Problems-

1. 2,000 calories is a good number for a human to consume in a day. How many joules does this equal?

$$(2000\ \text{cal}) \times \frac{4.186\ \text{J}}{1\ \text{cal}} = 8372\ \text{J}$$

2. Convert 10°C, 30°C, 32°F, and 75°F to Kelvins

$10°C + 273 = 283\ K$

$30°C + 273 = 303\ K$

$\frac{32°F - 32}{1.8} = 0°C$ $\quad 0°C + 273 = 273\ K$

$\frac{75°F - 32}{1.8} = 23.89°C$ $\quad 23.89°C + 273 =$ 296.89 K

3. How much heat energy is needed to raise the temperature of a 55 g sample of aluminum from 22.4 °C to 94.6 °C? c_{Al}=0.897 J/(gK) $\quad Q = m \cdot c \cdot \Delta t$

94.6 − 22.4 = 72.2

$$(55\ g)\left(0.897\ \frac{J}{g\,K}\right)(72.2\ K) = 3561.99\ J = 3.56\ KJ$$

4. Determine the specific heat of a material if a 35 g sample absorbed 48 J as it was heated from 293 K to 313 K. $\quad Q = m \cdot c \cdot \Delta t \quad \frac{Q}{m \cdot \Delta t} = c$

313 − 293 = 20 K

$$\frac{48\ J}{(35\ g)(20\ K)} = 1.069\ \frac{J}{g\,K}$$

5. 980 kJ of energy are added to 6.2 L of water at 291 K, what will the final temperature of the water be? The specific heat of water is 4.186 J/(gK). $\quad Q = m \cdot c \cdot \Delta t \quad \frac{Q}{m \cdot c} = \Delta t$

$$\Delta t = \frac{(980000\ J)}{(6200\ g)\left(4.186\ \frac{J}{g\,K}\right)} = 37.8\ K$$

$291 + 37.8 = 328.8\ K$

6. 3.5 kJ of heat are added to a 28.2 g sample of iron at 20°C. What is the final temperature of iron in Kelvins? c_{Fe} = 0.45 J/(gK)

$20 + 273 = 293\ K$

$$\Delta t = \frac{3500\ J}{(28.2\ g)\left(.45\ \frac{J}{g\,K}\right)} = 275.81\ K + 293\ K = 568.81\ K$$