Chris Hunt HW2 CH 201

2.1) Yellow zinc is a type of brass that is 34.0 - 37.0% zinc by mass

a) Find the mass range of copper in 185 g of yellow zinc

Mass range is 63.0 - 66.0% for copper in yellow zinc.

Mass range in grams: $.630(185g) - .660(185g) = \boxed{117 - 122\ g}$

b) If a sample of yellow zinc contains 46.5 g of copper what is the minimum and maximum mass of zinc in grams?

~~Find the total potential mass~~

$\text{Min Zinc} = \frac{46.5g\ \text{Copper}}{.660} - 46.5g = 24.0g$

$\text{Max Zinc} = \frac{46.5g\ \text{copper}}{.630} - 46.5g = 27.3g$

2.2) Copper sample = 0.352 mol

a) How many Cu atoms are contained in the sample?

$0.352\ \text{mol Cu} \cdot \frac{6.022 \times 10^{23}\ \text{atoms}}{1\ \text{mol}} = \boxed{2.12 \times 10^{23}\ \text{atoms Cu}}$

b) Molar mass of Cu = 63.546 g/mol

$0.352\ \text{mol Cu} \cdot \frac{63.546g}{1\ \text{mol Cu}} = \boxed{22.4g}$

2.3) a) Number of Zn atoms in 28.5 g of Zn

$28.5g\ Zn \cdot \frac{1\ \text{mol Zn}}{65.38g} \cdot \frac{6.022 \times 10^{23}\ \text{atoms}}{1\ \text{mol Zn}} = \boxed{2.63 \times 10^{23}\ \text{atoms Zn}}$

b) Amount (mol) of Mn atoms in 42.0 mg of Mn

$42.0mg\ Mn \cdot \frac{.001g}{1mg} \cdot \frac{1\ \text{mol Mn}}{54.938g\ Mn} = \boxed{7.64 \times 10^{-4}\ \text{mol Mn}}$

c) Number of Br atoms in 2.62 mol of Br_2

$2.62\ \text{mol}\ Br_2 \cdot \frac{6.022 \times 10^{23}\ \text{molecules}}{1\ \text{mol}} \cdot \frac{2\ \text{atoms}}{1\ \text{molecule}\ Br_2} = \boxed{15.8 \times 10^{23}\ \text{atoms Br}}$

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2.4) What is the molarity of a solution prepared by dissolving 0.084 mol of sodium chloride in enough water to make 400mL of solution

$$\text{Molarity} = \frac{\text{mol solute}}{\text{Liter solution}}$$

$$\text{Molarity} = \frac{0.084 \text{ mol NaCl}}{.4 \text{ L } H_2O} = \boxed{.21 \frac{\text{mol NaCl}}{\text{L } H_2O}}$$

2.5) How many mol of NH_4NO_3 is needed in 224mL of H_2O to make a 0.014 M solution

$$\frac{X \text{ g } NH_4NO_3}{.224 \text{ L } H_2O} = 0.014 \text{ M} \rightarrow X = 0.014\text{M} \cdot 0.224 \text{ L}$$

$$\boxed{X = 0.00314 \text{ mol } NH_4NO_3 \text{ is needed}}$$

2.6) Find the number of mol of N atoms contained in 7.82g of $Sr(NO_2)_2$

Find molar mass of $Sr(NO_2)_2$

Sr: $1 \times 87.62 \frac{g}{mol} = 87.62$

N: $2 \times 14.01 \frac{g}{mol} = 28.02$

O: $4 \times 16.00 \frac{g}{mol} = 64.00$

$179.64 \frac{g}{mol}$ $Sr(NO_2)_2$

Concentration of N atoms in $Sr(NO_2)_2$

$$\frac{28.02}{179.64} = .1560$$

Find how many mols of $Sr(NO_2)_2$:

$$7.82 \text{ g } Sr(NO_2)_2 \div \frac{179.64 \text{ g}}{1 \text{ mol}} = .04353 \text{ mol}$$

Find mol of N

$$.04353 \text{ mol } Sr(NO_2)_2 \cdot .1560 \text{ mol N} = \boxed{6.791 \times 10^{-3} \text{ mol N in } 7.82\text{g of } Sr(NO_2)_2}$$

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2.7) What is the mass percentage of Ca in the compound $CaSO_3$

Ca: $1 \times 40.08 = 40.08$

S: $1 \times 32.06 = 32.06$

O: $3 \times 16.00 = 48.00$

120.12

$\frac{40.08}{120.12} = .3337 \cdot 100$

33.37% Ca in $CaSO_3$

2.8) How many grams of WO_3 would contain 17.2g of oxygen

W: $1 \times 183.84 = 183.84$

O: $3 \times 16.00 = 48.00$

231.84

$\frac{48.00}{231.84} = .207$

$\frac{17.2g\ O}{.207} =$ **83.09 g WO_3 is needed**

2.9) Find the density of this irregularly shaped solid

Flask Weight: 241.325g Flask with H_2O and stopper = 291.774g

Mass of $H_2O = 291.774g - 241.325g = 50.449g\ H_2O$

Solid mass = 26.754g

Mass of Flask, stopper, sample, remaining water = 308.841g

Density of water = $0.99842\ g/cm^3$

Find displaced water:

$(308.841g - 26.754g) - 291.774g = -9.687g\ H_2O$ ~~-9.687~~

Find volume displaced:

$\frac{9.687g}{0.99842\frac{g}{cm^3}} = 9.80049\ cm^3$

Find density of solid:

$\frac{26.754g}{9.80049cm^3} =$ **$2.7299\frac{g}{cm^3}$**

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2.10) How many kg of seawater would be required to recover the same amount mass of bromine that could be harvested From 2.0 kg of water From the Dead Sea?

Sea Water

Density = 1.024 g/mL Bromine concentration = 0.065 g/L

Dead Sea Water

Density = 1.22 g/mL Bromine concentration = 0.50 g/L

Find mass Bromine From 2.0 kg Dead Sea Water:

Find volume of Dead Sea Water:

$$\frac{2000\,g}{1.22\,g/mL} = 1639.344262\,mL \cdot \frac{1\,L}{1000\,mL} = 1.639\,L$$

$$.5\,g/L \cdot 1.639\,L = .8195\,g \text{ Bromine From 2.0 kg Dead Sea Water}$$

Find kg sea water to get .8195 g of Bromine:

$$\frac{.8195\,g\ Br}{0.065\,g/L} = 12.607\,L \text{ sea water} \cdot \frac{1000\,mL}{1\,L} = 12607\,mL$$

$$12607\,mL \cdot 1.024\,g/mL = 12910\,g \cdot \frac{1\,kg}{1000\,g} = 12.9\,kg \text{ Sea Water}$$

You would need about 13 kg of sea water to extract .8195 g of Bromine.

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2.11) Find the molarity of a solution of Barium Hydroxide

a) 15.00 mL solution $Ba(OH)_2$

$0.012 \frac{mol\ Ba(OH)_2}{L} \cdot .1\ L = .0012\ mol\ Ba(OH)_2$ in dilute solution of $Ba(OH)_2$

$\frac{.0012\ mol\ Ba(OH)_2}{.01\ L\ solution} = .12 \cdot 100 =$ **12% Concentration of $Ba(OH)_2$**

b) How many mol is contained in the 15 mL sample?

$.12 \frac{mol\ Ba(OH)_2}{L} \cdot .015\ L =$ **1.8×10^{-3} mol $Ba(OH)_2$**

c) ~~Molar~~ How many grams of Ba were in the original sample?

Molar Mass $Ba(OH)_2$ = 171.35

There are 1 mol of Ba per mol $Ba(OH)_2$

Molar mass of Ba = 137.33

1.8×10^{-3} mol $Ba(OH)_2$ means there is 1.8×10^{-3} mol Ba

1.8×10^{-3} mol Ba $\cdot$ 137.33 = **.25 g Ba**