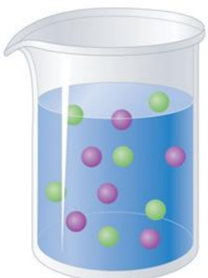
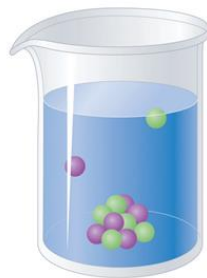
Title:	Solution basics
Standard:	*6.a I can define the solute, solvent, and solution.* *6.b I can describe the dissolving process at the molecular level by using the concept of random molecular motion*

1. Identify the solute, solvent, and solution in each example. **Below, the solute, solvent, and solution are listed in order.**
   a. Instant coffee powder is added to water to make coffee. Coffee powder, water, coffee.
   b. To make soda, sugar is dissolved into water along with other flavoring and carbon dioxide. (Sugar, flavoring, CO_2), water, soda.
   c. 70g of ethanol are mixed with 30g of water to make a mixture. Water, ethanol, the mixture.
   d. 15g of ethanol and 30g of water are dissolved in each other to make a homogenous mixture. Ethanol, water, mixture.
   e. Seawater has salt dissolved in water to make the solution salty. Salt, water, seawater
   f. Carbonated water has 1 mole of CO_2 mixed with 10 mol of water. CO_2, water, carbonated water
   g. Mr. Itow makes some Tang (fake orange juice) by dissolving some powder in water. Powder, water, Tang
   h. A fuel mixture contains 10g of oil and 100g of gasoline. Oil, gasoline, fuel mixture.

2. Diagram what a soluble and insoluble solid would look like on the molecular level if placed in water.

Soluble	Insoluble
	

3. Which forces must be stronger in order for a solid to be soluble in water: the forces of attraction inside the solid or the forces of attraction between water and the solid? **Explain:**

The solid needs to be broken up before it can mix thoroughly with the water. Therefore the forces between the water and solid must be stronger, or the solid will just stay together.

4. Why is random molecular motion important in the dissolving process?

Random molecular motion ensures that the solute is evenly spread throughout the solution.

Title:	Concentration (Molarity)
Standard:	*6.c I can calculate the concentration of a solute in terms of molarity.*

1) What is the concentration of a solution with 7 moles of HNO_3 dissolved in 0.2L of solution?

$$\frac{7\ mol}{0.2L} = 35M$$

2) If you want to prepare 250ml of a 2M salt solution, how many moles would you need?

$$0.25L\ x\ \frac{2\ mol}{1\ L} = 0.5mol$$

3) 22g of CO_2 dissolve into 4L of carbonated water. What is the concentration of CO_2?

$$\frac{22g}{}x\frac{1\ mol}{44g} = 0.5\ mol$$

$$\frac{0.5\ mol}{4\ L} = 0.125M$$

4) How many liters of solution are needed to obtain 0.05 moles of NaOH from a 2M solution?

$$\frac{1L}{2mol}x\frac{0.05\ mol}{} = 0.025L = 25mL$$

Title:	Rate of solution and solubility
Standard:	*6.d I can describe how temperature, pressure, and surface area affect the dissolving process.*

1. What is the difference between rate of solution and solubility?

Rate of solution is **how fast** a solute dissolves and solubility is **how much** solute can dissolve in a solvent

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2. Why do powders dissolve faster than chunks?

Powders have a higher surface area. This means there will be more interactions between the solute and solvent.

3. How does temperature affect rate of solution?

Temperature increases the random molecular motion of solute and solvent, which will lead to more interactions as they move around each other quicker. This will increase the rate of solution.

4. How does temperature affect the solubility of gases and solids in water?

Solids will be more soluble but gases will be less soluble in water.

5. What factors are important to consider when trying to dissolve a lot of a solid solute in a solvent?

First off, one should consider the solute and solvent to make sure they actually dissolve. Heating up sand is not going to make it any more soluble in water because the compound itself just does not dissolve in water.

The only other factor that really matters for solid solubility is temperature. Heating the solute up will most likely increase the solubility of the solid, as the solid gains more random molecular motion and can break up more easily.

It is important to note that agitation, surface area, and pressure have no effect on the **solubility** of solid solutes. Agitation and surface area will affect the rate of solution for solids. Pressure will have an effect on gases, but not solids.

Title:	Acid/Base Basics
Standard:	*6.e I can describe the observable properties of acids, bases, and salt solutions, including that acids donate hydrogen ions to solution and bases accept them from solution.*

1. A student tests four solutions. The table shows the results:

Solution	**Reaction with magnesium (Mg)**	**Color with litmus paper**	**Electrical conductivity**
A	Bubbles on surface of metal	Red	Bright conductor
B	No visible reaction	Pink	Weak conductor
C	No visible reaction	No change	None
D	No visible reaction	Blue	Bright Conductor

Classify each solution:

a. Strong acid
b. Weak acid
c. neutral
d. Strong base

2. Of the solutions above, which would be the sourest?
The strong acid would probably the sourest – so A.

3. A student records the following observations about an unknown solution:
   - Conducts electricity
   - pH = 2
   - Phenolphthalein remains clear

   The student should conclude that the unknown solution is most likely:
Because the pH is so low, we can conclude it is probably a strong acid.

4. Label the Acid and the Base.

a. H_2SO_4 (aq) acid + H_2O (l)base ⇆ HSO_4^- (aq) + H_3O^+ (aq)

b. H_2O (l)acid + H_2O (l)base ⇆ H_3O^+ (aq) + OH^- (aq)
You can switch the acid/base for this one. It doesn't really matter because the reactants are the same chemical. So water is both an acid and a base in this reaction.

c. CH_3COO^- (aq)base + H_2O (l)acid ⇆ CH_3COOH (aq) + OH^- (aq)

d. NH_3 (g)acid + H_2O (l)base ⇆ NH_2^- (aq) + H_3O^+ (aq)
This reaction hardly happens by the way. NH_3 almost always gains a hydrogen. It doesn't lose one often.

Title:	Strong/Weak Acids/Bases and the pH scale
Standard:	*6.f I can describe how strong acids and bases fully dissociate and weak acids and bases partially dissociate and that both can be characterized with the pH scale.*

1. A solution of nitric acid (HNO_3) conducts electricity. Which equation best demonstrates why this occurs? **Explain**
   a. HNO_3 (s) → HNO_3 (l)
   b. HNO_3 (s) → H^+(aq) + N^{-3}(aq) + 3O^{-2}(aq)
   c. HNO_3 (s) → HNO_3 (aq)
   d. HNO_3 (s) → H^+(aq) + NO_3^-(aq)

In order for a solution to conduct, there must be ions in solution. Choice B doesn't make sense because the nitrate (NO_3^-) is a polyatomic ion and should stay together.

2. If Cl^- acts as a base, it will react to form:____________HCl_____ -- Bases gain H^+

3. A conductivity tester is placed in a sodium hydroxide (NaOH) solution and shines with a bright light. The same conductivity tester is placed in an ammonia (NH_3) solution and shines with a dim light. Explain.

The NaOH is a strong base and dissociates completely. This produces many ions in solutions and allows for a greater conductivity. The ammonia is a weak base and only partially dissociates. This allows for a lower conductivity and thus a dimmer light.

4. What are reasonable pH values for the solutions in problem 3?

A strong base should have a pH higher than 11. A weak base could have a pH anywhere between 8-10.