

Water and Life- Lecture Notes
Unit 1: Chemistry of Life (1.1)

Phases of Matter

Solid	Liquid	Gas
Solid water	Liquid water	Gas

Terms Associated with Water and Life:

Water's Properties Facilitate an Environment for Life

_____ in water molecules results in _____:

- In the water molecule, electrons in the polar covalent bonds spend more time near the oxygen than the hydrogen.

Drawing:

- The water molecule is a polar molecule, which means...

Drawing:

- Polarity allows water molecules to form hydrogen bonds with each other.

Drawing:

Note: Intrinsic vs. Emergent—

4 Emergent Properties of Water that Contribute to Earth's Suitability for Life

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Cohesion and Adhesion of Water Molecules

- Collectively, _____ hold water molecules together (_____).
- _____: Attraction between different substances (e.g., between water and plant cell walls).

Surface Tension:

- Definition: A measure of how difficult it is to break the surface of a liquid.
- Water has unusually high surface tension due to hydrogen bonding of water molecules at the _____.

Importance to life:

Drawing:

Capillary Action:

- Definition: Ability of water to flow against gravity in narrow spaces.

Importance to life:

Drawing:

Moderation of Temperature by Water

- Water's Role in Heat Absorption and Release:

- _____: Water absorbs heat from warmer air and releases stored heat to cooler air.
- _____: Water can absorb or release a large amount of heat with only a slight change in its own temperature.

Importance to life:

Evaporative Cooling:

- Heat of vaporization:
- As a liquid evaporates, its remaining surface _____
- In order for a liquid to evaporate, what has to be broken??

Water's High Specific Heat:

- Water resists changing its temperature because of its high specific heat.
- High specific heat is due to _____.
- Heat is absorbed when hydrogen bonds _____.
- Heat is released when hydrogen bonds _____.

Expansion Upon Freezing, AKA Ice Floats!!

- Ice floats because hydrogen bonds in ice are more "ordered," making ice less dense than water.

Importance to life:

Drawing:

- Water reaches its greatest density at _____.

Versatility as a Solvent

- Definitions:

- _____: A liquid that is a completely homogeneous mixture of substances.
- _____: The dissolving agent of a solution.
- _____: The substance that is dissolved.
- _____: A solution in which water is the solvent.

- Water's versatility as a solvent is due to its _____.

Importance to life:

- Ionic Compounds Dissolved in Water: Each ion is surrounded by a sphere of water molecules (_____).

Drawing:

- Nonionic Polar Molecules: Large polar molecules (e.g., proteins) can dissolve in water if they have ionic and polar regions.

Drawing:

_____ and _____ Substances

- Definitions:

- Hydrophilic Substance: _____
- Hydrophobic Substance: _____

- Hydrophobic Examples: Oil molecules are hydrophobic due to relatively nonpolar bonds. Hydrophobic molecules are major components of cell membranes.

Drawing: