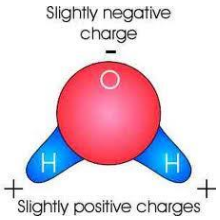
EVERYTHING YOU NEED TO KNOW ABOUT: **HYDROLOGY**

Properties of Water

Polarity: Water is a polar molecule. This means that it has uneven charges because the electrons in its covalent bond tend to move around the oxygen atom more than they move around the hydrogen atoms.



Cohesion: Water molecules like to stick together because they are polar. The negative charge on one water molecule is attracted to the positive charge on another water molecule.

Adhesion: Water molecules also like to stick to other polar substances. When water sticks to anything but water, it's adhesion.

Surface tension: Because water molecules are polar and stick together, water molecules at the top of a body of water constantly try to stay as close together as possible. They pull down and to the sides, creating a layer of tension at the top of bodies of water.

Universal solvent: Because water dissolves so many substances, we call it the "universal solvent." A solvent does the dissolving and a solute gets dissolved in a solution.

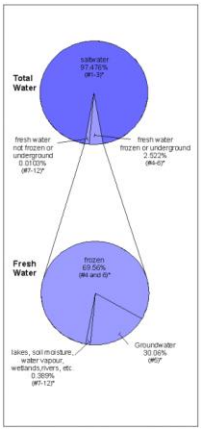
Density: It's how packed together molecules are. Mass/volume. Substances that are less dense than water will float in water, but more dense stuff will sink.

Buoyancy: Water pushes up on everything that is put in it. If a substance is less dense than water, water can push hard enough that it will float. If a substance is more dense than water, it will still sink (even though water is pushing up!)

Specific heat: It's the amount of energy it takes to change the temperature of a substance. Water has a high one, which means it takes lots of energy to change the temperature of water. Our bodies are made of water, so this helps keep us alive.

Structure of the Hydrosphere

*Only 3% of the water in the world is freshwater. That means that 97% of the water in our world is salt water found in the oceans, which humans cannot drink.



*Salinity is a measure of how salty water actually is.

*To get fresh water from salt water, we have to take the salt out. That process is called desalination.

*Of the freshwater, 69% of it is in ice form. 30% is groundwater (water underground), and 1% is found in rivers and lakes.

*Watersheds are an area where water collects and all runs to one point, like the ocean.

*Tributaries are small streams or rivers than run into larger rivers.

*Wetlands are an area that is wet during all or part of the year. They are a great habitat for animals and absorb water to keep the earth from flooding.

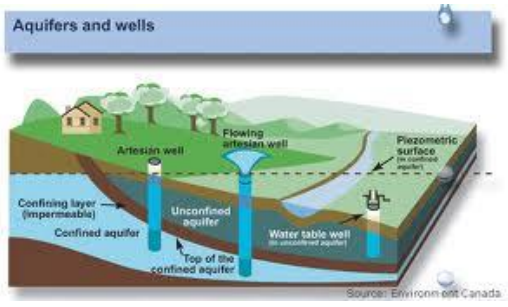
Groundwater

*Humans get most of their drinking water from aquifers and rivers/lakes.

*Groundwater is water underground that's usually stored in layers of rock called aquifers.

*Some rocks are permeable, so water can run through them. When the water reaches an impermeable rock formation (which won't hold water), it builds up in the permeable rock.

*To produce water, a well has to be drilled below the water table and in a permeable rock formation.



Oceans

*The ocean is divided into three zones: intertidal, neritic, and oceanic.

*The intertidal zone is the area of the beach that is sometimes covered by water (during high tide) and sometimes in the air (during low tide).

*The neritic zone is the area from that slopes from the shore to the ocean floor.

*The oceanic zone is made up of the open waters of the ocean.

*Estuaries are where salt water mixes with fresh water. They are usually protected by barrier islands or reefs.

*The calm waters of an estuary are generally the home to MANY different organisms.

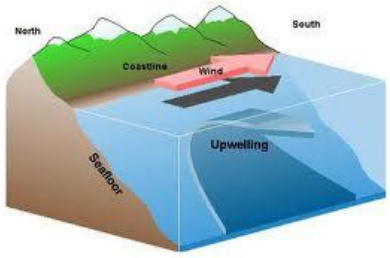
*Benthos are organisms that live at the bottom of the ocean.

*Plankton are organisms that float in the ocean.

*Nekton are organisms that swim in the ocean.

*Upwelling is the movement of nutrient-rich waters from the deep ocean into shallow areas, bringing nutrients that help organisms to thrive in upwelling areas.

*Upwelling occurs when winds blow warm water away from the shore. This brings colder water to the surface.



*The ocean supplies many resources to humans, including water (when desalinated) and many different types of food.

*The oceans resources, especially the foods that we obtain from the ocean, are not unlimited.

*Humans use sonar to measure how deep areas of the ocean are. Sound waves are sent from a boat, bounce off the bottom of the ocean, and bounce back up to the boat.

Water Quality Indicators

Temperature: A healthy water system has moderate to cool temperatures (because cool water holds more dissolved oxygen).

Dissolved oxygen: High dissolved oxygen levels are good. Cold water can hold more dissolved oxygen that warm water can.

pH: Most aquatic life functions best in water at a neutral or slightly basic (8.0-9.0) pH.

Nitrates: Nitrogen-containing compounds found in fertilizers that can pollute water systems.

Turbidity: High turbidity (murky water) is a sign of an unhealthy water system.

Bio-indicators: High levels of bio-indicators indicate a healthy water system. Low levels of bio-indicators indicate a polluted water system.

Pollution

*Point-source pollution is pollution that comes from one identifiable place.

*Non-point-source pollution is pollution that comes from more than one identifiable place. It's hard to pinpoint THE place it's coming from.

*Point-source pollution is usually easier to stop than non-point-source pollution because we can point to exactly where it's coming from

Indicator Levels

*Low dissolved oxygen=fish death → poor water quality

*High water temperature=low dissolved oxygen (because hot water can't hold much dissolved oxygen). → poor water quality

*If there are too many nutrients in a body of water, the water will have high turbidity, and algal blooms will occur. This leads to low dissolved oxygen → too water quality

*pH should be between 6-9 for a healthy water system.

*pH if there are few bio-indicators present, the water source cannot support life → poor water quality

Water Treatment

*Because water can be polluted and carry diseases, it's important that water be treated (or cleaned) before humans drink it.

*Wastewater treatment plants are places that process water to remove waste and then release the water into a lake or stream.