

5/21/14 Molar Relationships

Avogadro - Discovered/named the mole

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

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

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

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

$$2.62 \times 10^{23} \text{ atoms} \times \frac{1 \text{ mole}}{6.022 \times 10^{23} \text{ atoms}} = 0.435 \text{ moles}$$

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

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

Stoichiometry:

① Balance Equation

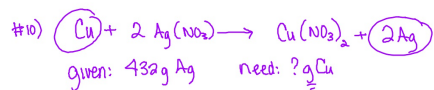
② Determine given + needed

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

④ Complete math

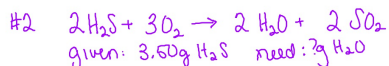
$$\text{amt. given} \times \frac{1 \text{ mol given}}{\text{molar mass} \text{ -or- } 22.4 \text{ L given}} \times \frac{\text{Coefficient mol needed}}{\text{Coefficient moles given}} \times \frac{\text{molar mass -or- } 22.4 \text{ L needed}}{1 \text{ mol needed}} =$$

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

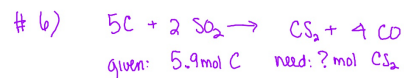


$$432 \text{g Ag} \times \frac{1 \text{ mol Ag}}{107.86 \text{ g Ag}} \times \frac{1 \text{ mol Cu}}{2 \text{ mol Ag}} \times \frac{63.55 \text{ g Cu}}{1 \text{ mol Cu}} = \boxed{127 \text{ g Cu}}$$

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



$$3.50 \text{g H}_2\text{S} \times \frac{1 \text{ mol H}_2\text{S}}{34.09 \text{ g H}_2\text{S}} \times \frac{2 \text{ mol H}_2\text{O}}{2 \text{ mol H}_2\text{S}} \times \frac{18.02 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{1.85 \text{ g H}_2\text{O}} \quad \text{C}$$

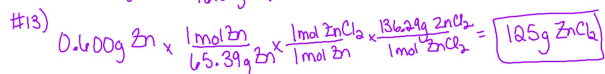


$$5.9 \text{ mol C} \times \frac{1 \text{ mol CS}_2}{5 \text{ mol C}} = \boxed{1.2 \text{ mol CS}_2}$$

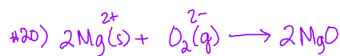


given: 4.00g CH₄ need: ?g O₂

$$4.00 \text{g CH}_4 \times \frac{1 \text{ mol CH}_4}{16.05 \text{ g CH}_4} \times \frac{2 \text{ mol O}_2}{1 \text{ mol CH}_4} \times \frac{32.00 \text{ g O}_2}{1 \text{ mol O}_2} = \boxed{16.0 \text{ g O}_2}$$



$$0.600 \text{g Zn} \times \frac{1 \text{ mol Zn}}{65.39 \text{ g Zn}} \times \frac{1 \text{ mol ZnCl}_2}{1 \text{ mol Zn}} \times \frac{136.29 \text{ g ZnCl}_2}{1 \text{ mol ZnCl}_2} = \boxed{1.85 \text{ g ZnCl}_2}$$



10 mol Mg ? mol O_2 = 5 mol O_2

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

Molarity = $M = \frac{n}{L}$ = $\frac{\text{grams given}}{\text{molar mass} \times L}$ for liquid

molality = $m = \frac{n}{\text{Kg}}$ = $\frac{\text{grams given}}{\text{molar mass} \times \text{Kg}}$ for solid

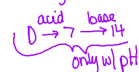
Dilution:

$M_1 V_1 = M_2 V_2$

#8 $2.00\text{M} = \frac{0.250\text{mol}}{L}$ $L = 0.125\text{L}$
 ? ml = 125 ml

pH = measurement of hydronium ion concentration = $-\log [\text{H}_3\text{O}^+]$

$[\text{H}_3\text{O}^+] = 1 \times 10^{-3}\text{M}$ pH = 3 acid



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

Practice # 1, 3, 23, 24

#1) ? pH = $[\text{H}_3\text{O}^+] = \frac{0.1\text{M}}{1 \times 10^{-1}\text{M}}$
 pH = 1

#23) to combat excess acid add base

#3) litmus paper

red → blue = base
 blue → red = acid

Cl^-/HCl

NaOH base NaCl salt HCl acid H_2O neutral

#24) $[\text{H}_3\text{O}^+] = 1 \times 10^{-7}\text{M}$ pH = 7

$2.3 \times 10^{-7}\text{M}$
 $-\log []$ pH = < 7
pH = 6.6