Global warming

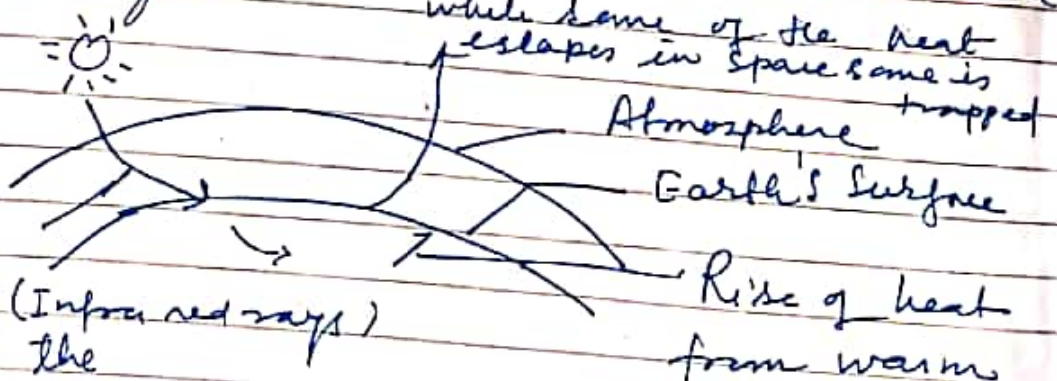
Global warming is defined as the increase of the average temperature on earth. As the earth is getting hotter disasters like hurricanes, droughts and floods are getting more frequent. Over the last 100 years, the average air temperature near the Earth's surface has risen by a little less than 1 degree celsius or 1.8 degrees Farehait. Global warming causes climatic change. This warming is strongest at the Earth's poles, the Arctic and the Antarctic. The United Nations panel on climate change finds that average Arctic temperature have increased at almost twice the global average rate in the past 100 years.

Causes of Green House effect - When sunlight reaches earth's surface some is absorbed and warms the earth and most of the rest is radiated back to the atmosphere at a longer wavelength than the sunlight. Some of these longer wave lengths are absorbed by the greenhouse gases in the atmosphere before they are lost to the space. The absorption of this long wave radiant energy warms the atmosphere. The greenhouses gases act like a mirror and reflect back to the earth some of the heat energy which would otherwise be lost in space. The reflecting back of heat energy by the atmosphere is called the greenhouse effect. The major natural greenhouse gases are water vapour, which causes about 36-70% of the greenhouse effect on earth. Carbon di oxide causes 9-26%. methane causes 4-9%.

and ozone causes 3-7%. It is not possible to state that a certain gas causes certain percentage of the greenhouse effect, because the influences of various gases are not additive. Other green house gases include nitrous oxide, Sulphur hexafluoride, hydrofluorocarbons, Per fluorocarbons, chlorofluorocarbons. The largest contributing source of greenhouse gas is the burning of fossil fuels leading to emission of carbon di oxide which is the main significant human cause of global warming.

Deforestation increases the severity of global warming as plants are the best known factors for balancing and storing carbon..

Carbon dioxide is also released from the nitrogen fertilizers which is used to ~~be~~ increase the plant growth.



Dig → Schematic representation of Greenhouse effect and global warming.

Effects of Global warming -

(1) Melting of land ice
(2) Rise in sea levels due to thermal expansion of oceans.
3) Amounts and patterns of Precipetation changes
4) changes in temperature and Precipetation patterns increases the frequency, duration intensity and other extreme weather events such as floods, droughts heat waves and tornadoes.
5) Higher and lower agricultural yields
6) Glacial retreat
7) Reduced Summer Stream flows
(8) Species extinction
(9) change in the hydrological cycle
10) changing currents in the oceans and air flows in the atmosphere.
11) Disturbance in regional pattern of rainfall and temperature.
12) Expansion of deserts.
13) United Nations Environmental Programme (UNEP) in february 2007, greenhouse gases are responsible for fewer cold days, hotter nights killer heat waves, floods and devastating droughts.
14) It also reduces plant biomass and consequently global absorption of CO_2 may decline.

OZONE LAYER DEPLETION - Atmosphere is divided into five layers troposphere, Stratosphere, mesosphere, ionosphere and exosphere. Stratosphere is characterised by the presence of a thick ozone layer which is formed by the ultra violet radiation on the oxygen.

The thick blanket of ozone layer in the atmosphere forms a protective cover and prevents 99% of the ultra violet radiation from reaching the earth's surface.

The thickness of this layer is measured in Dobson units. 100 % ozone present in troposphere is called bad ozone which is harmful to plants and animals.

In 1985 atmospheric Scientist for the first time reported decrease in ozone concentration in the upper atmosphere. This decrease were more pronounced over much of Antarctica in 1995 ozone thinning above Antarctica spanned in a large area, This thin area of ozone layer is described as "ozone hole"

Causes of ozone reduction – Chlorofluorocarbons (CFCs) are the major factors in the ozone reduction. These compounds of Chlorine, fluorine and Carbon are odourless and invisible. They are used as coolants in the refrigerators and air conditioners and also in spray cans and plastic foam containers. CFCs slowly escape into air and resist breakdown. When a free CFCl molecule absorbs ultraviolet light, it gives up one chlorine atom. If chlorine reacts with ozone, this yeilds oxygen and chlorine monoxide The latter react with free oxygen to release another chlorine atom. Each released chlorine atom can convert 10,000 or more ozone molecules to oxygen.

In nature there are two alternative mechanisms which utilize chlorine atoms and chlorine monoxide atoms and do not let them breakdown more ozone molecules, In one pathway chlorine monoxide combines with oxides of nitrogen and in the other Chlorine atoms combines with methane and forms hydrogen chloride.

$$\underset{\text{chlorine monoxide}}{ClO} + NO_2 \longrightarrow ClO.NO_2$$

$$\underset{\text{chlorine atom}}{Cl} + CH_4 \longrightarrow CH_3 + HCl$$

Thus nitrogen oxide and methane serves as natural scavengers for chlorine monoxide and chlorine atom. Since NO_2 and CH_4 leave no free ClO and Cl, chain reactions leading to ozone breakdown do not initiate

Effects of ozone layer depletion — As the ozone layer is thinning it lets more ultraviolet radiations reach the earth. It will cause for more skin cancers and cataracts. This radiation weakens our immune system. Plants will suffer more mutation, Stunted growth and surface damage. Ultraviolet radiations also affect photosynthesis. Studies have shown that the photosynthetic ability of antarctic phytoplankton decreases about 10% under ozone hole. This in turn harms the regions entire food chain from krill to fishes to birds and mammals including whales.

Protection of ozone layer — Protection of ozone layer is very essential to save the organisms on this planet from the harmful effects of ozone considering the urgency of such efforts 93 nations signed an international agreement in 1987 popularly known as Montreal Protocol. It became effective in 1989. Under the provisions of this agreement, signatory nations will phase out CFC production by 2010 Besides this, these nations are also committed to stop production of methyl bromide. It is hoped that in the meantime environmentally safer alternative substances will be use.

Shilpa Verma
Dept of Zoology