

## CONCEPT: CELL POTENTIAL: THE NERNST EQUATION

### The Reaction Quotient

- Recall, the reaction quotient (  $Q$  ) is \_\_\_\_\_ of product to reactant concentrations at a particular time.
  - It can be calculated by setting up an expression and ignoring \_\_\_\_\_ and \_\_\_\_\_.
  - For electrochemical cells, it helps find the \_\_\_\_\_ potential at the exact moment the cell circuit is connected.

**EXAMPLE:** What is the reaction quotient for the following redox reaction with the given concentrations?



### Calculate Nonstandard Cell Potential

- Recall, standard cell potential is calculated when ions in half-cells have values of \_\_\_\_\_ M, \_\_\_\_\_ atm and pH = \_\_\_\_\_.
  - The **Nernst Equation** is used to find the cell potential when ion concentration(s) \_\_\_\_\_ M.

#### **The Nernst Equation Formula**

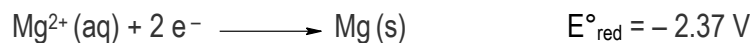
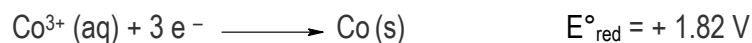
$$E_{\text{Cell}} = \text{_____} - \text{_____} \log Q$$

- \_\_\_\_\_ = Nonstandard Cell Potential
- \_\_\_\_\_ = Standard Cell Potential
- \_\_\_\_\_ = moles of  $e^{-}$  transferred
- \_\_\_\_\_ = Reaction Quotient

**EXAMPLE:** Calculate the cell potential for a reaction at 25.0°C when given the following ionic concentrations and standard reduction potentials.

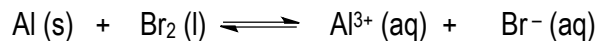
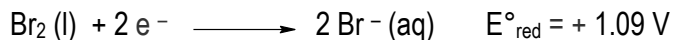


### Standard Reduction Potentials

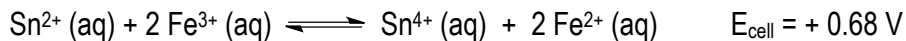


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**PRACTICE:** If  $[\text{Br}^-] = 0.010 \text{ M}$  and  $[\text{Al}^{3+}] = 0.022 \text{ M}$ , predict whether the following reaction would proceed spontaneously as written at  $25^\circ\text{C}$ :

**Standard Reduction Potentials**

**PRACTICE:** Determine  $[\text{Fe}^{2+}]$  for the following galvanic cell at  $25^\circ\text{C}$  if given  $[\text{Sn}^{2+}] = 0.072 \text{ M}$ ,  $[\text{Fe}^{3+}] = 0.0219 \text{ M}$ , and  $[\text{Sn}^{4+}] = 0.00345 \text{ M}$ .

**Standard Reduction Potentials**