Q # 1-4, 6-8 pg 291

1. The system is $CaCl_2$

The surroundings → H_2O, beaker, anything in contact with the beaker

The surroundings are gaining energy ∴ the system is losing thermal energy.

$\Delta E_{system} = -\Delta E_{surroundings}$

2. $\Delta T = T_f - T_i = 21.7°C + 6.4°C = 28.1°C$

$Q = mc\Delta T$

$= (350.0\,g)(2.44\,J/g°C)(28.1°C)$

$= 23997.4\,J$ or $24.0\,kJ$

$= 2.40 \times 10^4\,J$

3. a) ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}e$

b) ${}^{1}_{0}n \rightarrow {}^{1}_{1}p + {}^{0}_{-1}e$

c) ${}^{55}_{26}Fe + {}^{0}_{-1}e \rightarrow {}^{55}_{25}Mn$ + energy

4. $C_2H_5OC_2H_5$ (e) is only slightly polar ∴ the attraction of Na^+ & Cl^- would be small ΔH positive

likes dissolve likes

∴ $C_2H_5OC_2H_5$ & C_2H_5OH would mix better

more attraction ΔH less positive or could be negative → more energy released

6. $Q = mc(T_f - T_i)$

$$T_f - T_i = \frac{Q}{mc}$$

$$T_i = T_f - \frac{Q}{mc}$$

$$= 14.7^\circ C - \frac{164.7\ J}{(15.55 g)(0.129\ J/g^\circ C)}$$

$$= -67.4^\circ C$$

7. $Q_{air} = -Q_{water}$

$$(mc\Delta T)_{air} = -(mc\Delta T)_{water}$$

$$(2000 g)(1.01 J/g^\circ C)\Delta T = -(1000 g)(419\ J/g^\circ C)(20 - 40^\circ C)$$

$$\Delta T = -\frac{(1000 g)(419)(-20)}{(2000 g)(1.01)}$$

$$= 41.49\ ^\circ C$$

$$= 41.5\ ^\circ C$$

8. Energy cannot be created or destroyed but can be transferred from one form to another.

$$\Delta E_{universe} = E_{syst} + E_{surr} = 0$$

$$E_{syst} = -E_{surr}.$$