

Name: _____ Per_

Combined Gas Laws, Avogadro's Law, and the Ideal Gas Law

Practice Sheet #30

Directions: Use the following Gas Law relationships to answer the following questions.

Boyle's Law
 $P_1V_1 = P_2V_2$

Charles' Law
 $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Gay-Lussac's Law
 $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

Combined Gas Law
 $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

1. A sample of 2.5 L of helium at 1.05 atm of pressure is expanded to 3.8 L, what is the resulting pressure?
2. A balloon contains 950 mL of air at 302 K. If the temperature is lowered to 280 K, what will be the volume of the balloon?
3. A gas cylinder has a pressure reading 1.20 atm at 300 K. At what temperature will the pressure read 2.00 atm?
4. A hot air balloon contains 854 L of air at 25 °C. What will the volume of the balloon be if the temperature is lowered to 10 °C?
5. An aerosol can is under a pressure of 4.5 atm at 12 °C. What pressure will the can reach if it is heated to 35 °C?
6. A sample of argon under 4.40×10^4 Pa of pressure occupies 0.405 L. What volume will the sample occupy if the pressure is decreased to 1.50×10^4 Pa?
7. A sample of carbon dioxide occupies 10 mL at 50 °C and 3.2 atm of pressure. What volume will the sample occupy at 30 °C and 1.5 atm of pressure?
8. A tire occupies 6.0 L and has a pressure of 1.8 atm at 295 K. What will the pressure read if the tire has a volume of 5.9 L at 310 K?
9. A sample of 30 mL of chlorine gas under 5.4×10^5 Pa of pressure at -5 °C is expanded to occupy 45 mL under 4.6×10^5 Pa of pressure. What will the temperature of the sample be?

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 $1 \text{ mole} = 22.4 \text{ L @ STP}$ $PV = nRT$ $R = 0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}$ or $R = 8314 \frac{\text{L} \cdot \text{Pa}}{\text{mol} \cdot \text{K}}$

10. State the conditions of STP.
11. What volume does one mole of gas occupy at STP?
12. Determine the volume of 0.22 mol of CH_4 gas at STP.
13. How many moles of argon gas are contained in 50.6 L at STP?
14. What is the mass of 105 mL of krypton gas at STP? How many atoms of krypton are contained within this volume?
15. A 1.8 L balloon at STP is filled with carbon dioxide. What is the mass of the gas contained within the balloon? How many molecules of carbon dioxide are present?
16. What volume is occupied by 2.45 mol of water vapor at 0.850 atm and 450 K?
17. What is the pressure (in atm) of 0.65 mol of fluorine gas contained in 450 mL at 37 °C?
18. How many moles of radon are contained in 200 mL flask under 7.65×10^5 Pa of pressure at 250 K?
19. What is the temperature if a 25.4 L balloon contains 6.24 mol of helium at 3.56 atm?
20. What is the mass of nitrogen dioxide gas contained in an 860 mL sample under 4.35 atm of pressure at -15 °C?
21. What is the volume occupied by 1.24×10^{23} atoms of argon under 6.54×10^5 Pa of pressure at 150 K?
22. What is the pressure (in Pa) if 24.5 g of hydrogen gas occupy 424 L at 12 °C.