

SHOW ALL WORK

1. State how many minutes it would take to

a.) deliver 84,200 Coulombs using a current of 6.30 A.

$$6.30 \frac{C}{S} (x) = 84,200 C$$

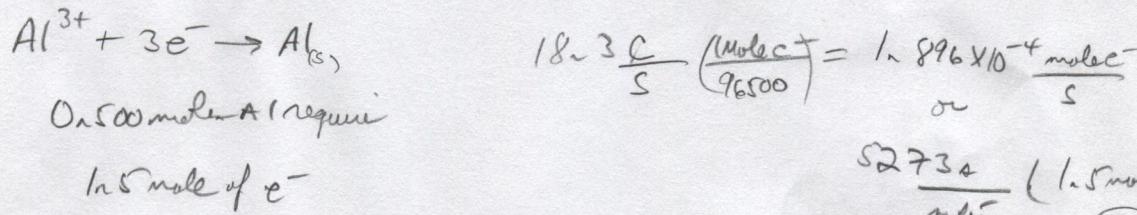
223 min

b.) deliver 1.25 moles of electrons using a current of 8.40 A.

$$(8.40 \frac{C}{S}) \frac{1 \text{ mole } e^-}{96500 \text{ C}} = 8.70 \times 10^{-5} \frac{\text{mole } e^-}{S} \Rightarrow \frac{11482 \text{ s}}{1 \text{ mole}} (1.25 \text{ mole}) = 14360 \text{ s}$$

239 min

c.) produce 0.500 moles of Al from molten  $\text{Al}_2\text{O}_3$  (in cryolite) using a current of 18.3 A.



2. What is the function of a salt bridge in a galvanic cell?

To maintain electrical neutrality. Cations in salt bridge move into one compartment to compensate for the excess negative charge and anions into the other to form the excess positive.

3. What are the signs of the anode and cathode in galvanic and electrolytic cells?

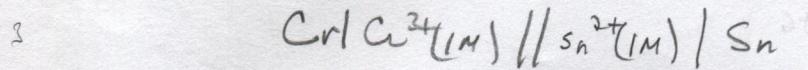
Galvanic: anode is -

Cathode is +

Electrolytic: anode is +

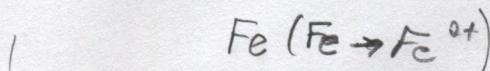
Cathode is -

4. Write a cell diagram that corresponds to the net cell reaction:



5. Which is a better reducing agent?

a.) Ni or Fe



Good Ox. Agent are  $E = +$  or written (Conc.)

b.)  $\text{SO}_4^{2-}$  or  $\text{F}^-$

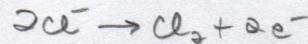


Good Red. Agent are  $E = +$  when placed

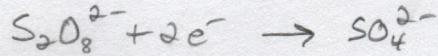
(Sep.,  $\text{SO}_4^{2-}$ )

(See p. 596-597 in Table)

6. Compute  $E^\circ$  and use its value to determine whether the following reaction will occur spontaneously.



$$E^\circ = -1.36$$

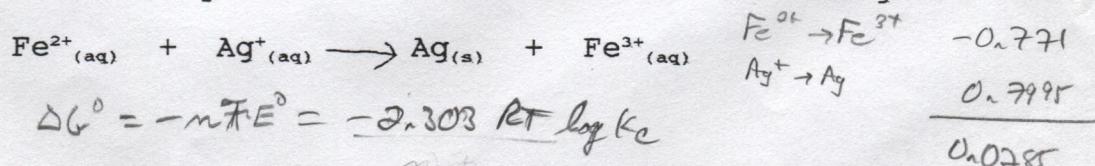


$$E^\circ = -0.01$$

$$E^\circ = 0.65$$

Yes, spontaneous

7. Calculate the equilibrium constant for the following reaction:



$$\log K_c = \frac{nFE^\circ}{RT}$$

$$\log K_c = \frac{(1)(96500)(0.0285)}{(8.314)(298)(2.303)} = \frac{2750}{5706} = 0.482$$

15  
 $K_c = 3$

15

8. Calculate  $\Delta G^\circ_{298}$  in kilojoules for the reaction in problem 6.

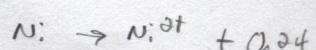
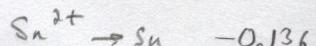
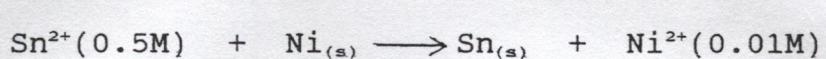
$$\Delta G^\circ = -nFE^\circ$$

$$\Delta G^\circ = -(2)(96500)(0.65) = -125450 \text{ J}$$

$$\boxed{-125 \text{ kJ}}$$

(5)

9. Write the Nernst equation and calculate  $E^\circ$  for the following reaction.



$$E = E^\circ - \frac{0.02303 RT}{nF} \log Q$$

$$\frac{0.104}{0.104}$$

$$E = 0.104 - \frac{(0.02303)(8.314)(298)}{(2)(96500)} \log \frac{(0.01)}{(0.5)}$$

$$0.104 - \left( \frac{5706}{193000} (-1.70) \right)$$

$$0.104 - (0.02956)(-1.70)$$

$$0.104 + 0.0507$$

$$\boxed{E = 0.154 \text{ V}}$$

(10)