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**CHEMISTRY**

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CLASS 11 & 12th



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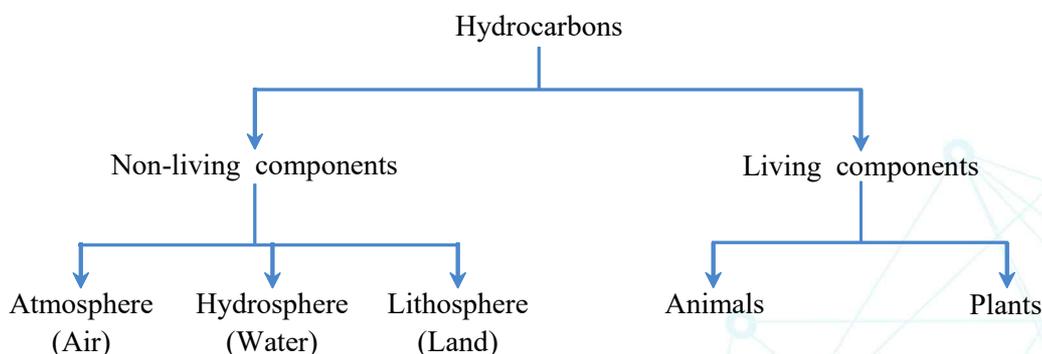
CLASS 11th

# Environmental Chemistry

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## 01. Introduction



### Components of Environment

There are four major components of environment :

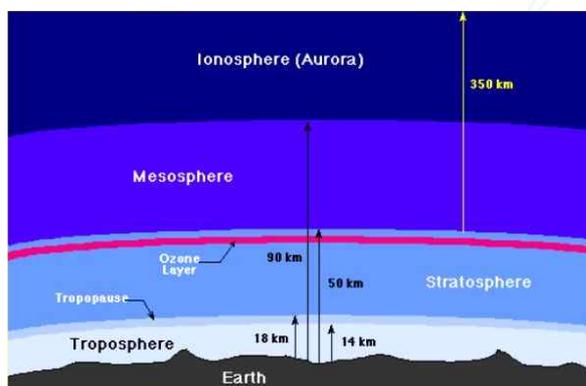
- (i) Atmosphere
- (ii) Hydrosphere
- (iii) Lithosphere
- (iv) Biosphere

#### (i) Atmosphere

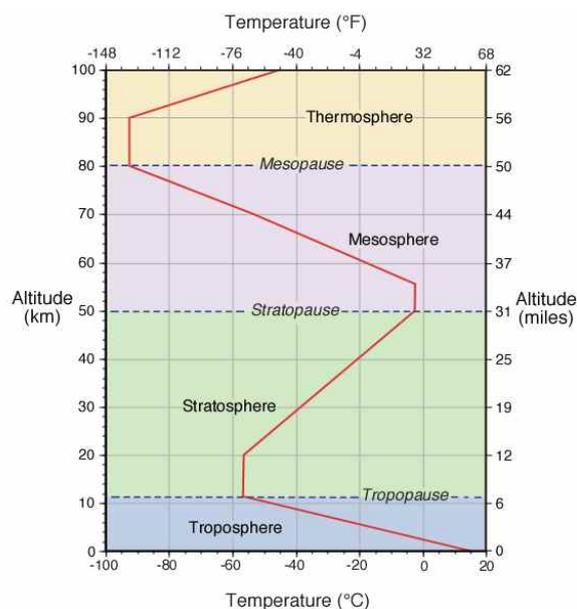
Gas	Percent	Gas	Percent
Nitrogen	78.08	Methane	$1.5 \times 10^{-4}$
Oxygen	20.95	Nitrous oxide	$2.5 \times 10^{-5}$
Argon	0.93	Hydrogen	$5.0 \times 10^{-5}$
Carbon dioxide	$3.3 \times 10^{-2}$	Ozone	$4.0 \times 10^{-6}$
Neon	$1.8 \times 10^{-3}$	Xenon	$8.0 \times 10^{-6}$
Helium	$5.2 \times 10^{-4}$	Sulphur dioxide, Nitrogen dioxide, Ammonia, carbon monoxide, iodine, etc.	} Minute quantities
Krypton	$1.1 \times 10^{-4}$		

**Structure of atmosphere :** On the basis of height, temperature and distinct characteristics, atmosphere may be divided to four zones :

- (a) Troposphere
- (b) Stratosphere
- (c) Mesosphere
- (d) Thermosphere



**NOTE** ✎ Mesosphere and thermosphere are also known as ionosphere because this region contain gases in ionic form. The temperature of different parts of atmosphere is not same and varies from  $-100^{\circ}\text{C}$  to  $1200^{\circ}\text{C}$ . The variation of temperature in different zones of atmosphere is given in the following figure.



**NOTE** ✎ The outermost part of atmosphere is exosphere and unbounded area beyond exosphere is known as Inter-stellar space.

### Functions of Atmosphere

- It provides the gases like  $\text{O}_2$ ,  $\text{CO}_2$ ,  $\text{N}_2$  etc. which are essential for life.  $\text{O}_2$  is essential for respiration while  $\text{CO}_2$  is used in photosynthesis.  $\text{N}_2$  is important source of nitrogenous fertilizers.
- It is important carrier of water vapours which are needed to run various natural cycles. Water vapours are also responsible for rain.
- It prevents the entry of cosmic rays (ozone layer) and saves the life from this highly energetic radiation.
- It maintains the temperature of earth's surface by absorbing and re-emitting the radiation.

### (ii) Hydrosphere

- Hydrosphere includes all the water sources present on earth like ocean, river, lakes, ponds etc. The water may be present as solid (ice in glacier), liquid (river) or vapour (moisture).
- About 75% of earth's surface is covered by water and out of total water supply of the world 97.3% is from oceans,  $\approx 2\%$  from polar ice caps and glaciers,  $\approx 0.6\%$  from underground sources and 0.01% from lakes and rivers.
- Oceanic water contains  $\approx 3.5\%$  dissolved salts and it is not fit for drinking purpose. The important ions present in sea water are given the following table.

**(iii) Lithosphere**

- (a) Lithosphere includes whole rocky material. The outermost (8-40 km) part is called crust.
- (b) The uppermost part containing weathered rocks as well as organic matter is known as soil.
- (c) The outer layer is made up of rocks rich in silica and aluminium.

**(iv) Biosphere**

- (a) Biosphere is that part of non-living components (atmosphere, lithosphere or hydrosphere) in which living organism interact with non-living parts.
- (b) Biosphere extends from 10 km below the sea level to 6 km above the sea surface.
- (c) Biosphere is regulated by various biogeochemical cycles like water cycle, carbon cycle, nitrogen cycle etc.

**02. Pollution**

Any undesirable change in physical, chemical or biological characteristics of environment is a type of pollution and the factor responsible for it is called pollutant.

Pollution is usually classified in two broad classes :

- (i) **Natural pollution** : It is caused by natural processes like volcanic eruptions, forest and coal mine fires, decomposition of organic matter floods etc.
- (ii) **Artificial pollution** : It is caused by human activities. Various sources of artificial pollution are industries, chemicals used in daily life burning of fuels etc.

**Pollutants**

Any substance present in such concentration as may be or may tend to be injurious to the environment.

**Contaminants** : A substance causing pollution which is not present naturally in the environment but introduced in significant amounts, accidentally or by human activity is called **contaminant**.

**Threshold limit value (TLV)** : The permissible concentration of a pollutant in the atmosphere to which if a healthy worker is exposed for 8 hrs. a day and 40 hrs. a week throughout his life, there is not adverse effect on him is called TLV e.g.

TLV for CO, CO<sub>2</sub> and phosgene are 40,5000 and 0.1 ppm respectively.

**Types of Pollutants**

- (i) **On the basis of native** : Pollutants may be of three types
  - (a) **Chemical agents** : gases and particulates, heavy metals, pesticides, petroleum, solid and liquid wastes etc.
  - (b) **Physical agents** : heat, noise, radiation etc.
  - (c) **Biological agents** : microbes, population etc.
- (ii) **Primary and secondary pollutants** : Primary pollutants are those which remain unchanged after entering in the environment. Secondary pollutants are formed by combination or primary pollutants in the environment.