

100,000 Pa = 0.9869 atm

Sturman Key

14-3 Practice Problems

① $V_1 = 458 \text{ mL}$ $P_1 V_1 = P_2 V_2$
 $P_1 = 1.01 \text{ kPa}$ $1.01 \text{ kPa} (458 \text{ mL}) = P_2 (477 \text{ mL})$
 $V_2 = 477 \text{ mL}$ $P_2 = 0.9697 \dots$
 $P_2 = ?$ $= \boxed{0.970 \text{ kPa}}$

② $V_1 = 2.45 \text{ L}$ $P_1 V_1 = P_2 V_2$
 $P_1 = 1.03 \text{ atm}$ $1.03 \text{ atm} (2.45 \text{ L}) = (0.980 \text{ atm}) V_2$
 $T_1 = 293 \text{ K} = T_2$ $V_2 = 2.575$
 $V_2 = ?$ $= \boxed{2.58 \text{ L}}$
 $P_2 = 0.980 \text{ atm}$

③ $V_1 = 0.6250 \text{ L}$ $P_1 V_1 = P_2 V_2$
 $V_2 = 0.0600 \text{ L}$ $765.1 \text{ mmHg} (0.6250 \text{ L}) = P_2 (0.0600 \text{ L})$
 $P_1 = 765.1 \text{ mmHg}$ $P_2 = 7969.79 \text{ mmHg}$
 $P_2 = ? \text{ kPa}$ $\frac{7969.79 \text{ mmHg}}{7.60 \text{ mmHg/kPa}} = \frac{760.0 \text{ mmHg}}{101.325 \text{ kPa}} \Rightarrow \boxed{1060 \text{ kPa}}$

④ $P_1 = 34,470 \text{ Pa}$ $P_1 V_1 = P_2 V_2$
 $V_1 = 473.18 \text{ mL}$ $34470 \text{ Pa} (473.18 \text{ mL}) = P_2 (13.16 \text{ mL})$
 $V_2 = 13.16 \text{ mL}$ $P_2 = 1,239,400.805$
 $P_2 = ?$ $= \boxed{1,239,000 \text{ Pa}}$

⑤ $V_1 = 10.0 \text{ L}$ $P_1 V_1 = P_2 V_2$
 $T_1 = 23.8^\circ \text{C} + 273.15 = 296.95$ $(78.6 \text{ lb/in}^2)(10.0 \text{ L}) = P_2 (2.8 \text{ L})$
 $= 297 \text{ K}$ $P_2 = 280.7 \text{ lb/in}^2$
 $P_1 = 78.6 \text{ lb/in}^2$
 $V_2 = 2.8 \text{ L}$
 $P_2 = ? \text{ kPa}$ $\frac{280.7 \text{ lb/in}^2}{14.7 \text{ lb/in}^2/\text{kPa}} = \frac{14.70 \text{ lb/in}^2}{101.325 \text{ kPa}} \Rightarrow 1934.825$
 $= \boxed{1930 \text{ kPa}}$
 ~~$\boxed{1900 \text{ kPa}}$~~

⑥ $T_1 = 309 \text{ K}$
 $V_1 = ?$
 $T_2 = 215 \text{ K}$
 $V_2 = 3.42 \text{ L}$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{V_1}{309 \text{ K}} = \frac{3.42 \text{ L}}{215 \text{ K}} \Rightarrow \boxed{V_1 = 4.92 \text{ L}}$$

⑦ $T_1 = 83^\circ\text{C} + 273^{15} = 356 \text{ K}$
 $V_1 = 1400 \text{ m}^3$
 $T_2 = ?$
 $V_2 = 1200 \text{ m}^3$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{1400 \text{ m}^3}{356 \text{ K}} = \frac{1200 \text{ m}^3}{T_2} \Rightarrow \boxed{T_2 = 305 \text{ K}}$$

↓
 $\boxed{310 \text{ K}}$

⑧ $T_1 = 23.6^\circ\text{C} + 273^{15} = 296.75 \text{ K}$
 $V_1 = 31.4 \text{ L}$
 $V_2 = 25.0 \text{ L}$
 $T_2 = ?$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{31.4 \text{ L}}{296.8 \text{ K}} = \frac{25.0 \text{ L}}{T_2}$$

★ $\boxed{T_2 = 236 \text{ K} \text{ or } -36.9^\circ\text{C}}$ ★

⑨ $T_1 = 22.4^\circ\text{C} + 273.15 = 295.6 \text{ K}$
 $V_1 = 10.6 \text{ mL}$
 $T_2 = 27.8^\circ\text{C} + 273.15 = 300.95 \text{ K}$
 $V_2 = ?$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{10.6 \text{ mL}}{295.6 \text{ K}} = \frac{V_2}{301.0}$$

$\boxed{V_2 = 10.8 \text{ mL}}$

⑩ $V_1 = .105 \text{ dm}^3$
 $T_1 = 100. \text{ K}$
 $T_2 = ? \text{ }^\circ\text{C}$
 $V_2 = .140 \text{ dm}^3$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{.105 \text{ dm}^3}{100. \text{ K}} = \frac{.140 \text{ dm}^3}{T_2}$$

$T_2 = 133 \text{ K} \Rightarrow -139.8 \Rightarrow \boxed{-140^\circ\text{C}}$

$$(11) T_1 = 75^\circ\text{C} + 273,15 = 348,15 = 348\text{K}$$

$$V_1 = 3,22\text{ dm}^3$$

$$V_2 = ?$$

$$T_2 = 75\text{ K}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{3,22\text{ dm}^3}{348\text{K}} = \frac{V_2}{75\text{K}} \Rightarrow V_2 = \boxed{0,69\text{ dm}^3}$$

$$(12) T_1 = 300,0\text{ K}$$

$$V_1 = 6,50\text{ dm}^3$$

$$V_2 = ?$$

$$T_2 = 250,0\text{ K}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \Rightarrow \frac{6,50\text{ dm}^3}{300,0\text{ K}} = \frac{V_2}{250,0\text{ K}} \Rightarrow V_2 = \boxed{5,42\text{ dm}^3}$$

$$(13) P_T = 600,0\text{ mm Hg} + 150,0\text{ mm Hg} + 102\text{ mm Hg} = \boxed{852\text{ mm Hg}}$$

$$(14) P_T = 785\text{ mm Hg} \quad P_{\text{H}_2} = 395\text{ mm Hg} \quad P_{\text{O}_2} = ?$$

$$P_T = P_{\text{H}_2} + P_{\text{O}_2} \Rightarrow 785\text{ mm Hg} = 395\text{ mm Hg} + P_{\text{O}_2} \Rightarrow P_{\text{O}_2} = \boxed{390\text{ mm Hg}}$$

$$(15) P_T = 776,134\text{ mm Hg}$$

$$P_T = P_{\text{O}_2} + P_{\text{N}_2} + P_{\text{CH}_4} \Rightarrow 776,134\text{ mm Hg} = 253,948\text{ mm Hg} + 515,390\text{ mm Hg} + P_{\text{CH}_4}$$

$$P_{\text{CH}_4} = 6,796\text{ mm Hg}$$

$$\frac{6,796\text{ mm Hg}}{x\text{ Pa}} = \frac{760,0\text{ mm Hg}}{101,300\text{ Pa}}$$

$$x = \boxed{905,835\text{ Pa}}$$

$$(16) P_T = 762\text{ mm Hg}$$

$$P_{\text{N}_2} = ? \quad 0,78(762\text{ mm Hg}) = 594,36 \Rightarrow \boxed{594\text{ mm Hg}}$$

~~$$\boxed{590\text{ mm Hg}}$$~~