Tuesday, February 3rd, 2015

Learning Target : I can express the concentration of a solution as molarity, percent by mass, percent by volume, and parts per million.

Homework: n/a

As you enter...

What is the definition and formula for molarity?

(hint: check out your brochure)

Molarity is the concentration of a solution.

$$M = \frac{\text{moles (mol)}}{\text{volume (Liters)}}$$

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

9th period

- Solution Calculations (40 min)
- Exit Tix (5 min)

Tix out the door

Write your name and **EMAIL** on the paper, please.

What is the concentration (molarity) of a solution with 6.0 moles of NaCl dissolved in 2.0 L of water?

New Unit: SOLUTIONS

1 What is a solution?
...solute vs solvent

2 How do you make solutions?
...dilution, concentration, solubility

3 Why do solutions form?
...intermolecular forces, polarity, "like dissolves like"

4 What can affect solution formation?
...solubility factors, particle diagrams

$\boxed{2}$

1.) 25g NaCl (solute) in 100g solution

$\frac{25\,g}{100\,g} \times 100 = \boxed{25\%}$ by mass

4.) 225 mL in 1L solution

$\frac{225\,mL}{1\,L} \times 100 = \frac{225\,mL}{1000\,mL} \times 100 = \boxed{22.5\%}$

$\boxed{3}$ Molarity = M

1 Molar

$M = \frac{mol}{volume}$ ← Liters

1. 2 mol NH_3 in 5L solution

$M = \frac{2\,mol}{5\,L} = 0.4\,M$

$\boxed{moles = \frac{mass}{gram\ formula\ mass}}$

3. $moles = \frac{20\,g}{23+16+1} = \frac{20}{40} = 0.5\,mol$

$\frac{M}{1} \times \frac{mol}{L}$

$mol = M \times L$

5. $M = \frac{mol}{L}$ ← volume

$\frac{5M}{1} \times \frac{x}{4L}$

$x = 5 \times 4 = \boxed{20\,mol}$

6. V = ?
M = 2 M
mol = 7

$M = \frac{mol}{L}$

$\frac{2}{1} = \frac{7}{x}$

$2x = 7$

7. Mass = ?
V = 4 L
M = .5

$0.5 = \frac{x}{4}$ ← moles

$x = 2\,mol$

mass → moles → $M = \frac{mol}{V}$

$moles = \frac{mass}{gfm}$

$\frac{2\,mol}{1} \times \frac{x}{56}$

x = ____

Wednesday, February 4th, 2015

Learning Target : I can make solutions and dilutions.
Homework: n/a

As you enter...

What is the molarity of a solution of 10 mol of $CaCl_2$ in 20 L.

(hint: use your reference table booklet if you forgot the formula)

$$M = \frac{mol}{volume} = \frac{10\ mol}{20\ L} = \boxed{0.5\ M}$$

Note: Final grades are posted above the collection bin.

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

8th/9th period
- Pre-Lab Lesson (15 min)
- Lab #14: Solutions and Dilutions (45 min)

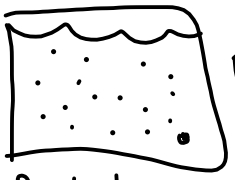
9th period
- Lab Recap (10 min)
- Exit Tix (5 min)

Tix out the door

Pt. 2 Write your name and **EMAIL** on the paper, please.

Describe how you would make 200 mL of a 1.0 M HCl solution from a 6.0 M stock solution.

5 Parts Per Million



Solution

$$PPM = \frac{\text{Grams of solute}}{\text{Grams of solution}} \times 1{,}000{,}000$$

1 E 6

1. $\frac{0.025\,g}{125\,g} \times 1{,}000{,}000 = 200$ ppm

2. mg → g

1000 mg = 1 g

.0035 g

.003,5 mg

3. 333 ppm
4. 142.9 ppm
5. 250 g sample contains 8 ppm O_2

$$\frac{8\text{ ppm}}{1} = \frac{x}{250\,g} \times 1{,}000{,}000$$

$1000\,000\,x = 8(250)$

6. 8.25×10^{-3} g
= .00825

7. Sample is 2.1 ppm with 0.0075 g Cd

$$\frac{2.1\text{ ppm}}{1} = \frac{.0075\,g}{x} \times 100000$$

$2.1x = (.0075)(1{,}000{,}000)$

$x = 3571\,g$

Part 1: Making a solution

TABLE E formulas:

Molarity = moles / Liters
(concentration) (volume)

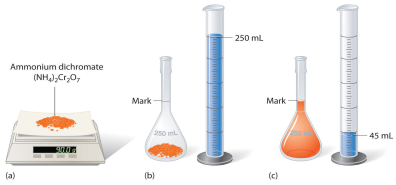
moles = mass / gram formula mass
OR
mass = moles x gram formula mass

So in lab... to make a solution of a specific concentration, you have to use these equations to figure out how many grams (mass) of the solid you will need to mix with a certain amount of water.

$M = \frac{mol}{L}$ $\quad 0.1\,M \times \frac{x}{0.1\,L}$ $\quad x = .01$ mol

Example: Make a 0.5 M NaCl solution in 250 mL.

1. *Convert volume to liters:* 250 mL (1 L / 1000 mL) = .25 L 0.1L
2. *Calculate moles:* moles = (0.5 M)(.25 L) = 0.125 mol NaCl .01 mol NaOH
3. *Use moles to calculate mass needed:* gram formula mass
   mass = (0.125 mol)(58 g/mol) = 7.25 g NaCl needed
4. *Make solution:* Put 7.25 g of NaCl in a 250 mL volumetric flask and fill flask with about 250 mL of distilled water (up to the line) and mix well to make a 0.5 M solution.



Part 2: Making a dilution

TABLE E formula:

$M_1V_1 = M_2V_2$

"stock" highly concentrated — dilution

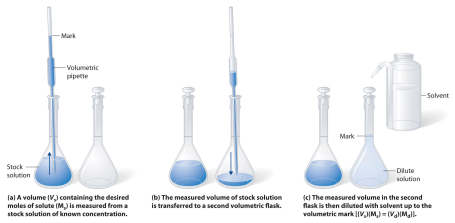
M = molarity (concentration)
V = volume
1 = refers to stock solution
2 = refers to diluted solution

So in lab... to make a dilution, you take a highly concentrated (stock) solution and water it down with a specific amount of water based on the desired concentration.

.005 .1

Ex: Make a 0.5 M NaCl solution in 200 mL from 6.0 M stock solution.

1. *Determine volume of stock solution needed using $M_1V_1 = M_2V_2$:*
   (6.0 M)(V_1) = (0.5 M)(200 mL) $(0.1)(V) = (.005)(100)$
   V_1 = 16.67 mL of stock solution required $V = 5$ mL
   Need
2. *Make dilution:* Since you want to make a 200 mL solution, pour 16.67 mL of the stock solution into the 200 mL volumetric flask and fill the rest of the flask with about 183.33 mL of distilled water up to the line. Plug the flask with a rubber stopper and carefully mix the solution. +95 mL H_2O



Thursday, February 5th, 2015

Learning Target : I can make solutions and dilutions (Take 2).

Homework: n/a

As you enter...

What mass of $CuSO_4$ will you need to make a 1M solution in 20 mL?

(hint: This is a two step problem.)

liters

① $M = \frac{mol}{volume}$ (molarity)

$\frac{20\,mL}{1000\,mL} = .02\,L$

$1\,M = \frac{x}{.02\,L}$

$x = 0.02\,mol$

Note: Final grades are posted above the collection bin.

② $moles = \frac{given\ mass}{gfm} \rightarrow .02 = \frac{x}{160}$

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

3.2g

9th period

- Lab #14: Solutions and Dilutions PART 2 (30 min)
- Lab Recap (10 min)
- Exit Tix (5 min)

Tix out the door

Write your name and **EMAIL** on the paper, please.

Describe the steps for how you would make 100 mL of a 2.0 M NaCl solution from a 10.0 M stock solution.

Friday, February 6th, 2015

Learning Target : I can construct a solubility curve and relate it to my understandings of saturation.

Homework: Table G HW (Need your reference tables booklet for this!)

As you enter...

How does temperature affect solubility (amount able to be dissolved in water).?

The higher the temp., the quicker the solute dissolves, and the more you can dissolve.

Note: As you enter checks will only be done in the first 10 minutes of class.

Big Idea: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

8th period

- Pre-Lab (15 min)
- Lab 15: Solubility (60 min)

9th period

- Post-Lab: Saturation (10 min)
- Exit Tix (5 min)

Tix out the door

Write your name and **EMAIL** on the paper, please.

What information does Table G in your reference tables give you?

PRE-LAB

Table E

potassium nitrate = KNO_3

gram formula mass = 101 g/mol

$39 + 14 + 3(16) =$

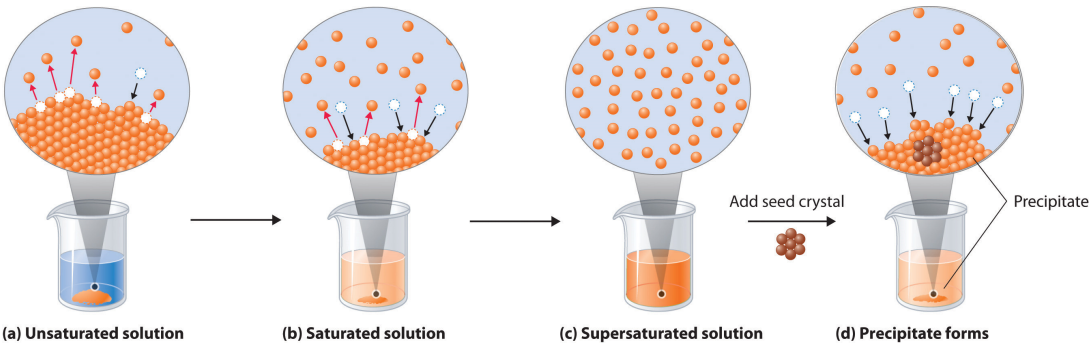
solute =

solvent =

solution =

- Read Overview & Safety
- Answer bottom questions

POST-LAB



Solubility graph tells you the maximum amount of a substance that can be dissolved in water.

Saturated = amount of substance ON the line

Unsaturated = amount of substance BELOW the line

Supersaturated = amount of substance ABOVE the line