Announcements – Lecture V– Tuesday, Sep 18th

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4.3 What Is a Mole and How Do We Use It to Calculate Mass Relationships.

Molar Mass ... (Formula Weight)

Al	Si	P	S
13	14	15	16
26.98	28.09	30.97	32.07

Al : 26.98 g.mol^{-1}

↳ P : 30.97 g.mol^{-1}

C_4H_{10} : 4(C) + 10(H)

4(12.01) + 10(1.01) = 58.14 g.mol^{-1}

Molar Mass

Reminder : 58.14 g.mol^{-1} = $\frac{58.14\ g}{1\ mol}$

4.3 What Is a Mole and How Do We Use It to Calculate Mass Relationships.

Example 1

a) How many ATOMS of fluorine are present in 3.30 moles of BF_3?

b) How many MOLES of fluorine are present in 3.09×10^{22} molecules of BF_3

$N = 6.023 \times 10^{23}$

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a) $3.30 \text{ mol } BF_3 \left| \frac{3 \text{ F}}{1 \text{ } BF_3} \right. = 9.90 \text{ mol F}$

$9.90 \text{ mol F} \left| \frac{6.023 \times 10^{23} \text{ atoms}}{1 \text{ mol}} \right. = 5.96 \times 10^{24} \text{ atoms F}$

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b) $3.09 \times 10^{22} \text{ molecules } BF_3 \left| \frac{1 \text{ mol}}{6.023 \times 10^{23} \text{ molecules}} \right. = 0.0513 \text{ mol } BF_3$

$0.0513 \text{ mol } BF_3 \left| \frac{3 \text{ F}}{1 \text{ } BF_3} \right. = 0.154 \text{ mol F}$

5.3 What Is a Mole and How Do We Use It to Calculate Mass Relationships.

Example 2

How many **MOLES** of water are present in 5.41 grams of this compound ?

O: 16.0 H: 1.01

a) 0.1 b) 0.2 c) 0.3 d) 0.4 e) Help

5.41 g water → ? mol water

H_2O : 2(H) + O

$2(1.01) + 16.0 = 18.02\ g.mol^{-1}$ .... $\frac{18.02\ g}{1\ mol}$

$$5.41\ g\ water \left| \frac{1\ mol}{18.02\ g} \right. = 0.3\ mol\ water$$

5.3 What Is a Mole and How Do We Use It to Calculate Mass Relationships.

Example 3

How many Grams of ethanol (CH_3CH_2OH) are present in 0.61 moles of this compound ?

C: 12.01 H: 1.01 O: 16.0

a) 46 b) 96 c) 28 d) Help

CH_3CH_2OH : 2(C) + 6(H) + O

$2(12.01) + 6(1.01) + 16.0 = 46.08\ g.mol^{-1}$

$\left(\frac{46.08\ g}{1\ mol}\right)$

$$0.61\ mol\ CH_3CH_2OH \left| \frac{46.08\ g}{1\ mol} \right. = 28.1\ g\ CH_3CH_2OH$$

Example 1

Balance the following chemical equation:

$$2\ Fe_2O_3(s) + 3\ C(s) = 4\ Fe(s) + 3\ CO_2(g)$$

Reactants					✓
Fe	2	2	4	4	4
O	3	3	6	6	6
C	1	1	1	1	3

Products					✓
Fe	1	2	2	4	4
O	2	2	6	6	6
C	1	1	3	3	3

$$2\ Fe_2O_3(s) + 3\ C(s) = 4\ Fe(s) + 3\ CO_2(g)$$

Example 2

Balance the following chemical equation:

$$\_\_C_2H_6(g) + \underline{7/2}\,O_2(g) = \underline{2}\,CO_2(g) + \underline{3}\,H_2O(l)$$

Reactants ✓					
C	2	2	2	2	
H	6	6	6	6	
O	2	2	2	7	

Products ✓					
C	1	2	2	2	
H	2	2	6	6	
O	3	5	7	7	

$$C_2H_6(g) + \tfrac{7}{2}O_2(g) = 2\,CO_2(g) + 3\,H_2O(l)$$

$\times 2$

$$2\,C_2H_6(g) + 7\,O_2(g) = 4\,CO_2(g) + 6\,H_2O(l) \quad ✓$$

4.4 How Do We Balance Chemical Equations?

Example 3

a) 1
b) 2
c) 3
d) 4
e) 5

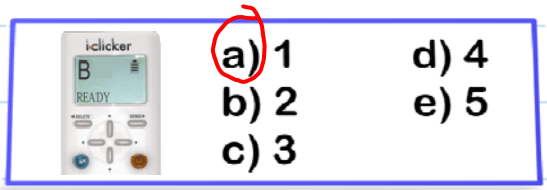
Balance the following chemical equation:

$$\_\_AgNO_3(aq) + \_\_K_2CrO_4(aq) = \_\_?\_\_Ag_2CrO_4(s) + \_\_KNO_3(aq)$$

? What is taking you so long !!

4.4 How Do We Balance Chemical Equations?

Example 3



Balance the following chemical equation:

$$\underline{2}\ AgNO_3(aq) + \underline{\ \ }\ K_2CrO_4(aq) = \underline{?}\ Ag_2CrO_4(s) + \underline{2}\ KNO_3(aq)$$

Reactants			✓		
Ag	1	2	2		
NO_3	1	2	2		
K	2	2	2		
CrO_4	1	1	1		

Products			✓		
Ag	2	2	2		
NO_3	1	1	2		
K	1	1	2		
CrO_4	1	1	1		

$$2\ AgNO_3(aq) + K_2CrO_4(aq) = Ag_2CrO_4(s) + 2\ KNO_3(aq)$$

Polyatomic ions ... when remaining intact ... treat as a single entity.