Boyle's Law Problems

1) **A container holds 500. mL of CO_2 at 20.° C and 742 torr. What will be the volume of the CO_2 if the pressure is increased to 795 torr?**

2) **A gas tank holds 2785 L of propane, C_3H_8, at 830. mm Hg. What is the volume of the propane at standard pressure?**

3) **A balloon contains 7.2 L of He. The pressure is reduced to 2.00 atm and the balloon expands to occupy a volume of 25.1 L. What was the initial pressure exerted on the balloon?**

4) **A sample of neon occupies a volume of 461 mL at STP. What will be the volume of the neon when the pressure is reduced to 93.3 kPa?**

5) **352 mL of chlorine under a pressure of 680. mm Hg are placed in a container under a pressure of 1210 mm Hg. The temperature remains constant at 296 K. What is the volume of the container in liters?**

Solutions

1) $P_1 = 742$ torr $\quad$ $P_2 = 795$ torr

$V_1 = 500.$ mL $\quad$ $V_2 = ?$

$T_1 = 20.° C + 273 = 293$ K $\quad$ $T_2 = 20.° C + 273 = 293$ K

$P_1V_1 = P_2V_2$

$V_2 = P_1V_1/P_2$

$V_2 = 742\ \cancel{\text{torr}} \times 500.\ \text{mL}/795\ \cancel{\text{torr}} = 467\ \text{mL}\ CO_2$

2) $P_1 = 830.$ mm Hg $\quad$ $P_2 = 760$ mm Hg

$V_1 = 2785$ L $\quad$ $V_2 = ?$

$P_1V_1 = P_2V_2$

$V_2 = P_1V_1/P_2$

$V_2 = 830.\ \cancel{\text{mm}} \times 2785\ \text{L}/760\ \cancel{\text{mm}} = 3040\ \text{L}\ C_3H_8$

3) $P_1 = ?$ $\quad$ $P_2 = 2.00$ atm

$V_1 = 7.2$ L $\quad$ $V_2 = 25.1$ L

$P_1V_1 = P_2V_2$

$P_1 = P_2V_2/V_1$

$P_1 = 2.00\ \text{atm} \times 25.1\ \cancel{\text{L}}/7.2\ \cancel{\text{L}} = 7.0\ \text{atm}$

4) $P_1 = 101.3$ kPa $P_2 = 93.3$ kPa

$V_1 = 461$ mL $V_2 = ?$

$P_1V_1 = P_2V_2$

$V_2 = P_1V_1/P_2$

$V_2 = 101.3\ \cancel{\text{kPa}} \times 461\ \text{mL}/93.3\ \cancel{\text{kPa}} =$ **501 mL Ne**

5) $P_1 = 680.$ mm $P_2 = 1210$ mm

$V_1 = 352$ mL $V_2 = ?$

$P_1V_1 = P_2V_2$

$V_2 = P_1V_1/P_2$

$V_2 = 680.\ \cancel{\text{mm}} \times 352\ \text{mL}/1210\ \cancel{\text{mm}} =$ **198 mL Cl_2**