Name _____   Date _____

Honors Physics   Thermodynamics WS #5H
Period _____   Mrs. Nadworny

Average Kinetic Energy

Directions: Read textbook pages 376 - 385. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. On the graph below, write the labels *lower temperature* and *higher temperature* to identify the curve that depicts the kinetic energy distribution of particles in a liquid at a lower temperature and at a higher temperature.
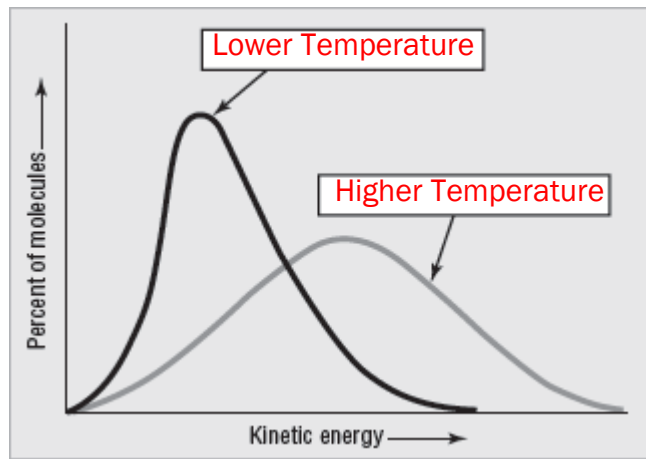
2. A 50 g container of nitrogen gas is at a temperature of 500. K. What is the average kinetic energy of the molecules in the gas?

$$\overline{KE} = \frac{3}{2}k_B T = \frac{3}{2}(1.38 \times 10^{-23}\,\tfrac{J}{K})(500.K)$$
$$\overline{KE} = 1.04 \times 10^{-20}\,J$$

3. Calculate the kinetic energy of an individual gas molecule of mass 3.5 x 10^{-26} kg moving at a speed of 600. m/s.

$$KE = \tfrac{1}{2}mv^2$$
$$KE = \tfrac{1}{2}(3.5 \times 10^{-26}\,kg)(600.\tfrac{m}{s})^2$$
$$KE = 6.3 \times 10^{-21}\,J$$

4. A sample of gas has an average kinetic energy of 4.71 x 10^{-22} joules. Calculate the average temperature of the sample.

$$T = \frac{2}{3}\frac{KE}{k_b} = \frac{2}{3}\frac{(4.71 \times 10^{-22}\,J)}{(1.38 \times 10^{-23}\,\tfrac{J}{K})} = 22.8K$$

Answers in size order: 6.3 x 10^{-21}, 1.04 x10^{-20}, 22.8