At the end of this unit of study, you should be able to do the following:

5. Determine if a molecule is organic or inorganic.
3. List 2 types of inorganic molecule.
4. Draw a picture of a water molecule.
5. Identify the positive and negative end of a water molecule.
6. Explain why water molecules stick together.
7. List and describe the 2 properties of water.
8. Use the following words in their correct context:

<table>
<thead>
<tr>
<th>organic molecule</th>
<th>Positive</th>
<th>Lipid</th>
</tr>
</thead>
<tbody>
<tr>
<td>inorganic molecule</td>
<td>negative</td>
<td>protein</td>
</tr>
<tr>
<td>water</td>
<td>density</td>
<td>nucleic acid</td>
</tr>
<tr>
<td>polar</td>
<td>carbohydrate</td>
<td>vitamin</td>
</tr>
</tbody>
</table>
Water is an extremely important inorganic molecule to living things for many reasons. Any living thing that is deprived of water for a long period of time usually dies. Water is an interesting inorganic molecule. Please examine the picture below. It shows a water molecule.

What did you notice about the water molecule?

You probably noticed its funny shape and the + and – signs. Try to remember that the water molecule has both a positive and a negative end - similar to the positive and negative ends of a magnet. Because of this, water is polar.

Polar means it has a positive and a negative end. Magnets are polar. The Earth is polar. Because the water molecule is polar, it is able to attach to other water molecules in the same way that magnets are able to attract each other.
Here is a picture that shows how water molecules would attach to each other.

Notice how the positive (+) end of a water molecule is attracted to the negative (-) end of the water molecule. Just like magnets.

**REMEMBER THIS!!!!**

*Water is a polar molecule because it has a positive (+) and a negative (-) end.*

**REMEMBER THIS!!!**

*Water molecules stick together because opposite charges (+) and (-) attract each other. Opposites attract.*

Your Turn: Try to draw a water molecule in the space below. Why can water molecules stick together?
4 Properties of Water

There are 2 important properties of water that make the water molecule important to all living things. 1) density 2) solubility. 3) Cohesion/Adhesion 40 temperature change. You will need to know them.

1. Property of Water: DENSITY

The first property of water that is important to life is density. Density means how tightly something is packed. Something that is very dense is tightly packed. Something that is very dense is also usually a solid. Solid water is known as ice. Something that is not as tightly packed, less dense, is usually a liquid. Finally something that is loosely packed, less dense, is usually a gas. Water vapor is a gas. These are the 3 states of matter.

REMEMBER THIS!!!
Density means how tightly a substance is packed.

The density of water molecules is important to all living things. Usually solids are more dense than their liquids, so they sink. However, water is the only type of matter that expands when it freezes, which makes ice less dense than water. This allows ice to float instead of sink. This is important because if ice sank in water then lakes and rivers would eventually freeze into one huge block of ice in the winter, killing all the fish and living organisms in the water. But, since ice floats, it just forms an icy layer on the top of the water which actually protects the water under the ice from freezing any more.

Question 6. Why does ice (the solid form of water) float on top of liquid water?

Question 7. Why is it important that ice can float on top of the water?
2. Property of Water: SOLUBILITY

The second property of water that is important to life is SOLUBILITY. Solubility is the ability of water to dissolve many substances. All life relies on this property of water, the ability of water to dissolve many substances that are used to support and maintain life. You have probably stirred sugar into iced tea. The water in the tea is dissolving the sugar. Kool-Aid dissolves in water to make a drink. You experience the process of dissolving in everyday living. Because water allows many substances to dissolve in it, it is important to all living things.

REMEMBER THIS!!!
Water is able to dissolve many substances that are important for use by living things.

Question 8. List 2 common examples of substances dissolving in water.

Interesting Scientific Fact: Many chemical reactions, like cellular respiration, (you will have to know what this word means later on) are required to occur in living things if they are to stay alive. The chemicals used in this process and others will not work until they are dissolved in water. If these reactions do not take place, the living things die. That is why all living things must contain water. Humans are mostly made of water.
REMEMBER THIS!!!

The basic functions of all living things depend upon water and the ability of water to dissolve substances needed by the body. Since blood is mostly water, it is an ideal medium for transporting nutrient and oxygen to all cells in your body. This is the only way your cells can get what they need from the outside environment. Blood is also able to transport waste and CO2 away from cells that would become toxic if they were allowed to build up.

Question 9. Explain two reasons why it is important to humans that water is able to dissolve many substances.

3. Cohesion and Adhesion

Water tends to stick to itself due to its cohesive properties. This is because the negative end of one water molecule is attracted to the positive end of another water molecule. Cohesions caused surface tension. Surface tension is the reason insects can walk on water, or why water drops form a dome on a penny. Water also has adhesive properties, which is the ability to for water to stick to other types of polar or charged molecules. Adhesion is important to plants. Since water tends to stick to itself and other molecules, it can move up the vascular tissue in the stems of plants against gravity. This process is known as capillarity. Without capillarity, plants would not be able to get the water and the nutrients and minerals dissolved in the water that they need from the soil. If plants do not survive, they would not be able to produce oxygen for consumers and the food chain would collapse.

Question 10. Explain why cohesion is an important property to insects.

Question 11. Explain why adhesion is an important property to plant life.
4. **Water is slow to change temperature**

Ever hear the expression, “A watched pot never boils?” Or have you ever been to the ocean in the early summer. Even though the air may be hot, the ocean may still be freezing cold. In the early fall, the air may be cooler, but the ocean still feels warm. This is because water takes a long time to change temperature, especially when compared to other materials like metal.

This helps organisms like us to maintain a constant body temperature, even if the outside environment is very different from the body.

**Interesting Scientific Fact:** This is why it is important to stay properly hydrated when exercising on a hot day. If you become too dehydrated, your body can no longer keep its temperature down and the risk of heat exhaustion and heat stroke increases.

Stranded hikers have been known to suffer from hyperthermia in temperatures as high as 60 degree F. because they became so dehydrated that they could no longer keep their body temperature from dropping below 90 degrees F.

**Question 11:** Why does water's slow temperature change help organisms to do?
Self Test: Organic vs Inorganic Molecules & Water

Short Answer

1. Without looking.... Can you define organic molecule?

2. Can you explain why water is considered an inorganic molecule?

3. Are vitamins organic or inorganic? Why?

4. Without looking, list the 4 properties of water.

Matching – Match the following. Choices may be used more than once.

_____ 1. organic molecules
_____ 2. inorganic molecules
_____ 3. carbohydrate
_____ 4. lipid
_____ 5. proteins
_____ 6. vitamins
_____ 7. minerals
_____ 8. nucleic acids
_____ 9. water
_____ 10. polar

A. Organic molecule
B. Inorganic molecule
C. A molecule that contains carbon atoms
D. A molecule that does not contain carbon atoms.
E. A molecule that has a positive end and a negative end.
True or False

1. Organic molecules are molecules that do not contain carbon atoms. [False]
2. Inorganic molecules are molecules that do not contain carbon atoms. [True]
3. Proteins, carbohydrates, and minerals are organic molecules. [False]
4. Minerals and water are inorganic molecules. [True]
5. Lipids are molecules that contain carbon atoms. [True]
6. Carbohydrates are molecules that contain carbon atoms. [True]
7. Water molecules contain carbon atoms. [False]
8. Water molecules are inorganic. [False]
9. Water is a polar molecule. [True]
10. Water has a positive end and a negative end. [True]
11. When the negative end of one water molecule comes near the negative end of another water molecule, the molecules are attracted. [True]

Fill in the Blank - Words may be used more than once.

organic molecules  inorganic molecules  polar
carbohydrates    lipids             proteins
minerals         vitamins          water
nucleic acids

1. ____________________ are molecules that contain carbon atoms.
2. Organic molecules include __________, __________, __________, __________, __________, and __________.
3. ____________________ are molecules that do not contain carbon atoms.
4. Inorganic molecules include __________ and ____________________.
5. Living things are made of ____________________ and ____________ ____________.
6. Water is a (an) ____________________ (or _____) molecule.
7. A __________ molecule has a positive end and a negative end
True or False

_____ 1. Water is a polar molecule.
_____ 2. Water is a molecule that has a positive end and a negative end.
_____ 3. Ice sinks in liquid water.
_____ 4. Ice floats in liquid water.
_____ 5. Water is good at dissolving other substances.
_____ 6. Water is not good at dissolving other substances.
_____ 7. The cell must contain water in order for cellular reactions to occur.

Fill in the Blank

Polar positive end negative end float dissolve

1. The _____________ nature of water gives it a negative end and a positive end.
2. The _________________ of one water molecule is attracted to the negative end of another molecule.
3. The _________________ of one water molecule is attracted to the positive end of another molecule.
4. The ability of ice to _______________ on top of liquid water prevents lakes from freezing solid during the winter.
5. The ability of water to _______________ many substances allows a cell to carry out many chemical reactions in the cell.

Answer the following.

1. What is the difference between an organic molecule and an inorganic molecule?

2. Classify each of the following as organic or inorganic.
   - water ____________________ carbohydrates ____________________
   - vitamins __________________ proteins _________________________
   - lipids ____________________ nucleic acids ___________________
   - minerals __________________
3. What is meant by the word polar when describing a water molecule?

4. Draw a picture of a water molecule. Show where the positive (+) charge and the negative (-) charge is located.

5. Why is it important that ice can float on top of the water?

6. Explain two reasons why it is important to humans that water is able to dissolve many substances.

7. Explain why cohesion is an important property to insects.

8. Explain why adhesion is an important property to plant life.

9. Why does water’s slow temperature change help organisms to do?
Organic vs Inorganic Molecules & Water Answer Sheet

Part I- Organic vs Inorganic Molecules

Question 1: How would you know if a molecule was organic?

Questions 2: List 5 examples of organic molecules.

Question 3: How would you know if a molecule is inorganic?

Question 4: List 2 examples of inorganic molecules.

Question 5: If someone asked you whether a molecule was organic or inorganic, how would you distinguish between an organic and an inorganic molecule?
Part II - Water

Question 6. Why does ice (the solid form of water) float on top of liquid water?

Question 7. Why is it important that ice can float on top of the water?

Question 8. List 2 common examples of substances dissolving in water.

Question 9. Explain two reasons why it is important to humans that water is able to dissolve many substances.

Question 10. Explain why cohesion is an important property to insects.

Question 11. Explain why adhesion is an important property to plant life.

Question 12: Why does water's slow temperature change help organisms to do?