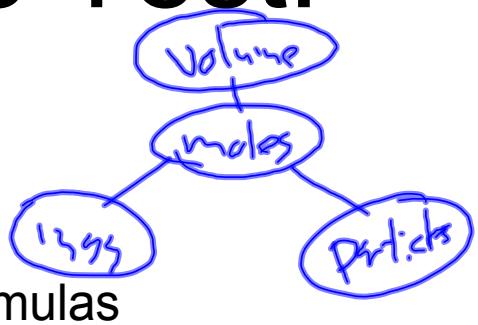
Topics on the Test:

- Molar Calculations
  - One-Step
  - Two-Step
- Percent Composition
- Empirical and Molecular Formulas
- Balancing Equations
- Types of Reactions
  - Formation $A + B \rightarrow AB$
  - Decomposition $AB \rightarrow A + B$
  - Combustion
  - Single Replacement $A + BC \rightarrow B + AC$
  - Double Replacement $AB + CD \rightarrow AD + CB$



A sample of a substance contains 39.99% carbon, 6.73% hydrogen, and 53.28% oxygen.

a) What is the empirical formula of the substance?

b) If the molar mass of the substance is 180.18g/mol, what is the molecular formula?

a) $39.99\,g\,C \times \frac{1\,mol\,C}{12.01\,g\,C} = 3.33\,mol\,C \div 3.33 = 1$

$6.73\,g\,H \times \frac{1\,mol\,H}{1.01\,g\,H} = 6.66\,mol\,H \div 3.33 = 2$

$53.28\,g\,O \times \frac{1\,mol\,O}{16.00\,g\,O} = 3.33\,mol\,O \div 3.33 = 1$

empirical formula = CH_2O

b) molar mass: 180.18 g/mol

$C = 1 \times 12.01$

$H = 2 \times 1.01$

$O = 1 \times 16.00$

$30.03\,g/mol$

how much bigger is the molecular molar mass than the empirical?

6 times bigger

$C_6H_{12}O_6$

Bill Nye has a 345.6g sample of C_3H_7OH.

a) How many molecules does he have?

b) How much volume does the sample take up @STP?

c) What is the percent composition of the sample?

d) If he wrote the balanced equation for the combustion of his sample, what would it look like?

a) g → mol → molecules

$345.6\,g \times \frac{1\,mol}{60.11\,g} \times \frac{6.02 \times 10^{23}\ molecules}{1\,mol} = 3.46 \times 10^{23}\ molecules$

b) $345.6\,g \times \frac{1\,mol}{60.11\,g} \times \frac{22.4\,L}{1\,mol} = 128.8\,L$

c) C_3H_7OH

total = 60.11

$C = \frac{36.03}{60.11} = 59.94\%$

$H = \frac{8.08}{60.11} = 13.44\%$

$O = \frac{16.00}{60.11} = 26.62\%$

100%

d) $2C_3H_7OH + 9O_2 \rightarrow 6CO_2 + 8H_2O$

There are two beakers on a lab bench. The first beaker contains a substance that has a percent composition of 70.20% calcium, 28.03% oxygen, and 1.77% hydrogen. The second beaker contains a substance that has a percent composition of 39.34% sodium and 60.66% chlorine. If both substances have the same molecular formula as empirical formula, write and balance a double displacement reaction showing the reaction of the two substances.

Substance 1

70.20g Ca ÷ 40.08g/mol = 1.75mol = 1
28.03g O ÷ 16.00g/mol = 1.75 mol = 1
1.77g H ÷ 1.01g/mol = 1.75mol = 1

CaOH

Substance 2

39.34g Na ÷ 22.99g/mol = 1.71mol = 1
60.66g Cl ÷ 35.45g/mol = 1.71mol = 1

NaCl

Error ☹

$CaOH + NaCl \rightarrow CaCl + NaOH$