What are Faraday's Laws of Electrolysis?

Worksheet

Faraday's first law: moles of substance = Q / (nF), where Q is charge (C), n is electrons, F is Faraday's constant (96485 C/mol). Mass deposited is proportional to current and time.

$$n = \frac{Q}{nF} = \frac{It}{nF}$$

Questions

1. Moles of Cu deposited from CuSO if Q = 1000 C and n = 2?

A) 10.4 mol
B) 0.00519 mol
C) 0.0519 mol
D) 5.19 mol

2. Which has the second law of electrolysis identified?

A) Mass charge
B) Different ions require different charge for equal moles
C) Anode and cathode are identical
D) E_cell is constant

3. Faraday constant F equals

A) 8.314 J/(molK)
B) 96485 C/mol
C) 6.022 10
D) 1.6 10 C

4. Electrolyze for 1 hour at 1 A. If n=3, what is Q?

A) 3600 C
B) 96485 C
C) 360 C
D) 1 C

5. Electrolyzing CuSO with 2 A for 10 min, how many moles of Cu deposited? (n=2)

6. If 0.5 mol of Ag deposits (1 e per Ag), what charge passed?

7. Electrolyze AgNO at 3 A for 5 min. How much Ag (M=107.9 g/mol) deposits?

8. Define: What is Faraday's first law of electrolysis?

9. Define: What is the Faraday constant F?

10. Define: How do I find total charge Q?

Answer Key

1. B) 0.00519 mol - moles = Q/(nF) = 1000/(296485) 0.00519 mol.

2. B) Different ions require different charge for equal moles - Faraday's second law: under equal charge, moles of product (molar mass / n).

3. B) 96485 C/mol - F = N_A e (Avogadro's number electron charge) 96485 C/mol.

4. A) 3600 C - Q = It = 1 A 3600 s = 3600 C (time in seconds).

5. Q = It = 2 A 600 s = 1200 C Cu + 2e Cu moles = Q/(nF) = 1200/(296485) moles = 1200/192970 = 0.00622 mol

6. Ag + e Ag, so n=1 Q = moles n F Q = 0.5 1 96485 Q = 48242.5 C

7. Q = It = 3 300 = 900 C moles Ag = Q/(nF) = 900/(196485) = 0.00933 mol mass = 0.00933 107.9 = 1.007 g 1.01 g

8. The mass of substance deposited/dissolved is proportional to the charge passed: moles = Q/(nF).

9. F = 96485 C/mol; the charge of one mole of electrons.

10. Q = It, where I is current (A) and t is time (s). Unit: coulombs (C).