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Concept of Biosphere [Hydrosphere B.Sc. Part I Paper IIA & Atmosphere]

II Hydrosphere :- About three fourths of the earth's surface is covered with hydrosphere, the main component of which is water. Water is one of the most unique material compound found on Earth. Life on Earth began in the sea and water is some fish or other is absolutely essential for the maintenance of life. Water in its two forms - salt water and fresh water, forms two chief aquatic environments - marine environment and fresh water environment of Earth. The oceans holding marine environment are two and one half times more extensive than land and provide over 300 times the living space, since they are habitable throughout their entire depths by certain groups of organisms. Water is obviously heavier than air which imparts a greater buoyancy to the aquatic medium, enabling organisms to survive at variable depths.

The Hydrological Cycle - water continuously circulates between the atmosphere and

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the Earth's surface, Lithosphere; is known as the hydrologic cycle. The energy for driving this cycle and thus ensuring a constant supply of fresh water on land comes from the Sun. Solar heat evaporates water from the Ocean which is a great reservoir of water. A lesser amount of water is also evaporated from the surface of the land and from plants, a process known as evapotranspiration. All these vaporised water forms clouds which is moved by winds; may pass over lands when they are cooled enough to precipitate the water as rain or snow. Some of the precipitated water soaks into ground, some runs off the surface into streams and goes directly back to the sea. The ground water is returned to the surface by springs, by pumps and by transpiration - the movement of water in plants from roots to leaves. Water inevitably ends up back in the sea, but it may become incorporated into the bodies of several different organisms, one after another. The aquatic environment is subject to water movement ranging from small vertical

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circulations to strong currents. Aquatic animals accordingly, have taken to sedentary or sessile lives depending on water movement.

Water makes up a large proportion of the bodies of plants and animals, whether they live on land or in water. Active cytoplasm holds about 70-90 percent of water. It has several unique physiological properties due to which it forms the basis of life.

III Atmosphere - The multilayered gaseous envelope surrounding the planet Earth is called atmosphere. The atmosphere remains in contact with all the major types of environment of earth, interacting with them and greatly affecting their ability to support life. It filters sunlight reaching the earth, affect climate, and is a reservoir of several elements essential for life.

Physico-chemical structure of Atmosphere - According to Smith (1974), the atmosphere surrounding the Earth consists of a series of following layers - Exosphere, Mesosphere, Stratosphere & Troposphere.

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1. Exosphere - It is the outer fringe of Earth's atmosphere which extends some 20,000 miles from the planet. Its dominant element is hydrogen and its temp. ranges from 200° to $10,000^{\circ}$ F. In this region, the atoms are so far apart that rarely collide and friction is negligible. Its high temperature is caused by solar energy (radiant energy of sun.). The lower part of exosphere contains abundance of Helium besides hydrogen and is called Helium Zone.

2. Thermosphere - The exosphere is followed by Ionosphere or Thermosphere. In this zone, oxygen and nitric oxide occur in a ionized state and their ionization is caused by ultraviolet radiation. The outer reach of ionosphere is 250 miles from earth. Its temp. is 200° F and its upper limits are characterized by a layer of oxygen largely ionized into ozone by ultraviolet radiation. The lower end region of thermosphere is called Thermosphere. It is 125 miles out from the Earth and contains mixture of nitrogen and oxygen in the 1:1 ratio.

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In thermosphere, molecules of air are so widely spaced that high frequency audiable sounds are not carried by the atmosphere. Further, as the temperature decreases as the distance from the sun increases.

(3) Mesosphere - Mesosphere is that layer of air which is within 55 miles of the Earth's surface. This is a region of cold temperature (i.e. -120°F). The temperature of mesosphere, however, is gradually increased as mesosphere leads to stratosphere.

(4) Stratosphere - The stratosphere is 30 miles away from the Earth, having a fairly constant temperature at -75°F to -45°F in its outer reaches which increases upto 30°F at its lower boundary. Within the stratosphere, ozone (O_3) accumulates sufficiently to produce a well marked ozone layer called ozonosphere, which extends from about 13 to 23 miles above the sea level. In ozonosphere, the sunlight ionizes oxygen to ozone by photochemical dissociation. The ozonosphere completely absorbs solar radiation, ultraviolet radiation from the sun and also a lot of solar infra-red thus becoming warmer than adjacent layers above or below.

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The amount of ozone present varies from time to time, probably with seasons and with solar activity, but because of its extra heat, it acts like a blanket that reduces the cooling rate of earth and thus adds to the effect of water vapour.

(5) Troposphere - The lowest region of atmosphere which begins at 5 miles over the earth at the poles, nearly 10 miles over the earth at the equator and which subjects to differential heating, temperature inversions and convection currents is called troposphere. In it temperature drops rapidly from 30° to -70° F. Troposphere is the layer of sulphates and is the region of strong air movements and cloud formation i.e. it is the locus of most weather phenomena. Man along with other living organisms live in troposphere. Air, also contains a no. of micro-organisms and an habitat for many bacteria. They also form the base of entire biotic world as living organisms cannot live without them even for an hour. CO₂