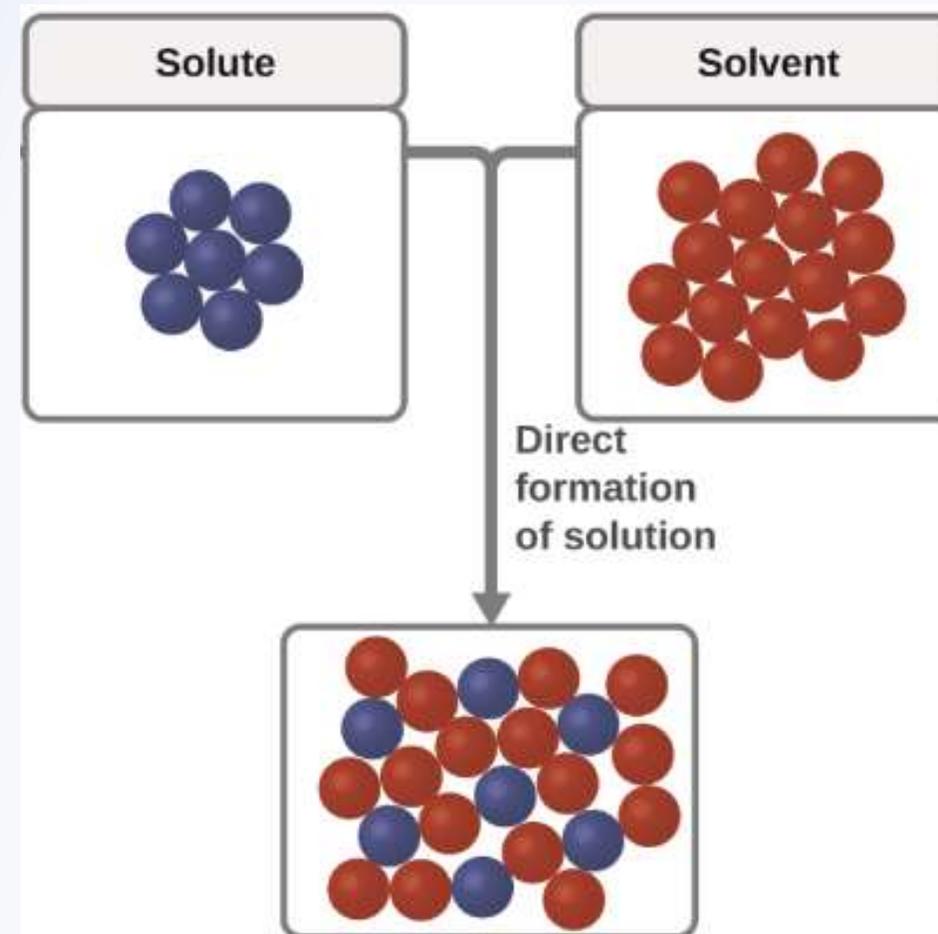


# WUHS Chemistry: Conservation of Matter Unit

Week 1 – What happens  
to a substance when it  
dissolves?



# Conservation of Matter Unit – Week 1

- **Driving Question: What happens to a substance when it dissolves**
- What is matter?
- What are the relationships between matter, mass, volume, and density?
- How can matter be changed?



[Image Source](#)

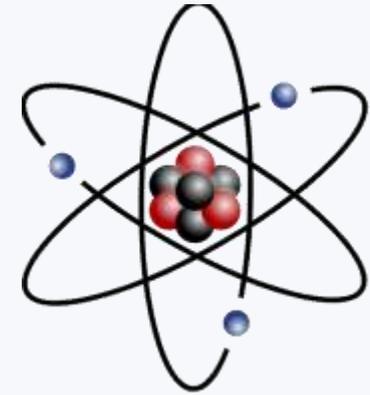
# Week 1 – What happens to a substance when it dissolves?

Conservation of Matter Unit



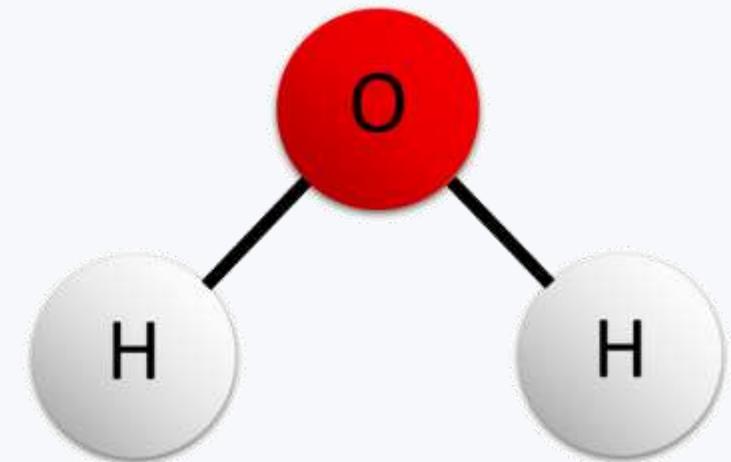
# Matter & Atoms

- **Chemistry is the study of matter and how it can be transformed.**
  - Matter is anything that has mass and takes up space.
  - Anything that is a liquid, solid, or a gas is comprised of matter.
  - All the 'stuff' that exists is made of matter.
- **All matter is made of atoms.**
  - Atoms are small indivisible particles of matter.
  - When atoms bond to each other, they form molecules.
  - For example, water is a molecule comprised of one oxygen and two hydrogen atoms.



Atoms are the basic unit of matter (above).

Atoms can bond to each other to form molecules (*e.g., a water molecule is made of one oxygen and two hydrogen atoms*).



# Elements

- **Different types of atoms are called elements.**
  - Just as there are different "flavors" of candy, there are different kinds of atoms; each "flavor" of atom is called an element.
  - Examples of elements include oxygen, hydrogen, and carbon.
- **Generally, atoms remain the same element throughout a chemical reaction.**
  - For example, a hydrogen atom will not become an oxygen atom in response to most chemical reactions.
  - Atoms can rearrange to form new molecules but stay the same element over time (*like how you may be a part of multiple classes each day but keep your same identity*).



Gold is a type of element. Pure gold consists of only one type of atom – gold.

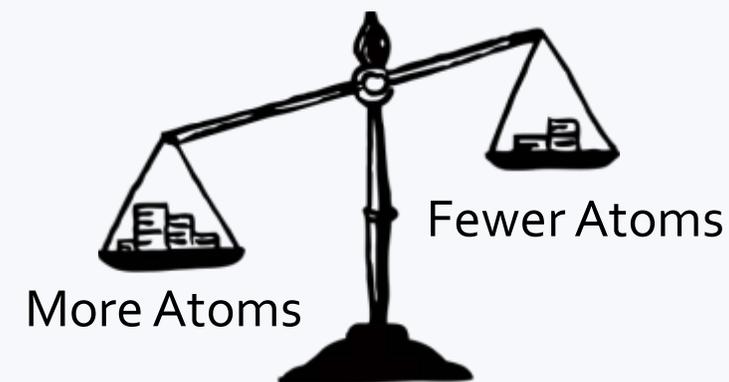
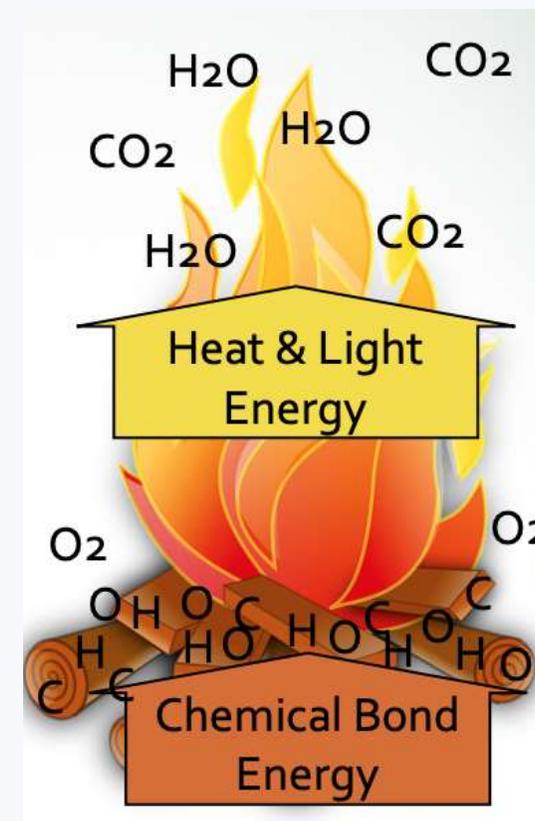
# Mass

- **Atoms cannot “disappear” or be destroyed - they can only be moved from one substance to another.**

- For example, if you burn a log on a fire, the atoms in the wood rearrange with oxygen to form  $\text{CO}_2$  and  $\text{H}_2\text{O}$  gases. The atoms in the wood still exist - they were just rearranged to form new substances.
- Atoms generally cannot be created or destroyed, only moved.

- **Mass refers to the amount of matter in an object.**

- If something gains mass, it must gain atoms.
- If something loses mass, it loses atoms.
- A burning log loses mass because its atoms are moved onto  $\text{CO}_2$  and  $\text{H}_2\text{O}$  molecules.



# Mass vs. Weight

- **Mass and weight are not the same thing.**
  - Mass refers to how many atoms a substance has.
  - Weight is the force exerted on an object by gravity in response to its mass.
- **Weight can change, but mass cannot.**
  - For example, an astronaut's weight changes depending on whether they are on earth, in space, or on the moon.
  - However, their mass is always roughly the same.



Both the astronaut and the satellite are weightless. However, the satellite has considerably greater mass than the astronaut.

# Dissolving Substances

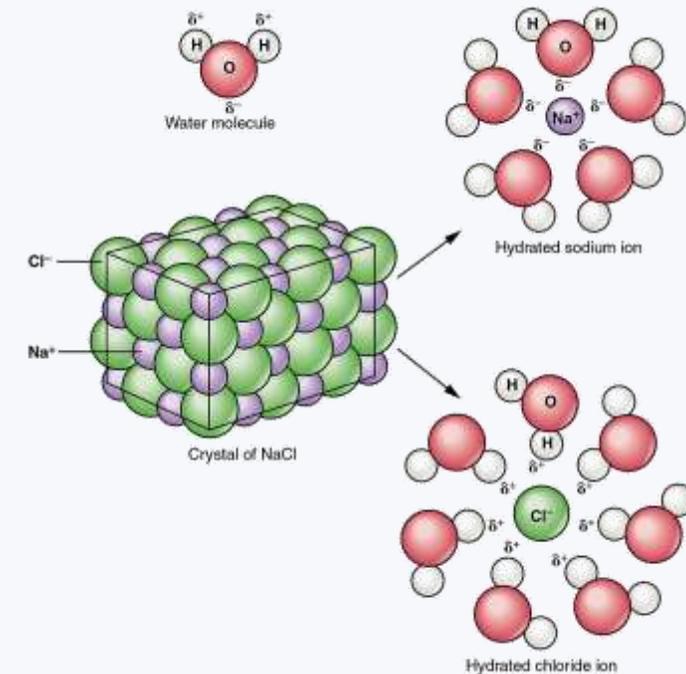
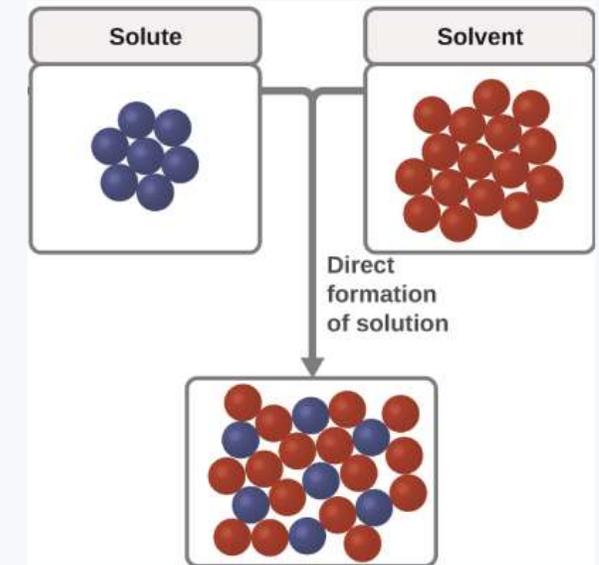
- **When a substance dissolves, the number of atoms in each substance remains the same.**
  - The atoms cannot 'disappear' – all atoms are still there.
- **For example, if you add sugar to water, the sugar molecules eventually are no longer visible.**
  - The sugar molecules did not disappear – all the atoms in those molecules still exist.
  - Instead, the sugar molecules are surrounded by water molecules.
  - A substance (solute) dissolves when its individual atoms or molecules are surrounded by the water molecules (or other solvent).



[Image Source](#)

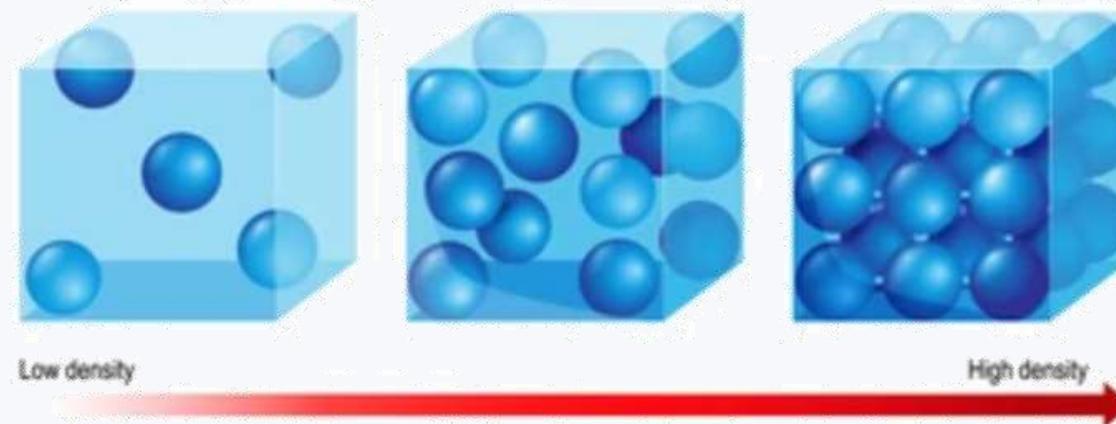
# Solute, Solvent, Solution

- A solute is what dissolves into another substance.
- A solvent is what dissolves another substance.
- A solution is the combination of the solute and solvent.
- For example, saltwater is a *solution* consisting of salt (the *solute*) and water (the *solvent*).
  - Water molecules surround each atom in salt as it dissolves in the water.



# Density

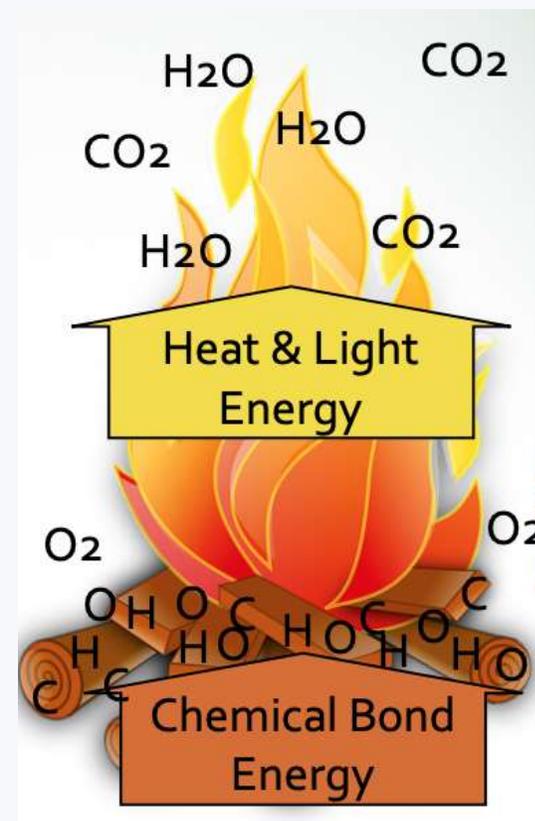
- **Density refers to the amount of atoms within a specific volume of a substance.**
  - The more atoms in a particular volume, the greater its density.
    - *Volume refers to how much space a substance occupies.*
  - A substance with the same volume but fewer atoms will have less density.
  - Saltwater and sugar water have greater density than pure water due to more atoms.
- **Density explains why some substances float and others don't.**
  - Substances with less density will float on substances with greater density.
  - For example, a ship lower density compared to the water around it.
  - Rocks sinks because they have more atoms per unit of volume than water.



[Image Source](#)

# Energy

- **Energy is the capacity for matter to change.**
  - For example, matter can move to a new location, change temperature, give off light, etc.
  - The atoms in matter can also be rearranged, changing the properties of that substance.
  - Energy cannot be created or destroyed; energy can only be changed.
- **There are multiple kinds of energy, including:**
  - Potential (stored energy)
  - Kinetic (movement of matter)
  - Radiant (moving electromagnetic waves)
  - Heat (movement of atoms)
  - Sound (vibrations that travel through matter)
  - Nuclear (release of energy due fission or fusion of atoms)
  - Electric (movement of charge through matter)



As a log burns on a fire, the energy stored in the bonds of its molecules is transformed into heat and light energy.

# Revising Our Claims

- **How could you improve your responses to these questions?**
- **Driving Question: What happens to a substance when it dissolves**
- What is matter?
- What are the relationships between matter, mass, volume, and density?
- How can matter be changed?



# Looking Ahead: Part 3 Investigation

- **In Part 3 you will make predictions about how mass of a solute, solvent, and solution change as sugar is dissolved in water.**



# Key Points

- **Chemistry is the study of matter and how it can be transformed.**
  - Matter is anything that has mass and takes up space.
- **All matter is made of small indivisible particles of matter called atoms.**
  - When atoms bond to each other, they form molecules.
  - A type of atom is called an element.
- **Atoms cannot “disappear” or be destroyed in most cases - they can only be moved from one substance to another.**
  - Mass refers to the amount of matter (number of atoms) in an object. If something gains mass, it must gain atoms.
  - Weight is the force exerted on an object by gravity in response to its mass.
  - Density refers to the amount of atoms within a specific volume of a substance.

# Key Points

- **When a substance dissolves, the number of atoms in each substance remains the same.**
  - For example, if you add sugar to water, the sugar molecules become surrounded by water molecules, but all the same atoms still exist.
  - Sugar would be the solute, water would be the solvent, and sugar water would be the solution.
- **Energy is the capacity for matter to change.**
  - Examples of energy include kinetic (movement), heat, sound, etc.
  - Energy cannot be created or destroyed; energy can only be changed.

# Key Vocab

- Matter is anything that has mass and takes up space.
- Atoms are small indivisible particles of matter.
- When atoms bond to each other, they form molecules.
- Different types of atoms are called elements.
- Mass refers to the amount of matter in an object.
- Weight is the force exerted on an object by gravity in response to its mass.
- A solute is what dissolves into another substance. A solvent is what dissolves another substance. A solution is the combination of the solute and solvent.
- Density refers to the amount of atoms within a specific volume of a substance.
- Volume refers to how much space a substance occupies.
- Energy is the capacity for matter to change.