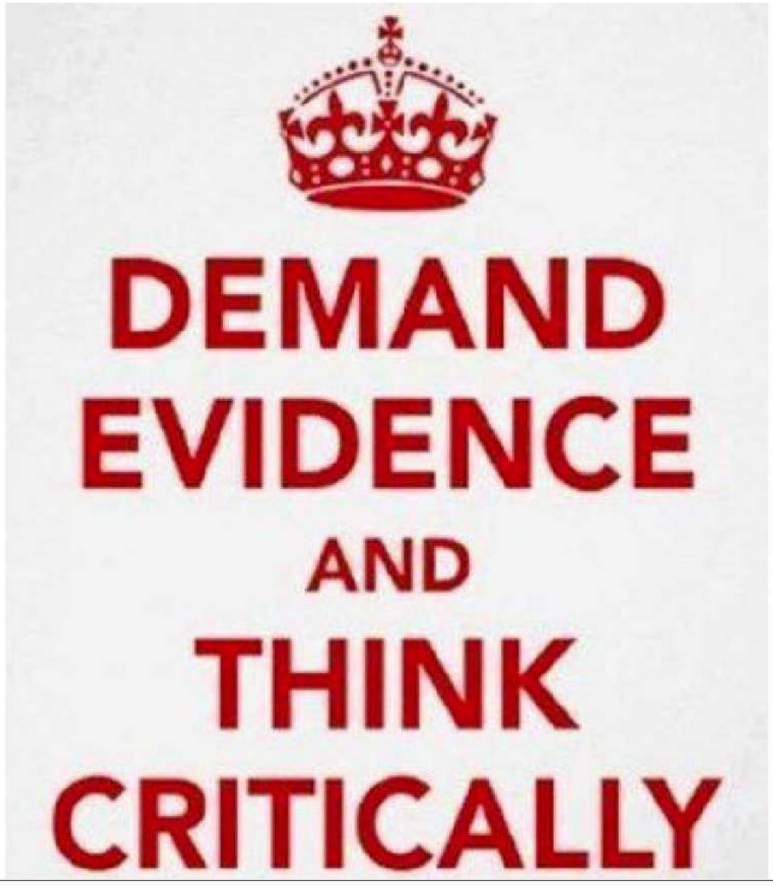
Do Now: In your notes, write down what this has to do with reasoning.



Do now:

Using dimensional analysis, convert 1 foot to centimeters. 1ft=12in 1in=2.54cm.

$$\frac{1\ ft}{1} \times \frac{12\ in}{1\ ft} \times \frac{2.54\ cm}{1\ in} = \frac{30.5\ cm}{1}$$

30.5 cm

Ch. 10 Homework

- Homework Due Tuesday ~~Wednesday~~: Ch problems #s 50-54, 58, 59, 62-66, 68, 69.

Missing Work:
All missing work is due by Thursday. After Thursday at 3:00pm, all missing work will be put in as a zero.

Ch. 10: Chemical Quantities

- The Mole: Avogadro's Number.
- Mole Mass and Volume Relationships.
- Percent Composition and Chemical Formulas.

Measuring Matter

- 3 main methods for measuring matter:
  - Count it (#)
    Eggs | Doughnuts
  - Mass (Kg)
    Bananas / Deli Item
  - Volume (_m^3 or _L) Drinks

Relating Quantities of Measurement

- We can convert one measurement of matter to another.
- Ex: number to weight
- This is an estimation based on averages.

Take these values and make a referance equation.

Dimensional Analysis

1 ft = 12 in

Starting amount	Equal amounts	End Amount
24 inches	1 foot	= feet
	12 inches	
24 inches	1 foot	= 2 feet
	12 inches	

Examples

- How many eggs are in three dozen?
- How many cm in 1 km?
- How many ml in 500 L?

1 dozen = 12 eggs

100 cm = 1 m

1 km = 1000 m

1000 ml = 1 L

How many apples in a bushel?

- 1 dozen apples = 12 apples
- 1 dozen apples = 2.0 Kg of apples
- 1 dozen apples = 0.2 bushels of apples
- Use Dimensional Analysis (DA) to solve for the number of apples in a bushel as well as the weight of a bushel of apples.

$\frac{5 \text{ fam}}{1} \cdot \frac{4 \text{ ppl}}{1 \text{ fam}} \cdot \frac{2.5 \text{ sl}}{1 \text{ ppl}} \cdot \frac{1 \text{ pza}}{8 \text{ sl}} = \frac{50 \text{ pza}}{8}$

Estimation

$= 6.25 \text{ pza} \approx 7 \text{ pza}$

- Use dimensional analysis to estimate the number of pizzas needed for a party given the following data:
  - There are 5 families coming to the party.
  - Each family has about 4 people.
  - The average person eats about 2.5 slices of pizza.
  - Each pizza has eight slices.

- 0-8:21

The Mole

The Mole

- Relates Weight, Atomic Mass and the Number of particles of a substance.
- 1 Mole = 1 gram of AMU
- If the AMU of Oxygen is 16, then a sample of 16g of oxygen contains 6.02×10^{23} atoms of Oxygen.
- If you know the atomic mass of a substance, then you can calculate the # of representative particles you have.

Representative Particles:

Ionic compounds: Formula Units

1 mole NaCl = 6.02×10^{23} Formula Units

Metals: Atoms

1 mole Fe = 6.02×10^{23} Atoms

Covalent Comounds: ~~Formula Units~~ molecules

1 mole CH_4 = 6.02×10^{23} molecules

Molar Mass

- The weight of one mole of an element.
- Finding the molar mass of a compound:
  - Find the Atomic Mass of the compound.
  - Take the formula of the compound that you are working with and figure out how many of each particle are in the compound.
  - Find the atomic mass of each element and total up the mass.

Mass of one Mole

- The mass of one mole of a particle (atom, ion, molecule, subatomic particle) is equal to the atomic mass of the particle. Instead of AMU it's in grams.
- CO_2: Carbon Dioxide. AMU of the compound is about 44 AMU.
- That means that one mole of CO^2 weighs 44g

1 mole = 6.02×10^{23} molecules = 28 g = 22.4 L

How many moles of Nitrogen gas are in a 50g sample?

K: 50 g

U: # moles

$$\frac{50\ g}{1} \times \frac{1\ mol}{28\ g} = \frac{50\ mol}{28} = 1.8\ mol$$

Mole-Mass Relationship

- Use the molar mass to convert between the mass and the number of moles of a substance.
- If you know the molar mass, you can convert:
  - Weight (in grams) to the moles of a substance.
  - Moles of a substance to weight.

Do Now: Write all of the reference equations in order to solve the following:

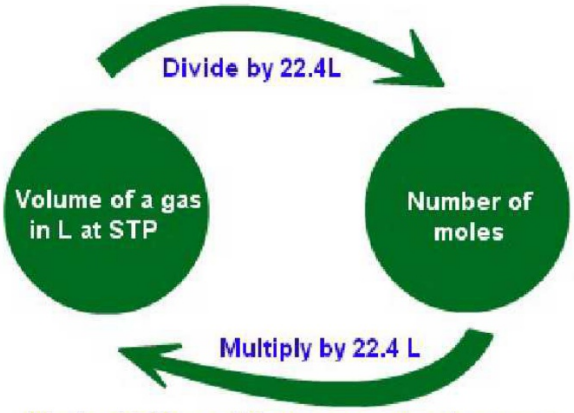
19.72 mol

- How many moles of water are in a 355ml can of coke?
- Remember: 1ml of water is 1g.
- H_2O: 1+1+16=18 g/mole
- Use DA to solve for the number of moles of water.

Please take out the worksheet from yesterday

The Mole-Volume Relationship

- At STP: 1 mole of a gas will occupy a volume of 22.4 liters.
- STP: Standard Temperature (0^{oC}) & Pressure (1 atm).



Under S.T.P conditions,one mole of any gas occupies a constant volume of 22.4 L.

Check your answers to the homework.

What problems would you like to see solved?

6, 1, 93

1) $1\,mol = 38\,g = 22.4\,L = 6.02\times10^{23}\,molecules$

K: 60 g U: # molecules

$$\frac{60\,g}{1}\times\frac{6.02\times10^{23}\,molecules}{38\,g} = \frac{361.2\times10^{23}\,molecules}{38}$$

$$9.51\times10^{23}\,molecules$$

Homework Problems

x: 3.24×10^{22} molecules

V: L

$$\frac{3.24 \times 10^{22} \text{ molecules}}{1} \times \frac{22.4 \text{ L}}{6.02 \times 10^{23} \text{ molecules}}$$

$= 1.21 \text{ L}$

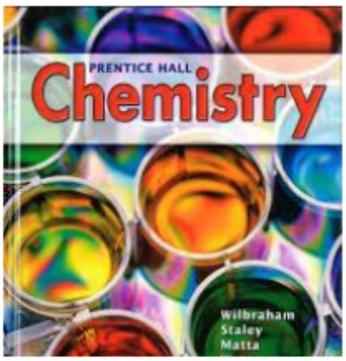
9) 14 g

7) 0.0378 moles

Your Turn

- How many moles of Oxygen are contained in 13.7 L of the gas?
- Use DA to solve.
- Remember: 1 mole = 22.4 L
- What is the volume of 37 moles of nitrogen gas?

What is the volume of 25g of fluorine gas?



Chapter 10/12 Chemistry Review

High School chemistry review of moles and stoichiometr

Play ▸ Preview Favourite ★

Share

Or, copy & share this link: https://play.kahoot.it/#/k/769149ae-eb1d-411f

kahoot.it

1-12

Worksheet: Take the next 20 or so minutes to complete the worksheet.

Remember: Reference equation, known, unknown, cancel units, resolve the fraction.

If we finish with 15 minutes left, we can do another kahoot.

Ch. 10 Homework

- Homework Due

  Ch problems #s

  50-54, 58, 59, 62

Molar Mass from "Density"

- You can use the molar volume of gas to calculate the density of a gas.
- Molar Mass = density at STP x molar volume at STP.
- [grams/mole] = [grams/L] x [22.4L/mole]

Rice Lab:
You and your partner will apply your knoledge of molar quantities to determine the mass and volume of one mole of "ricium."

This week:

T: Mole lab and dimensional analysis practice.

W: Percent composition calculations.

R: Review of chapter 10 (possible lab)

F: Chapter 10 quiz. Begin Chapter 11.

Ch. 10 Homework

- Homework Due Wednesday: Ch problems #s 50-54, 58, 59, 62.

There are canisters of different materials around the room.

Each has a label with the name of the material and a "tare" mass.

Tare mass (T) is the mass of the canister.

Mass each of the canisters with the material in it. Do not open the canisters.

Subtract the mass of the container to find the mass of the matateriał.

Mass each of the canisters with the material in it. Do not open the canisters.

Subtract the mass of the container to find the mass of the matatерial.

From this, calculate the number of moles and particles (atoms, formula units or molecules).

When finished, put the lab in your lab book and begin the moles practice sheet.

Grab a whiteboard for you and your lab partner.

http://ths.sps.lane.edu/chemweb/unit2/problems/molarmass/index.htm

Good Morning:

Please take out your homeowork.

Check it with the solutions by the chem hood.

Solve the following in your notes:
What is the volume of 13g of oxygen gas?
Remember, oxygen gas is diatomic.

What is the volume of 13g of oxygen gas?

10.3: Percent Composition

- % by mass: Use the molar mass and chemical formula to determine the total weight of one mole of the compound.
- Use the molar mass of the individual elements multiplied by the number of atoms of the element. Divide that number by the molar mass of the compound.

Example

- Determine the % composition of each element of H_2SO .
- Find the total molar mass of the compound: (2x1)+(1x32)+(4x16)= 98g/mol
- Determine the mass of each element & divide it by the weight of the compound:
  - Hydrogen: 2x1= (2g/mol)/(98g/mol)= 2%
  - Sulfur: 1x32= (32g/mol)/(98g/mol)=32.6%
  - Oxygen: 4x16=(64 g/mol)/(98g/mol)= 65.3%

Determine the %mass composition of CH_4

Molar mass of CH_4:

Mass of C:
Mass of H x 4:

%C:

%H:

Conversion Factors

- Use % composition to calculate the weight of any element in the mass of a compound.
- Ex: How much Hydrogen is in 11g of water (by weight)?
- 11x(2/18)=1.22g of Hydrogen

I have 10g of HCl that I want to use in an experiment. If I assume that all of the Chlorine is used up, how much hydrogen do I have left? Answer in grams.

Empirical Formula

- The smallest **whole number** ratio of atoms in a compound. Think ionic compounds
- This is a ratio of atoms, not the chemical formula for a particular compound.
- Example: Ethene C_2H_2 has a ratio of 1:1. So does Styrene with C_8H_8. Both have the same ratio, but have different physical and chemical properties.

Molecular Formula

- The **exact number** of atoms in a compound.
- If there are more or less atoms in the ratio then the compound is different.
- Example: Nitric Oxide: NO. Byproduct of combustion & cardiovascular signaling molecule.
- Nitrous Oxide: N_2O: Laughing gas.

Solving for the Molecular Formula

- If you know the Empirical Formula then you can solve for the Molecular formula.
- Lets say you have a compound that tested to have a mass of 60g/mol. We know, based on the reaction, that the empirical formula is a ratio of CH_4N. What is the Molecular formula?
- Find the molar mass of the Empirical formula.
- Use that to find the ratio of the molar mass of the compound.

Computation

- The molar mass of CH_4N is 30g/mol.
- The molar mass of the compound in question is 60g/mol.
- The compound has twice the molar mass of the Empirical formula (60/30=2).
- Therefore, the Molecular formula of the compound being investigated is $C_2H_8N_2$.

You encounter a compound that is 180 g/mol. You experimented and know that for every carbon atom, two hydrogen atoms are used. Also, for every carbon atom, one oxygen is used. What is the molecular formula of the compound?

Worksheets:

Finish the Chapter 10 Moles Practice Sheet.

Also, Complete the Empirical Formula Worksheet.

Finish both for homework.

http://ths.sps.lane.edu/chemweb/unit2/problems/molarmass/index.htm

Grab a laptop.

Get online and complete the online quiz with your lab partner.