Exercise 11.2b

The Combined Gas Laws

Name: _____

Date: _____ Per: _____

DIRECTIONS: Calculate the following in the space provided.

Boyle's Law and Charles' Law can be combined into the following formula.

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad \text{or} \quad P_1V_1T_2 = P_2V_2T_1$$

1. A sample of gas with a volume of 40.0 L (V_1), a pressure of 2.50 atm (P_1) and a temperature of 400. K (T_1) is cooled to 300. K (T_2) and pressurized to 10.0 atm (P_2). What is the new volume (V_2)?

2. At a temperature of 390. K, the volume of a gas is 2400. mL. If the pressure remains constant while the temperature is lowered to 300. K, what will the new volume be?

3. A quantity of gas has a volume of 15.0 L at 300. K and 770. mmHg of pressure. If the conditions are changed to STP, what will the new volume be? If the density of the gas is 0.0150 g/L what will the mass of the gas be?

4. A quantity of gas has a volume of 20.0 L at 256 °C and 800. mmHg of pressure. To what temperature must the gas be cooled for its volume to be reduced to 17.0 L at a pressure of 710. mmHg?

5. A 5.00 gallon propane tank for a backyard barbecue can hold gases at a pressure of 200. psi. If propane exerts a pressure of 7.50 psi at 0.00 °C, what is the maximum temperature that a filled tank can withstand before bursting?

6. A quantity of gas has a volume of 450. L at 50.0 °C and 720. mmHg of pressure. If the gas has a mass of 2.50 g, what is the density of the gas at STP?

7. A 10.0 L gas container is designed to hold gases with a pressure of up to 4000. mmHg. If a gas sample that has a pressure of 800. mmHg at 30.0 °C is placed in the container, at what temperature will the container burst?

Answers: 1) 7.50 L 2) 1850 mL 3) 13.8 L & 0.207 g 4) 399 K or 126°C 5) 7280 K or 7010 °C 6) 360. L & 0.00694 g/L 7) 1520 K or 1240 °C