Unit 5 Test - Hunza Khokhar

1. Given

$P_1 = 96.3\ kPa$

$V_1 = 2.99 \times 10^3\ L$

$P_2 = 60.8\ kPa$

$P_1V_1 = P_2V_2$

∵ Constant Temperature

∵ Constant amount of gas

Required

$V_2 = ?$

Solution

$$P_1V_1 = P_2V_2$$

$$V_2 = \frac{P_1V_1}{P_2}$$

$$= \frac{96.3\ kPa\,(2.99 \times 10^3\ L)}{60.8\ kPa}$$

$$= 3167.763158$$

$$\doteq 3170$$ [redacted] → ∴ $V_2 = 3170$ [redacted] L

Final volume is 3170 [redacted] L

2. Given

$V_1 = 1.50\ L$ helium gas

$T_1 = 294\ K$

$V_2 = 1.55\ L$ helium gas

∵ Constant Pressure

∵ Constant amount gas

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

Required

$T_2 = ?$

Solution

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$T_2 V_1 = V_2 T_1$$

$$T_2 = \frac{V_2 T_1}{V_1}$$

$$T_2 = \frac{1.55\ L\ (294\ K)}{1.50\ L}$$

$$= 303.8$$

$$T_2 \doteq 304\ K$$

∴ The air temperature outdoors in kelvins is 304 K

3. Given

$n = 2.5\ mol$

$V = 56.5\ L$

$P = 1.20\ atm$

$R = 0.08206\ \frac{L \cdot atm}{mol \cdot K}$

Required

$T = ?$

$PV = nRT$

Solution

$PV = nRT$

$T = \frac{PV}{nR}$

$T = \frac{1.20\ atm\ (56.5\ L)}{2.5\ mol\ (0.08206\ L \cdot atm/mol \cdot K)}$

$= 330.489885 \doteq 330\ K$

$T°C = T°K - 273.15$

$= 330 - 273.15$

$= 56.85°C$

∴ The temperature is 56.85°C

4. Given

$V = 500.0\ mL$

$= 0.500\ L$

$m = 1.58\ g$

$P = 101.3\ kPa$

$PV = \frac{m}{M}RT$

$T = 273.15\ K$

$R = 8.314\ \frac{kPa \cdot L}{mol \cdot K}$

Required

$M = ?$

Solution

$PV = \frac{mRT}{M}$

$MPV = mRT$

$M = \frac{mRT}{PV}$

$= \frac{1.58\ g\left(8.314\ \frac{kPa \cdot L}{mol \cdot K}\right)(273.15\ K)}{101.3\ kPa \cdot (0.500\ L)}$

$= 70.9416817 \doteq 70.8\ g/mol$

∴ The molar mass is 70.8 g/mol