Homework Set #8 Solutions (10/20 - 10/24):

Chapter 12: **Questions** 22, 49 **Exercises** 13, 17, 19

Questions:

22. The air exerts an equal upward force on the bottom of the cookie sheet.

49. The buoyant force is the same because they both displace the same volume.

Exercises:

13. Imagine a column of mercury with a cross-section of 1 in.^{2} Then the pressure is
$$P = \frac{W}{A} = \frac{\left(1 \text{ in.}^2\right)\left(30 \text{ in.}\right)\left(0.5 \text{ lb/in.}^3\right)}{1 \text{ in.}^2} = 15 \text{ lb/in.}^2 = 15 \text{ psi}$$

17. Find mass when it floats. It equals mass of water displaced, which is 18 g. Find volume when it sinks. It equals volume displaced, which is 20 cm^3.
$$D = \frac{M}{V} = \frac{18 \text{ g}}{20 \text{ cm}^3} = 0.9 \text{ g/cm}^3$$

19. The buoyant force equals the weight of the displaced water, which is (1000 kg) (10 m/s^2) = 10,000 N.
$$T = W - F_B = (8930kg)(10m/s^2) - 10{,}000 = 79{,}300N$$

Chapter 13: **Questions** 1, 7 **Exercises** 3, 5

Questions:

1. The gravitational potential energy is first converted in kinetic energy and then to thermal energy.

7. If the thermometer is initially at a different temperature heat must flow between the thermometer and the system to achieve thermal equilibrium. This changes the temperature of the system.

Exercises:

3. $W = Fd = \left(200 \text{ N}\right)\left(4 \text{ m}\right) = 800 \text{ J}$
$$Q = 800 \text{ J}\left[\frac{1 \text{ cal}}{4.2 \text{ J}}\right] = 190 \text{ cal}$$

5. $Q = cm\Delta T = (1cal/g \cdot °C)(1000g)(10°C) = 10{,}000cal = 10Cal$