Study unit 3: Components of the Environment

3.0 The four constituent parts of the environment

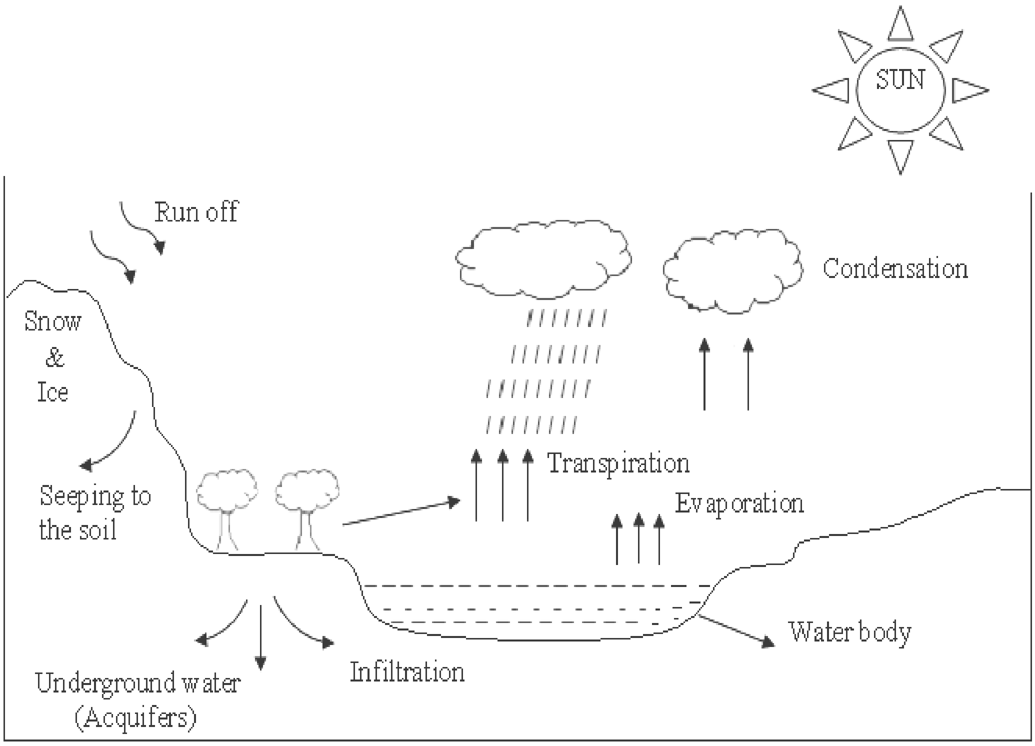
3.1 Hydrosphere:

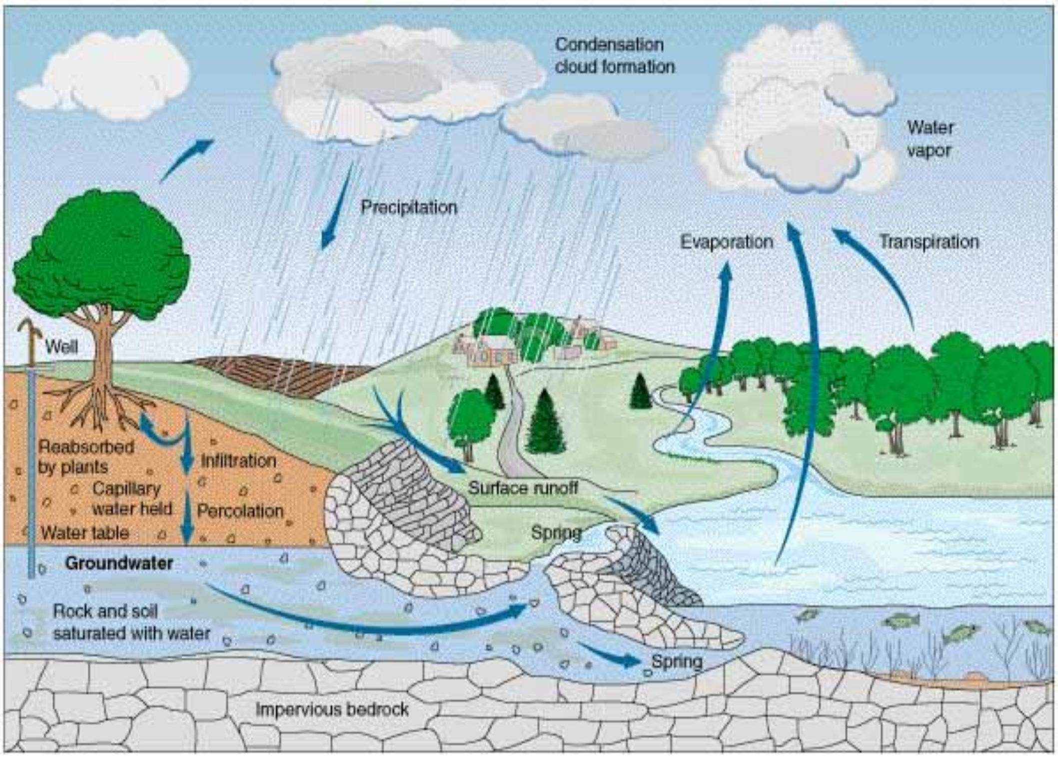
It is composed of all the water on the earth. The abundance of water on earth is a unique feature that clearly distinguishes our blue planet from the solar system. Water on earth is found in many places/forms, e.g. streams, lakes, rivers, oceans, seas, within rocks, in the soil and even moisture in the air.

Approximately 71% of the earth is covered by water and the rest 29% is landmass. 97% of this water is salty and exists in oceans and seas, the remaining 3% are fresh water; ¾ of the fresh water is solid and exists in ice sheets. Water in earth is in constant move and changes state from liquid, gas to solid and then back to liquid, this is known as “Hydrological cycle”. There are a number of ways through which water gets to the atmosphere, e.g. through the process of evaporation, liquid water at the surface of oceans, lakes and rivers becomes water vapour in the atmosphere. This is the most common way through which water vapour moves. Water vapour can also form snow and ice through the process of “Sublimation” and it can be formed from plants through a process of transpiration.

The water vapour rises in the atmosphere and cools forming little water droplets in the atmosphere through a process of “Condensation” and it is these droplets that make up “Clouds”. If these droplets combine with each other, they will grow large in size and therefore become too heavy to stay in the atmosphere and will fall to the ground as “Precipitation”. Some precipitation falls as ‘rain’ while some falls as ‘snow and ice’ depending on the temperatures on the atmosphere. Most of precipitation that falls becomes part of the water falls, lakes and rivers, while some stays as ‘glaciers’ (= ice sheets) and in ‘snow films’. Some of the precipitation sinks in the ground and becomes part of the ground water, e.g. drop of water may spend over 3000 years in an ocean before moving in to another part of water cycle, while a drop of water spends an average of just 8 days in the atmosphere before falling back on to the earth as rainfall.

Figure 1.0: The Hydrological Cycle





Water is received through Precipitation (P) and this leads to Infiltration (I) and Run off (RO).Water is lost through Evaporation (E) and Transpiration (T)

- Water recipient = P+I+RO
- Water loss = E+T (ET)
- When Precipitation is greater than Runoff and Infiltration and Evapo-transpiration, causing 'Floods' (P> RO+I+ET = Floods)
- But when Precipitation is less than Runoff and Infiltration and Evapo-transpiration, causing 'Drought' (P< RO+I+ET = Drought)

  Therefore there should be a balance between the 'Water loss and Water received' that is Precipitation must be equal to Runoff and Infiltration and Evapo-transpiration (P = RO+I+ET). This reflects between the water exchange, between the surface of the earth and atmosphere.

3.2 Atmosphere:

This is the thin layer of gases surrounding our planet. Many of the planet in the Solar system have atmosphere but none is so far known to have an atmosphere like that of earth which can support life. The atmosphere is composed of gases, smoke, dust, water vapour and other minor particles that influence the different reactions taking place. The gases include Nitrogen (N_2), Oxygen (O_2), Carbon dioxide (CO_2), Neon (Ne), Helium (He), Methane (CH_4), Hydrogen (H_2)

The atmosphere is held to the planet by the force of gravity which also determines the types of gases present in state. The original atmosphere of the earth was far much different from today's and consisted primarily of Ammonia (NH_3), trace of Carbon dioxide (CO_2) and water vapour. There was very little, if any, free Oxygen (O_2) present hence it was called "Reducing atmosphere". Originally Scientists thought that temperatures decrease continuously with increase in height until reaching absolute zero (-273.16 $^{0}\dot{C}$). This decrease of temperature with increasing altitude is also known as "Environmental Lapse Rate" and is approximately 6.5 $^{0}\dot{C}$ for every 1000 meters.

3.3 Biosphere

The Biosphere is the 'life zone' of the earth that including all living organisms and organic matter that has not yet decomposed. From the biophysical point of view the biosphere is the global ecological system integrating all living things and their relationships including their interaction with the element of the lithosphere, hydrosphere and atmosphere. Nearly every part of the planet from the Polar ice-caps to the equator support life of some kind. Recent advances in microbiology have revealed that microbes live deep beneath the earth's terrestrial surface and that the total 'micro-bind' life in so is called the 'un-habitable zone', and mainly in biomass exceed all plants and animals life on the earth's surface.

The actual thickness of biosphere on earth is hard to measure; for example birds typically fly at an altitude 650-2000m and that fish which live deep under water can be found as low as 8372m in the Puerto Rico trench located in the boundary between Carribean sea and Atlantic ocean.

3.4 Lithosphere:

This is the solid or rock part of the earth's environment and it is majorly divided into three (3) parts, namely:

1. The core (inner and outer core)

2. The mantle (lower and upper mantle)

3. The earth's crust (oceanic and continental crust)

Self-Review Questions (SRQ) For Study Session 3

1. Describe the hydrological cycle and show how floods and drought a rise
2. Briefly, describe the four constituent parts that make up the earths environment