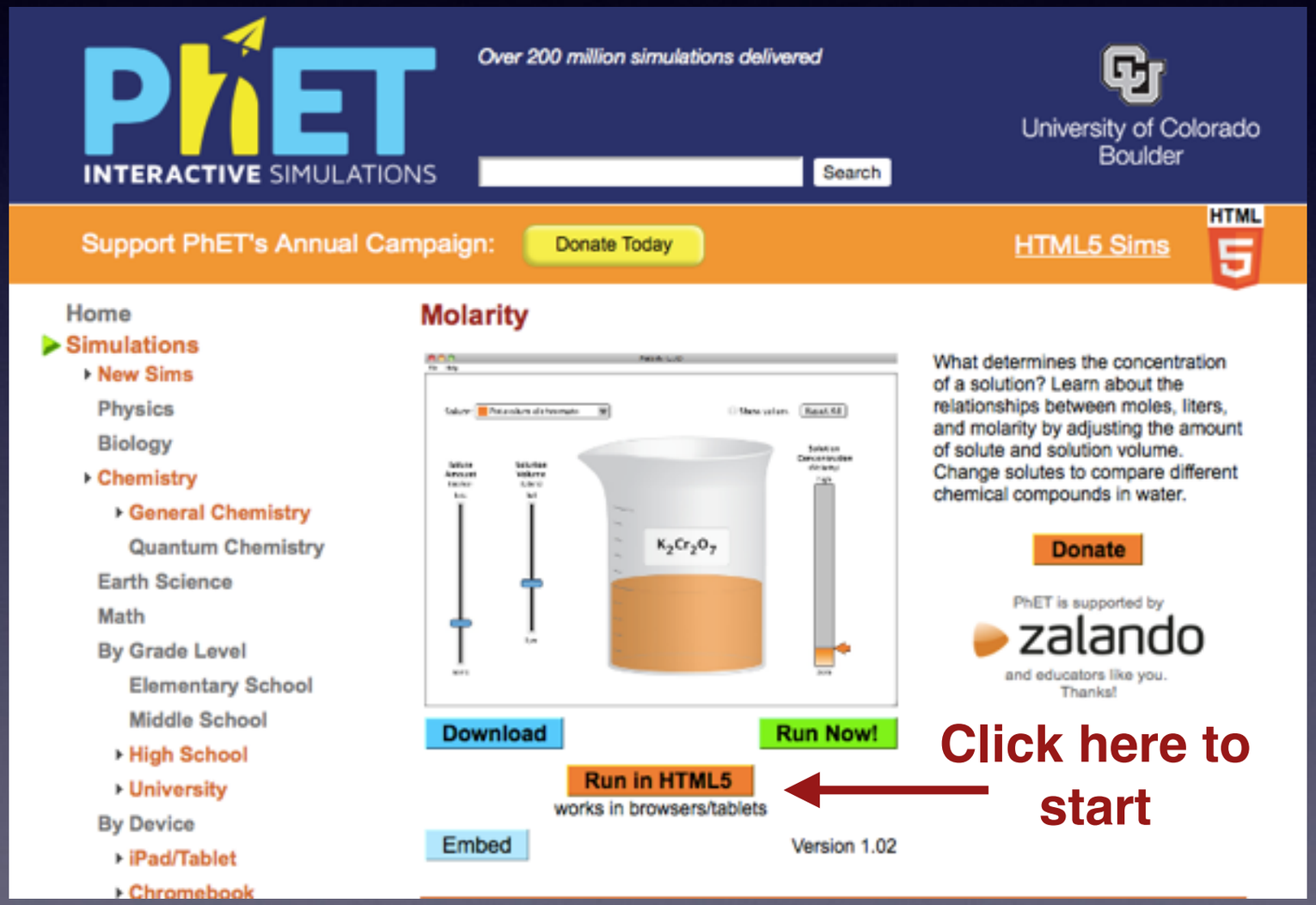
Molarity

Warm Up 3/19/2015

- I make my Kool-Aid with 342 g of sugar $C_{12}H_{22}O_{11}$ per liter. Kool-Aid recommends 120 grams per liter, how would you describe my pitcher?

- 1 packet of Kool-Aid makes 2 liters, how much sugar do I need to make 2 liters?

What relationships exist between moles, volume and molarity?



http://phet.colorado.edu/en/simulation/molarity

Molarity

- Molarity is the way scientists describe concentration of solutions.
- Relates the number of moles to the quantity of liquid (liters).
- Scientists use molarity primarily to solve for moles.

$$\text{Molarity (M)} = \frac{\text{number of moles (moles)}}{\text{amount of liquid (L)}}$$

Steps for Molarity
-Identify two of the following to solve for the third

$$\text{molarity (M)} = \frac{\text{moles (mol)}}{\text{liters (L)}}$$

1. Number of moles.
    - Calculate using dimensional analysis or volume and molarity.
2. Quantity of liquid in liters.
    - Calculate using molarity and moles.
    - Remember 1 L = 1,000 mL
3. Molarity.
    - Calculate using volume and moles

Making Kool-Aid

342 g of sugar ($C_{12}H_{22}O_{11}$) is dissolved in 2 liters of water with 1 packet of Kool-Aid.

1 mole $C_{12}H_{22}O_{11}$ = 342 g

- What is the molarity of sugar in my Kool-Aid solution?

Making Kool-Aid

- How many moles of sugar need to be added to 750 mL of water to make a 0.95 M batch of Kool-Aid?

Making Kool-Aid

- Kool-Aid recommends 112.5 grams of sugar to make a 0.28 M solution.
- How many mL of water do you need to add?

Solving Basic Stoichiometry/Molarity problems

1. Star what you are solving for.
2. Write what variables you are given.
3. Identify an equation that relates given variables to one another.
4. Box any values you don't know in your equation.
5. Identify other equations you could use to solve boxed values.

*Hint moles are the magic unit that goes between molarity and stoichiometry problems, just like the mole ratio goes between two different compounds/ elements.

3 Primary Ways to solve for moles: 1) molar mass, 2) mole ratio between two compounds/elements, and 3) molarity

Stoichiometry:

$$\text{mass A (g)} \left| \frac{\text{1 mol A}}{\text{mass A (g)}} \right. \left| \frac{\text{mol B}}{\text{mol A}} \right. \left| \frac{\text{mass B (g)}}{\text{1 mol B}} \right.$$

molar mass (periodic table) | molar ratio (equation) | molar mass (periodic table)

Molarity:

$$molarity\ (M) = \frac{moles (moles)}{volume\ (L)}$$