Name _____ Date _____

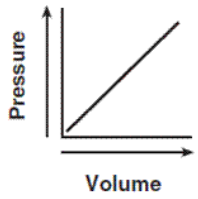
Honors Physics Thermodynamics WS #4H

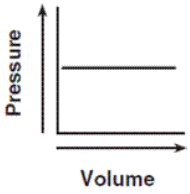
Period _____ Mrs. Nadworny

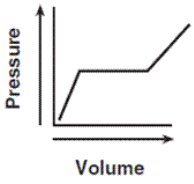
Gas Laws

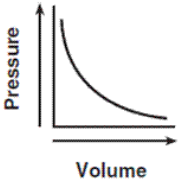
Directions: Read textbook pages 376 - 385. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. Which graph represents the relationship between pressure and volume for a sample of an ideal gas at constant temperature?

(A) 

(B) 

(C) 

(D) 

2. Which statement describes the particles of an ideal gas?

(A) The particles move in a well-defined, circular paths.
(B) When particles collide, energy is lost.
(C) There are forces of attraction between the particles.
(D) The volume of the particles is negligible.

3. An ideal gas is enclosed in a sealed container. Upon, heating, which property of the gas does not change?

(A) Pressure (B) Volume (C) Average Speed (D) Kinetic Energy

4. A box contains two compartments of equal volume separated by a divider. The two compartments each contain a random sample of *n* moles of a certain gas, but the pressure in compartment *A* is twice the pressure in compartment *B*. Which of the following statements is true?

(A) The temperature in *A* is twice the temperature in *B*
(B) The temperature in *B* is twice the temperature in *A*
(C) The value of the ideal gas constant, *R*, in *A* is twice the value of *R* in *B*
(D) The temperature in *A* is four times as great as the temperature in *B*
(E) The gas in *A* is a heavier isotope than the gas in *B*

5. There are four moles of a gas at 5.6 x 10^5 Pa and a volume of 0.012 m^3. Calculate the temperature of the gas.

$$PV = nRT$$

$$T = \frac{PV}{nR} = \frac{(5.6\times10^5 Pa)(0.012 m^3)}{(4 mol)(8.31 \frac{J}{mol\cdot K})} = 2.0\times10^2 K$$

6. There is an unknown quantity of gas at 1.2 x 10^5 Pa and a volume of 0.031 m^3 and a temperature of 87 ^oC. How many moles of gas is there?

$$PV = nRT$$

$$n = \frac{PV}{RT} = \frac{(1.2\times10^5 Pa)(0.031 m^3)}{(8.31\frac{J}{mol\cdot K})(360K)} = 1.2 mol$$

7. A gas in a closed container is under a pressure of 1 Pa and a temperature of -173 ^oC. The gas is then heated to 27 ^oC. What is the new pressure of the gas?

100 K

300 K

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$P_2 = \frac{P_1 T_2}{T_1} = \frac{(1\text{ Pa})(300\text{ K})}{100\text{ K}} = 3\text{ Pa}$$

8. A gas has a volume of 3.0 x 10^{-4} m^3 at 4.0 x 10^4 Pa. Calculate the new volume if the pressure is changed to 8.0 x 10^4 Pa while temperature remains constant.

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$V_2 = \frac{P_1 V_2}{P_2} = \frac{(4.0\times10^4 Pa)(3.0\times10^{-4} m^3)}{8.0\times10^4 Pa} = 1.5\times10^{-4} m^3$$

9. A sample of gas has 3.95 x 10^{36} particles in it. Calculate the number of moles contained in the sample.

$$n = \frac{N}{N_A} = \frac{3.95\times10^{36}}{6.02\times10^{23} mol^{-1}} = 6.56\times10^{12} mol$$

Answers in size order: 1.5 x 10^{-4}, 1.2, 3, 2.0 x 10^2, 6.56 x 10^{12}