Problem 1

(a) +1

(b) +1

(c) −1

(d) +1

(e). $x + 4(-1) = -2 \Rightarrow +2$

(f) +3

(g) +6

(h) +2

Problem 2

It is ~~not~~ oxidizet ant reduced.

Problem 3

(a): • Write half reactions:

$Cr_2O_7^{-2} \rightarrow Cr^{+3}$ (1)

$C_2H_6O \rightarrow C_2H_4O$ (2)

• Balance (1)

$Cr_2O_7^{-2} \rightarrow 2Cr^{+3}$ (1)

• Add water:

$Cr_2O_7^{-2} \rightarrow 2Cr^{+3} + 7H_2O$ (1)

• Add hydrogen:

$Cr_2O_7^{-2} + 14H^+ \rightarrow 2Cr^{+3} + 7H_2O$ (1)

$C_2H_6O \rightarrow C_2H_4O + 2H^+$ (2)

• Add electrons ~~and multiply~~:

$Cr_2O_7^{-2} + 14H^+ \rightarrow 2Cr^{+3} + 7H_2O + 6e^-$

$C_2H_6O + 2e^- \rightarrow C_2H_4O + 2H^+$

Multiply and add

$Cr_2O_7^{-2} + 3C_2H_6O + 8H^+ \rightarrow 2Cr^{+3} + 7H_2O + 3C_2H_4O$

$Cr_2O_7^{-2}$ is the oxidizing agent, C_2H_6O is the reducing agent

(b): Follow the exact same series of steps as (a) to get

$2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{+2} + 5O_2 + 8H_2O$

MnO_4^- is the oxidizing agent, H_2C_2 is the reducing agent

Problem 4

(a) We are going to solve as if acidic, then add OH to each side:

$5(2CO_2 + 2e^- \rightarrow C_2O_4^{-2} \quad (1))$

$+$

$2(F_2 + 3H_2O \rightarrow FO_3^- + 6H^+ + 5e^- (2))$

$10CO_2 + 2F_2 + 6H_2O \rightarrow 5C_2O_4^{-2} + 2FO_3^- + 12H^+$

adding 12 OH^- to each side,

$10CO_2 + 2F_2 + 12OH^- \rightarrow 5C_2O_4^{-2} + 2FO_3^- + 6H_2O$

(b) Get the half-equations for acidic:

$2Cr(OH)_3 + 2H_2O \rightarrow 2CrO_4^{-2} + 10H^+ + 6e^- \quad (1)$

$Br_2 + 2e^- \rightarrow 2Br^-$

Sum and add OH^- to get

$2Cr(OH)_3 + 3Br_2 + 10OH^- \rightarrow 2CrO_4^{-2} + 6Br^- + 8H_2O$

Problem 5

(a): At the anode, $Zn + 2OH^- \rightarrow ZnO + H_2O + 2e^-$

At the cathode, $2MnO_2 + H_2O + 2e^- \rightarrow Mn_2O_3 + 2OH^-$

Overall,

$$Zn + 2MnO_2 \rightarrow ZnO + Mn_2O_3$$

Problem 6

$30A \cdot 3600 \text{ seconds} \cdot \frac{1 \text{ mol}}{96,485 \text{ C}} = 1.12 \text{ moles } e^-$

Molar mass $W = 183.84 \text{ g/mol} \Rightarrow 2+$