Section 2.4
Simple gas laws

Textbook, p. 97 to 99

2.4.1 Relationship between pressure and volume

2. $P_1V_1 = P_2V_2$

$95.0\ \text{kPa} \cdot 50\ \text{mL} = 48.5\ \text{kPa} \cdot V_2$

$$V_2 = \frac{95.0\ \cancel{\text{kPa}} \cdot 50\ \text{mL}}{48.5\ \cancel{\text{kPa}}} = 98\ \text{mL}$$

Answer: The volume occupied by the gas will be 98 mL.

3. $P_1V_1 = P_2V_2$

$90\ \text{kPa} \cdot 68\ \text{mL} = P_2 \cdot 45\ \text{mL}$

$$P_2 = \frac{90\ \text{kPa} \cdot 68\ \cancel{\text{mL}}}{45\ \cancel{\text{mL}}} = 1.4 \times 10^2\ \text{kPa}$$

Answer: The pressure of the gas will be 1.4×10^2 kPa.

4. $P_1V_1 = P_2V_2$

$82.3\ \text{kPa} \cdot 63.4\ \text{mL} = P_2 \cdot 78.5\ \text{mL}$

$$P_2 = \frac{82.3\ \text{kPa} \cdot 63.4\ \cancel{\text{mL}}}{78.5\ \cancel{\text{mL}}} = 66.5\ \text{kPa}$$

Answer: The pressure of the gas will be 66.5 kPa.

5. *1. Calculation of the pressure:*

$P_2 = 2 \cdot 98\ \text{kPa} = 196\ \text{kPa}$

2. Calculation of the volume:

$P_1V_1 = P_2V_2$

$89\ \text{kPa} \cdot 4.6\ \text{L} = 196\ \text{kPa} \cdot V_2$

$$V_2 = \frac{98\ \cancel{\text{kPa}} \cdot 4.6\ \text{L}}{196\ \cancel{\text{kPa}}} = 2.3\ \text{L}$$

Answer: The volume occupied by the gas will be 2.3 L.

6. $P_1V_1 = P_2V_2$

$93\ \text{kPa} \cdot 0.25\ \text{L} = P_2 \cdot 0.20\ \text{L}$

$$P_2 = \frac{93\ \text{kPa} \cdot 0.25\ \cancel{\text{L}}}{0.20\ \cancel{\text{L}}} = 1.2 \times 10^2\ \text{kPa}$$

Answer: A pressure of 1.2×10^2 kPa must be exerted on the gas.

7. *1. Calculation of the pressure:*

$V_2 = 87\ \text{kPa} + 3\ \text{kPa} = 90\ \text{kPa}$

2. Calculation of the volume:

$P_1V_1 = P_2V_2$

$87\ \text{kPa} \cdot 303\ \text{L} = 90\ \text{kPa} \cdot V_2$

$$V_2 = \frac{87\ \cancel{\text{kPa}} \cdot 303\ \text{L}}{90\ \cancel{\text{kPa}}} = 2.9 \times 10^2\ \text{L}$$

Answer: The volume occupied by the gas will be 2.9×10^2 L.

8. $P_1V_1 = P_2V_2$

$101.3\ \text{kPa} \cdot 0.75\ \text{L} = P_2 \cdot 0.50\ \text{L}$

$$P_2 = \frac{101.3\ \text{kPa} \cdot 0.75\ \cancel{\text{L}}}{0.50\ \cancel{\text{L}}} = 1.5 \times 10^2\ \text{kPa}$$

Answer: The final pressure exerted on the oxygen (O_2) is 1.5×10^2 kPa.

10. $P_1V_1 = P_2V_2$

$100\ \text{kPa} \cdot 28.8\ \text{L} = 350\ \text{kPa} \cdot V_2$

$$V_2 = \frac{100\ \cancel{\text{kPa}} \cdot 28.8\ \text{L}}{350\ \cancel{\text{kPa}}} = 8.23\ \text{L}$$

Answer: The volume occupied by the hydrogen is 8.23 L.