CHE 112 - Homework - Ch 16e

p. 886-900 **Electrolysis** Score: _____/35

Name: _____ Date: _____

[2 pt] 1. What is the same about "rust, tarnish, and patina"?

[4 pt] 2. Copper in moist air slowly acquires a dull green coating or "patina", due to the formation of a 1:1 mixture of Copper (II) hydroxide and Copper (II) carbonate. The coating is appreciated on roof tops because it water insoluble and produces a distinctly pretty color. Determine the oxidation number for all elements. Which element is oxidized? Which element is reduced?
$Cu(s) + H_2O(l) + CO_2(g) + O_2(g) \longrightarrow Cu(OH)_2(s) + CuCO_3(s)$

[4 pt] 3. What are 4 ways to protect, prevent or slow down rusting? For each briefly describe how it protects, prevents or slows down rusting.
(a)

(b)

(c)

(d)

[2 pt] 4. What is cathodic protection? Which of the following metals Zn, Ni, Al, Sn is capable of offering such protection to an iron pipe? Explain. 4. _____

[2 pt] 5. The standard oxidation potential for the reaction $Cr(s) \longrightarrow Cr^{+3} + 3e^-$ is 0.74 V. Despite the large positive oxidation potential, chromium is used as a protective coating on steel (Fe) automobile bumpers. Why doesn't the chromium corrode?

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[6 pt] 6. If a molten mixture of $CaCl_2$ and LiF is electrolyzed:

(a) List all possible reactions at the cathode:

(b) List all possible reactions at the anode:

(c) Write the 1/2 reactions and net reaction for the cell:

(d) Calculate E^o_{cell} for the reactions

(e) Sketch a picture of the electrolytic cell.

[3 pt] 7. Why would the products produced in an elecrolytic cell containing molten KCl and a cell containing aqueous KCl differ?

[4 pt] 8. How many grams of silver will be obtained when an aqueous silver nitrate solution is electolyzed for 20.0 minutes with a constant current of 2.40 A? 8. _____

[4 pt] 9. A constant current of 100.0 A is passed through an electrolytic cell having an impure copper anode and a pure copper cathose, and uses aqueous $CuSO_4$ as an electrolyte. How many kilograms of copper are refined by transfer from the anode to the cathode in a 24.0 hour period? 9. _____

[4 pt] 10. What constant current in Amps is required to produce aluminum by the Hall-Heroult process at a rate of 40.0 kg/hour? 10. _____