ARIS

Q9. $4KMnO_4 + 6H_2SO_4 \rightarrow 2K_2SO_4 + 4MnSO_4 + 6H_2O + 5O_2$

$7.29g\ KMnO_4 + 10.32g\ H_2SO_4$.

How much XS reactant is left over? $3.53g\ H_2SO_4$

$KMnO_4$		H_2SO_4	
K	= 39.10	2×H	= 2.016
Mn	= 54.94	1×S	= 32.07
4×O	= 64.00	4×O	= 64.00
	158.04		98.09

start with → $10.32g\ H_2SO_4$

used-up → $-\ 6.79g\ H_2SO_4$

remain → $3.53g\ H_2SO_4$

$g\ KMnO_4 \longrightarrow g\ H_2SO_4$

(LR) $7.29g\ KMnO_4$ | $1\ mol\ KMnO_4$ / $158.04g\ KMnO_4$ | $6\ mol\ H_2SO_4$ / $4\ mol\ KMnO_4$ | $98.09g\ H_2SO_4$ / $1\ mol\ H_2SO_4$ → $6.79g$

$g\ H_2SO_4 \longrightarrow g\ KMnO_4$

(XS) $10.32g\ H_2SO_4$ | $1\ mol\ H_2SO_4$ / $98.09g\ H_2SO_4$ | $4\ mol\ KMnO_4$ / $6\ mol\ H_2SO_4$ | $158.04g\ KMnO_4$ / $1\ mol\ KMnO_4$ → $11.08g\ KMnO_4$

Common Redox Rxns

Combination rxns: $\overset{(0)}{S} + \overset{(0)}{O_2} \longrightarrow \overset{(+4)(-2)}{SO_2}$

2 or more substance → 1 substance

Decomposition rxns:

$\overset{(+2)(-2)}{2HgO} \longrightarrow \overset{(0)}{2Hg} + \overset{(0)}{O_2}$

red: $2HgO \rightarrow 2Hg$; ox: $2HgO \rightarrow O_2$

Combustion Rxns

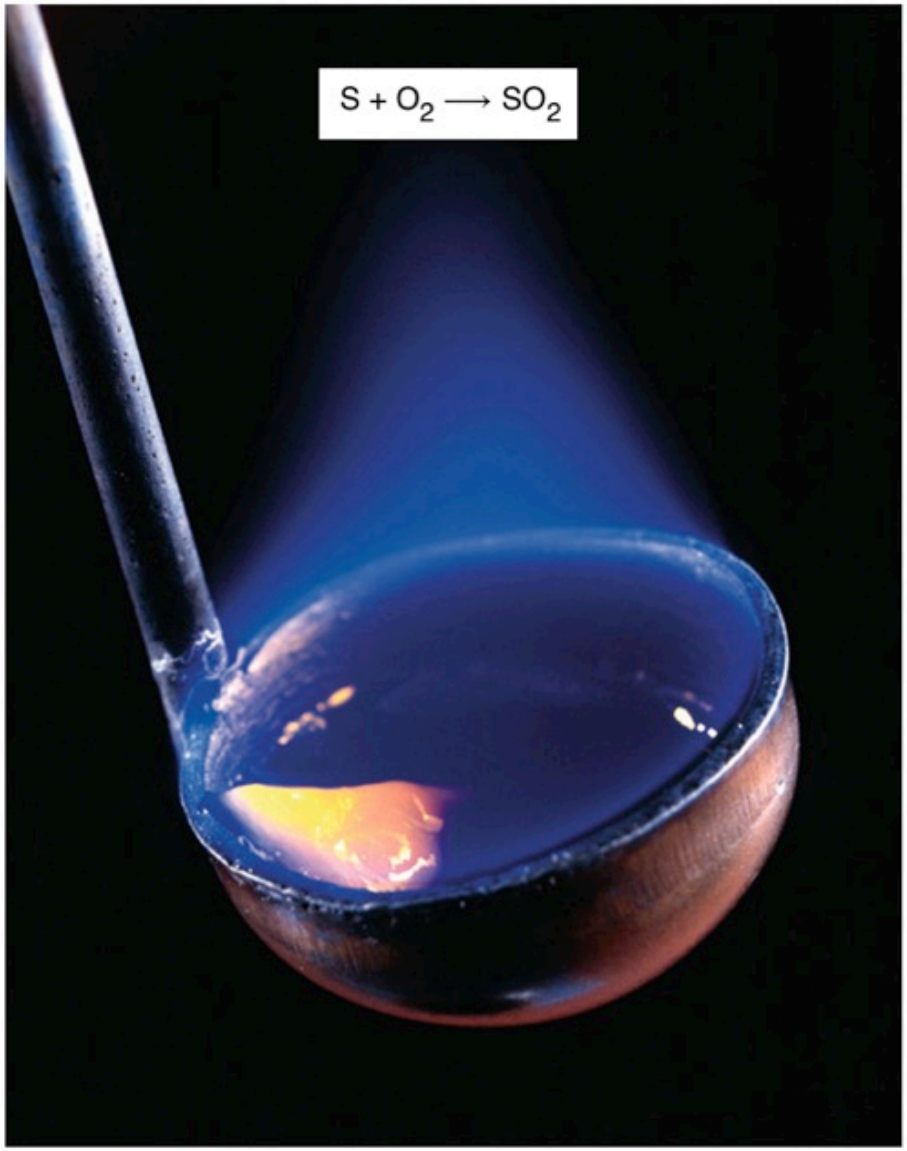
$\overset{(0)}{C_6H_{12}O_6} + \overset{(0)}{6O_2} \longrightarrow \overset{(+4)(-2)}{6CO_2} + \overset{(+1)(-2)}{6H_2O}$

red: $6O_2 \rightarrow 6CO_2$; ox: $C_6H_{12}O_6 \rightarrow 6CO_2$

Single Displacement

$\overset{(0)}{Zn_{(s)}} + \overset{+1\ -1}{2HCl_{(aq)}} \longrightarrow \overset{(+2)\ -1}{ZnCl_{2(aq)}} + \overset{(0)}{H_{2(g)}}$

red: $2HCl \rightarrow H_2$; ox: $Zn \rightarrow ZnCl_2$



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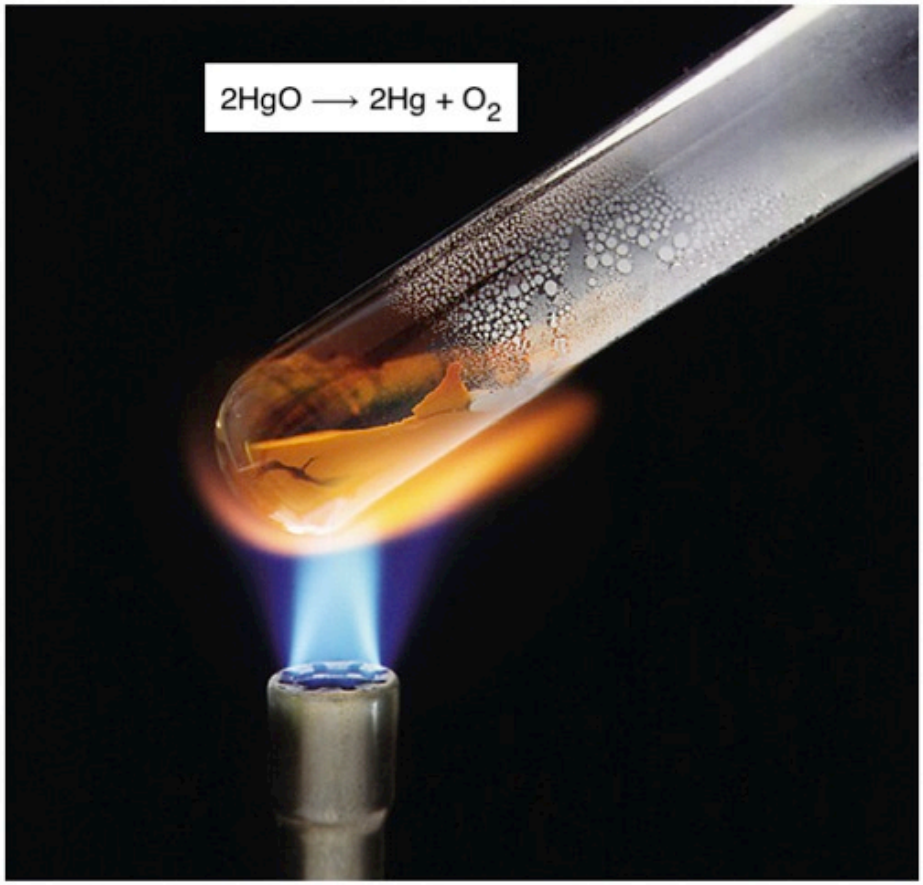

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ox # = ox. state

O.N. = O.S

Concentration of Solutions.

Molar concentration = Molarity

$$= \frac{\#\text{mol solute}}{\text{vol soln (L)}}$$

ex: 0.26 mol H_2SO_4 in 0.73 L

$$\text{Molar conc} = \frac{0.26\ \text{mol } H_2SO_4}{0.73\ \text{L}}$$

$$= 0.36\ \frac{\text{mol}}{\text{L}}\ H_2SO_4$$

$$= 0.36\ \text{M}$$

mole = mol = ~~m~~ = ~~M~~

Molar conc. of H_2SO_4 = 0.36 M

molarity " " = 0.36 M

$$[H_2SO_4] = 0.36\ \text{M}$$

We can use molarity as a conversion factor!

ex: 0.36 M H_2SO_4

$$\frac{0.36\ \text{mol } H_2SO_4}{1\ \text{L}} \qquad \frac{1\ \text{L}}{0.36\ \text{mol } H_2SO_4}$$

∞ sf $\qquad\qquad$ ∞ sf

ex: 2.5 L of 0.36 M H_2SO_4 contains ? mol H_2SO_4

$$2.5\ \text{L} \left| \frac{0.36\ \text{mol } H_2SO_4}{1\ \text{L}} \right. = 0.90\ \text{mol } H_2SO_4$$

What vol contains 0.12 mol H_2SO_4?

$$0.12\ \text{mol}\ H_2SO_4 \left| \frac{1\ \text{L}}{0.36\ \text{mol}\ H_2SO_4} \right.$$

$= 0.33\ \text{L}$ H_2SO_4 soln.

$$X\ \text{M} \rightarrow \frac{X\ \text{mol}}{1\ \text{L}}$$

$$\searrow \frac{1\ \text{L}}{X\ \text{mol}}$$

$$\text{mol} \xrightarrow{\times \frac{1\ \text{L}}{X\ \text{mol}}} \text{L}$$

$$\text{L} \xrightarrow{\times \frac{X\ \text{mol}}{1\ \text{L}}} \text{mol}$$

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ex How many moles of $MgCl_2$ are there in 15.2 mL of a 0.131 M $MgCl_2$ (aq) soln?

$$0.131\ \text{M}\ MgCl_2 \rightarrow \frac{0.131\ \text{mol}\ MgCl_2}{1\ \text{L}}$$

$$\searrow \frac{1\ \text{L}}{0.131\ \text{mol}\ MgCl_2}$$

$$15.2\ \text{mL} \longrightarrow \text{mol}$$

$1000\ \text{mL} = 1\ \text{L}$ // $1\ \text{mL} = 10^{-3}\ \text{L}$

$$15.2\ \text{mL} \left| \frac{1\ \text{L}}{1000\ \text{mL}} \right| \frac{0.131\ \text{mol}\ MgCl_2}{1\ \text{L}}$$

$= 0.00199\ \text{mol}\ MgCl_2$

$= 1.99 \times 10^{-3}\ \text{mol}\ MgCl_2$

$= 1.99\ \text{mmol}\ MgCl_2$

ex: 31.5g CH_2O was dissolved in enough H_2O, so that final volume was 250.0mL.

Q. What is $[CH_2O]$?

Q. How many mol CH_2O are in 15.0mL of this sol'n?

$$[CH_2O] = \frac{\#\text{mol } CH_2O}{\#\text{L}}$$

$\#\text{L} = 0.2500\text{L}$

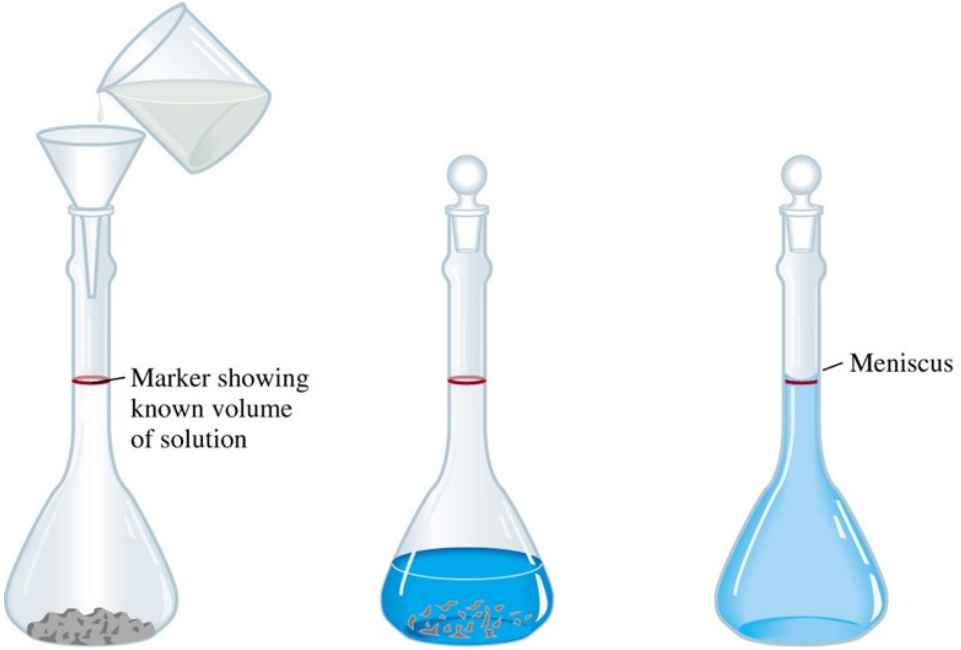
$$\frac{250.0\text{mL} \mid 1\text{L}}{1000\text{mL}} = 0.2500\text{L}$$

250.0 → 0.1750mL = 0.01750L

CH_2O

1×C = 12.01
2×H = 2.016
1×O = 16.00
30.03

$$\frac{31.5\text{g } CH_2O \mid 1\text{mol } CH_2O}{30.03\text{g } CH_2O} = 1.05\text{mol } CH_2O$$



$$[CH_2O] = \frac{1.05\,mol}{0.2500\,L} = 4.20\,\frac{mol}{L}\ CH_2O$$

$$= 4.20\,M\ CH_2O$$

$15.0\,mL \longrightarrow ?\ mol\ CH_2O$.

$$15.0\,\cancel{mL} \left|\frac{1\,L}{1000\,\cancel{mL}}\right| \frac{4.20\,mol\ CH_2O}{L}$$

$$= 0.0630\,mol\ CH_2O$$

Diluting Soln's

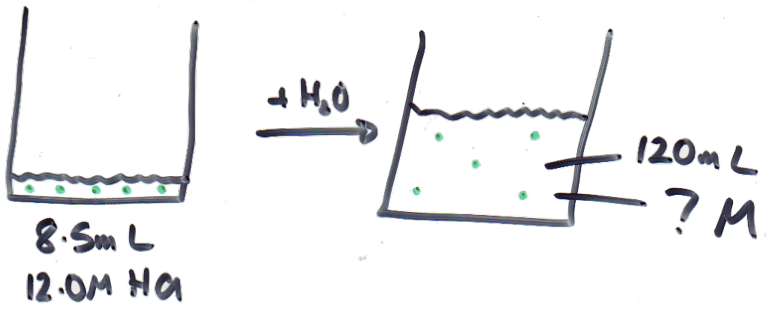
"Stock Soln" = Concentrated

- Dilute by adding water

ex: Hydrochloric acid: $HCl_{(aq)}$

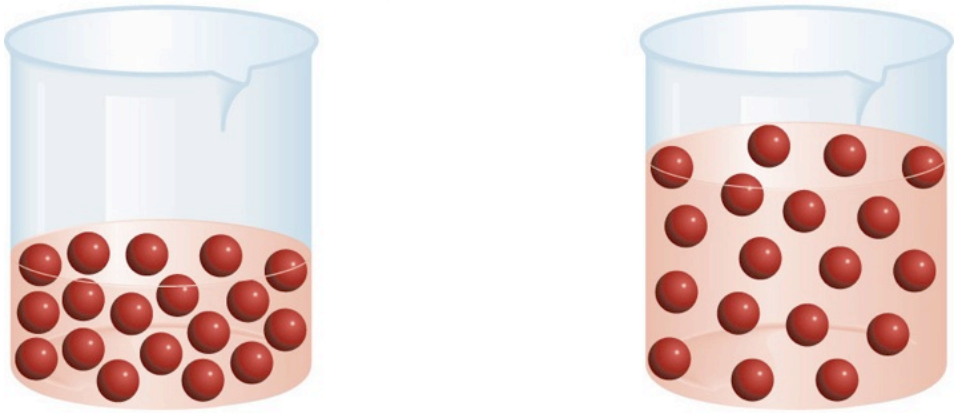
12.0M HCl

ex: We take 8.5mL of stock HCl (12.0M) and add H_2O so that final volume is 120mL. What is [HCl]?



By adding H_2O, there is no change in # mol HCl

$\Rightarrow$ #mol HCl (Before) = #mol HCl (Afte



(a) (b)