

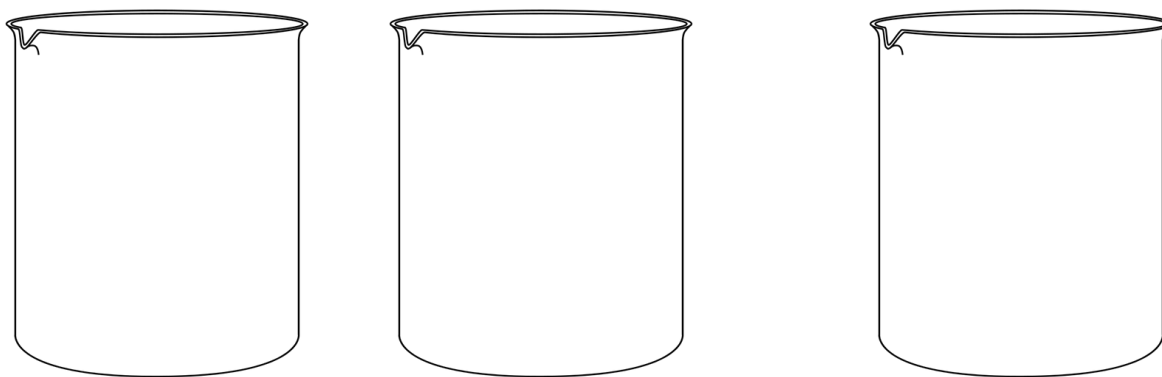
Name:
Teacher:
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Ways to Represent Reactions
(Net Ionic Equations and Particulate Diagrams)
Unit 4: Chemical Reactions (Notes 2)

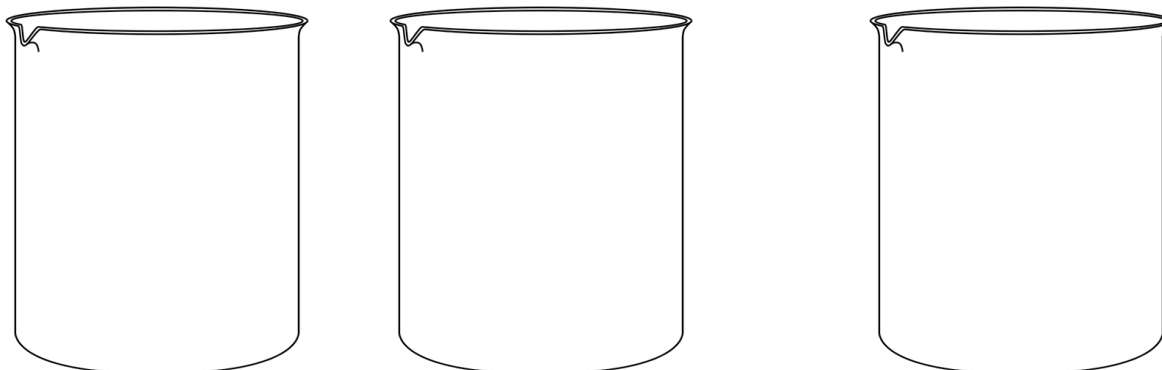
AP Chemistry Standards: 4.1 Introduction to Reactions; 4.2 Net Ionic Equations; 4.3 Representations of Reactions

Video notes:

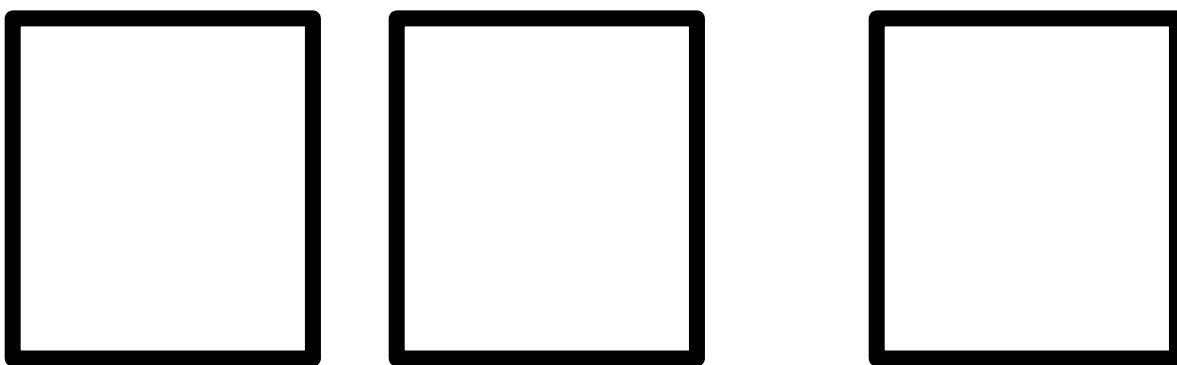
When aqueous solutions of sodium hydroxide and magnesium chloride are combined in a beaker, a solid precipitate forms at the bottom of the beaker.



Hydrochloric acid is added to potassium hydroxide. No visible change occurs, but the beaker feels warm.



Water vapor is synthesized by reacting oxygen gas with hydrogen gas. Show the products and leftover reactants if four oxygen molecules react with four hydrogen molecules and the reaction goes to completion.



Practice Problems:

For each problem, write the molecular equation, write the net ionic equation, and draw a particulate diagram to represent the reaction. If helpful, write the complete ionic equation. I recommend doing this for the first couple, then skipping this step once you get the hang of net ionic equations.

1. You mix aqueous silver nitrate with aqueous potassium chloride in a test tube. A solid, white precipitate (which you decide must be silver chloride) forms at the bottom of the test tube.

M.E. :

Particulate
Diagram:

N.I.E. :

2. You add solid pieces of zinc metal to a blue solution of copper(II) sulfate. There is bubbling, and over the course of the next hour, the metal turns to a copper color. This is because the zinc has dissolved and solid copper has precipitated. *[In actuality, this is a pretty complex reaction. For this problem, treat this as a single displacement reaction, and ignore the bubbling hydrogen gas.]*

M.E. :

Particulate
Diagram:

N.I.E. :

3. Gaseous carbon monoxide reacts with hydrogen gas to form gaseous methane (CH_4) and liquid water.

M.E. :

Particulate
Diagram:

N.I.E. :

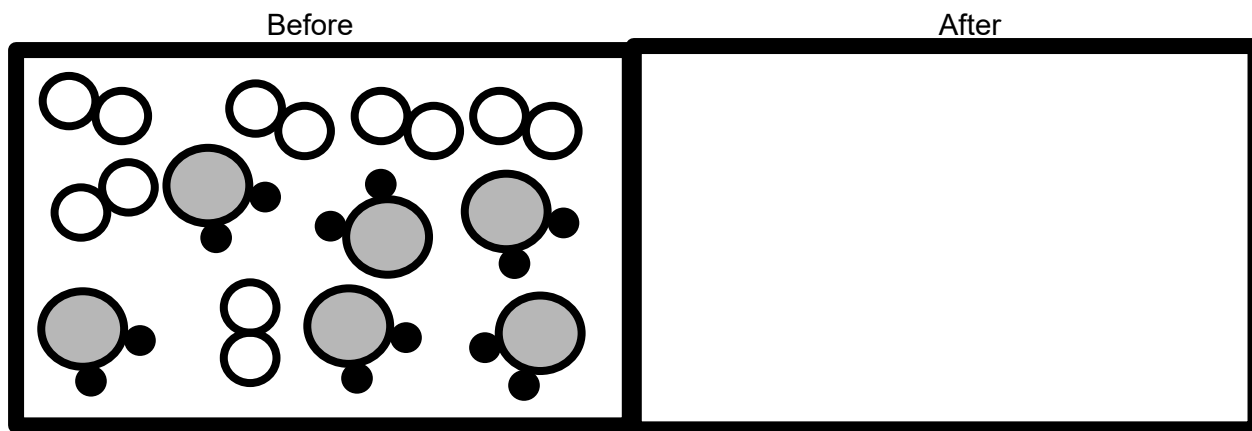
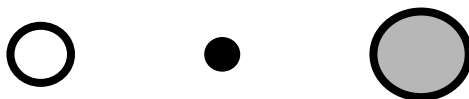
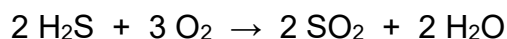
4. You add solid magnesium strips to a solution of hydrochloric acid. It starts to bubble (this is the formation of hydrogen gas), leaving behind a solution of magnesium chloride. [For the particulate diagram, show the gas molecules floating up out of the beaker.]

M.E. :

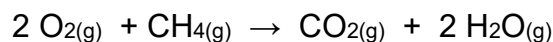
Particulate
Diagram:

N.I.E. :

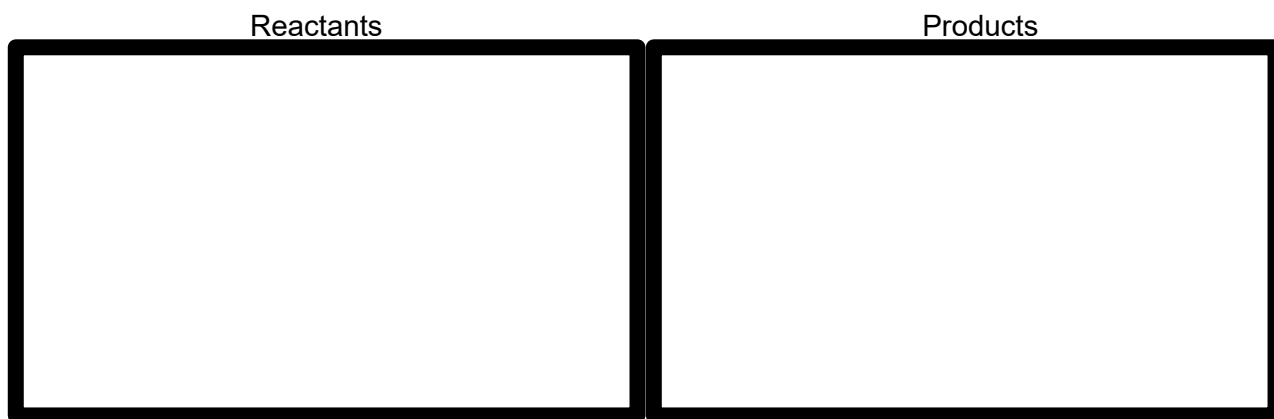
5. Using the reaction below, draw the products and leftover reactants in the rigid container after the reaction proceeds to completion. Here is a [helpful optional video](#) if you need a refresher!



6. Oxygen gas reacts with methane gas according to the balanced reaction shown below. Draw a reaction mixture that starts with 5 oxygen molecules and 4 methane molecules. Assuming the reaction goes to completion, draw the products (including any leftover reactants). Include a key!



Key



The limiting reactant is _____.

After the reaction is complete, there are ____ (number) _____ (reactant) molecules left over.

Explain how this example proves this statement to be false:

“The limiting reactant must be the reactant with the fewest number of particles.”

Review problems from Notes 1: Solutions

7. You pour 200.0 mL of 0.5 M magnesium chloride (MgCl_2) into a beaker.
- How many particles (in moles) of MgCl_2 are in the beaker?
 - How many Mg^{2+} ions (in moles) are in the beaker? *[Hint: This is the same answer as part (a)!]*
 - How many Cl^- ions (in moles) are in the beaker? *[Hint: This is twice the amount of Mg^{2+} ions because there are two Cl^- ions for every Mg^{2+} ion!]*
8. You weigh out 175.32 g of NaCl, which is 3.0 moles of NaCl, and add it to a large graduated cylinder. Then you add 2 liters of water to the cylinder and stir the solution to make sure all the NaCl is dissolved. What is the molarity of the solution you created?
9. How much water do you need to add to 50.0 mL of 6.0 M KBr to dilute the solution to 2.0 M?