

p 381 29-35, 39 odd

(29)  $PV = nRT$

$$V_1 = 3.00 \text{ m}^3$$

$$P_1 = 1 \text{ atm} = 101.3 \text{ kPa}$$

$$T_1 = 273 \text{ K}$$

$$V_2 = ?$$

$$P_2 = 3.20 \text{ atm} = 324.16 \text{ kPa}$$

$$T_2 = 38^\circ\text{C} = 311 \text{ K}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$V_2 = \frac{P_1 V_1 T_2}{T_1 P_2} = \frac{(101.3 \times 10^3 \text{ Pa})(3 \text{ m}^3)(311 \text{ K})}{(273 \text{ K})(324.16 \times 10^3)} = \underline{1.07 \text{ m}^3}$$

(31) density,  $\rho = \frac{\text{mass}}{\text{Vol.}}$

$$PV = nRT$$

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

but  $n = \frac{\text{mass}}{\text{molar mass}} = \frac{m}{M}$

$$\frac{m}{V} = \frac{PM}{RT} = \frac{(101.3 \times 10^3 \text{ Pa})(0.032 \text{ kg})}{(8.31 \text{ J K}^{-1} \text{ mol}^{-1})(273 \text{ K})} = \underline{1.43 \text{ kg m}^{-3}}$$

(33) (a)  $PV = nRT$

$$P = 101.3 \text{ kPa}$$

$$T = 273 \text{ K}$$

$$V = \frac{nRT}{P}$$

$$n = \frac{m}{M} = \frac{18.5 \text{ kg}}{0.028 \text{ kg}} = 660.7 \text{ mol}$$

$$= \frac{(660.7 \text{ mol})(8.31 \text{ J K}^{-1} \text{ mol}^{-1})(273 \text{ K})}{(101.3 \times 10^3 \text{ Pa})}$$

$$= \underline{14.8 \text{ m}^3}$$

$$33 \text{ (b)} \quad n = \frac{m}{M} = \frac{18.5 \text{ kg} + 15 \text{ kg}}{0.028 \text{ kg}} = \frac{33.5 \text{ kg}}{0.028 \text{ kg}} = 1196.4 \text{ mol}$$

$$T = 273 \text{ K}$$

$$V = 14.8 \text{ m}^3$$

$$PV = nRT$$

$$P = \frac{nRT}{V} = \frac{(1196.4 \text{ mol})(8.31 \text{ J K}^{-1} \text{ mol}^{-1})(273 \text{ K})}{14.8 \text{ m}^3}$$

$$= 1.83 \times 10^5 \text{ Pa} \quad \text{or} \quad 183 \text{ kPa}$$

$$(35) \quad V = 35.0 \text{ L} = 0.035 \text{ m}^3$$

$$n = \frac{m}{M} = \frac{105 \text{ kg}}{0.040 \text{ kg}} = 2625 \text{ mol}$$

$$T = 385 \text{ K}$$

$$PV = nRT$$

$$P = \frac{nRT}{V} = \frac{(2625 \text{ mol})(8.31 \text{ J K}^{-1} \text{ mol}^{-1})(385 \text{ K})}{0.035 \text{ m}^3}$$

$$= 2.40 \times 10^8 \text{ Pa}$$

$$(39) \quad V_1 = 61.5 \text{ L} = 61.5 \times 10^{-3} \text{ m}^3$$

$$T_1 = 18^\circ \text{C} = 291 \text{ K}$$

$$P_1 = 2.45 \text{ atm} = 2.482 \times 10^5 \text{ Pa}$$

$$V_2 = 48.8 \text{ L} = 48.8 \times 10^{-3} \text{ m}^3$$

$$T_2 = 50^\circ \text{C} = 323 \text{ K}$$

$$P_2 = ?$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$P_2 = \frac{P_1 V_1 T_2}{T_1 V_2} = \frac{(2.482 \times 10^5 \text{ Pa})(61.5 \times 10^{-3} \text{ m}^3)(323 \text{ K})}{(291 \text{ K})(48.8 \times 10^{-3} \text{ m}^3)}$$

$$= 3.47 \times 10^5 \text{ Pa}$$