



Temperature (WATER)

What is Temperature?

The temperature of an object tells us how much heat, or energy, an object has. It is the measure of the average kinetic energy of the atoms or molecules in the system. As the speed of particles increases, so does the temperature. Additionally, heat will flow naturally from a hotter object to a colder object.

For example, a boiling cup of water has very active molecules moving around very quickly. Colder objects do not have as much energy. Their molecules are much less active.

Why do we measure temperature? What is the significance of measuring temperature?

Accurate, reliable temperature measurement is important in all fields of science and engineering as well as everyday life.

As it relates to ponds, streams, lakes or oceans, temperature is an important water quality measurement.

Temperature has a significant impact on aquatic species such as fish and plants that live in these bodies of water as they all have a temperature "comfort range" for their environment. Aquatic plants typically flourish in warmer temperatures, while some fishes such as trout or salmon prefer colder streams. Temperatures too far outside this preferred range can cause stress or even death to these organisms.

Temperature is also important because of its influence on water chemistry. Warm water holds less dissolved oxygen than cool water and may not contain enough dissolved oxygen for the survival of different species of aquatic life. If water is too warm, it will not hold enough oxygen for aquatic organisms to survive.

An increase in temperature can increase the pH of water. The pH scale ranges from 0 to 14, with 7 being neutral. The lower the pH, the more acidic water will be. Water with a pH of 2 would be very acidic and would have a detrimental effect on aquatic life. High pH causes a bitter taste to drinking water and depresses the effectiveness of the disinfection of chlorine.

Some compounds, like ammonia and lead, are also more toxic to aquatic life at higher temperatures.

Water temperature and water density are directly related. As the temperature of water increases or decreases, it will alter the density of water. Warm, less dense water floats above colder, denser water. If you have ever been swimming in a lake in the summer, you have probably noticed your arms felt like they are in a warm bath while your feet are chilled.

Water temperature can be influenced by natural and human processes such as sunlight, heat transfer from the environment, run-off, deforestation, and dams that affect the natural patterns of water.





Temperature sensors are used every day for regulating water temperature, controlling refrigeration systems, monitoring building temperatures, assessing patient vitals, and more.

How does a Temperature sensor work?

Temperature is often measured with the use of a thermometer. Temperature is measured with a thermometer which can be calibrated in various temperature scales using reference points such as freezing or boiling temperatures.

Temperature is measured via a digital temperature sensor with a semiconductor based integrated circuit that will change its electrical properties in response to a change in temperature.

What data is collected? Units of measure?

The most common scales are the Celsius scale ($^{\circ}\text{C}$), the Fahrenheit scale ($^{\circ}\text{F}$), and the Kelvin scale (K), which is typically used for scientific purposes.

The lowest theoretical temperature is absolute zero on the Kelvin scale.

Resources

US Geological Service

<https://www.fondriest.com/environmental-measurements/parameters/water-quality/water-temperature/>

[Global Temperature | Vital Signs – Climate Change: Vital Signs of the Planet \(nasa.gov\)](#)

[Climate Change: Global Temperature | NOAA Climate.gov](#)

[Temperature | US EPA](#)

[Track active weather with NOAA's new radar viewer | National Oceanic and Atmospheric Administration](#)

Extension Activities

Thermocouple

Glossary

[Atoms](#) (noun): a tiny particle : BIT, the smallest particle of an element that has the properties of the element and can exist either alone or in combination; the atom considered as a source of vast potential energy

[Deforestation](#) (noun): the action or process of clearing an area of forests; the state of having been cleared of forests

[Kinetic energy](#) (noun): energy associated with motion and heat

[Heat](#) (noun): a form of energy that causes substances to rise in temperature or to go through associated changes (as melting, evaporation, or expansion)

[Molecule](#) (noun): the smallest particle of a substance having all the characteristics of the substance

[Organism](#) (noun): something having many related parts that function together as a whole; an individual living thing that carries on the activities of life by means of organs which have separate functions but are dependent on each other : a living person, plant, or animal





[pH](#) (noun): a number used in expressing acidity or alkalinity on a scale whose values run from 0 to 14 with 7 representing neutrality, numbers less than 7 increasing acidity, and numbers greater than 7 increasing alkalinity

[Toxic](#) (adjective): of, relating to, or caused by a poison or toxin

[Turbid](#) (adjective): clouded or discolored by sediment

