

Name: _____
Blk: _____ Date: _____

Chemistry 12
Electrochem Lesson #9
STANDARD REDUCTION POTENTIALS

The tendency of _____ to flow in an electrochemical cell is called the _____ or _____ to do work.

VOLTAGE is the **WORK DONE** per **ELECTRON TRANSFERRED!**

To measure the electrical potentials the _____ between two electrical potentials of two different _____ is measured.

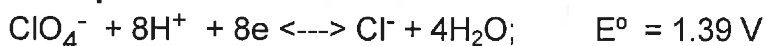
The ZERO POINT on the voltage scale for the half-reaction of _____
Is arbitrarily set! $2\text{H}^+ + 2\text{e} \rightleftharpoons \text{H}_2(\text{g}); E^\circ = 0.00\text{V}$

E° is the Standard REDUCTION potential (in Volts)
"°" implies a **STANDARD STATE**.

An electrochemical cell is in a **STANDARD STATE** if:

- i.
- ii.
- iii.
- iv.

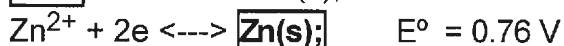
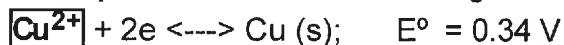
Example 1. For the half-reactions:



NOTE:

The voltages for each half-reaction is relative to the **HYDROGEN HALF-CELL!!!**

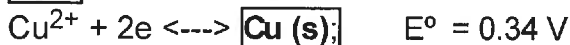
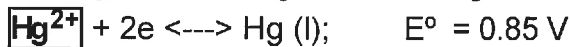
Example #2: When the following half reactions are combined:



Note: Writing the half-reaction as an oxidation half reaction requires that you switch the sign of E°

Cu^{2+} reacts with $\text{Zn}(\text{s})$ so that the resulting $E^\circ = 1.10 \checkmark$

Example 3: Joining the following half-reactions:



Hg^{2+} reacts with Cu (s) so that the resulting $E^\circ = 0.51 \text{ V}$

Another way to calculate E° is to use the values for each half-reaction and plugging them in (NOT CHANGING THEIR SIGN) to the following equation:

$$E^\circ \text{ cell} = E^\circ \text{ red} - E^\circ \text{ ox}$$

Example 4: Calculate the potential ($E^\circ \text{ cell}$) of the cell $\text{Ni}^{2+} + \text{Fe} \rightarrow \text{Ni} + \text{Fe}^{2+}$

1. Write out the individual half-reactions with their E° values

2. re-Write the half-reactions according to how they are acting in the above redox equation (changing the E° on the oxidation half-reaction)

3. Add the two E° values together

4. OR use $E^\circ \text{ cell} = E^\circ \text{ red} - E^\circ \text{ ox}$

Example 5: Use either of the two techniques above to calculate the potential for the cell $\text{Ni} + \text{Fe}^{2+} \rightarrow \text{Ni}^{2+} + \text{Fe}$

NOTICE: if the E° value is **POSITIVE**, the reaction is **SPONTANEOUS**

If the E° value is **NEGATIVE**, the reaction is **NON-SPONTANEOUS**

Seatwork/Homework: Read pgs 218- 224 before attempting Exercises 36- 41 (odd letters ie a,c, e etc) pg 224-225 and **PLO's U6 - U10**