WKS
Boyle's Law & Charles's Law

NAME Answer Key
Period _____ **Date** _____

Boyle's Law	Charles's Law
$P_1V_1=P_2V_2$	$\frac{V_1}{T_1}=\frac{V_2}{T_2}$
T, moles constant	P, moles constant K = °C + 273

1. A sample of neon gas occupies a volume of 2.8 L at 1.8 atm. What will its volume be at 1.2 atm?

$$(1.8\ \text{atm})(2.8\ \text{L})=(1.2\ \text{atm})V_2 \Rightarrow V_2=\frac{(1.8\ \cancel{\text{atm}})(2.8\ \text{L})}{1.2\ \cancel{\text{atm}}}=\boxed{4.2\ \text{L}}$$

2. To what pressure would you have to compress 48.0 L of oxygen gas at 99.3 kPa in order to reduce its volume to 16.0 L?

$$(99.3\ \text{kPa})(48.0\ \text{L})=P_2(16.0\ \text{L}) \Rightarrow P_2=\frac{(99.3\ \text{kPa})(48.0\ \cancel{\text{L}})}{16.0\ \cancel{\text{L}}}=\boxed{298\ \text{kPa}}$$

3. A chemist collected 29.0 mL of sulfur dioxide gas at an atmospheric pressure of 0.989 atm. What was the volume when the pressure was reduced to 0.967 atm?

$$(0.989\ \text{atm})(29.0\ \text{mL})=(0.967\ \text{atm})V_2 \Rightarrow V_2=\frac{(0.989\ \cancel{\text{atm}})(29.0\ \text{mL})}{0.967\ \cancel{\text{atm}}}=\boxed{29.7\ \text{mL}}$$

4. 2.20 L of hydrogen at 6.50 atm pressure is used to fill a balloon at a final pressure of 1.15 atm. What is its final volume?

$$(6.50\ \text{atm})(2.20\ \text{L})=(1.15\ \text{atm})V_2 \Rightarrow V_2=\frac{(6.50\ \cancel{\text{atm}})(2.20\ \text{L})}{1.15\ \cancel{\text{atm}}}=\boxed{12.4\ \text{L}}$$

5. A balloon full of air has a volume of 2.75 L at a temperature of 18°C. What is the balloon's volume at 45°C? [remember to ALWAYS convert °C to K!]

$T_1 = 18°C + 273 = 291\ \text{K};\ T_2 = 45°C + 273 = 318\ \text{K}$

$$\frac{2.75\ \text{L}}{291\ \text{K}}=\frac{V_2}{318\ \text{K}};\ V_2=\frac{(318\ \cancel{\text{K}})(2.75\ \text{L})}{291\ \cancel{\text{K}}}=\boxed{3.01\ \text{L}}$$

6. A sample of argon has a volume of 0.43 mL at 24°C. At what temperature in °C will it have a volume of 0.57 mL?

$T_1 = 24°C + 273 = 297\ \text{K}$

$$\frac{0.43\ \text{mL}}{297\ \text{K}}=\frac{0.57\ \text{mL}}{T_2};\ T_2=\frac{(0.57\ \cancel{\text{mL}})(297\ \text{K})}{0.43\ \cancel{\text{mL}}}=394\ \text{K}$$

$T_2 = 394 - 273 = \boxed{121°C}$

[Turn over for additional questions and answers]

7. 4.40 L of a gas is collected at 50.0°C. What will be its volume upon cooling to 25.0°C?

$T_1 = 50.0°C + 273 = 323\ K;\ T_2 = 25.0°C + 273 = 298\ K$

$$\frac{4.40\ L}{323\ K} = \frac{V_2}{298\ K};\ V_2 = \frac{(298\ \cancel{K})(4.40\ L)}{323\ \cancel{K}} = \boxed{4.06\ L}$$

8. 5.00 L of a gas is collected at 100 K and then allowed to expand to 20.0 L. What must the new temperature be?

Temperature is already in K; no need to convert!

$$\frac{5.00\ L}{100\ K} = \frac{20.0\ L}{T_2};\ T_2 = \frac{(20.0\ \cancel{L})(100\ K)}{5.00\ \cancel{L}} = \boxed{400\ K}$$