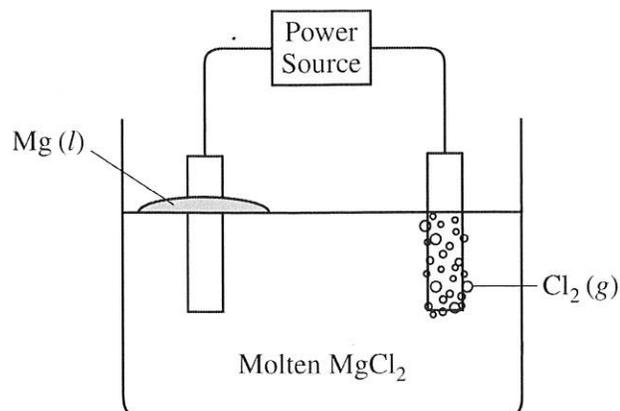


Begin your response to **QUESTION 5** on this page.

Half-Reaction	$E^\circ$ (V)
$\text{Mg}^{2+} + 2 e^- \rightarrow \text{Mg}$	-2.37
$\text{Cl}_2 + 2 e^- \rightarrow 2 \text{Cl}^-$	+1.36

5. Molten  $\text{MgCl}_2$  can be decomposed into its elements if a sufficient voltage is applied using inert electrodes. The products of the reaction are liquid  $\text{Mg}$  (at the cathode) and  $\text{Cl}_2$  gas (at the anode). A simplified representation of the cell is shown above. The reduction half-reactions related to the overall reaction in the cell are given in the table.

(a) Draw an arrow on the diagram to show the direction of electron flow through the external circuit as the cell operates.

(b) Would an applied voltage of 2.0 V be sufficient for the reaction to occur? Support your claim with a calculation as part of your answer.

(c) If the current in the cell is kept at a constant 5.00 amps, how many seconds does it take to produce 2.00 g of  $\text{Mg}(l)$  at the cathode?

**GO ON TO THE NEXT PAGE.**

Use a pencil or pen with black or dark blue ink only. Do NOT write your name. Do NOT write outside the box.