5/21/14 MolAR Relationships

Avagadro – Discovered/named the mole.

$1\text{ mole} = 6.022 \times 10^{23}$ atoms / molecules $= 22.4\text{ L (gas)} =$ molar mass in grams (on Periodic table)

If given 2.62×10^{23} atoms of Carbon, how many moles are there?

given: 2.62×10^{23} atoms need: ? moles

$$\text{amt given} \times \frac{\text{need}}{\text{given}}$$

$$2.62\cancel{\times10^{23}}\ \cancel{\text{atoms}} \times \frac{1\text{ mole}}{6.022\cancel{\times10^{23}}\ \cancel{\text{atoms}}} = \boxed{0.435\text{ moles}}$$

If He gas fills 44.8L, how many grams are present?

given: 44.8L need: ? grams

$$44.8\cancel{L} \times \frac{4.00\text{g}}{22.4\cancel{L}} = \boxed{8.00\text{ g}}$$

Stoichiometry:

① Balance Equation

② Determine given + needed

③ Create the molar ratio $\frac{\text{Coefficient moles needed}}{\text{Coefficient moles given}}$

④ Complete math

$$\text{amt. given} \times \frac{1\text{ mol given}}{\text{molar mass -or- }22.4\text{L given}} \times \frac{\text{Coefficient mol needed}}{\text{Coefficient moles given}} \times \frac{\text{molar mass -or- }22.4\text{L needed}}{1\text{ mol needed}} =$$

Practice: 2, 6, 10, 12, 13, 20, 22

#10) $Cu + 2\ Ag(NO_3) \longrightarrow Cu(NO_3)_2 + 2Ag$

given: 432g Ag need: ? $\underline{\underline{g}}$ Cu

$$432g\ \cancel{Ag} \times \frac{1\ \cancel{mol\ Ag}}{107.86\ \cancel{g\ Ag}} \times \frac{1\ \cancel{mol\ Cu}}{2\ \cancel{mol\ Ag}} \times \frac{63.55g\ Cu}{1\ \cancel{mol\ Cu}} = \boxed{127g\ Cu}$$

$$(432 \times 1 \times 1 \times 63.55) \div (107.86 \times 2 \times 1) =$$

#2 $2H_2S + 3O_2 \rightarrow 2\ H_2O + 2\ SO_2$

given: 3.50g H_2S need: ?g H_2O

$$3.50g\ H_2S \times \frac{1\ mol\ H_2S}{34.09g\ H_2S} \times \frac{2\ mol\ H_2O}{2\ mol\ H_2S} \times \frac{18.02g\ H_2O}{1\ mol\ H_2O} = \boxed{1.85g\ H_2O}\quad \boxed{C}$$

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6) $5C + 2\ SO_2 \longrightarrow CS_2 + 4\ CO$

given: 5.9mol C need: ? mol CS_2

$$5.9\ mol\ C \times \frac{1\ mol\ CS_2}{5\ mol\ C} = \boxed{1.2\ mol\ CS_2}$$

#12) $CH_4 + 2\ O_2 \longrightarrow CO_2 + 2\ H_2O$

given: 4.00g CH_4 need: ?g O_2

$$4.00g\ CH_4 \times \frac{1\ mol\ CH_4}{16.05g\ CH_4} \times \frac{2\ mol\ O_2}{1\ mol\ CH_4} \times \frac{32.00g\ O_2}{1\ mol\ O_2} = \boxed{16.0g\ O_2}$$

#13)
$$0.600g\ Zn \times \frac{1\ mol\ Zn}{65.39g\ Zn} \times \frac{1\ mol\ ZnCl_2}{1\ mol\ Zn} \times \frac{136.29g\ ZnCl_2}{1\ mol\ ZnCl_2} = \boxed{125g\ ZnCl_2}$$

#20) $2\overset{2+}{Mg}(s) + \overset{2-}{O_2}(g) \longrightarrow 2MgO$

10 mol Mg   ? mol O_2 $= \boxed{5 \text{ mol } O_2}$

#22) 6.02×10^{23} atoms (STP) = 22.4 L (g)

# of moles

Molarity = $M = \frac{n}{L} = \frac{\left(\frac{\text{grams given}}{\text{molar mass}}\right)}{L}$ for liquid

molality = $m = \frac{n}{Kg} = \frac{\left(\frac{\text{grams given}}{\text{molar mass}}\right)}{Kg}$ for solid

Dilution:

$M_1V_1 = M_2V_2$

#8 $2.00M = \frac{0.250\text{mol}}{L}$ $L = 0.125L$

$?ml = \boxed{125ml}$

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pH = measurement of hydronium ion concentration = $-\log[H_3O^+]$

$[H_3O^+] = 1 \times 10^{-3} M$ pH = 3   acid

$\underbrace{\overset{\text{acid}}{0 \rightarrow 7} \overset{\text{base}}{\longrightarrow 14}}_{\text{only w/ pH}}$

$[OH^-] = 1 \times 10^{-11} M$ pOH = 11

Practice # 1, 3, 23, 24

#1.) ? pH = $[H_3O^+] = \boxed{\begin{matrix} 0.1M \\ 1\times10^{-1}M \end{matrix}}$

pH = 1

#3.) litmus paper

red → blue = base

blue → red = acid

$\boxed{c}$ HCl

NaOH	NaCl	$\boxed{\begin{matrix}\text{HCl}\\ \text{acid}\end{matrix}}$	H_2O
base	Salt		neutral

#23) to combat excess acid add base

#24) $[H_3O^+] = 1\times10^{-7}M$ $\boxed{pH = 7}$

$2.3 \times 10^{-7} M$

$-\log[\swarrow]$ pH = < 7

$\boxed{pH = 6.6}$