WATER

WATER: -Water is the most abundant and inexhaustible renewable natural resource. Water is the only chemical substance, which is present on the earth simultaneously as a gas (water vapour), a liquid (water) and as a solid (ice, snow).

Water plays a vital role in the various physical and chemical processes in biological systems. In fact, water, is essential for the sustenance of plant and animal life.

Cavendish in 1781 showed that water is made up of hydrogen and oxygen combined in the ratio 2:1 by volume. In 1784, Laviosier decomposed water by passing steam over red-hot iron. In 1800, Nicholson and Carlisle decomposed water by using electricity. Davy in 1806 established the fact that water contained hydrogen and oxygen in the ratio 2:1 by volume.

Noyes in 1907 fond that the mass of hydrogen, which combines, with 8.000 g of oxygen was 1.00787 g. Based on these results, water was assigned the molecular formula H_2O. The chemical name of water is hydrogen monoxide.

OCCURRENCE OF WATER: -

Water is widely distributed in nature both in the free as well as in the combined forms. Free water occurs as a solid (ice and snow), liquid (water) and gas (water vapour). Distribution of water in nature is described below.

(1) As Solid. In the liquid state, water exists as ice and snow. Water is the solid state occurs on the peaks of high mountains, in the regions. In Antarctica, water exists mostly as ice and snow.

(2) As liquid. In the liquid form, water occurs in Oceans, Seas, Rivers, Lakes, Ponds, Springs, Wells etc. Liquid water covers more than two-third surface of the earth. The total Ocean water is about 3×10^{18} cubic metre. Animal and plant tissue also contain water. About 75% of the body weight of animals is due to the presence of water in their tissue.

(3) As gas. In the gaseous state, water exists as water vapor or steam. The earth's atmosphere contains a large amount of water vapour. The presence of large amount of water vapour in the atmosphere makes it humid.

(4) As water of crystallization. Water also exists in the combined form as water of crystallization in a large number of crystalline salts and minerals. Some typical salts which contain water of crystallization are,

(a)	Copper sulphateor	copper (II) sulphate	$CuSO_4$ $5H_2O$	
(b)	Iron sulphate	or	Iron (II) sulphate	$FeSO_4$ 7H2O
(c)	Borax	or	Sodium borate	$Na_2B_4O_7$ $10H_2O$

WATER OF CRYSTALLIZATION

When aqueous solution of many soluble salts are left for crystallization, a certain definite number of water molecules may combine with a molecule of the salt. These water molecules, which become a part of the crystal (or molecule) are called water of crystallization or water of hydration. For example, when a saturated aqueous solution of copper sulphate or copper II sulphate ($CuSO_4$) is allowed to crystallize, crystals of $CuSO_4$ $5H_2O$ (copper sulphate pentahydrate) are obtained. Thus, a molecule of copper sulphate has five molecules of water of crystallization.

Different salts contain different number of water molecules as the water of crystallization. For example, magnesium chloride ($MgCl_2$) forms magnesium chloride hexahydrate ($MgC_{l2}. 6H_2O$), ferrous sulphate or iron (II) sulphate forms ferrous sulphate heptahydrate ($FeSO_4 . 7H_2O$). There are however, many salts that do not contain water of crystallization.

PROPERTIES OF WATER: -

Following are the properties of water, each of which has a great significance in real life situations.

1. Water molecules cling to each other with strength greater than that between the atoms of certain metals. This force of attraction is the cohesive force among water molecules. It also has strong adhesive forces to bind to a variety of other materials, such as glass, soil or anything that has oxygen in it.
2. Water can creep uphill, despite gravity. This is the property of capillarity, which results because of the cohesive and adhesive forces.
3. Water molecules join with each other in a peculiar way, forming a lattice. This pulls the surface layer of water in a tight sheet – a phenomenon known as surface tension.
4. Water does not show any affinity for most organic substances but is strongly attracted by most of the inorganic materials. This property greatly influences permeability, properties of cell membranes, and the process of exchange of materials across them.
5. Water, like other liquids, transmits pressure equally (when inside a closed container) in all directions.
6. Water can change the direction of propagation of light by the phenomenon of refraction.
7. Water can absorb and release large amounts of energy during its dissociation and formation respectively.
8. Water neither gains, nor loses heat easily. This is why it has very high values of both boiling and freezing points, compared to other similar molecules.
9. Water expands on heating and contract on cooling. Water too behaves similarly but up to a certain point. When cooled below 4^0 C, instead of continuing to contract, it suddenly begins to expand. It has therefore maximum density at 4^0 C. When cooled from 4^0 C to 0^0 C, it becomes ice, which due to expansion becomes lighter and floats on water.
10. Water is both a binder and splitter of large molecules.
11. Water is a universal solvent.

USES OF WATER: -

Water plays an important role in everyday life. Human controlled industries cannot function without water. These industries not only employ millions of people, but some of them also earn the precious foreign exchange and add to the national earnings. Some of these large-scale uses are as follows: -

1. It is used as a source of power in the form of steam for driving machines and is used in generating electricity from dams, as in hydroelectric plants.
2. Water is a cooling agent in heating systems, as in engines, other machines, steel plants, high voltage precision equipments such as electron microscope, in mining industry etc.
3. It is used as a raw matter in the production of a large variety of industrially useful chemicals, beverages, pharmaceuticals, etc.
4. Water is used as a solvent in the chemical reactions involving the manufacture of bleaches and is used in paper mills for washing impurities from the pulp.

5. Human civilization evolved at places where water was in abundant supply. Progress of mankind could not occur without using water for irrigation purposes. The daily requirement of water of humans is also quite substantial.
6. Water is involved in the extraction of various salts from oceans.

SOURCES OF WATER: -

Various sources of water on the earth are,

a) Rivers b) Seas/Oceans c) Wells d) Ponds e) Lakes f) Springs

g) Rains h) Glaciers.

Small quantities of water are also present in the soil and air.

Water is drawn from each of these sources has some characteristics of its own. For example, different samples of natural water differ in taste and odour due to the presence of different salts in them. The characteristics of water from some of the sources are described below.

1. **Rain water: -** Rainwater is considered to be the purest of all natural waters. However, first showers of the rain are impure because they contain most of the impurities of air, e.g. carbon dioxide, ammonia, dust, bacteria, germs, oxides of sulphur and nitrogen, smoke etc. subsequent showers of the rain are pure because they do not contain any such impurities. Rainwater resembles distilled water to some extent because both are formed by the same process i.e. vaporization of water followed by the condensation of water vapour.
2. **River water: -** The water in rivers comes from rains and melting of snow on the high mountains. The water flows down the hills and then the plains before it goes to rivers. On its way, it may dissolved some soluble salts and also may carry some coarse and fine suspensions of the undissolved substances. In the mountainous regions, river water is relatively clearer and purer. But, as it flows in the plains, it gets polluted due to the impurities it carries with it.
3. **Seawater: -** The seawater contains large amounts of dissolved impurities. It contains chlorides, bromides, iodides, bicarbonates and sulphates of Na, K, Mg, Ca, Fe etc. Seawater contains dissolved salts to an extent of about 3.6% by mass. Seawater contains sodium chloride to an extent of about 2.8%. The largest source of water is seawater. But this water can neither be used for drinking nor for irrigation purposes. Many methods are being tried for removing impurities from the seawater. But none has been found to be economically feasible so far.
4. **Spring water: -** Surface percolates through the soil to reach impervious rocks, where it starts accumulating. If some opening is available at the lower level, this water gushes out as spring water. The nature of the spring water depends upon the nature of the soil through which it passes before gushing out. Spring water is free from suspended impurities as it undergoes natural filtration through the various layers of the soil. Many spring waters contain some dissolved minerals, which have curative effect for certain diseases. That is why water from certain springs is used for medicinal purposes. Spring waters contain impurities of salts of Mg, Ca, K, Na and Fe along with some dissolved gases like SO_2, H_2S, CO_2. Spring waters have peculiar tastes and odours.
5. **Well water: -** When earth is dug deep down, water reservoirs are found. They occur at different depths at different places. These water reservoirs or underground streams of water are called wells.

Well water, like spring water, also contains dissolved impurities. The nature of these impurities depends upon the nature of the soil, which surrounds the well. Usually, water from a deep well is purer than that from a shallow well.

IMPORTANCE OF WATER FOR HUMANS AND ANIMALS: -

Water is considered to be the source of life. It is important for animal life because of the following reasons: -

a) Water is a vital body fluid, which is essential for regulating the processes such as, digestion, transport of nutrients and excretion. Water dissolves ionic and a large number of polar organic compounds. Thus it transports the products of digestion to the place of requirement in the body.
b) Water regulates the body temperature by the process of sweating and evaporation.
c) Water is a medium for all metabolic reactions in the body. All metabolic reactions in the body take place in solution phase.
d) Water provides habitat for various animals in the form of ponds, rivers, seas etc.

IMPORTANCE OF WATER FOR PLANTS: -

Water is important for plants because of the following reasons: -

a) Water helps in the germination of seeds.
b) Water helps in the process of photosynthesis by which plants prepare their food.
c) Water helps in the transport of nutrients and minerals from the soil to the plants.
d) Water helps in the maintenance of the plant structure by providing the appropriate pressure to the plant tissues.
e) Water provides habitat in the form of ponds, rivers, lakes and sea for a large number of plants.

STRUCTURE OF THE WATER MOLECULE: -

Water is made up of hydrogen and oxygen combined in the ratio 2: 1 by volume. Thus, the molecular formula of water is H_2O. In a molecule of water one oxygen atom is bounded to two hydrogen atoms and the two O – H bonds are inclined to each other at an angle of 104.50. Thus H_2O has a bent structure.

POLARITY OF WATER MOLECULE: -

In water molecule, one oxygen atom forms bonds with two hydrogen atoms by sharing of electrons. Thus, oxygen atom shares one electron pair with each hydrogen atom. Oxygen is more electronegative than hydrogen. So, oxygen atom pulls the shared pairs of electrons towards it. This leads to a small negative charge on the oxygen atom and small positive charges on the two hydrogen atoms. This makes water molecule to develop polarity. In other words, water molecule is a polar molecule.

EXPERIMENT TO SHOW THAT WATER IS A POLAR COMPOUND: -

Suspend a burette on a burette stand. Fill it with distilled water and place a beaker (250 ml capacity) under the jet of the burette. Allow a thin stream of water to run out of the burette. The water stream runs out of the jet vertically downwards.

Rub a piece of thermocol against a sheet of flannel and bring the rubbed edge of the thermocol near the running stream of water. The stream of water gets attracted towards the thermocol piece.

THIS CAN BE EXPLAINED AS FOLLOWS: -

When thermocol is rubbed against flannel, it develops a negative charge. When this negatively charged thermocol is brought nearer to the stream of water, the water stream gets attracted towards it. This shows that water molecules have some positive charge on them.

Now rub a glass rod with a piece of silk cloth and bring the rubbed end of the glass rod nearer to the stream of water. The water stream gets attracted towards the glass rod. This can be explained as follows.

When a glass rod is rubbed with silk, it develops a positive charge on it. When this positive charged glass rod is brought nearer to the stream of water, the water stream gets attracted towards it. Opposite charges attract each other. Therefore, this experiment shows that water molecule have some negative charge on them.

Thus, we see that water molecules have both negative and positive charges on them. Therefore, water molecule is a polar molecule.

WATER AS A UNIVERSAL SOLVENT: -

Water is a universal solvent. Given enough time, water will dissolve almost any inorganic substance. A solid compound when dropped in water is quickly broken up by water molecules. Water molecules force their way between the clusters of particles, break them apart, surround the separated particles with a protective shield and prevent them from regrouping.

Water becomes a saturated solution when it has dissolved a solute to its maximum capacity and any further solute, if added cannot be dissolved. Sometimes heating or warming helps in increasing the solubility of water. An unsaturated solution is the one, which retains the capacity of dissolving more of a particular solute.

The following properties of water make it a universal solvent: -

a) Water is a polar molecule.
b) Water can form hydrogen bonds with other polar compounds.
c) Water dissolves many substances by reacting with them chemically.
d) Water is cheap and easily available everywhere.

DISSOLUTION OF IONIC COMPOUNDS IN WATER: -

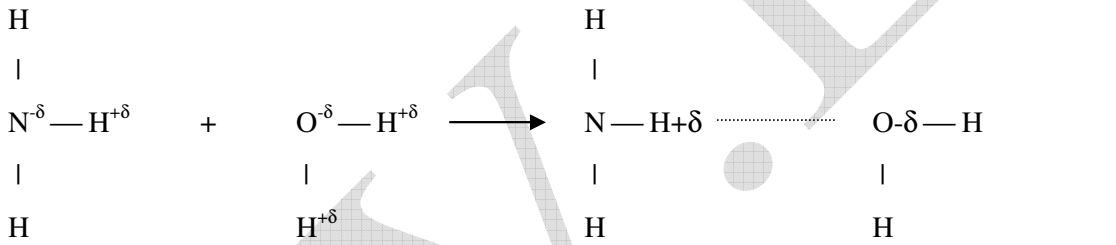
Ionic compounds consist of ions. For example, sodium chloride (common salt) consists of Na^+ and Cl- ions. When a solid ionic compound is added to water, the force of attraction between the ions gets weakened and it

splits up into the positive and negative ions. The polar water molecules then surround these ions and the hydrated ions get distributed into the water giving a solution. This is how an ionic solid dissolves in water.

Dissolution of covalent compounds in water due to hydrogen bond formation: -

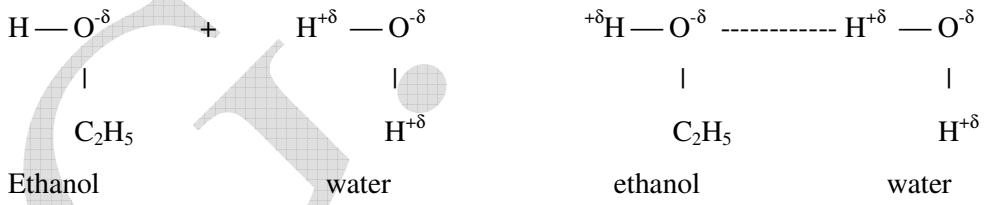
Polar covalent compounds dissolve in water either due to ionization or due to the formation of hydrogen bonds. For example, hydrogen chloride (HCl) gas dissolves in water due to ionization to give free hydronium ion (H_2O^+) and chloride ion (Cl^-).

DISSOLUTION OF AMMONIA IN WATER: -



(Ammonia dissolves in water due to hydrogen bond formation)

DISSOLUTION OF ETHANOL IN WATER: -



(Ethanol dissolves in water due to hydrogen bond formation)

SOLUTION: -

A solution may be defined as follows: -

A homogeneous mixture of two or more substances is called a solution. Homogeneous means physically and chemically uniform thorough out. For example.

1) When a small amount of sodium chloride is dissolved in water, a homogeneous mixture so obtained is called a solution of sodium chloride in water. The solution of sodium chloride in water is homogeneous because the properties of the solution are the same through out the solution.

Some other common solutions are: -

a) Sugar solution, b) Copper sulphate solution c) Vinegar

2) A homogeneous mixture of two or more miscible liquids is also called a solution. For example ethanol dissolves in water to give a solution of ethanol in water.

SOLUTE AND SOLVENT: -

A solution is obtained when a substance is dissolved in another substance. The substance which is dissolved to obtain a solution is called solute, whereas the substance in which the solute is dissolved is called solvent. For example, when sugar is dissolved in water to obtain a sugar solution, sugar and water is solvent.

Most common solutes are solids and solvents are liquids. However, solutes may also be liquids and gases.

AQUEOUS SOLUTION: - Solution in which water is the solvent is called aqueous solution. For example, when sugar is dissolved in water, the solution obtained is called an aqueous solution of sugar. An aqueous solution of any solute is described by writing the word (aq) immediately after the name of the solute. Thus, an aqueous solution of sugar is described by sugar (aq).

Non-aqueous solution: - The solution obtained by dissolving a solute in my solvent other than water are called non-aqueous solutions. For example, if a solute is dissolved in any solvent such as benzene, alcohol, either carbon disulphide, carbon tetrachloride, acetone etc. the solution obtained is called a non-aqueous solution.

Some commonly used non-aqueous solutions are,

a) Solution of sulphur in carbon disulphide.
b) Solution of iodine in carbon tetrachloride.
c) Solution of iodine in alcohol (tincture of iodine)

TRUE SOLUTION: -

A microscopically homogeneous mixture of two or more substances in which size of the solute particles is about 10^{-10} m is called a true solution. In a true solution, the solute particles and the solvent molecules cannot be distinguished even under microscope.

In a true solution, the solute particles are trapped into space between the solvent molecules.

Aqueous solutions of low molecular mass solutes are true solutions. For example, solutions of sodium chloride, copper sulphate, glucose etc. in water are true solutions.

In common use, the term solution actually means true solution.

CHARACTERISTICS OF TRUE SOLUTION: -

A true solution shows the following characteristics: -

a) A true solution is homogeneous at the molecular level i.e. the solute particles and the solvent molecules cannot be distinguished even under microscope. The composition and properties of a true solution are the same through out.
b) A true solution is clear and transparent.
c) A true solution does not scatter light.
d) In a true solution, the solute particles are very small: of the order of about 10-10 m.
e) The components of a true solution (the solute and the solvent) cannot be separated by filtration. This is because both solute particles and the solvent molecules are very small as compared to the pores in the filter paper.
f) The solute particles in a true solution do not settle down.

SOLUBILITY: -

Solubility of a substance is defined as mass of the solute in grams, which dissolves in 100 g of a solvent to form a saturated solution. For example, 100 g of water at 250 C can dissolve 36.5 g of sodium chloride to obtain a saturates solution. So, the solubility of sodium chloride at 250 C is 36.5 g per 100 g of water.

If w g of a solute dissolves in Wg of a solvent to obtain a saturated solution at any particular temperature and pressure, then

Solubility of the solute = w / W x 100 g / 100 g of solvent.

THE SOLUBILITY DEPENDS ON THE FOLLOWING FACTORS:

1) **Temperature:** - The solubility of solid solutes in liquids usually increases with a rise in temperature and decreases with a fall in temperature. The solubility of a gas in a liquid usually decreases with a rise in temperature.
2) **Pressure: -** Pressure has very little effect on the solubility of solids in liquids. However, the solubility of a gas in a liquid increases with an increase in the pressure of the gas.
3) **Nature of solute and solvent: -** Polar and ionic compounds dissolve more in polar solvents. For example, the solubility of polar compounds which can form hydrogen bonds with water usually much higher.

UNSATURATED SOLUTION: -

A solution in which more solute can be dissolved at any fixed temperature is called an unsaturated solution. For example, a solution of sugar in which more sugar could be dissolved. Without changing its temperature is called an unsaturated solution of sugar.

SATURATED SOLUTION: - A solution in which no more solute can be dissolved at any fixed temperature is called saturated solution. In other words, a solution which contains the maximum possible amount of a solute at any given temperature is called saturated solution.

EFFECT OF HEATING ON A SATURATED SOLUTION: -

A saturated solution of a substance is saturated at a particular temperature only. This is because the solubility of any substance has a fixed value at a particular temperature.

In general, the solubility of a solute increases with a rise in temperature. So, when the temperature of a saturated solution is raised, more solute can be dissolved in it. A solution in which more solute can be dissolved is called unsaturated solution. Therefore, when the temperature of a saturated solution is raised, it becomes an unsaturated solution.

It may however, be noted that if a solution is left open at higher temperature for a long time, the solvent slowly vaporize leaving behind the solid solute.

SUSPENSIONS: -

A suspension is a heterogeneous mixture in which very fine particles (10-7 m) of a solid are dispersed in any medium (liquid or gas). Fine particles of the solid remain suspended in the medium.

Example: Muddy pond water; smoke coming out of a chimney of a factory, chalk-water mixture, paints etc, are suspensions.

PROPERTIES OF SUSPENSIONS: -

Following are the characteristic properties of suspensions: -

a) **Heterogeneous nature:** A suspension is a heterogeneous system.
b) **Visibility:** The particles in a suspension can be seen with naked eyes or under a simple microscope.

c) **Particle size:** In a suspension, the size of the particle is of the order of 10^{-7} m or larger.

d) **Sedimentation.** The particles in a suspension tend to settle down. Very fine particles however remain suspended in the medium.

e) **Separation by filtration**: - Larger particles in a suspension can be separated from the liquid or air by filtration.

COLLOIDAL SOLUTION: -

A homogeneous looking heterogeneous mixture in which size of the particles is between $10^{-9} - 10^{-7}$ m is called a colloidal solution. The colloidal solutions are simply called as solutions.

Example: Milk, office paste (gum), blood, toothpaste, mist (water vapour dispersed in air), jelly etc, are colloidal solutions.

PROPERTIES OF COLLOIDAL SOLUTION: -

Some characteristic properties of colloidal solutions are described below: -

a) **Heterogeneous nature: -** A colloidal solution is heterogeneous in nature. The particles in a colloidal solution can be seen only with a powerful microscope.

b) **Particle size: -** The size of particle in a colloidal solution lies between 10^{-9} m to 10^{-7} m.

c) **Separation of colloidal particles by filtration: -** Colloidal particles can easily pass through the pores of a filter paper. Therefore, colloidal particles cannot be separated by filtration.

d) **Stability: -** Colloidal solutions are unstable unless stabilized by adding suitable stabilizer. The colloidal particles tend to come together and settle down.

e) **Brownian movement of colloidal particles: -** When seen under a microscope, the colloidal particles in a colloidal solutions are seen to be moving in a random fashion. This motion of particles in a colloidal solution is called Brownian motion.

f) **Light scattering by colloidal particles:** Tyndle effect: - When a strong beam of light is passed through a colloidal solution kept in a dark room, the path of the light beam through the colloidal solution becomes visible. This occurs due to the scattering of light by the colloidal particles, the scattering of light by the particles in a colloidal solution is called Tyndall effect.

True solutions do not scatter light. Therefore, true solutions do not show Tyndall effect.

g) **Electrophoresis: -** Many colloidal particles have electrical charge on them, i.e. colloidal particles may have positive or negative charge on them. So, when electric current is passed through a colloidal solution, the colloidal particles move towards the oppositely charged electrode. The movement of colloidal particles under the influence of electric field is called electrophoresis.

DISTINGUISH BETWEEN TRUE SOLUTION, COLLOIDAL SOLUTION AND SUSPENSION: -

TRUE SOLUTION	COLLOIDAL SOLUTION	SUSPENSION
1. A true solution is a homogeneous mixture of two or more than two substances 2. In a true solution, solute cannot be seen even with a microscope. 3. In a true solution, the size of a particle is about 10^{-10} m. 4. The constituents of a true solution cannot be separated by filtration.	1. A colloidal solution is a homogeneous looking, but heterogeneous mixture. 2. In a colloidal solution, the dispersed particles can be seen by microscope. 3. In a colloidal solution, the size of particle is between $10^{-7} - 10^{-9}$ m. 4. The constituents of a colloidal solution cannot be separated by filtration	1. A suspension is a heterogeneous mixture of a solid dispersed in a liquid, or a gas. 2. In a suspension, the particles can be seen with the naked eyes. 3. In a suspension, the size of particle is bigger than 10^{-7} m. 4. The constituents by ordinary filtration.

SEA, AS A GOOD HABITAT FOR MARINE ORGANISMS: -

Sea is a good habitat for marine organisms because of the following reasons: -

a) Sea water has dissolved carbon dioxide and oxygen gases: - Seawater contains dissolved carbon dioxide and oxygen gases. Oxygen gas is used by sea animals for breathing. The dissolved carbon dioxide is used by sea plants to carry out photosynthesis.

b) Sea water contains a number of salts and minerals: - Seawater contains a number of salts and minerals. Dissolved salts containing nitrogen, phosphorus such as nitrates and phosphates are used by the sea organisms for their growth. Calcium salts are good for shell fishes, corals, etc.

c) Temperature of seawater: - The temperature of seawater does not change much. In other words, the temperature variations in the seawater are moderate. This is very favourable for the survival of sea plants and animals.

e) Sunlight: - Sunlight can easily pass through the seawater (at least up to the certain depth). Thus, sunlight is available in the seawater to help the process of photosynthesis.

WHICH COMMON SALTS ARE PRESENT IN SEAWATER?

Seawater contains about 36 g of soluble salts per kilogram of the seawater (or 3.6% by mass). The relative amounts of various salts per kilogram of seawater are given below:

Sodium chloride (common salt)	28 g per Kg	or	2.8% by mass
Magnesium salts	6 g per kg	or	0.6% by mass
Calcium salts	1 g per kg	or	0.1% by mass
Potassium salts	1 g per kg	or	0.1% by mass

Sodium chloride (common salt) is the most abundant salt present in seawater. Seawater contains about 28 g of sodium chloride per kilogram of the sea water (or 2.8% by mass). Therefore, commercially common salt is obtained from the seawater. Some plants and animals use some of the salts present in the seawater. For example, sea-shells and pearls are made up of calcium carbonate ($CaCO_3$).

SOURCES OF SALTS PRESENT IN SEA WATER: -

Seawater gets the salts present in it from the rivers, which flow, into it. When river water flows over the rocks and soil, it dissolves the salts present in them. The river water takes these salts to the sea. The undissolved soil and salts settle down to the seabed. The loss salts from seawater due to their use by sea plants and animals is compensated by the salts brought in by the rivers. As a result, the overall concentration of the salts in seawater remains almost constant.

Important elements found in seawater: -

The elements present in seawater are classified into three groups depending upon their concentration in the seawater.

a) The elements which are present in seawater in trace amounts (very small amounts) are, iodine, nitrogen, lithium, phosphorus, iron and zinc. Seaweeds are the source of iodine, i.e., seaweeds are rich in iodine.

b) The elements which are present in seawater in small amounts are – Bromine, Carbon, Boron, Silicon, and Fluorine.

c) The elements which are present in seawater in relatively larger amounts are called major elements of the seawater. The major elements present in seawater are – sodium (Na), Magnesium (Mg), Calcium (Ca), Potassium (K), Chlorine (Cl) and Sulphur (S). Sodium and bromine are commercially obtained form seawater.

HOW IS COMMON SALT (OR SODIUM CHLORIDE) OBTAINED FROM SEAWATER: -

Common salt (or chloride) is obtained from seawater by evaporation. This is done as follows:

PROCEDURE: - In coastal areas, seawater is collected in small, rectangular or square lagoons (shallow ponds/lakes). The water is allowed to evaporate in sunlight. After all the water has evaporated, crystals of common salt are left behind. The common salt so obtained is purified by recrystallisation i.e. by cooling a saturated solution of common salt prepared at a slightly higher temperature.

$$\text{NaCl (aq)} \xrightarrow{\text{Cool}} \text{NaCl (s)}$$

Saturated solution at highly temperature crystalline sodium chloride separates out

WHY IS COMMON SALT IODIZED?

Common salt to which small quantity of iodine in the form of potassium iodide or potassium iodate is added is called iodized salt. Iodized salt prevents the disease called goitre. The disease goiter is caused by the deficiency of iodine in the body.

Multiple Choices: -

Q1. Water is nearly universal solvent due to its: -

a) Polar character b) Bent shape

c) Containing two small H atoms d) Low freezing and high boiling points

Q2. The purest form of natural water is: -

a) River water b) Rain water c) Sea water d) Well water

Q3. The most versatile property of water, which makes it an ideal liquid as, a body-fluid is: -

a) Hydrogen bonded structure b) Low vapour pressure at body temperature

c) Polar nature d) High viscosity

Q4. Water dissolves covalent compounds by: -

a) Dissociation b) Hydrogen bond formation

c) Breaking covalent bonds. D) Chemical reaction

Q5. Which of the following is generally used for sterilization of drinking water: -

a) Caustic soda b) Ammonia

c) Chlorine d) Potassium permangnate

Q6. Colloidal particles can be seen: -

a) By unaided eyes b) Through ultramicroscope.

c) Through microscope d) None of these.

Q7. To know the nature of charge on the colloidal particles one should conduct: -

a) Tyndall effect b) Brownian motion

c) Ultrafiltration d) Electophoresis

Q8. Size of a colloidal particle is: -

a) > 10-6 m b) < 10-9 m

c) 10-9 – 10-7 m d) > 10-9 m

Q9. Seawater can be treated to make it possible (fit for drinking) by a method called: -

a) Boiling b) Osmosis

c) Reverse osmosis d) Distillation

Q10. When a beam of light is passed through colloidal solution then the light gets: -

a) Reflected b) Refracted

c) Absorbed d) Scattered