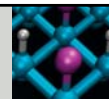


Homework Assignments:



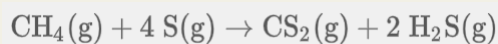
- Chapter 3 HW due Tomorrow (September 20), 11:55 pm
- Chapter 4 HW due September 26, 11:55 pm
- Quiz 2 (Covers the Chapters 3 and 4) will post this Friday and due Monday 11:59 pm
- **Exam 1** will be on **September 26 (Wednesday)**, 50 minutes (20 - 25 MCQs), covers chapters 1, 2, 3, and 4

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31

Questions from Percent Yield and solution stoichiometry:

12) The percent yield of the following reaction is consistently 87%.



How many grams of sulfur would be needed to obtain 80.0 g of CS_2 ?

(12) $\text{CH}_4(\text{g}) + 4 \text{S}(\text{g}) \rightarrow \text{CS}_2(\text{g}) + 2 \text{H}_2\text{S}(\text{g})$
 mass ? 80.0 g
 Percent yield = $\frac{\text{Actual yield of } \text{CS}_2}{\text{Theoretical yield of } \text{CS}_2} \times 100\%$
 $87 = \frac{80.0 \text{ g}}{\text{Theoretical yield of } \text{CS}_2} \times 100$
 Theoretical yield of CS_2 } = $\frac{80.0 \text{ g}}{0.87} = 92 \text{ g}$
 mass of CS_2 $\xrightarrow{\text{MM of } \text{CS}_2}$ moles $\xrightarrow{\text{mole ratio}}$ moles S $\xrightarrow{\text{MM of S}}$ mass S
 $\frac{92 \text{ g}}{76.13 \text{ g/mol}} \times \frac{4}{1} \times 32.06 \text{ g/mol}$
= 150 g S

MM $\text{CS}_2 = 76.13 \text{ g/mol}$
 MM S = 32.06 g/mol

13) If 18.4 g of Mg_3N_2 forms from the reaction of 20.0 g of magnesium with excess nitrogen, what is the percent yield?



(13) $3 \text{Mg}(\text{s}) + \text{N}_2(\text{g}) \rightarrow \text{Mg}_3\text{N}_2(\text{s})$
 20.0 g 18.4 g
 mass Mg \rightarrow mol Mg \rightarrow mol Mg_3N_2 \rightarrow mass Mg_3N_2
 $\frac{20.0 \text{ g}}{24.305 \text{ g/mol}} \times \frac{1}{3} \times 100.929 \text{ g/mol} = 27.7 \text{ g}$
 % yield = $\frac{\text{Actual yield of } \text{Mg}_3\text{N}_2}{\text{Theoretical yield of } \text{Mg}_3\text{N}_2} \times 100\%$
 $= \frac{18.4 \text{ g}}{27.7 \text{ g}} \times 100\%$
 $= \frac{18.4 \text{ g}}{27.7 \text{ g}} \times 100\%$
= 66.4 %

MM $\text{Mg}_3\text{N}_2 = 100.929 \text{ g/mol}$

- 14) How many grams of H_2 can be prepared from 25.0 mL of 6.00 M H_2SO_4 and excess zinc?



14) $\text{Zn(s)} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{g})$

Excess $V = 25.0 \text{ mL}$
 $M = 6.00 \text{ M}$
 $n_{\text{H}_2\text{SO}_4} = M \times V$

$$n_{\text{H}_2\text{SO}_4} = M \times V = 6.00 \text{ mol L}^{-1} \times 25.0 \times 10^{-3} \text{ L}$$

$$= 0.150 \text{ mol}$$

$$n_{\text{H}_2} = 0.150 \text{ mol} \times \frac{1}{1} = 0.150 \text{ mol}$$

mass of H_2 } $= 0.150 \text{ mol} \times \text{MM}_{\text{H}_2}$

$$= 0.150 \text{ mol} \times 2.016 \text{ g mol}^{-1}$$

$$= \underline{\underline{0.302 \text{ g}}}$$

- 15) What volume, in mL, of 0.512 M NaOH is required to react completely with 25.0 mL of 0.234 M H_2SO_4 ?

15) $2\text{NaOH(aq)} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Na}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O(l)}$

$V ?$ $V = 25.0 \text{ mL}$
 0.512 M $M = 0.234 \text{ M}$

$$n_{\text{H}_2\text{SO}_4} = M \times V = 0.234 \text{ mol L}^{-1} \times 25.0 \times 10^{-3} \text{ L}$$

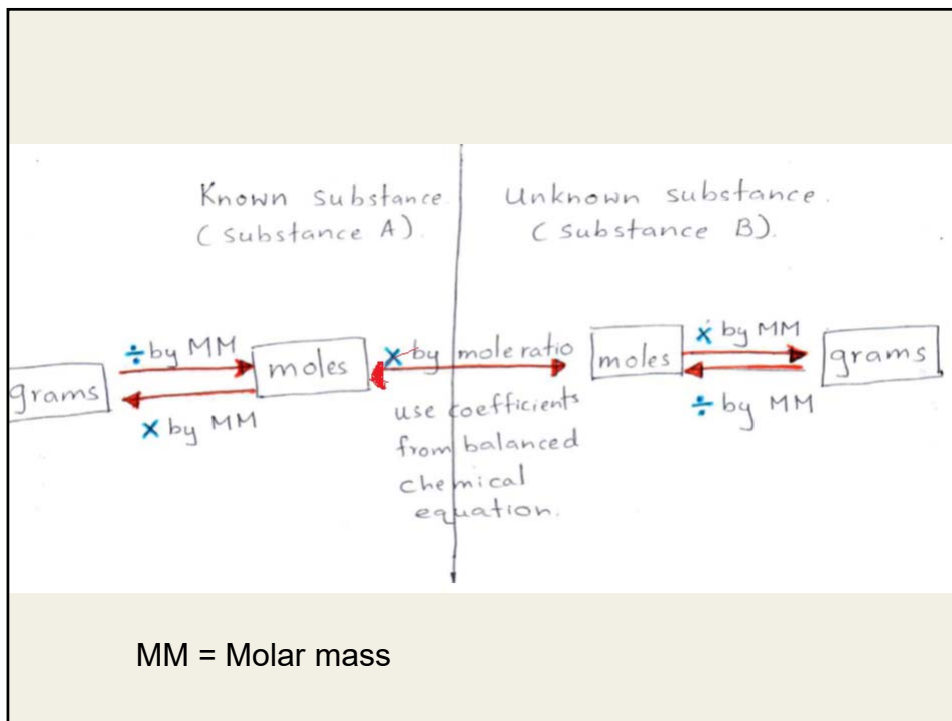
$$= 5.85 \times 10^{-3} \text{ mol}$$

$$n_{\text{NaOH}} = 5.85 \times 10^{-3} \text{ mol} \times \frac{2}{1} = 1.17 \times 10^{-2} \text{ mol}$$

$$\checkmark n = \checkmark M \times V$$

$$V_{\text{NaOH}} = \frac{n_{\text{NaOH}}}{M_{\text{NaOH}}} = \frac{1.17 \times 10^{-2} \text{ mol}}{0.512 \text{ mol L}^{-1}}$$

$$= \underline{\underline{22.9 \text{ mL}}}$$



Groupings of Elements

1 IA	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA	
ALKALI METALS		ALKALINE EARTH METALS										NOBLE GASES						
1	Li	2	Be	3	B	4	C	5	N	6	O	7	F	8	Ne			
2	Na	Mg		Al	Si	P	S	Cl	Ar									
3	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
4	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
5	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
6	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Nh	Fl	Mc	Lv	Ts	Og

Symbol — H

TRANSITION ELEMENTS

REPRESENTATIVE ELEMENTS

LANTHANIDES

ACTINIDES

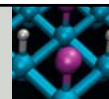
INNER TRANSITION ELEMENTS

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

- The inner transition elements are divided into the **lanthanide series** and the **actinide series**.

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Ionic Charges



	1 IA	2 IIA												13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIII
2	1+ Li															3- N	2- O	1- F	He
3	1+ Na	2+ Mg												3+ Al		3- P	2- S	1- Cl	Ne
4	1+ K	2+ Ca															2- Se	1- Br	Ar
5	1+ Rb	2+ Sr													4+ Sn			1- I	Kr
6	1+ Cs	2+ Ba													4+ Pb				Xe
7																			

- **Metals** have a positive ionic charge equal to their group number
- **Nonmetals** have a negative ionic charge equal to 8 minus their A group number.

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39

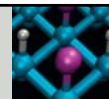
Table 2.3: Common Monatomic Ions



Cation Name	Symbol	Anion Name	Symbol
Sodium ion	Na ⁺	Fluoride ion	F ⁻
Lithium ion	Li ⁺	Chloride ion	Cl ⁻
Potassium ion	K ⁺	Bromide ion	Br ⁻
Magnesium ion	Mg ²⁺	Sulfide ion	S ²⁻
Aluminum ion	Al ³⁺	Nitride ion	N ³⁻

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40

Common cations: (Table 2.5)

Sodium ion	Na^+
Magnesium ion	Mg^{2+}
Iron(II) ion	Fe^{2+}
Iron(III) ion	Fe^{3+}
Silver ion	Ag^+
Ammonium ion	NH_4^+
Potassium ion	K^+
Calcium ion	Ca^{2+}
Copper(I) ion	Cu^+
Copper(II) ion	Cu^{2+}
Zinc ion	Zn^{2+}
Hydronium ion	H_3O^+

Common anions (Table 2.6)

Halides	F^- , Cl^- , Br^- , I^-
Nitrate	NO_3^-
Phosphate	PO_4^{3-}
Carbonate	CO_3^{2-}
Sulfate	SO_4^{2-}
Hydroxide	OH^-
Cyanide	CN^-
Oxide	O^{2-}