What are Standard Electrode Potentials?

Worksheet

A standard electrode potential (E) is the voltage of a half-reaction at standard conditions (1 M concentration, 25C, 1 atm), with hydrogen as reference (0 V). More positive = stronger oxidizer, more negative = stronger reducer.

Questions

1. Which half-reaction is the strongest oxidizer? F2F (+2.87V) or Cl2Cl (+1.36V)?

A) Cl2Cl
B) F2F
C) Both equal
D) Cannot determine

2. In a Zn-Cu cell, which is cathode? (Zn: 0.76V, Cu: +0.34V)

A) Zn
B) Cu
C) Both
D) Neither

3. Ecell = 0.50 V. Is the reaction spontaneous?

A) Yes
B) No
C) Equilibrium
D) Cannot determine

4. Standard conditions include:

A) 1 atm, 25C, 1 M concentration
B) 10 atm, 100C, 0.1 M
C) 1 bar, 0C, 2 M
D) varies per reaction

5. Cell with Cu/Cu (+0.34 V) and Zn/Zn (0.76 V). Which is cathode?

6. Can Br oxidize Fe to Fe? (Br/Br: +1.07 V; Fe/Fe: +0.77 V)

7. Rank Ag, Cu, Zn as oxidizing strength (Ag/Ag: +0.80 V, Cu/Cu: +0.34 V, Zn/Zn: 0.76 V).

8. Define: What is a standard electrode potential?

9. Define: What does a positive E mean?

10. Define: What does negative E mean?

Answer Key

1. B) F2F - Higher E = stronger oxidizer. +2.87 > +1.36.
2. B) Cu - Cathode = higher E. Cu (+0.34V) > Zn (0.76V).
3. B) No - Ecell < 0 means non-spontaneous (reverse is favoured).
4. A) 1 atm, 25C, 1 M concentration - IUPAC standard = 1 bar (1 atm), 25C, 1 M.
5. Cathode = higher E = Cu/Cu Anode = lower E = Zn/Zn Cell potential Ecell = 0.34 (0.76) = +1.10 V
6. For oxidation: Ecell = Ecathode Eanode = 0.77 1.07 = 0.30 V Negative not spontaneous. No.
7. Higher E = stronger oxidizer Ag (+0.80 V) > Cu (+0.34 V) > Zn (0.76 V)
8. The voltage of a half-reaction at standard conditions (1 M, 25C) vs. the hydrogen reference (0 V).
9. The half-reaction is easily reduced - it's a strong oxidizer.
10. The half-reaction is easily oxidized - it's a strong reducer.