PEER Life Science Water’s the Matter Measuring Mass Notes Outline Key

**Introduction**

* Humans are about 75% water.
* Living organisms need clean water to survive.
* Water molecules are made up of two atoms of hydrogen and one atom of oxygen.
* The property that causes water molecules to attract one another in a way to form drops is called cohesion.
* The property that causes water to be attracted to other substances (like the sides of a glass) is called adhesion.
* Water boils at 212℉ and freezes at 32℉.
* Water has a high heat capacity or requires a large amount of energy to be absorbed in order to increase temperature. This is what causes aquatic environments to remain relatively consistent in temperature.
* Ice, or frozen water, is less/more dense than liquid water which is why sheets of ice form at the top of bodies of water rather than at the bottom.
* Water is called the “universal solvent” by chemists because it is capable of dissolving more substances than any other liquid.
* Water molecules have a polar arrangement, meaning that one side has a more positive charge and the other has a more negative charge. This allows it to dissolve other polar substances like table salt (NaCl).
* Because water can dissolve so many things, it takes many substances with it through the water cycle. One example is how it dissolves gases and nutrients like oxygen that is used by aquatic organisms. However, it also means that it can carry away harmful substances like pollutants.
* Most toxic pollution comes from man-made chemicals that enter water, like herbicides, pesticides, and industrial compounds.
* Heat can also be a form of pollution. As water heats up, gases, like oxygen, are less soluble than in cool water. This keeps nutrients away from aquatic life.
* Organic matter can also cause water pollution because decaying matter uses up a lot of oxygen.
* Water quality differs based on what it is used for. It can be thought of as a measure of the suitability of water for a particular use based on its physical, chemical, and biological characteristics.
* We can determine if water is suitable for its intended purposes by measuring mass, volume, and concentration of water and the substances in it.

**Lesson**

* Mass and volume are extensive properties of matter, meaning that they depend on the amount of matter present.
* Mass and weight are related but are/are not the same.
  + Mass is the measure of the quantity of matter that a body contains. It is measured in grams.
  + Weight is related to gravity. It is a force that is equal to the product of the object’s mass and the acceleration of gravity.
  + The more gravity present, the more something will weigh. This is why weight changes on different planets, but mass does not.
  + The metric unit for measuring mass is the gram.
    - 1000 milligrams = 1 gram
    - 1000 grams = 1 kilogram
  + Fill in the table for metric prefixes:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1/1,000,000 | 1/1,000 | 1/100 | 1000 | 1,000 |
| Micro- | Milli- | Centi- | Kilo- | Mega- |
| μ | m | c | k | M |

* The measurement of how much space something occupies is called volume.
  + Volume has 3 dimensions: length, width, height.
  + In the metric system, the basic unit of length is the meter. Volume can be expressed in cubic meters (m3). This is very large, so for smaller objects cubic centimeters (cm3) are used.
  + Measuring the volume of liquids, like water, can be done using a graduated cylinder and the metric unit of the liter. If working with smaller quantities of fluid, volume can be measured in milliliters (mL) instead. This unit is equivalent to a cubic centimeter!
  + When objects have unusual shapes, volume can be measured by water displacement. This can be done by the equation:
    - Volume of object = volume of water with/without object - volume of water with/without object
* Mass and volume can be used together to describe matter by calculating concentration.
  + If we add a substance to a liquid, and we know the mass of the substance and the volume of the liquid, then we can calculate the concentration of the solution.
    - Concentration = mass / volume
  + Salinity (the measure of the amount of salt in water) can be used to apply this equation. The salt is considered the solute, or the substance being dissolved. Water is considered the solvent or dissolving medium. The more solute added to a solvent, the higher/lower the concentration becomes.
  + The formula above can be rearranged to calculate mass or volume. To calculate volume, the equation would be:
    - Volume = mass / concentration
  + Concentration is a measure of how much matter is in a given volume.