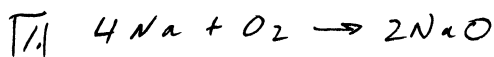


AP Chemistry
Gas Law practice



$$n = \frac{PV}{RT} = \frac{(755/760)(2.5)}{(0.0821)(273+15)} = .105 \text{ mol O}_2$$

$$.105 \text{ mol O}_2 \times \frac{4 \text{ mol Na}}{1 \text{ mol O}_2} = .420 \text{ mol Na } (22.99 \text{ g/mol})$$

$$= \underline{9.66 \text{ g O}_2}$$

2. $\text{mol CO}_2 = 13.203 / 44.01 \text{ g/mol} = .3 \text{ mol}$

$$7.2064 \text{ g} / 18.02 = .4 \text{ mol H}_2\text{O}$$

$$n_{\text{TL}} = .7 \text{ mol}$$

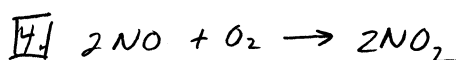
$$P = \frac{(.7)(0.0821)(353.15)}{(20.4)} = .9949 \text{ atm}$$

$$.9949 \text{ atm} \left(\frac{760 \text{ mmHg}}{1 \text{ atm}} \right) = 756.108 + 11 \text{ mmHg}$$

$$\approx \underline{767 \text{ torr}}$$

3. $\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 V_2}{n_2 T_2}$ $\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 (4V_1)}{(2n_1)(2T_1)}$

$$\underline{P_2 = P_1}$$



$$\frac{30 \text{ g NO}}{30.0061 \text{ g/mol}} \approx 1 \text{ mol} \quad \frac{30 \text{ g O}_2}{32.0 \text{ g/mol}} = .9375 \text{ mol}$$

NO limits

$$.9375 - .5 = .4375 \text{ mol O}_2 \text{ left over}$$

1 mol NO₂ produced

$$n_{\text{TL}} = 1.4375 \text{ mol}$$

$$P = \frac{(1.4375)(0.0821)(293.15)}{10.4}$$

$$= 3.46 \text{ atm} = 2628 \text{ torr}$$

$$\underline{2.6 \times 10^3 \text{ torr}}$$

5. $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$ $\frac{(1)(12)}{(273.15)} = \frac{(65)(V_2)}{(243.15)}$

$$V_2 = \underline{21.4 \text{ L}}$$

6. $\frac{20 \text{ g He}}{4.00 \text{ g/mol}} = 5 \text{ mol He}$

$$n = \frac{(86.11)(1.50 \text{ L})}{(0.0821)(298)} = 5.279 \text{ mol}$$

$$5.279 \text{ mol} - 5 \text{ mol He}$$

$$= .279 \text{ mol Unknown}$$

$$\frac{20.0 \text{ g Unknown}}{.279 \text{ mol}} = \underline{71.68 \text{ g/mol}}$$

Closest to Cl₂

7. a. $781 \times \left(\frac{1}{760} \right) = 1.03 \text{ atm}$

b. $356 \left(\frac{101.3}{760} \right) = 47.5 \text{ kPa}$

c. $2.3 \left(\frac{760}{1} \right) = 1748 \text{ torr}$

d. $2.1 \times 10^3 \left(\frac{1}{101,300} \right) = .021 \text{ atm}$

e. $201 \text{ kPa} \left(\frac{1}{101.3} \right) = 1.98 \text{ atm}$

8. $\frac{P_1}{1 \text{ mol}} = \frac{P_2}{5 \text{ mol}}$ $P_2 = 5P_1$

The pressure will be 5 times greater.

9. $760 - 609.5 - 0.5 = 150 \text{ mmHg}$ } oxygen
 $= .197 \text{ atm}$

$$\frac{150 \text{ mmHg}}{760 \text{ mmHg}} = .197 \text{ mole fraction}$$

Pressure is directly related to # of moles. $P \propto n$

$$10. \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad \frac{(760)(1,000)}{323} = \frac{(380)(V)}{283}$$

$$V_2 = 1752 \text{ L} = \underline{\underline{1.75 \times 10^3 \text{ L}}}$$

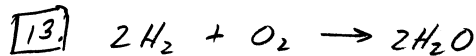
$$11. \frac{32.0 \text{ g O}_2}{32.0 \text{ g/mol}} = 1 \text{ mol O}_2 \quad P = \frac{nRT}{V}$$

$$P = \frac{(1)(.0821)(303)}{(20)} = \underline{\underline{1.24 \text{ atm}}}$$

$$12. PV = nRT \quad PV = \frac{mRT}{M}$$

$$M = \frac{mRT}{PV} \quad \frac{(96.0)(.0821)(300)}{(3.0)(25.0)}$$

$$= \underline{\underline{31.86 \text{ g/mol}}}$$



$$\frac{20.0 \text{ g O}_2}{32.0 \text{ g/mol}} = .625 \text{ mol O}_2$$

$$.625 \text{ mol O}_2 \left(\frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol O}_2} \right) = 1.25 \text{ mol H}_2\text{O}$$

$$V = \frac{nRT}{P} \quad \frac{(1.25)(.0821)(423.15)}{(0.5)}$$

$$= \underline{\underline{86.85 \text{ L}}}$$

$$14. \frac{\text{Rate}_1}{\text{Rate}_2} = \sqrt{\frac{MM_2}{MM_1}} \approx \frac{\text{Time}_2}{\text{Time}_1}$$

The greater the "rate" the shorter the time.

$$\frac{1.5}{1} = \sqrt{\frac{MM_2}{32 \text{ g/mol}}} \quad MM_2 = (1.5)^2(32)$$

$$= \underline{\underline{72 \text{ g/mol}}}$$

15. The coefficients in the balanced equation are all 1, therefore we expect equal volumes $2.5 \times 10^{10} \text{ dm}^3 \text{ CO}_2$

$$16. a. \text{Twice the Volume} = \frac{1}{2} \text{ pressure}$$

$$P = .25 \text{ atm}$$

$$b. (1+.5)/2 = .75 \text{ atm}$$

$$c. (1+0)/2 = .50 \text{ atm}$$

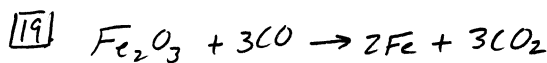
$$d. (1+.5+0)/3 = .50 \text{ atm}$$

$$17. 95.3 \text{ kPa} = P_{\text{H}_2} + 4.24 \text{ kPa}$$

4.24 kPa is the Vapor pressure of water @ 30°C

$$P_{\text{H}_2} = \underline{\underline{91.1 \text{ kPa}}}$$

$$18. \left(\frac{7.2 \text{ g}}{39.9 \text{ g/mol}} \right) (.0821)(351) = \underline{\underline{9.8 \text{ L}}}$$



$$\frac{95.34 \text{ g}}{160 \text{ g/mol}} = .596 \text{ mol Fe}_2\text{O}_3 \quad .596 \left(\frac{3}{1} \right) = 1.788 \text{ mol CO}$$

$$(1)(V) = (1.788 \text{ mol})(.0821)(298.15) = \underline{\underline{43.8 \text{ L CO}}}$$

$$20. 1.3 \text{ g Mg} \left(\frac{1 \text{ mol Mg}}{24.3 \text{ g}} \right) \left(\frac{1 \text{ mol H}_2}{1 \text{ mol Mg}} \right) \left(\frac{22.4 \text{ L}}{1 \text{ mol H}_2} \right) = \underline{\underline{1.21 \text{ L H}_2}}$$

$$21. PV = \frac{mRT}{M} \quad \frac{m}{V} = \text{density} = MP/RT$$

$$(44.01 \text{ g/mol})(1 \text{ atm}) / (.0821)(273.15 \text{ K}) = \underline{\underline{1.96 \text{ g/dm}^3}}$$

$$22. 753 \text{ torr} \left(\frac{101.3 \text{ kPa}}{760 \text{ torr}} \right) = 100.37 \approx \underline{\underline{100 \text{ kPa}}}$$

$$23. .98 \text{ atm} \left(\frac{760 \text{ mmHg}}{1 \text{ atm}} \right) + 35 \text{ mm} = 779.8 \text{ mmHg}$$

$$\approx \underline{\underline{780 \text{ mmHg}}}$$

$$24. P_1 V_1 = P_2 V_2$$

$$(250 \text{ torr})(3.5 \text{ L}) = (455 \text{ torr})(V_2)$$

$$V_2 = \underline{\underline{1.9 \text{ L}}}$$

$$25. P_1 V_1 = P_2 V_2$$

$$P_1(5.0 \text{ L}) = P_2(8.0 \text{ L})$$

$$P_2 = .625 P_1$$

$$\text{Percent decrease} = 1 - .625 = .375$$

$$\underline{\underline{37.5\%}}$$