US HW 1

1 ATM = 760 mmHg = 760 torr = 101.3 KPa

FITCH

1. a. $\frac{(755\ \text{mmHg})}{X\ \text{ATM}} = \frac{(760\ \text{mmHg})}{1\ \text{ATM}}$

$760X = 755$

$X = .99\ \text{ATM}$

b. $(1.5\ \text{ATM})\left(\frac{101.3\ \text{KPa}}{1\ \text{ATM}}\right)\left(\frac{1000\ \text{Pa}}{1\ \text{KPa}}\right) = 152002\ \text{Pa}$

c. $(800\ \text{mmHg})\left(\frac{101.3\ \text{KPa}}{760\ \text{mmHg}}\right) = 106.6\ \text{KPa}$

d. $(5\ \text{ATM})\left(\frac{760\ \text{mmHg}}{1\ \text{ATM}}\right) = 3800\ \text{mmHg}$

e. $(500\ \text{KPa})\left(\frac{1\ \text{ATM}}{101.3\ \text{KPa}}\right) = 4.94\ \text{ATM}$

f. $(500\ \text{KPa})\left(\frac{760\ \text{mmHg}}{101.3\ \text{KPa}}\right) = 3751.23\ \text{mmHg}$

g. $(700\ \text{torr})\left(\frac{1\ \text{ATM}}{760\ \text{Torr}}\right) = .92\ \text{ATM}$

h. $(550\ \text{mmHg})\left(\frac{760\ \text{torr}}{760\ \text{mmHg}}\right) = 550\ \text{torr}$

2. a. $0°C = 273K \Leftrightarrow K = °C + 273$

b. $27°C = 300K$

c. $300K = 27°C \rightarrow 300°K = °C + 273 \Rightarrow 300 - 273 = °C = 27°C$

d. $212°F = ?C \Rightarrow °C = \frac{°F - 32}{1.8} = \frac{212 - 32}{1.8} = 100°C$

e. $150K \Rightarrow °C \quad 150 - 273 = °C = -123°C$

f. 70°F → K $°C = \frac{70-32}{1.8} = 21.1°C + 273 = 294.1\ K$

g. 100°C → K = 373K

h. 0K → C = −273°C

3. $P_1V_1 = P_2V_2$

a. $(350\ mmHg)(200\ ml) = (700\ mmHg)(V_2)$

$\frac{(350\ mmHg)(200\ ml)}{700\ mmHg} = V_2 = 100\ ml$

b. $(.75\ atm)(V_1) = (.48\ atm)(435\ ml)$

$V_1 = \frac{(.48\ atm)(435\ ml)}{.75\ atm} = 278.4\ ml$

c. $P_1(2.4\times10^5 L) = (180\ torr)(1.7\times10^3 L)$

$P_1 = \frac{(180\ torr)(1.7\times10^3 L)}{2.4\times10^5 L} = 1.35\ torr$

4. $P_1 = 325\ mmHg$ $V_1 = 240\ ml$ $P_2 = 550\ mmHg$ $V_2 = ?$

$\frac{(325\ mmHg)(240\ ml)}{550\ mmHg} = V_2 = 141.8\ ml$

5. $V_1 = 155\ cm^3$ $P_1 = 22.5\ kPa$ $P_2 = ?$ $V_2 = 90\ cm^3$

$\frac{(155\ cm^3)(22.5\ kPa)}{(90\ cm^3)} = P_2 = 38.75\ kPa$

Ch 6 HW 1 (cont)

6. a. $\frac{(1\ \text{atm})(450\ \text{mL})}{2\ \text{atm}} = \frac{(V_2)(2\ \text{atm})}{2\ \text{atm}}$ $V_2 = 225\ \text{mL}$

b. $\frac{(1\ \text{atm})(450\ \text{mL})}{.25\ \text{atm}} = \frac{(V_2)(.25\ \text{atm})}{.25\ \text{atm}}$ $V_2 = 1800\ \text{mL}$

7. $\frac{(1.00 \times 10^6\ \text{mL})(575\ \text{mm Hg})}{950\ \text{mm Hg}} = V_2 (950\ \text{mm Hg})$

$V_2 = 605263.16\ \text{mL}$

$= 6.05 \times 10^5\ \text{mL}$

$V_1 T_2 = V_2 T_1$

8. a. $\frac{(90\ \text{mL})(350\ \text{K})}{300\ \text{K}} = \frac{V_2 (300\ \text{K})}{300\ \text{K}}$ $V_2 = 93.3\ \text{mL}$

b. $\frac{(125\ \text{L})(400\ \text{K})}{85\ \text{L}} = \frac{(85\ \text{L})(T_1)}{85\ \text{L}}$ $T_1 = 588.24\ \text{K} = 315.2^\circ\text{C}$

9. $(140\ \text{mL})(T_2) = (50\ \text{mL})(340\ \text{K})$

$T_2 = \frac{(50\ \text{mL})(340\ \text{K})}{140\ \text{mL}} = 121.4\ \text{K}$

10. $(275\ \text{mL})(403\ \text{K}) = (V_2)(273\ \text{K})$

$V_2 = \frac{(275\ \text{mL})(403\ \text{K})}{273\ \text{K}} = 405.9\ \text{mL}$

$= 406\ \text{mL}$

$V_1T_2 = V_2T_1$

11. $(5000\ L)(250\ K) = (V_2)(298\ K)$

$$V_2 = \frac{(5000\ L)(250\ K)}{298\ K} = \boxed{4194.6\ L}$$

12. $(500\ ml)(325\ K) = V_2\ (298\ K)$

$$V_2 = \frac{(500\ ml)(325\ K)}{298\ K} \quad \boxed{545.3\ ml}$$

- THE CAN WON'T LET THE VOLUME INCREASE AT ALL. IF THE PRESSURE IS GREAT ENOUGH AT THIS TEMP, THE CAN COULD BURST EXPLOSIVELY

13. $P_1T_2 = P_2T_1$

$$(750\ mmHg)(350K) = P_2\ (320\ K)$$

$$320\ K$$

$$P_2 = \boxed{273.4\ mmHg}$$

14. $(P_1)(T_2) = (2P_1)(200\ K)$

$$T_2 = \frac{(2P_1)(200\ K}{P_1} \quad \boxed{= 400\ K = 127°C}$$

15. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} =$

$$\frac{(550\ mmHg)(350\ ml)}{(309\ K)} = \frac{P_2\ (425\ ml)}{(330\ K)}$$

$$\frac{(550\ mmHg)(350\ ml)(330\ K)}{(309\ K)(425\ ml)} = P_2$$

$$\boxed{485.3\ mmHg}$$

16. $\frac{(7.75 \times 10^4 \text{ Pa})(750 \text{ cm}^3)}{290 \text{ K}} = \frac{(8.1 \times 10^4 \text{ Pa})(720 \text{ cm}^3)}{T_2}$

$$T_2 = \frac{(290 \text{ K})(8.1 \times 10^4 \text{ Pa})(720 \text{ cm}^3)}{(7.75 \times 10^4 \text{ Pa})(750 \text{ cm}^3)}$$

$$= 256.7 \text{ K} = -16.3^\circ\text{C}$$

17. $\frac{(740 \text{ mmHg})(250 \text{ L})}{(295 \text{ K})} = \frac{(570 \text{ mmHg})(V_2)}{(221 \text{ K})}$

$$\frac{(740 \text{ mmHg})(250 \text{ L})(221 \text{ K})}{(295 \text{ K})(570 \text{ mmHg})} = V_2$$

$$243.1 \text{ L} = V_2$$

18. $\frac{(760 \text{ mmHg})(15 \text{ L})}{273 \text{ K}} = \frac{(500 \text{ mmHg})(V_2)}{350 \text{ K}}$

$$\frac{(760 \text{ mmHg})(15 \text{ L})(350 \text{ K})}{(273 \text{ K})(500 \text{ mmHg})} = V_2$$

$$29.2 \text{ L} = V_2$$