CHE – THE SPERES OF THE EARTH

The major spheres of the earth are: atmosphere, hydrosphere, and lithosphere.

Atmosphere

The lower atmosphere is a mixture of molecules of 3 important gases, oxygen (O_2), nitrogen (N_2), and carbon dioxide (CO_2), along with water vapour and trace amounts of several other gases that have no immediate biological importance. The gases in the atmosphere are normally stable, but under some circumstances they react chemically to for new compounds (for example, ozone is produced from oxygen in the upper atmosphere).

Hydrosphere

While the atmosphere is a major source of carbon and oxygen for all organisms, the hydrosphere is the source of hydrogen. Each molecule of water consists of two hydrogen atoms bonded to an oxygen atom, so the chemical formula for water is H_2O. A weak attraction known as hydrogen bonding exists between water molecules. At temperature below freezing, hydrogen bonding holds the molecules in position with respect to one another, and the result is a solid (ice or snow). At temperatures above freezing but below vaporization, hydrogen bonding still holds the molecules close but allows them to move past one another, producing the liquid state. Vaporization occurs as hydrogen bonds break and water molecules move into the air independently. As temperatures are lowered again, all of these changes of state go in the reverse direction. Despite the changes of state, the water molecules themselves retain their basic chemical structure of two hydrogen atoms bonded to an oxygen atom.

Lithosphere

All the other elements required by living organisms, as well as the 72 or so elements that are not required by them are found in the lithosphere, in the form of rocks and soil minerals. A mineral is any hard, crystalline, inorganic material of a given chemical composition. Most rocks are made up of relatively small crystals of two or more minerals; and soil generally consists of particles of many different minerals. Each mineral is made up

of dense clusters of two or more kinds of atoms bonded together by an attraction between positive and negative charges on the atoms.

Interactions among the Spheres

Air, water and minerals interact with each other in a simple, but significant manner. Gases from the air and ions (charged atoms) from minerals may dissolve in water. Therefore, natural water is inevitably a solution containing variable amounts of dissolved gases and minerals. This solution is constantly subject to change, because any dissolved substances in it may be removed by various processes, or additional materials may dissolve in it. Molecules of water enter the air by evaporation and leave it again by condensation and precipitation. Thus, the amount of moisture in the air fluctuates constantly. Wind may carry dust or mineral particles, but the amount changes constantly because the particles gradually settle out from the air.