and write balanced electrode equations. Explain why heating alone and electrolysis are different processes.

Equipment

- Booklet, pencil, periodic table and optional molecular model kit

Desk activity only; keep small model pieces away from mouths.

Course coverage: Chemistry only: 1.58C–1.59C. Recorded-evidence lesson; no lead salt, bromine or molten-salt apparatus is issued.

Plan, model or apparatus sketch

Draw a labelled structure or model to explain your reasoning for this lesson.

Method and reasoning

Read the whole sequence before starting

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1. Draw molten $PbBr_2$ as mobile Pb^{2+} and Br^- ions.

2. Label negative cathode and positive anode connected to a DC supply.

3. Use supplied reference evidence: lead forms at the cathode and bromine at the anode when current passes through the melt.

4. Balance $Pb^{2+} + 2e^- \rightarrow Pb$ and $2Br^- \rightarrow Br_2 + 2e^-$; check both atoms and charge.

5. Identify reduction as electron gain and oxidation as electron loss.

6. Combine the half-equations and explain why a current-dependent decomposition differs from melting alone.

Cleanup

- Return shared equipment and retain corrected reasoning.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Reference evidence, not a classroom observation: solid $PbBr_2$ does not conduct; the melt conducts, with lead at the negative electrode and bromine at the positive electrode. The original live demonstration requires specialist heat/fume controls; this activity uses the written evidence only.

Task	My structure / working	Reason / correction
Cathode		
Anode		
Overall / evidence		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Which ions move to the cathode?

2. Write the cathode equation.

3. Write the anode equation.

4. Which electrode process is oxidation?

5. Write the overall decomposition.

6. Why must this not become an improvised pupil experiment?