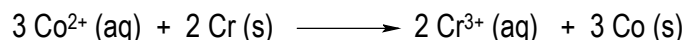


CONCEPT: CELL POTENTIAL AND GIBBS FREE ENERGY

- In terms of electrochemical cells, Gibbs Free Energy () represents the electrical work that can be created.
 - Connections between spontaneity, Gibbs Free Energy and standard cell potential are illustrated by the formula:

$E^\circ_{\text{Cell}} - \Delta G$ Formula	
$\Delta G^\circ = - \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}}$	<input type="checkbox"/> ΔG° = Gibbs Free Energy in <u> </u> .
	<input type="checkbox"/> <u> </u> = moles of e^- transferred
	<input type="checkbox"/> <u> </u> = Faraday's Constant in <u> </u>
	<input type="checkbox"/> <u> </u> = Cell Potential in <u> </u> (V)

EXAMPLE: Calculate the maximum electrical work that can be produced by this cell.



Given the following reduction potentials:



Faraday's Constant

- Represents the (C) in coulombs of 1 mole of electrons and is named after the British scientist Michael Faraday.
 - The that passes through the cell equals the moles of e^- times Faraday's constant.

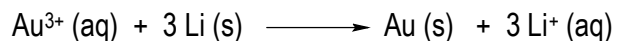
Electrochemical Cell Charge

$$\text{Charge} = \underline{\hspace{1cm}} \cdot \underline{\hspace{1cm}}$$

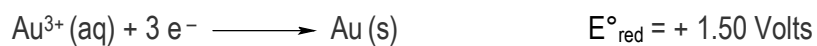
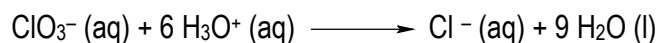
- The **conversion factor** between coulombs and Joules is $1 \text{ C} = \underline{\hspace{1cm}} \text{ J/V}$.

Faraday's Constant Units		
When using C	Conversion Factor	When using J/V
$\frac{\text{C}}{\text{mol } e^-}$		$\frac{\text{J}}{\text{V} \cdot \text{mol } e^-}$

EXAMPLE: Determine the overall charge (C) when an aluminum solid is oxidized as an anode.

CONCEPT: CELL POTENTIAL AND GIBBS FREE ENERGY**PRACTICE:** What is the gibbs free energy change for the given reaction at 25°C?

Given the following reduction potentials:

**PRACTICE:** The reduction of chlorate is given by the equation:

If the standard cell potential is given as 1.373 V, how many electrons are transferred under standard conditions?

Substance	G°_f (kJ/mol)
$\text{ClO}_3^{-}(\text{aq})$	- 717.5
$\text{H}_3\text{O}^{+}(\text{aq})$	- 103.4
$\text{Cl}^{-}(\text{aq})$	- 131.2
$\text{H}_2\text{O}(\text{l})$	- 237.1