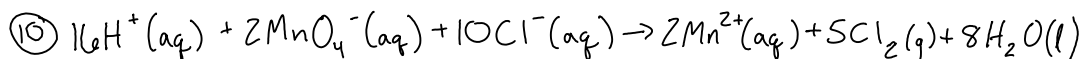


# Homework: Chapter 21

Wednesday, January 10, 2007  
12:13 AM

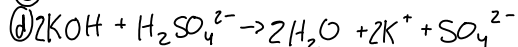
Problems: 10, 12, 13, 14, 15, 16, 17, 27, 28, 29, 33, 34, 46, 47, 56, 57, 60, 61, 70, 71, 101, 109, 120, 147



Ⓐ  $\text{Cl}^-$

Ⓒ  $\text{Cl}^-$

Ⓑ  $\text{MnO}_4^-$

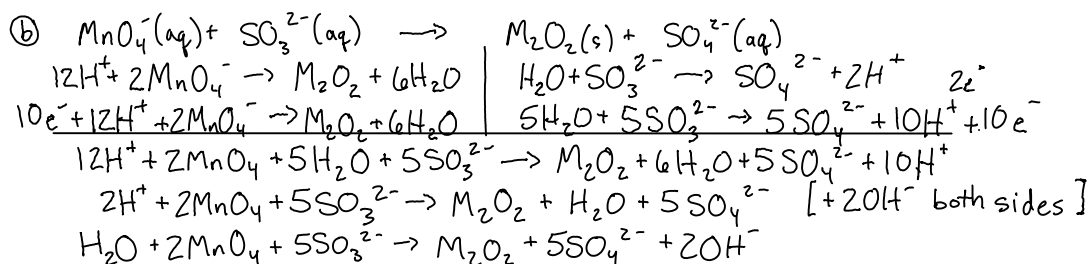


Ⓒ  $\text{MnO}_4^-$

Ⓓ  $\text{H}^+$

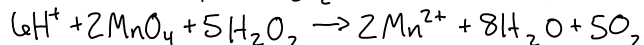
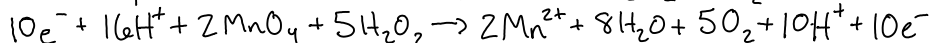
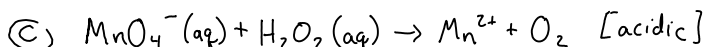


reduced | oxidized  
oxidizing agent | reducing agent



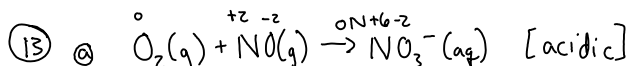
oxidized:  $\text{SO}_3^{2-}$  reducing agent

reduced:  $\text{MnO}_4^-$  oxidizing agent



oxidized:  $\text{H}_2\text{O}_2$  reducing agent

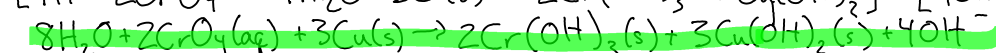
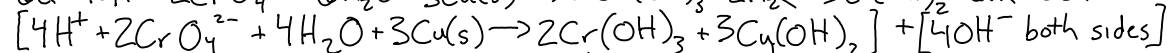
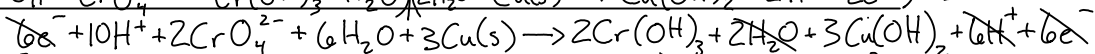
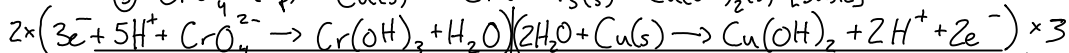
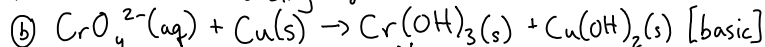
reduced:  $\text{MnO}_4^-$  oxidizing agent



already balanced

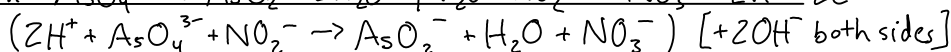
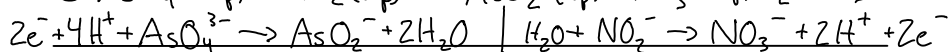
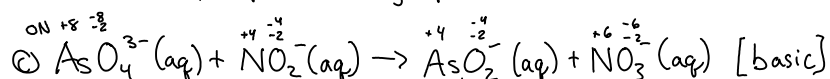
oxidized  $\text{O}_2$  reducing agent

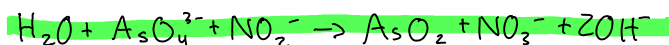
reduced  $\text{NO}$  oxidizing agent



oxidized:  $\text{Cu}(\text{s})$  reducing agent

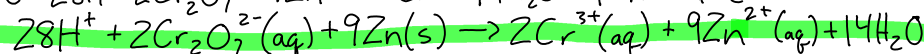
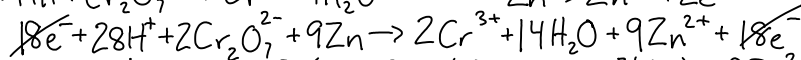
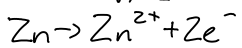
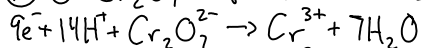
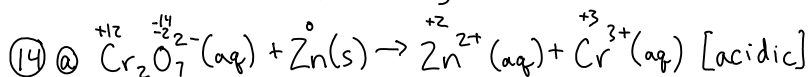
reduced:  $\text{CrO}_4^{2-}(\text{aq})$  oxidizing agent





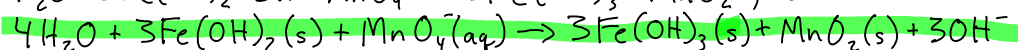
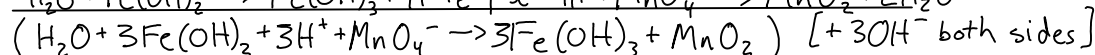
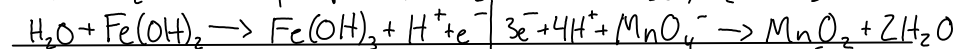
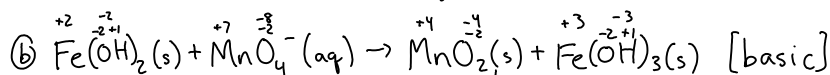
oxidized:  $\text{NO}_2(\text{aq})$  reducing agent

reduced:  $\text{AsO}_4^{3-}(\text{aq})$  oxidizing agent



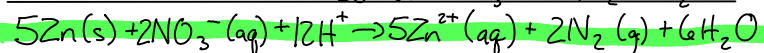
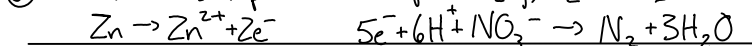
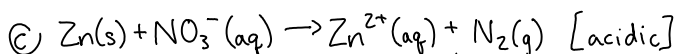
oxidized  $\text{Zn}(\text{s})$  reducing agent

reduced  $\text{Cr}_2\text{O}_7^{2-}(\text{aq})$  oxidizing agent



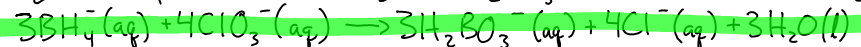
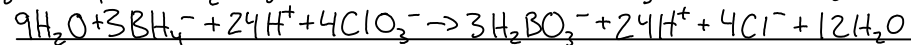
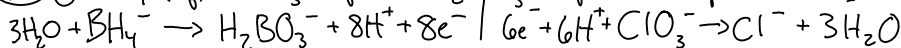
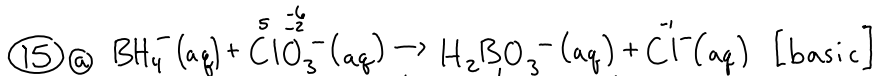
oxidized  $\text{Fe}(\text{OH})_2(\text{s})$  reducing agent

reduced  $\text{MnO}_4^-(\text{aq})$  oxidizing agent



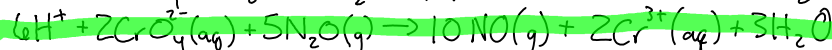
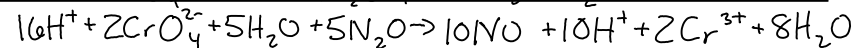
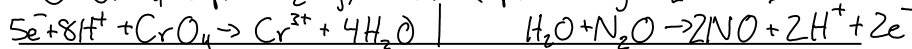
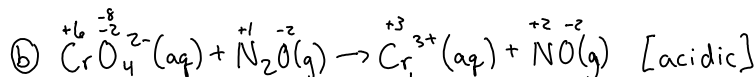
oxidized  $\text{Zn}(\text{s})$  reducing agent

reduced  $\text{NO}_3^-(\text{aq})$  oxidizing agent



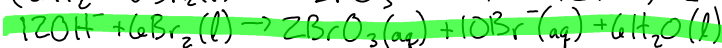
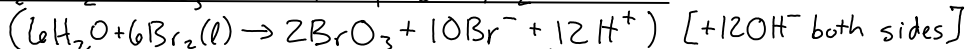
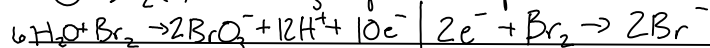
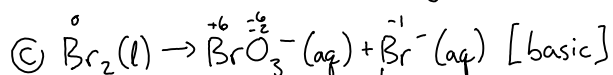
oxidized  $\text{BH}_4^-$  reducing agent

reduced  $\text{ClO}_3^-$  oxidizing agent



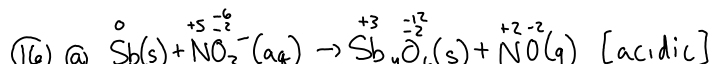
oxidized  $\text{N}_2\text{O}(\text{g})$  reducing agent

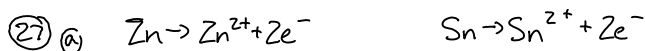
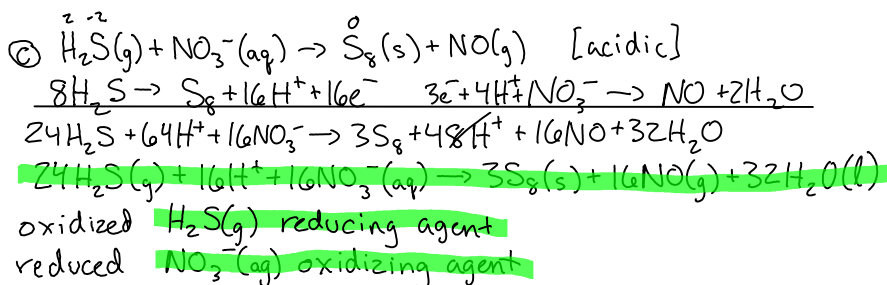
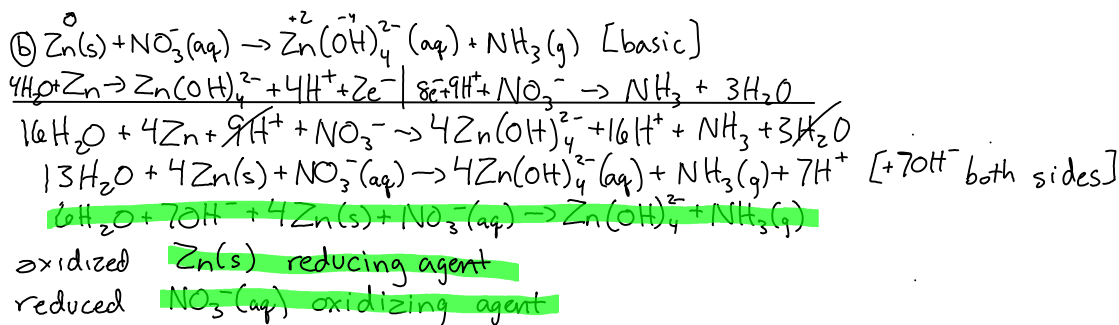
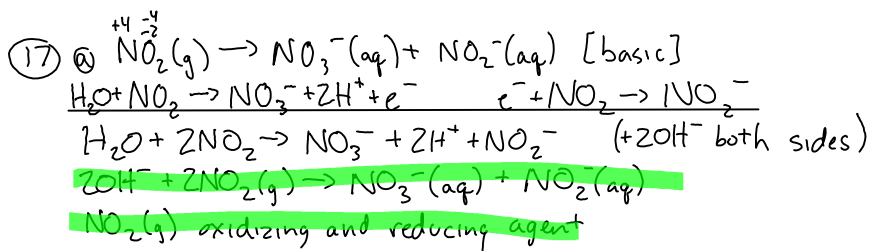
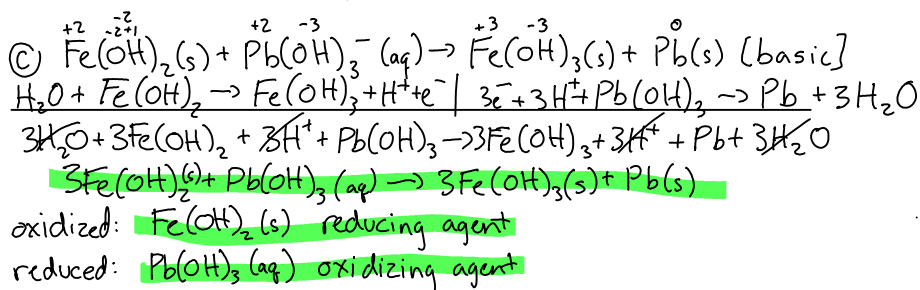
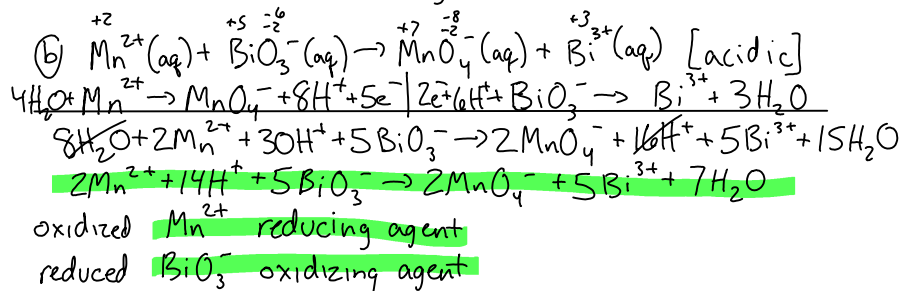
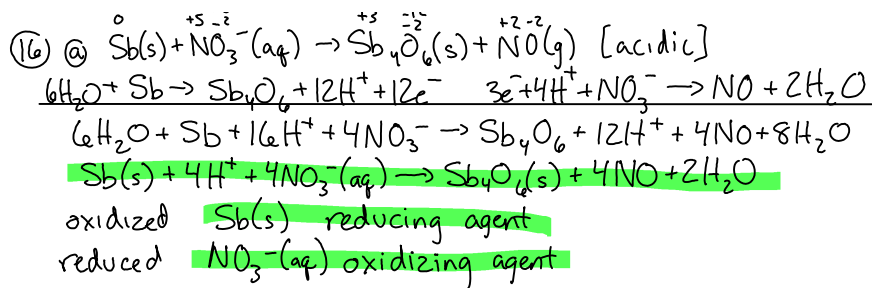
reduced  $\text{CrO}_4^{2-}(\text{aq})$  oxidizing agent

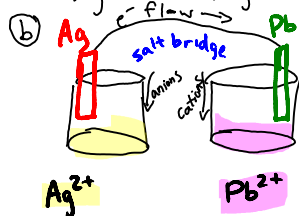
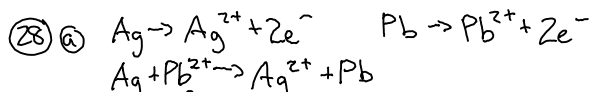
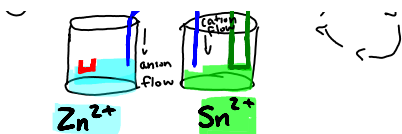


oxidized  $\text{Br}_2$  oxidizing agent

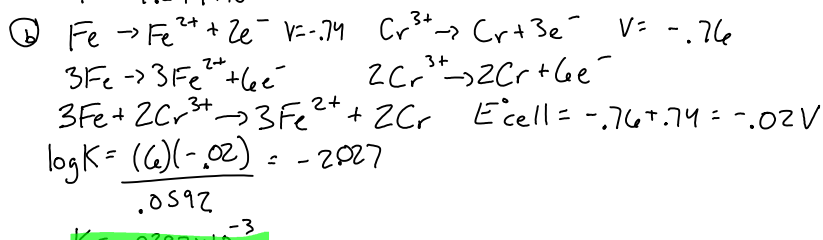
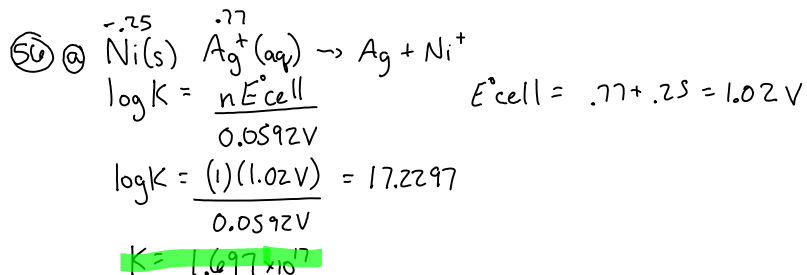
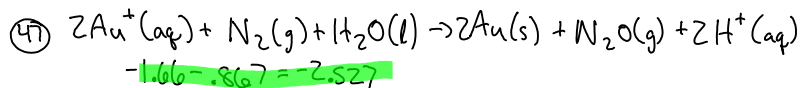
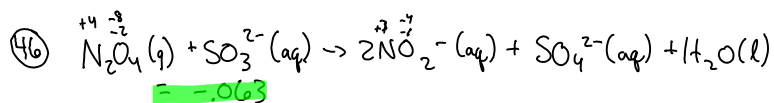
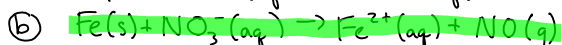
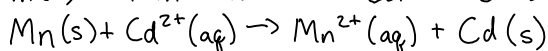
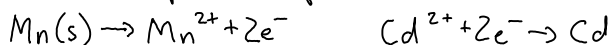
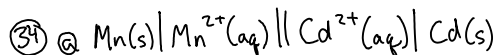
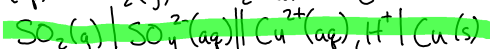
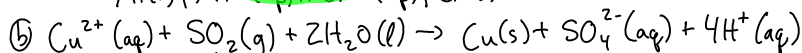
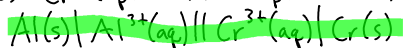
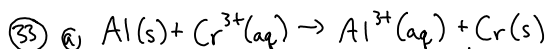
reduced  $\text{Br}_2$  reducing agent





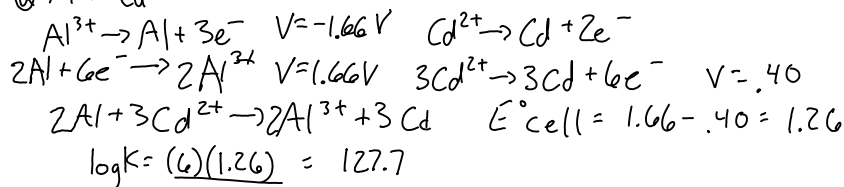


- 29 a) toward Ni    ④ 1M NiSO<sub>4</sub>  
 b) left    ⑥ K<sup>+</sup> and NO<sub>3</sub><sup>-</sup>  
 c) right    ⑦ Fe  
 d) Ni    ⑧ right to left  
 e) Fe    ⑨  $\text{Fe}(s) \rightarrow \text{Fe}^{2+} + 2e^-$      $\text{Ni}^{2+} + 2e^- \rightarrow \text{Ni}$   
 f) Fe     $\text{Fe} + \text{Ni}^{2+} \rightarrow \text{Fe}^{2+} + \text{Ni}$



$$K = 9.397 \times 10^{-3}$$

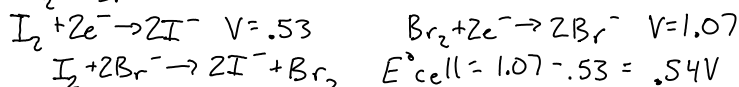
57) a) Al & Cd<sup>2+</sup>



$$\log K = \frac{(6)(1.26)}{0.0592} = 127.7$$

$$K = 5.04 \times 10^{127}$$

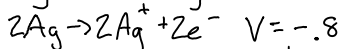
b) I<sub>2</sub> & Br<sup>-</sup>



$$\log K = \frac{(2)(.54)}{0.0592} = 24.66$$

$$K = 4.59 \times 10^{24}$$

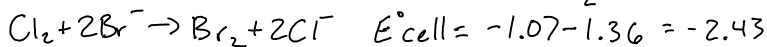
58) a) Ag & Mn<sup>2+</sup>



$$\log K = \frac{(2)(.944)}{0.0592} = 33.58$$

$$K = 3.81 \times 10^{33}$$

b) Cl<sub>2</sub> & Br<sup>-</sup>



$$\log K = \frac{(2)(-2.43)}{0.0592} = -82.09$$

$$K = 8.04 \times 10^{-83}$$

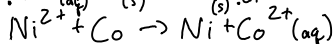
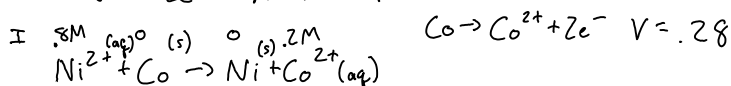
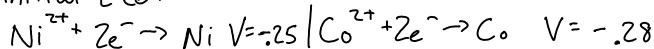
60) a)  $\Delta G = (-1)(96.5)(1.02) = -98.43 \text{ kJ/mol}$

b)  $\Delta G = (-4)(-.02)(96.5) = 11.58 \text{ kJ/mol}$

61) a)  $\Delta G = (-6)(96.5)(1.26) = -729.54 \text{ kJ/mol}$

b)  $\Delta G = (-2)(96.5)(.54) = -104.22 \text{ kJ/mol}$

70) a) initial E<sup>o</sup><sub>cell</sub>



$$E^\circ_{\text{cell}} = .28 + .25 = .53\text{V}$$

$$\log K = \frac{(2)(.53)}{0.0592} = 17.9 \quad K = 8.04 \times 10^{-17}$$

$$E^\circ_{\text{cell}} = .28 + .25 = .53\text{V}$$

$$.53 - \frac{.0592V}{2} \log \frac{.7}{.8} = .548V$$

$$⑥ .03V = .53 - \frac{.0592}{2} \log Q$$

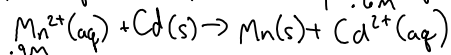
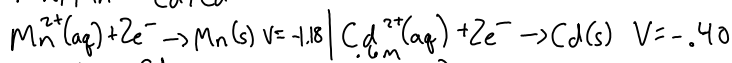
$$\log Q = -.4704$$

$$Q = .338 = \frac{[\text{products}]}{[\text{reactants}]}$$

$$[Ni^{2+}] = \frac{[\text{products}]}{.338}$$

$$Ni^{2+} = .59M$$

$$⑦ Mn/Mn^{2+} \quad Cd/Cd^{2+}$$



$$E^\circ_{cell} = .40 + 1.18 = 1.58V$$

$$⑧ E_{cell} = 1.58 - \frac{.0592}{2} \log \frac{.6}{.9} = 1.59V$$

$$⑨ E_{cell} = 1.58 - \frac{.0592}{2} \log Q \quad Q = \frac{.050M}{.35M} = .1429$$

$$E_{cell} = 1.6V$$

$$⑩ .055V = 1.58 - \frac{.0592}{2} \log Q$$

$$Q = .03196 = \frac{[\text{product}]}{[\text{reactants}]}$$

$$[Mn^{2+}] = \frac{[\text{products}]}{.03196}$$

$$⑪ ③ 36.2g \text{ Mg} \times \frac{1 \text{ mol}}{24.31g} \times \frac{2 \text{ mole}^-}{1 \text{ mol Mg}} = 2.98 \text{ mole}^-$$

$$④ 2.98 \times 9.65 \times 10^4 = 287396 \text{ C}$$

$$⑤ \frac{287396 \text{ amp}}{1 \text{ sec}} \times \frac{3600 \text{ sec}}{1 \text{ hr}} \times 2.5 \text{ hr} = 2.6 \times 10^9 \text{ amps}$$

$$⑫ \frac{.755A}{2.0 \text{ days}} \times \frac{1 \text{ day}}{24 \text{ hr}} \times \frac{1 \text{ hr}}{3600 \text{ sec}} \times \frac{1 \text{ mol}}{96485A} \times \frac{2e^-}{1 \text{ mol Zn}} \times \frac{1 \text{ mol}}{65.41g} = 1.38 \times 10^{-12}g$$

$$⑬ 53.4g \text{ Cu} \times \frac{1 \text{ mol}}{63.55g} \times \frac{2 \text{ mole}^-}{1 \text{ mol Cu}} \times \frac{96485A}{1s \cdot 1 \text{ mol}} \times \frac{3600 \text{ sec}}{1 \text{ hr}} \times \frac{10 \text{ hr}}{5.8A} = 1.01 \times 10^9$$

$$⑭ -.37 - .80 = -1.17$$

$$\log K_f = \frac{(-1)(-1.17)}{(.0592)}$$

$$K_f = 1.0 \times 10^4$$

$$K = 5.8 \times 10^{-9}$$