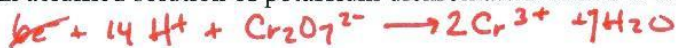


21 • Electron Transfer Reactions

QUICK CHECK 1

☐ Balancing Redox Equations

An acidified solution of potassium dichromate is added to a solution of iron(II) sulfate.



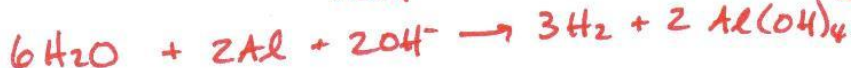
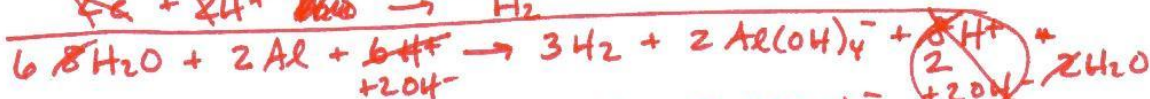
From Green Sheet



Fe²⁺ gets oxidized

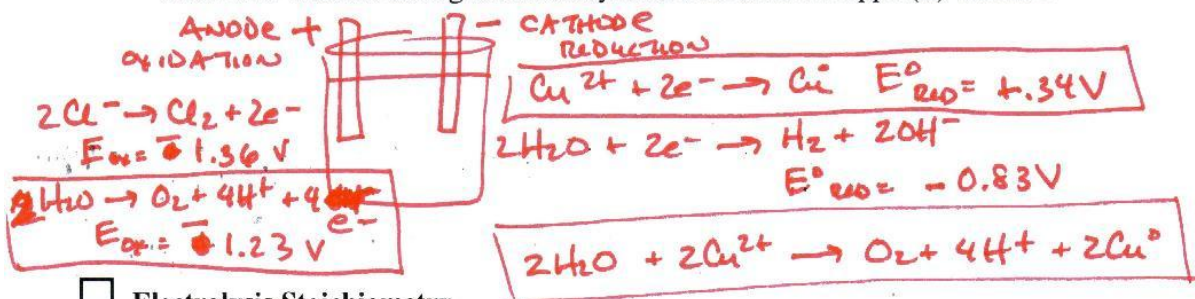


Aluminum metal is added to a strongly basic solution of sodium hydroxide forming bubbles of hydrogen gas and the complex ion, Al(OH)₄⁻.



☐ Electrolysis Reactions

Use your Reduction Potential Chart to determine the reaction at the anode, reaction at the cathode, and the overall reaction during the electrolysis of a solution of copper(II) chloride.



☐ Electrolysis Stoichiometry

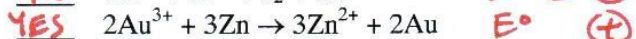
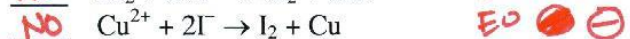
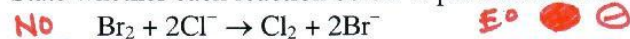
A current of 2.50 amps is passed through a solution of Ni(NO₃)₂ for 2.00 hours.

What mass of Ni metal is deposited?

$$2.50 \text{ amp} \times 2 \text{ hr} \times \frac{3600 \text{ s}}{1 \text{ hr}} \times \frac{1 \text{ C}}{1 \text{ amp} \cdot \text{s}} \times \frac{1 \text{ mole } e^-}{96500 \text{ C}} \times \frac{1 \text{ mole Ni}}{2 \text{ mole } e^-} \times \frac{58.69 \text{ g}}{1 \text{ mole Ni}} = 5.47 \text{ g Ni}$$

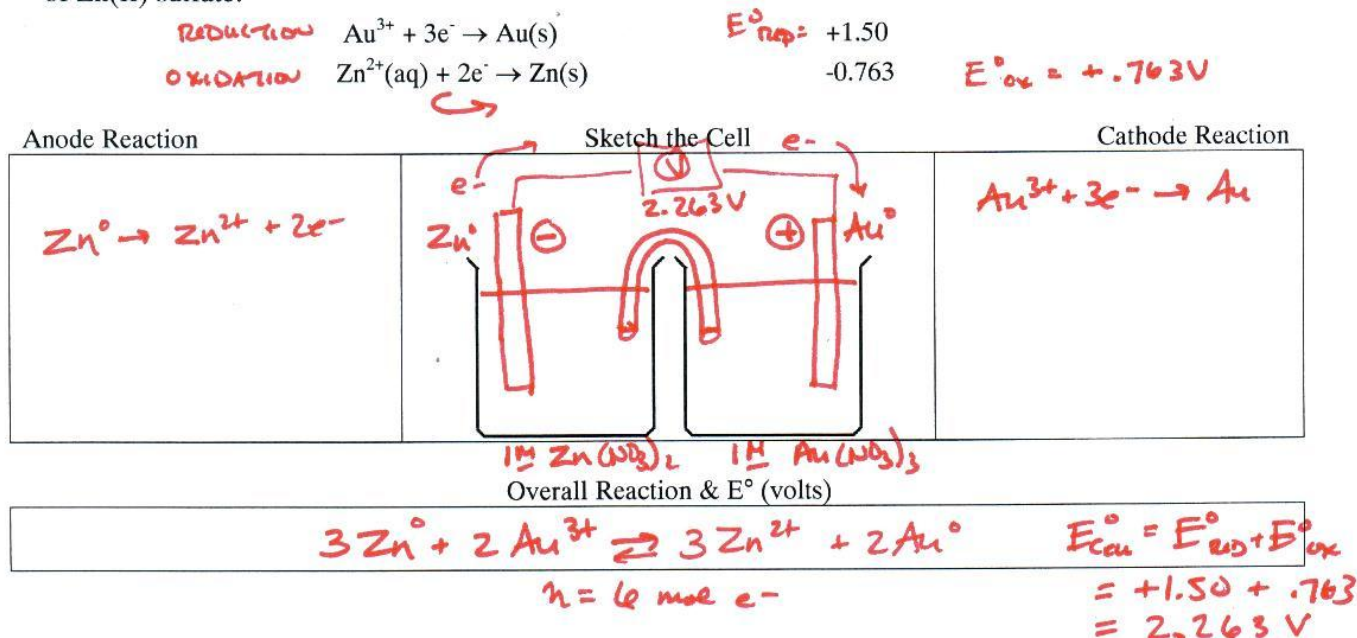
☐ Predicting Spontaneous (Product-Favored) Reactions

State whether each reaction below is product-favored or not. Use your reduction potential chart.



Electrochemical Cell

Sketch the cell made from Au in a 1.0 M solution of gold(III) nitrate and Zn in a 1.0 M solution of Zn(II) sulfate.



Non-Standard Electrochemical Cell

Calculate the voltage of the above cell if the $[\text{Au}^{3+}] = 5.00 \text{ M}$ and $[\text{Zn}^{2+}] = 0.100 \text{ M}$.

$Q = \frac{[\text{Zn}^{2+}]^3}{[\text{Au}^{3+}]^2} = \frac{(0.100 \text{ M})^3}{(5.00 \text{ M})^2} = 4.00 \times 10^{-5}$
 $E_{\text{cell}} = E^\circ_{\text{cell}} - \frac{0.0592}{n} \log Q$
 $= 2.263 - \frac{0.0592}{6} \log (4 \times 10^{-5})$
 $= 2.306 \text{ V}$

expect higher voltage than E°_{cell}

Alkali Metal in Water

Write the balanced chemical equation for the reaction of potassium metal dropped into water.



Oxidation-Reduction of Alkali Metals in Water

Which element in the chemical equation above, was oxidized and which element was reduced?

~~K~~ was oxidized and was the reducing agent
~~H₂O~~ was reduced and was the oxidizing agent

Electrolysis of Water

Write the balanced chemical equation for the electrolysis (or decomposition) of water.



What are the two **half-reactions** for this overall reaction, showing the reduction and the oxidation?

