Physical Properties of ocean water :

Water is a molecule. A molecule is a group of atoms held together by chemical bonds. H_2O consist of 2 hydrogen atom and 1 oxygen atom. the angle form by the two hydrogen and the central oxygen atoms about 105°.

The angular shape of the water molecule makes it electrically asymmetrical or polar. Each water molecule can be thought as having a positive end and a negative end. The polar nature of water also permits to attract other water molecule. When hydrogen atom in one water molecule is attracted to the oxygen atom of an adjacent water molecule a hydrogen bonds form. The water molecules are bonded together by electrostatic forces. Hydrogen bonds greatly influence the properties of water by allowing individual water molecule to stick to each other, a property called Cohesion.

The Physical properties of ocean water are :

1) **Ocean water temperature :** The most important properties of water are related to its behavior as it absorbs or loses heat. Water unusual thermal characteristics to prevent wide temperature variation day to night and from winter to summer, permit vast amount of heat to flow from equator to polar region.

   Heat and temperature not the same things. Heat is energy produced by the random vibration of atom or molecules. Heat is measure of how many molecules are vibrating and how rapid they are vibrating. Temperature record only how rapidly molecule of a substance are vibrating. Temperature is an object response to an input or removal of heat. The amount of heat required to bring a substance to a certain temperature varies with the nature of heat substance. The surface water temperature measured by standard thermometer and the inner water temperature measured by Reversing thermometer. Pure water have more significant properties : its freezing point 0° and boiling point 100°.

Heat capacity : heat capacity is a measure of the heat required to rise the temperature of 1 gram of a substance by 1°C temperature. Heat capacity measured **Calorie/gram**

Substance	Heat capacity (calories/gram/°c)
Silver	0.06
Granite	0.20
Aluminum	0.22
Gasoline	0.50
Acetone	0.51
Pure water	1.00
Alcohol	0.30

Table : Heat capacity of common substance

2) **Density of water :** Density refers to the amount of mass per unit volume of substance. It usually measured in gram/cm^3 . Density of pure water is 1.00 g/ cm3 at the temperature 4°C. The average density of sea water 1.0278 g/ cm3 which is 2 to 3 % higher than the density of pure water at 4°C temp. The density of sea water gradually increases with decreasing temperature and highest density recorded at the temperature of -1.3°C.

Temperature (°C)	0	10	20	25	30
Density (g/ cm3)	1.028	1.0270	1.0248	1.0234	1.0217

Salinity and pressure also impact on density. Salinity positively related to the density that is increasing salinity increasing density. Similarly pressure is positively related to ocean water density.

3) **Optical properties of sea water** : it is depend on the penetration of sun rays to the interior of ocean water. Based on the penetration there have some zones from surface to bottom of ocean :

Depth of water(m)	Light zone	Name of the region
0-200	Photic zone	Epipelagic or photic or

		sunlight zone
200-1000	Twilight zone	Mesopelegic zone
1000-4000	Midnight zone	Bhathipelagic zone
4000-6000	Boundless darkness	Abyssopelegic zone
>6000	Complete Darkness	Hadal zone

4) **Colours of sea water :** Clear ocean water looks blue because blue light can travel through water far enough to be scattered back through the surface to our eyes. Where the phytoplankton are abundant , the Chlorophyll absorb blue light and scatter green light so we look water green. Suspended particles scatter some colour os light and absorb others. Some sediments reflect yellow light giving the ocean a yellow cast.

5) **Sound wave :** The sound wave on water control by the temperature, salinity and pressure. Increase the temperature the sound wave increase rapidly.

1° C temperature	Sound wave 4m/sec
1PSU salinity	Sound wave 1.4m/sec
1000m depth	Sound wave 17m/sec

Chemical properties of ocean water

1) **Solvent power :** The major properties of water is the solvent power so water called the universal solvent. The major constituents of sea water comprise mainly primary solutes in the form of cations and anions of which chloride and sodium are by far the most significant solutes as they combined together represent more than 85% of all solutes present in the sea water. These two ions chloride and sodium are responsible to make halites which is responsible for the salinity of water. Another solutes are sulphate, magnesium, calcium and potassium.

Salt ion	Weight (gram/kg weight of seawater)
Chloride	18.98
Sodium	10.556
Sulphate	2064
Magnesium	1.27
Calcium	0.40
Potassium	0.38
Bicarbonate	0.14
Bromide	0.06
Boric Acid	0.02
Strontium	0.01
Floride	0.001
Total	34.48

2) **Nutrients of sea water :** The major nutrients of sea water which enable marine phytoplankton to convert them into organic matter through the process of Photosynthesis include the compounds of nitrogen (0.5 ppm) , silicon (3ppm), phosphorous (0.07 ppm) .
3) **Gases :** through there is concentration of several gases varing proportions of sea water, namely nitrogen, oxygen, carbon dioxide, hydrogen and few minor gases such as argon, neon, helium etc. but only dissolved oxygen and co_2 play major role in photosynthesis.
4) **Trace elements :** Present in sea water include manganese, lead, mercury, gold, iron etc. very low amount of these elements in sea water is significant in marine organism. Sometimes relatively higher concentration of a few trace elements such as mercury and lead make the sea water toxic and thus kill marine organism.