Physical properties of water 2

lesson Two

◆ The properties of water affect on many natural phenomena and affect the distribution of living organisms in different environments G.R

◆ bec : Water has unique physical properties. that distinguish it from other fluids (liquids and gases) as it has :

1. low density when it reaches the freezing point
2. high specific heat .

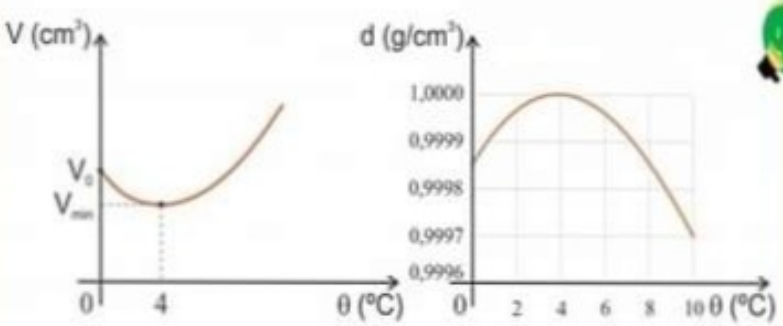
Density

It is the mass per unit volume of a substance at a certain temparature.

Density of water

● The mass of 1 cm^3 of pure water at 4°C = 1 gram . so The density of it = 1 g/cm^3 which is equivalent to the international unit of density , 1000 kg/m^3

● As the temperature of water decreases below 4°C , approaching its freezing point, its density decreases



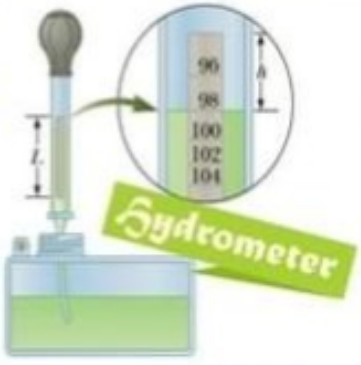
Nota

- The highest density of water is 1 g/cm^3 at 4°C
- below and above 4°C the density gradually decreases
- the density of water at 0 °C is not the lowest one

Relative density =

$$\frac{\text{density of a substance}}{\text{density of pure water}}$$

measured by



Aquatic Ecosystem

Density of water and currents in oceans

The density of seawater is affected by many factors as pressure , salinity and temperature :

Note

The avreage salinity of ocean water is 35 grams per liter of water (or the equivalent of two teaspoons per cup of water)

PRESSURE

As the depth increases, the water molecules get more closer causing a slightly increasing in density.

Direct

Salinty

As the salinity increase the , the density increase .

Direct

Temp

As temperature decreases (until it reaches 4°C), water molecules close to each other , occupying less space (volume) , increasing its density.

on decreases below 4°C or increases above 4°C ← **inverse**

Differences in water density are the main reason of ocean currents

These currents transport :

1. **heat and salts from the tropical region to the two poles**
2. **transport nutrients from the ocean depths to the surface**
3. **freshwater from rivers or melting glaciers to various locations around the globe.**

Density of water in Polar Regions

The density of water changes as its temperature changes, generally the volume of a liquid increases as the temperature increases and the volume of a liquid decreases as the temperature decreases. Water is an exception to this rule. As :

from 0°C to 4°C, as the temperature of pure water increases the water shrinks and as a result its density increases

at 4°C the density of water reaches its highest value (1000 kg/ m3)

when the temperature rises above 4°C the Water expands as it gains heat energy so the molecules move rapidly and the distance between them and volume increase so its density decreases.

Finally, the surface water freezes, and the ice remains on the surface as the density of the ice is less than the density of the water while the water remains near the bottom at 4oC.

- If not, fish and other marine life would not survive