

WUHS Biology: Matter & Energy Unit

Week 1 – What
happens when
something burns?

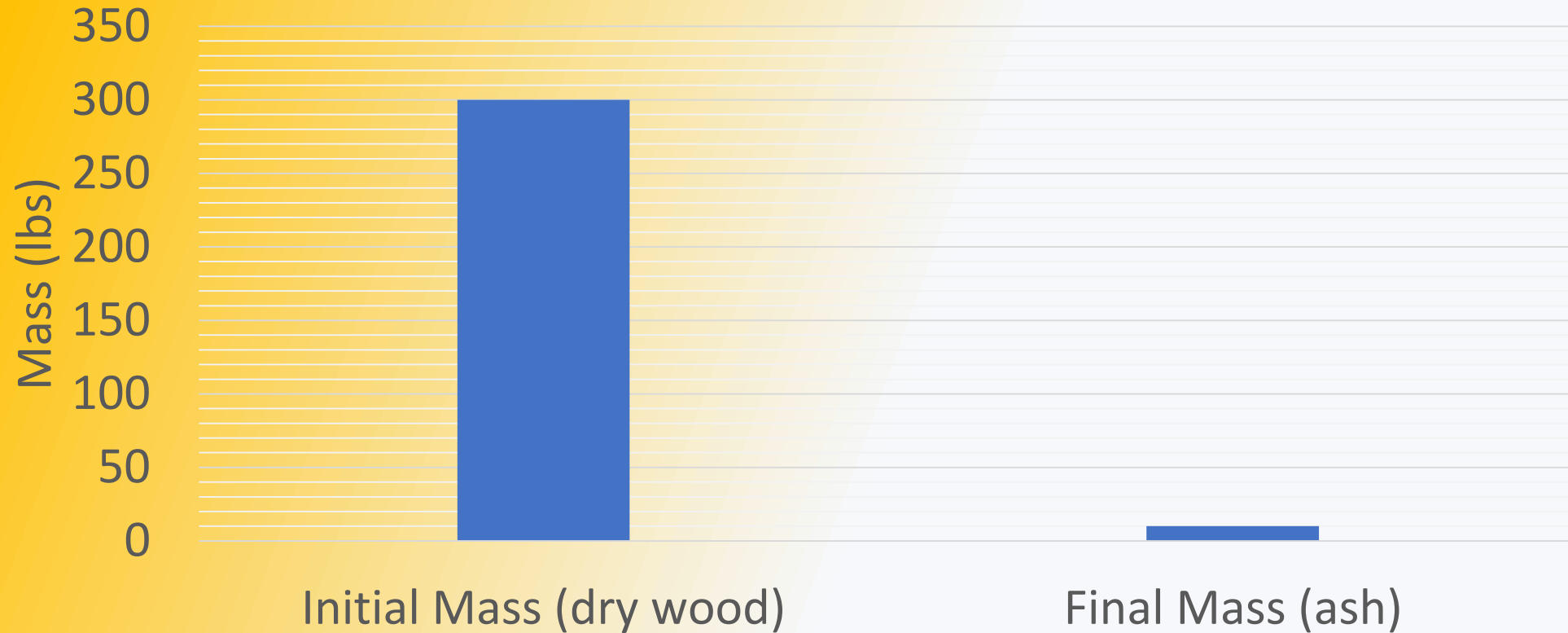


Matter & Energy Unit – W1 Driving Question

- **Driving Question: What happens when something burns?**
- What happens to matter during combustion?
- What happens to energy during combustion?
- How are matter & energy different from each other?



Part 1 Recap



- What claims can we make based on the data above?
- Did the wood disappear into "thin air"?





Introducing: Atoms!

WUHS Biology

Discussion Question

- **The image at the right shows an empty glass. Is there anything inside of this glass?**
- Discuss within your small groups.
- Be prepared to defend your ideas with evidence and reasoning.

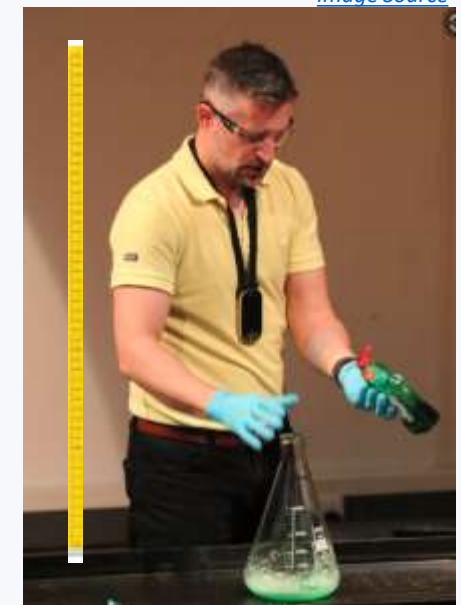


Zooming Into Air

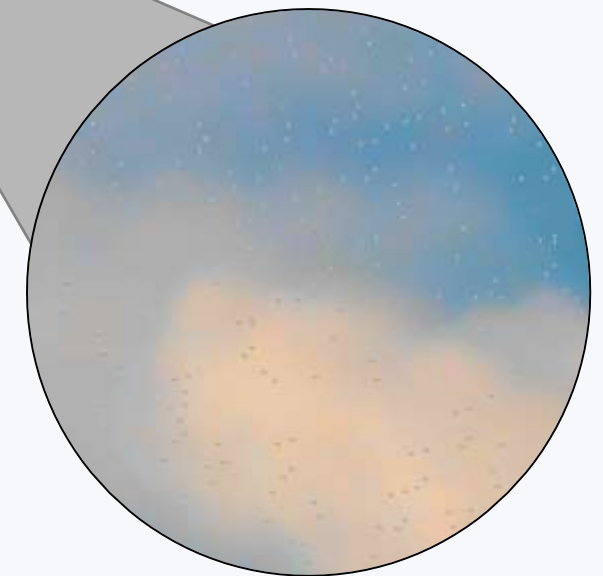
- If we could increasingly shrink ourselves down, what would we see as we became smaller?
 - If we shrunk to one meter (about 3 feet), we would see an empty glass.
 - If we shrunk down to 0.001 meters (*one millimeter*), we could start to see individual droplets of water vapor (H_2O) in the air.
 - *A millimeter is the smallest unit of measurement on most metersticks.*



This mason jar is about 6 inches tall. This is about 0.15 meters, or 15 cm.



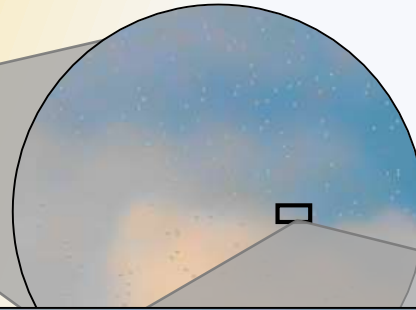
A meter is roughly 3 feet.



At about 0.001 meters (or 1 millimeter) we could see individual drops of vapor.

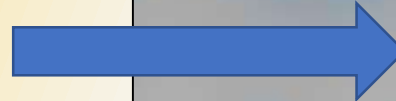


Zooming Into Air



At $1/100^{\text{th}}$ of a millimeter, we would be the size of a vapor drop.

- **At 0.00001 meters ($1/100^{\text{th}}$ of a millimeter), we would be roughly the size of a drop of water vapor.**

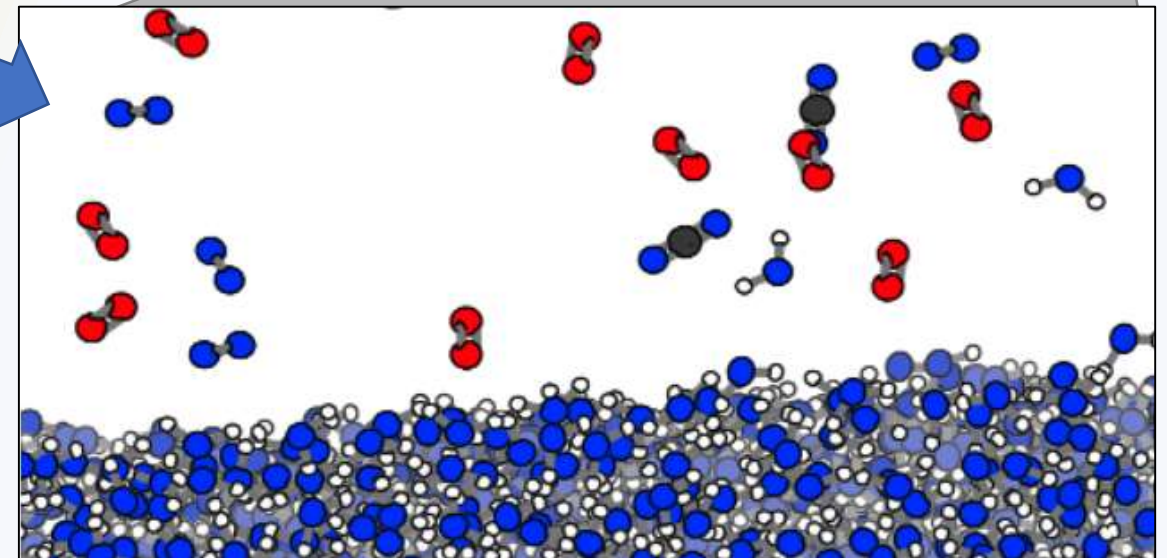
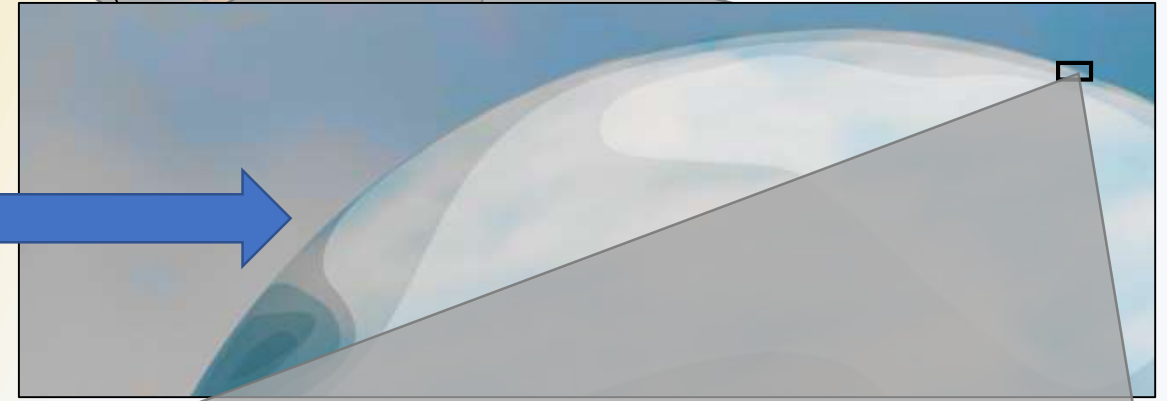


- At 0.00000001 meters ($1/100,000^{\text{th}}$ of a millimeter), we would begin to see tiny particles.



- **At this size, we could see that every solid, liquid, and gas is made of these tiny particles.**

- Something cannot be a solid, liquid, or gas unless they contain these particles.



At the size of $1/100,000^{\text{th}}$ of a millimeter, we could see the individual particles that make up all substances.

Atoms & Matter

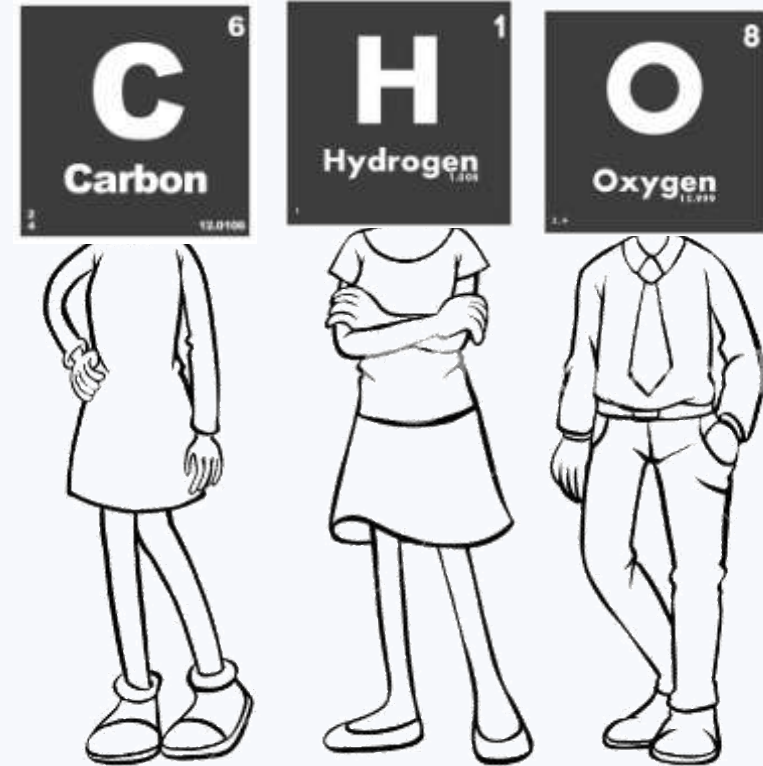
- **All solids, liquids, and gases are called *matter*.**
 - Matter is any physical substance that takes up space.
 - In other words, stuff that exists is made of *matter*, which is made of *atoms*.
- **All matter (solids, liquids, and gases) is made of tiny particles of matter called atoms.**
 - Anything that exists and takes up space is made of atoms.
- **The more atoms something has, the greater its mass.**
 - The more mass something has, the more it weighs.
- **Atoms last forever. Atoms *cannot* be created or destroyed.**
 - In biology, an atom never stops existing. Atoms can only be moved from one place to another.



If we were a millionth of our current size, we'd see that water is made of tiny particles called atoms.

Elements = “Flavors” of Atoms

- **There are different kinds of atoms that exist.**
 - Different kinds of atoms are called elements.
 - Carbon, oxygen, & hydrogen are examples of elements.
 - *An element is sort of like a ‘flavor’ of atom.*
 - *Just like candy has different flavors (like grape or cherry), atoms can exist as different elements.*
- **In biology, an atom cannot become a different element. Atoms themselves do not change.**
 - A carbon atoms is always a carbon atom.
 - A hydrogen atom cannot become an oxygen atom.



Different kinds of atoms are called *elements*. In biology, an atom will always stay the same element.

Molecules = Bonded Groups of Atoms

- **Atoms can attach to each other.**

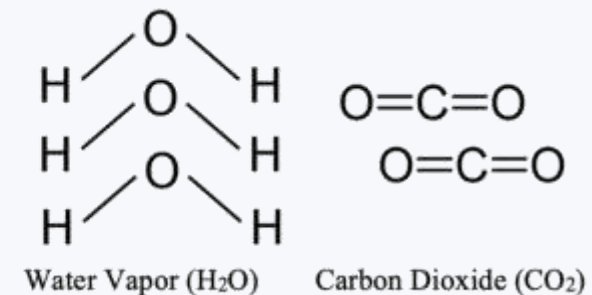
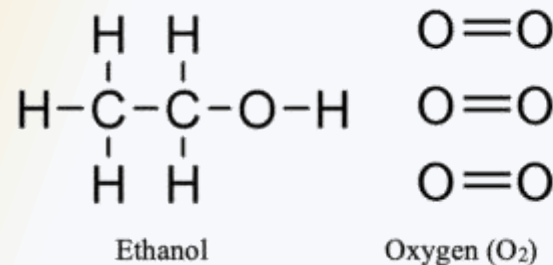
- A molecule is a group of atoms bonded together.
- For example, water is a molecule that consists of two hydrogen atoms bonded to an oxygen atom.
- Just like individual students can be a part of a *class*, individual atoms can be a part of *molecules*.



A group of students = a class.

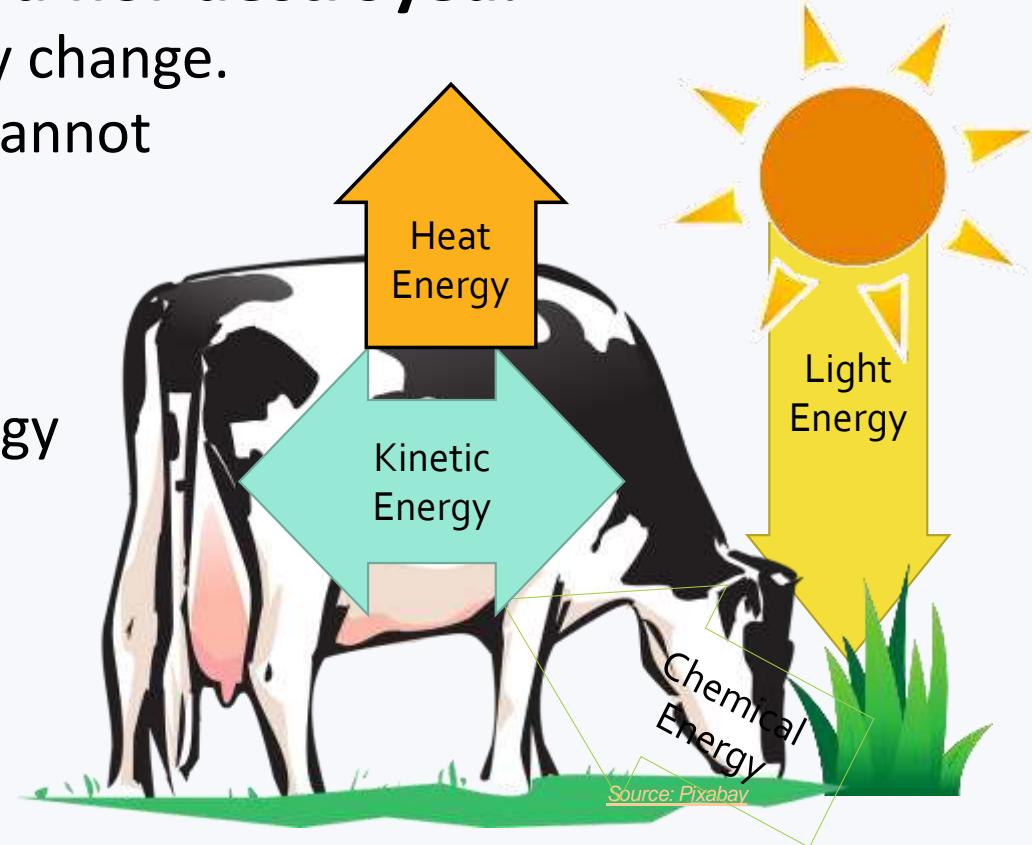
- **Atoms can be rearranged to form new molecules.**

- For example, the atoms found in ethanol and oxygen molecules can be rearranged to form carbon dioxide and water molecules.



Energy = Changing Matter

- **Energy is how matter (“the stuff”) changes.**
 - For example, matter can be moved or it can change temperature.
- **Like matter, energy can neither be created nor destroyed.**
 - Energy cannot cease to exist. Energy can only change.
 - Energy cannot turn into matter, and matter cannot turn into energy in biology.
- **Energy can be transformed.**
 - For example, plants can convert visible light energy of the sun into chemical energy (energy stored within molecules like sugar).
 - Cows convert some chemical energy in the plants they eat into motion (kinetic energy)
 - Eventually all energy becomes heat energy which dissipates into space.



Recap: The “Rules” Of Matter & Energy

- **1) All solids, liquids, and gases are made of tiny particles called atoms.**
 - Atoms can bond together to form molecules.
 - These same atoms can be rearranged to form new molecules.
- **2) In biology, atoms last forever. Atoms cannot be created or destroyed.**
 - Atoms cannot change (e.g., carbon atoms are always carbon atoms).
 - If something gains mass, it gains atoms. If it loses mass, it loses atoms.
- **3) In biology, energy lasts forever. Energy cannot be created or destroyed.**
 - Energy can exist as light, heat, motion, or as chemical energy stored in the bonds of molecules.
 - Energy in one form can be transformed (e.g., light energy can be transformed into heat energy).



Matter & Energy Unit – W1 Driving Question

- **Are we better able to answer these questions with this new info?**
- What happens when something burns?
- What happens to matter during combustion?
- What happens to energy during combustion?
- How are matter & energy different from each other?



Looking Ahead: Part 3 Investigation

- **In Part 3 you will be conducting two investigations.**
 - In Part A, you will measure how the mass of ethanol changes as it burns.
 - In Part B, you will use a chemical called BTB to determine how the amount of atoms in the air changes as something burns.



Key Points

- **Any physical substance (solid, liquid, or gas) that takes up space is called matter.**
- **All matter is made of tiny particles called atoms.**
- **The more atoms a substance has, the greater its mass.**
 - If something loses atoms, it loses mass. If it gains atoms, it gains mass.
- **Atoms last forever; atoms cannot be created or destroyed.**
 - Atoms can only be moved from one substance to another.
- **Different kinds of atoms are called elements.**
 - Atoms cannot become a different element (e.g., carbon is always carbon).
 - In biology, atoms do not change; they always remain as the same element.



Key Points

- **A group of atoms bonded to each other is called a molecule.**
 - Atoms in one molecule can be rearranged to form a different molecule.
- **Energy is how matter changes.**
 - Matter and energy are two different things.
 - In biology, matter cannot become energy, and energy cannot become matter.
- **Energy cannot be created or destroyed.**
 - However, energy can be transformed from one form to another.
 - For example, light energy can be transformed into heat energy.
- **Four common forms of energy are light, heat, chemical energy (found within molecules), and kinetic energy (motion).**



Key Vocab

- **Matter**: any substance (solid, liquid, or gas) that takes up space.
- **Atoms**: the tiny particles that make up all matter.
- **Element**: a type of atom (such as carbon or hydrogen).
- **Mass**: a measure of how many atoms are found within a substance.
- **Molecule**: a group of atoms bonded together.
- **Energy**: how matter is changed.