

Environmental Chemistry I

Chapter #14:- Atmosphere

Atmosphere:- envelope of gases and water vapour surrounding the planet earth. Composition of Air:- Nitrogen : 78% Oxygen : 21% Argon : 0.93% CO ₂ : 0.038% Neon : 0.0018% Helium : 0.00052% Methane : 0.00015% Krypton : 0.00011% Hydrogen : 0.00005%	Air Pollutants:- Anything which has a harmful effect on environment. Sulphur oxides:- $2SO_2 + O_2 \rightarrow 2SO_3$ - readily absorbed in respiratory system - colourless gas - unpleasant odour - Power stations & Industries using fossil fuels cause headache, brain damage & death. (7) Carbon Monoxide:- $2C + O_2 \xrightarrow{\text{limited}} 2CO$ $C + O_2 \xrightarrow{\text{excess}} CO_2$ - colourless, odourless, poisonous gas - Incomplete burning of wood, fuels & vehicle exhausts. - Breathing difficulties, bronchitis, emphysema, lung cancer, acid rain and greenhouse effect. (Sulphur) Nitrogen oxides:- NO → colourless, odourless, soluble in water. NO ₂ → reddish brown pungent, odour, soluble in water. Both toxic & high. CFCs:- - colourless - aerosol spray foams, refrigerants, air-conditioning systems.	Incineration:- - waste treatment process in which solid waste is burned at high temperature. - consumes all combustible materials, leaving behind ash residue & non-combustible materials. Generally reduces volume of waste by two third but not clean as it produces smoke & odour contains oxides of N & Sulphur. Acid Rain:- pH of 5-6. Acidity of rain greatly increases in polluted areas during thunderstorms. $2SO_2 + O_2 \rightarrow 2SO_3$ $SO_3 + H_2O \rightarrow H_2SO_4$ $4HNO_2 + O_2 + 2H_2O \rightarrow 4HNO_3$ Acid rain may have a pH of less than 2.1. - corrodes metals, stone buildings & statues. $Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$	Ozone depletion:- - allotropic form of oxygen comprising of three O atoms (O ₃) - UV rays from sun are screened out & filtered by ozone layer. On absorbing UV rays ozone molecule breaks up to form an oxygen molecule & atomic oxygen. $O_3 \xrightarrow{UV} O_2 + O$ $O_2 + O \rightarrow O_3 + \text{heat}$ These reactions maintain level of ozone. - The region in which the amount of ozone has been reduced is called ozone hole. CFCs (CCl ₃ F) escape into atmosphere. Inert so they don't react with any other chemical in troposphere and diffuse into ozone layer. $CCl_3F \xrightarrow{UV} CCl_2F + Cl$ $Cl + O_3 \rightarrow ClO + O_2$ $ClO + O \rightarrow Cl + O_2$ $O_3 + O \rightarrow 2O_2$ Net reaction On Cl can destroy thousands of ozone molecules.
Troposphere:- means turning. - 12 km above earth. - closest to earth. - contains 75-80% mass. we live in it. - aircraft fly. - 17°C - -55°C temp.	Stratosphere:- Second layer. - 12-50 km. - -55°C to -5°C temp. - upper stratosphere warmer than lower because it contains ozone layer. The energy from ozone layer is converted to heat. - ozone absorbs sun's energy and protects us from harmful rays of sun/ultraviolet radiations.	Mesosphere:- means middle layer. - 50-80 km. - protects earth from being hit by meteoroids.	Thermosphere:- means heat. - very hot because sun strikes it first. - lower layer is ionosphere 80 km - 400 km. - outer layer is thermosphere. exosphere 400 km - thousands of km above earth's surface.
Aurora Borealis:- light displays in northern hemisphere. Particles from sun enter ionosphere near poles and strike atoms in the ionosphere.	Global Warming:- warming of atmosphere which is due to our influence on the greenhouse effect is global warming. Gases like water vapour, methane, CFC's also act in similar way in atmosphere. The gases are called greenhouse gases. Increase of average temp of the earth's surface due to greenhouse effect is global warming.	Chemical reactions: $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$ $CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O + CO_2$ - kills fish, destroys trees, lakes & rivers & become too acidic for living things to survive in them.	