**Electrochem**

**Answer Section**

1) D

2) A

3) B

4) C

5) D

6) A

7) A

8) A

9) C

10) D

11) E

12) B

13) C

14) C

15) E

16) D

17) A

18) D

19) D

20) C

21) E

22) C

23) B

Short Answer

1. Copper is the better netal to use because it will not oxidize. The zinc will become part of the reaction if used and will not allow the nickel to plate.
2. 2Al + 3Pb2+ → 2 Al3+ + 3Pb

E = Eo – 0.0591/n log [anode]/[cathode]

[Al3+] increased by 0.6M and [Pb2+] decreased by 0.9M

= 1.53V - .0591/6 x log(1.6)2/ (0.1)3 = 1.5V

1. The reaction is Cu2+ + Pb → Cu + Pb2+ so adding sulfuric acid effects the Pb ions since lead sulfate is insoluble.
   1. Lechatelier - More acid will cause a shift to the right which will increase the cell potential
   2. Nernst – removing lead will decrease the size of the Q which will lower the subtracted part from the Nernst equation increasing the E.

AP #1 from 1986D

Answer:

(a) (1.100 hr)(3600 sec/hr) = 3960 sec.

(3960 sec)(0.125 amp) = 495 coul

495 coul   = 5.1310-3 faraday

(b) Fe3+ + 1e- → Fe2+

(c) MnO4- + 8 H+ + 5e- → Mn2+ + 4 H2O

5 Fe2+ → 5 Fe3+ + 5e-

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MnO4- + 8 H+ + 5 Fe2+ → 5 Fe3+ + Mn2+ + 4 H2O

(d) 

Ap #2 from 2001D

1. zinc; Zn*(s)* Zn2+*(aq)* + 2 *e*–

(b) Zn*(s)* + Ni2+*(aq)* → Zn2+*(aq)* + Ni*(s)*

*E°cell*  = +0.76 + (-0.25) V = +0.51 V

(c) decrease *Ecell* ; *Ecell*  = *E°cell* – log *Q*, *Q* = , when the value of Q becomes larger than 1 then the log Q > 1 and is subtracted from the standard potential of the cell.

1. greater than 1. All spontaneous reactions (this reaction is spontaneous because the cell potential is larger than 0) have a *Keq* that are larger than 1, which favors the formation of products.

AP #3 from 1991 D

(a) Cl– is more easily oxidized than water

water is more easily reduced than Na+

(b) Fe2+ req. 2 farad/mol Fe*(s)* or 1 farad → 1/2 mol Fe*(s)*

Fe3+ req. 3 farad/mol Fe*(s)* or 1 farad → 1/3 mol Fe*(s)*

for equal numbers of farad 1/2:1/3 :: 1.5:1

(c) using LeChatelier’s principle

if [Zn2+] ↓, reaction shifts →, ∴ cell potential ↑

if [Pb2+] ↓, reaction shifts ←, ∴ cell potential ↓

**or** using the Nernst Equation

Ecell = *E* - RT lnQ, where Q = [Zn2+]/[Pb2+],

if [Zn2+] ↓, Q<1, Ecell > *E*

if [Pb2+] ↓, Q>1, Ecell < *E*

(d) [Zn2+]/[Pb2+] does not change regardless of the values, ∴ Ecell = *E*

**or** [Zn2+]/[Pb2+] = 1; ln Q = 0; Ecell = *E*