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ENVIRONMENTAL ISSUES

SYLLABUS

Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warning; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

KEY CONCEPTS

POLLUTION

* **Pollution** is any undesirable change in physical chemical or biological characteristics of air, land, water or soil.
* **Pollutant:** Any solid, liquid or gas released into the environment in such a huge quantities that make our environment unhealthy is called pollutant.
* Environment (protection) Act, 1986 to protect and improve the quality of our environment (air, water and soil)

AIR POLLUTION & ITS CONTROL

* Any undesirable change in the physical, chemical and biological characteristics of air that exert adverse effects on human beings is defined as **air pollution**.

(i) Causes :

* Use of vehicles is the main cause of air pollution due to release of harmful gases.
* Use of petrol & coal in industries and cigarette smoking also contribute to air pollution. Improper disposal of domestic & industrial wastes led to the release of methane.

(ii) Air pollutants : It can be classified into two groups:

(a) **Particulate pollutants**, e.g., metallic particles, dust particles, soot, aerosol and smoke.

(b) **Gaseous pollutants,** e.g., carbon monoxide (CO), nitrogen dioxide (NO_2), hydrogen sulphide(H_2S), sulphur dioxide (SO_2), etc.

* **Smog:** Mixture of air pollutants (like arsenic, lead, NO, CO etc), dust & fog is called smog and is deadly to the body as it results in deposition of dry mucus in the alveoli of lungs, tuberculosis, lung cancer, aging, premature death etc.

(iii) Effect of air pollution:

* Cause injury to all living organisms.
* Reduce growth and yield of crops.
* Cause premature death of plants.
* Particulate size 2.5 micrometers or less are responsible for breathing and respiratory symptoms like irritation, inflammations and damage to the lungs and premature death.
* **Carbon monoxide** (released from smoke of automobile) is highly toxic gas, it combines with haemoglobin of the blood and blocks the transportation of oxygen. Thus, it impairs respiration and it causes death due to asphyxiation when inhaled in large amount.
* **Hydrogen sulphide** causes nausea, eye and throat irritation.

* **Sulphur dioxide** (Produce from coal burning, smelters, oil refineries) causes respiratory tract diseases like asthma, bronchitis, cancer, emphysema, etc.

(iv) Control methods of air pollution

(a) Electrostatic precipitator

* Widely used to remove particulate matter in the exhaust from a thermal power plant.
* Electrode wires that are maintained at several thousand volts, which produce a corona that release electrons.
* Electron binds with particulate matter giving them a net negative charge.
* Positively charged collecting plates attract the charged dust particle.

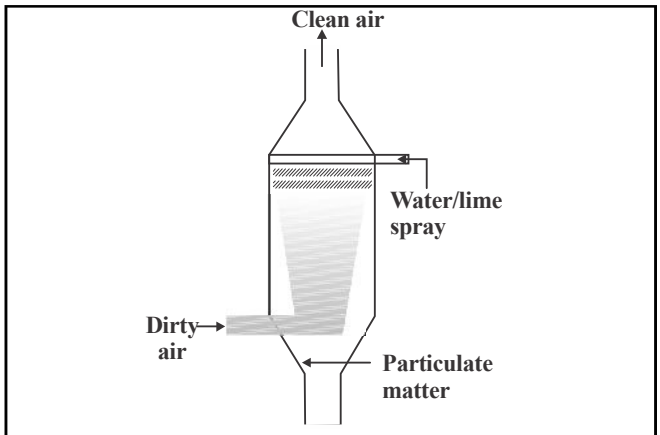


Figure : Scrubber

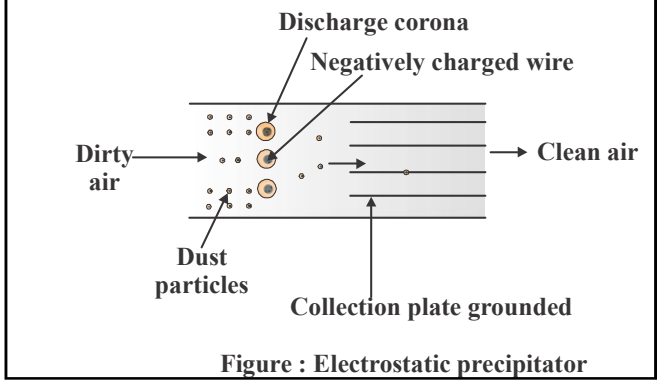


Figure : Electrostatic precipitator

(b) Scrubber:

* Removes gases like sulphur dioxide.
* The exhaust is passed through a spray of water or lime.
* Water dissolves gases and lime reacts with sulphur dioxide to form a precipitate of calcium sulphate and sulphide.

(c) Catalytic converter:

* These are fitted into automobiles for reducing emission of poisonous gases like NO_2 and CO.
* Having expensive metals namely platinum, palladium and rhodium as the catalyst.
* The unburnt hydrocarbons are converted into CO_2 and H_2O.
* Carbon monoxide and nitric oxide are changed to carbon dioxide and nitrogen gas respectively.
* Motor vehicle equipped with catalytic converter should use unleaded petrol because lead in the petrol inactivates the catalyst.

(v) Controlling Vehicular pollution: A case study of Delhi:

* All the buses of Delhi are converted to run on CNG
* **Advantages of CNG (compressed natural gas)**
  - CNG burns most efficiently.
  - Very little remain unburnt.
  - Cannot be siphoned
  - Cannot be adulterated like petrol or diesel.
  - CNG is cheaper than petrol and diesel.
* **Problem of use of CNG:**
  - Difficulty in laying down pipelines to deliver CNG
  - Non-assurance of uninterrupted supply.
* **Other parallel steps taken in Delhi:**
  - Phasing out old vehicles.
  - Use of unleaded petrol.
  - Use of low-sulphur petrol and diesel.
  - Use of catalytic converter in vehicle.
  - Application of strict pollution level norms for vehicle.
* **New auto fuel policy to cut down vehicular pollution.**

The goal of this policy is to reduce Sulphur to 50 ppm in petrol and diesel and reduce levels of aromatic hydrocarbons to 35% of the fuel.

Euro-II norms (Bharat Stage-II) : Sulphur reduced to 350 ppm in diesel, Sulphur reduced to 150 ppm in petrol, Aromatic hydrocarbon to be reduced to 42 %. All automobiles and fuel-petrol and diesel – were to have met the **Euro III** emission specifications in 11 cities (Delhi, Mumbai, Kolkata, Chennai, Bengaluru,

Hyderabad, Ahmedabad, Pune, Surat, Kanpur and Agra) from 1 April 2005 and was to meet the **Euro-IV** norms by 1 April 2010. The rest of the country was to implement Euro-III emission norm compliant automobiles and fuels by 2010.

* Due to above steps taken by Delhi Govt. there is substantial fall in CO_2 and SO_2 level between 1997 and 2005.

NOISE POLLUTION

* Undesirable high level of sound is called noise pollution.
* In India, The Air (Prevention and Control of Pollution) Act came into force in 1981, but was amended in 1987 to include noise as an air pollutant.

Harmful effect of noise pollution:

* Psychological and physiological disorder in humans.
* High sound level, 150dB or more may damage ear drums.
* Noise causes sleeplessness
* Increased heart rate.
* Altered breathing pattern.

Prevention of Noise Pollution:

* Use of sound absorbent materials or by muffling noise in industries
* Demarcation of horn free zones around hospitals and schools.
* Permissible sound levels of crackers,
* Timings after which Loudspeakers cannot be played.

WATER POLLUTION AND ITS CONTROL

* **Water pollution :** It's the pollution of water bodies with substances like domestic wastes, industrial, thermal, mineral, toxic, nitrogen & phosphorous rich wastes. The nutrient rich wastes multiply the algae concentration in the water bodies & this leads of depletion of oxygen in these bodies & hence leads to the death of fish and other biodiversity in the area.
* The Government of India has passed the Water (Prevention and Control of Pollution) Act, 1974 to safeguard our water resources.

Domestic sewage and industrial effluents:

* It includes everything that comes from residential area to common public sewage system.
* Domestic sewage contains–
  - Suspended solids, e.g., sand, silt and clay.
  - Colloidal materials, e.g., feacal matter, bacteria, paper and cloth fibres.
  - Dissolved materials, e.g., nitrates, ammonia phosphate, sodium, calcium salt.
* Domestic sewage mainly contains biodegradable organic wastes which are readily decomposed with the help of decomposers.
* A mere 0.1 percent impurities make domestic sewage unfit for human use
* Sewage contains dissolve salts like nitrates, phosphates, and other nutrients, and toxic metal ions and organic compounds.

BOD (Biochemical oxygen demand) :

* BOD refer to the amount of oxygen that would be consumed if all the organic matter is one litre of water were oxidized by bacteria.
* The BOD test measures the rate of uptake of oxygen by micro-organisms in a sample of water.
* Indirectly BOD is a measure of the organic matter present in the water.
* The greater the BOD of waste water, more is its polluting potential.

Changes take place on discharge of sewage into the river.

* Micro-organism involved in biodegradation of organic matter in the receiving water body consume a lot of oxygen, hence there is sharp decline in dissolved oxygen downstream from the point of discharge.
* Due to low DO there is mortality of fish and other aquatic animals.

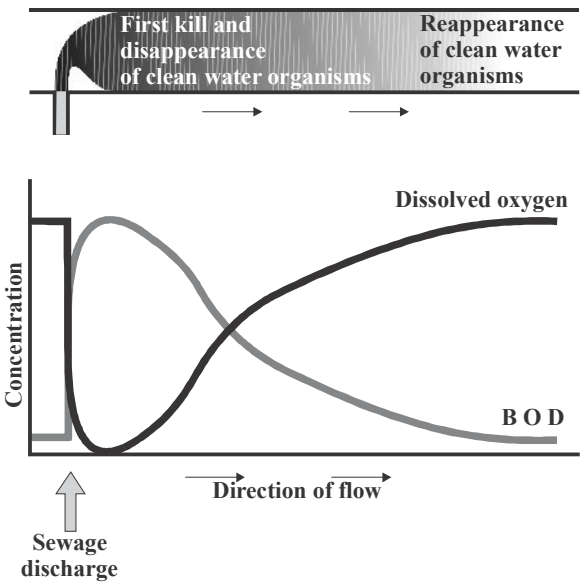


Figure : Effect of sewage discharge on some important characteristics of a river

Algal bloom:

* Presence of large amount of nutrients in water also causes excessive growth of **Planktonic** (free floating) algae, called **algal bloom**.
* Algal bloom imparts distinct color to water bodies.
* Deterioration of water quality and fish mortality.
* Some bloom-forming algae are extremely toxic to human and animals.
* The world's most problematic aquatic weed is water hyacinth (*Eichhornia crassipes*) called **'Terror of Bengal'.**
  - Introduced to India for their lovely flowers.
  - Excessive growth causes blocks in waterways.
  - They grow abundantly in eutrophic water bodies.
  - Causes imbalance in ecosystem and dynamics of water body.

Diseases:

* Sewage from home and hospital contain pathogenic microbes.
* Discharge of such sewage without proper treatment causes diseases like dysentery, typhoid, jaundice, cholera etc.

Toxic heavy metals (defined as elements with density > 5g/cm^3), released from:-

* Petroleum industry.
* Paper manufacturing.
* Metal extraction and processing.
* Chemical manufacturing industries.

Biomagnifications:

* Increase in concentration of the toxicant at successive trophic level is called biological magnification or biomagnifications.
* Toxic substance accumulated by an organism cannot be metabolized or excreted.
* The accumulated toxic passed to the next trophic level.
* This phenomenon is well known for mercury and DDT.
* Bio magnification of DDT in Aquatic food chain.
  Water ⟶ Zooplankton ⟶ Small fish
  0.003 ppm 0.04 ppm 0.5 ppm
  ⟶ Large fish ⟶ Fish-eathing Birds
  2 ppm 5 ppm
* High concentration of DDT disturbs calcium metabolism in birds, which causes thinning of egg shell and their premature breaking, causing decline in birds population.

Eutrophication:

* It the process of nutrient enrichment of water and subsequent loss of species diversity like fishes.
* Excess nutrients causes algal bloom which may cover the whole surface of water body and release toxins.
* It causes oxygen deficiency in water that leads to the death of aquatic animals like fishes.
* **Natural Eutrophication:**
  - Streams draining into the lake increase nutrients like nitrogen and phosphorus.
  - Increase in nutrient encourages growth of aquatic organisms.
  - Over centuries, as silt and organic debris pileup the lake grows shallower and warmer.
  - Warm-water organisms dominate over that thrive in a cold environment.
  - Marsh plants take root in the shallows and begin to fill in the original lake basin.
  - Eventually the lake gives way to large masses of floating plants (bog), finally converting into land.
* **Cultural or Accelerated Eutrophication:**
  - Pollutants from man's activities like effluents from

the industries and homes can radically accelerate the aging process. This phenomenon is called Cultural or Accelerated Eutrophication.

- **Causes:** (a) Sewage and agricultural and industrial wastes. (b) Prime contaminants are nitrates and phosphates which act as plant nutrients.
- **Effects:**
  (a) Unsightly scum and unpleasant odors.
  (b) Robbing the dissolved oxygen from water.
  (c) Pollutant inflow kills the fish.
  (d) Decomposition of dead fish causes further depletion of DO.
  (e) Finally a lake can literally choke to death.

A case study of integrated waste water treatment:

* Waste water including sewage can be treated in an integrated manner, by utilizing a mix of artificial and natural process.
* It has been done in town of Arcata, in the northern coast of California.
* **The treatment is done in two stages:-**

(a) The conventional sedimentation, filtering and chorine treatment are given.

(b) The biologist developed a series of six connected marshes over 60 hectares of marshland. Appropriate plants, algae, fungi and bacteria were seeded into this area, which neutralize, absorb and as similate the pollutant. The water flows through the marshes, it get purified naturally.

* The marshes also constitute a sanctuary, with high level of biodiversity in the form of fishes, animals and birds that now reside there.
* A citizens group called **Friends of the Arcata Marsh (FOAM)** is responsible for the upkeep and safeguarding of this project.

Ecological sanitation:

* Ecological sanitation is a sustainable system for handling human excreta, using dry composting toilets.
* This is a practical, hygienic, efficient and cost-effective solution to human waste disposal.
* With this composting method human excreta can be recycled into a source (as natural fertilizer).
* 'EcoSan' toilets are being used in Kerala and Srilanka.

SOLID WASTES

* These are discarded solid materials which are produced due to various human activities.
* **Types:**

(i) **Municipal solid wastes** are wastes from homes, offices, stores, schools, hospitals etc. It comprises paper, food wastes, plastics, glass, metals rubber, leathers, textiles etc.

(ii) **Industrial waste:** The wastes like scraps,flyash etc., generated by industries.

(iii) **Hospital wastes:** Hospitals generate hazardous wastes that contain disinfectants and other harmful chemicals, and also pathogenic organisms.

(iv) **Electronic wastes (e-wastes):** Irreparable computers and other electronic goods are known as electronic wastes (e-wastes).

Solid waste disposal

* All solid wastes are categorized into three types:
  - Bio-degradable. • Recyclable.
  - Non-biodegradable.
* All the garbage generated is sorted first.
* Recyclable material to be separated and send for recycles.
* Biodegradable wastes can be put into deep pits in the ground and be left for natural breakdown.
* **Sanitary landfills:** Wastes are dumped in a depression or trench after compaction and covered with dirt everyday.

Disadvantages:

- Shortage of space for huge garbage's.
- Danger of seepage of chemicals, polluting the ground water resources.

* The use of incinerators is crucial to disposal of hospital wastes.
* E-Wastes are buried in landfills or incinerated.
* Metals like copper, iron, silicon, nickel and gold are recovered during recycling process of e-wastes.
* Manual recycling process exposes workers to toxic substances present in e-wastes.
* Recycling is the only solution for the treatment of e-wastes.

Prevention

* The need to reduce our garbage generation should be a prime goal.
* Reduction in use of plastics and use of eco-friendly packaging.
* Carrying cloth or other natural fiber carry bags when we go shopping.
* Refusing polythene bags.

Case study of Remedy for Plastic wastes: (Ahmed Khan)

* **Polyblend**, a fine powder of recycled modified plastic, was developed by his company.
* Polyblend is mixed with bitumen that is used to lay roads.
* It increases the water repelling property of bitumen, and helped to increase road life by a factor of three.
* The raw material used for polyblend is plastic film waste.

AGRO-CHEMICALAND THEIR EFFECTS

* Undesirable changes in soil profile due to heavy use of inorganic fertilizers,pesticides, herbicides, fungicides etc affecting soil productivity is called soil pollution.
* Increasing amounts of artificial fertilizers causes eutrophication.

Case study of organic farming: (Ramesh Chandra Dagar of Sonipat)

* Integrated organic farming is a cyclical, zero waste procedure, where waste products from one process are cycled in as nutrients for other processes.
* Maximum utilization of resource and increase the efficiency of production.
* He includes bee-keeping, dairy management, water harvesting, composting and agriculture in a chain of processes, which support each other and allow an extremely economical and sustainable venture.
* **Advantages:**
  There is no need of use of chemical fertilizers for crops.
  Cattle excreta are used as manure.
  Crop waste used to create compost, which can be used as a natural fertilizer or can be used to generate natural gas for energy need.

RADIOACTIVE WASTES

* Nuclear energy was hailed as a non-polluting way for generating electricity.
* Later on it was realized that it has two very serious inherent problems:-
  Accidental leakage, as occurred in Three Mile Island and Chernobyl.
  Safe disposal of radioactive wastes.
* Radiation from radioactive waste causes mutation at very high rate.
* High dose of nuclear radiation is lethal, but lower doses create genetic disorders and also cause cancer.
* **Disposal of nuclear wastes:** Storage of nuclear waste, after sufficient pre-treatment, should be done in suitably shielded containers buried within the rocks about 500 m deep below the earth's surface.

GREENHOUSE EFFECT AND GLOBAL WARMING

* The term "Greenhouse effect" has been derived from a phenomenon that occurs in greenhouse.
* In a greenhouse the glass panel (greenhouse gases like carbon dioxide,methane,CFC etc) lets the light in, but does not allow heat to escape. Therefore the greenhouse warms up, very much like inside a car that has been parked in the sun for a few hours.
* The greenhouse effect is a naturally occurring phenomenon that is responsible for heating of Earth's surface and atmosphere.
* Without greenhouse effect the average temperature at surface of earth would have been a chilly –18°C rather than the present average of 15°C.
* Clouds and gases reflect about one-fourth of the incoming solar radiation and absorb some of it but half of incoming solar radiation falls on Earth's surface heating it, while a small portion is reflected back.

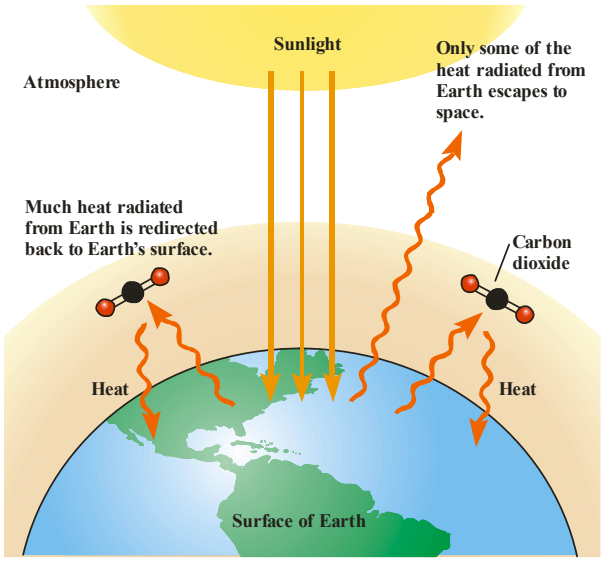


Figure : Enhanced greenhouse effect
The buildup of carbon dioxide and other greenhouse gases in the atmosphere absorbs some of the outgoing infrared (heat) radiation and redirects it back to Earth's surface. As a result, the atmosphere, land, and ocean are warming.

* Earth's surface re-emits heat in the form of infrared radiation but some part of this does not escape into space because of atmospheric gases (e.g. carbon dioxide, methane etc).
* The molecule of these gases radiate heat energy and a major part of which again comes to Earth's surface, thus heating it up once again.
* Carbon dioxide and methane - are commonly called as greenhouse gases because they are responsible for greenhouse effect.

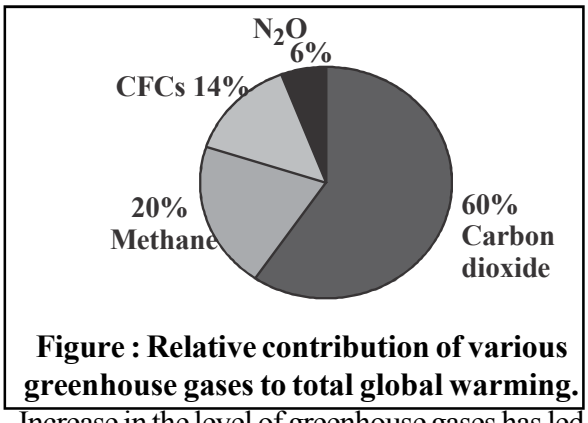


Figure : Relative contribution of various greenhouse gases to total global warming.

* Increase in the level of greenhouse gases has led to considerable heating of Earth leading to global warming or enhanced green house effect.
* During the past century, the temperature of Earth has increased by 0.6°C.

Effect of global warming:

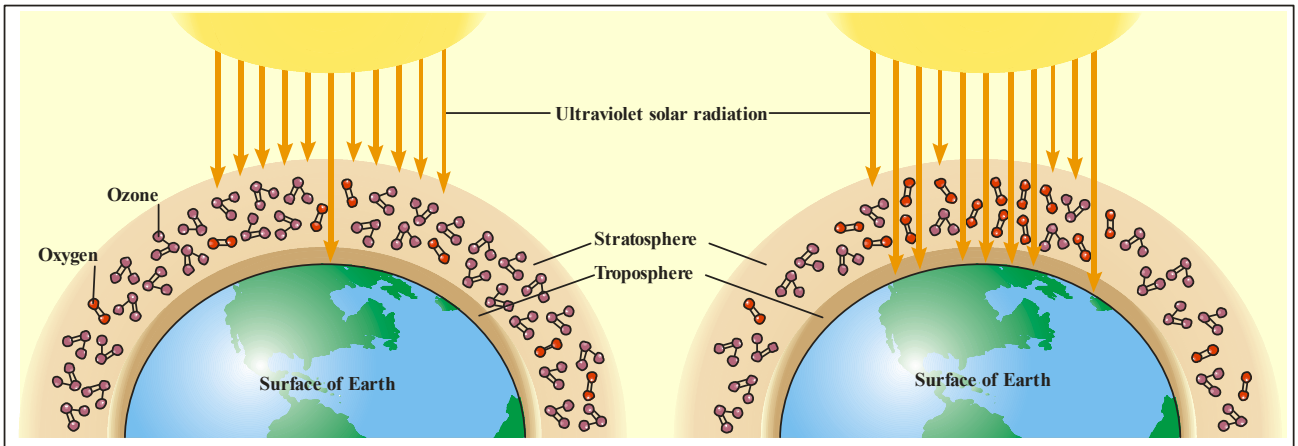
* Deleterious changes in the environment and resulting in odd climatic changes (e.g. **El Nino effect**).
* **El Nino effect** is the process in which water of Pacific ocean get warm, in this process warm water current flows to equator and peru in between 5 to 8 year at Christmas time. Effect of **El Nino is flood,** drought and monsoon damage in India. On the other other hand when cold water comes in effect in pacific ocean it is called **La-Nina** effect.
* Increased melting of polar ice caps as well as of other places like the Himalayan snow caps.
* Rise in sea level that can submerge many coastal areas.
* Increased temperature will lead to increased weed growth, eruption of diseases and pests. Thus, crop productivity will decrease.

Control of global warming:

* Reduce use of fossil fuel.
* Improving efficiency of energy usage.
* Reducing deforestation.
* Promoting aforestation programme.(planting trees)
* Slowing down growth of human population.
* International initiative to be taken to reduce emission of green house gases.

OZONE DEPLETION IN THE STRATOSPHERE

* **'Bad' ozone** formed in the lower atmosphere (troposphere) that harms plants and animals.
* There is **'good' ozone** also; this ozone is found in the upper part of the atmosphere called **stratosphere**, and it acts as a shield absorbing ultraviolet radiation from the sun.
* The thickness of ozone layer is measured in terms of **Dobson units (DU).**
* Ozone (O_3) gas is continuously formed by the action of UV rays on molecular oxygen, and also degraded into molecular oxygen in the stratosphere.



(a) Stratospheric ozone absorbs 99% of incoming ultraviolet radiation, effectively shielding Earth's surface.

(b) When stratospheric ozone is reduced, more high-energy ultraviolet radiation penetrates the atmosphere to the surface, where it harms organisms.

Figure : Ultraviolet radiation and the ozone layer

* There should be proper balance of formation and degradation of ozone.

Ozone depletion:

* Balance of ozone in stratosphere is disrupted due to enhancement of ozone degradation by chlorofluorocarbons (CFCs). CFCs find wide use as refrigerants.
  CFCs discharged in the lower part of atmosphere move upward and reach stratosphere.
* **Steps leading to ozone depletion**
  - UV-rays split CFCs and release atomic chlorine (Cl)
  - UV-rays also split ozone into oxygen.
  - Chlorine atoms trap oxygen atoms and ozone is not formed again from oxygen. This leads to depletion of ozone in the stratosphere.

$$CF_2Cl_2(g) + h\nu \longrightarrow Cl^{\bullet}(g) + {}^{\bullet}CF_2Cl(g)$$
$$Cl(g) + O_3(g) \longrightarrow ClO^{\bullet}(g) + O_2(g)$$
$$ClO^{\bullet}(g) + O(g) \longrightarrow Cl^{\bullet}(g) + O_2(g)$$

(active chlorine)

* The depletion is marked particularly over the Antarctic region. This has resulted in formation of a large area of thinned ozone layer, commonly called as the **ozone hole.**

Effects of UV rays:

* UV radiations shorter than UV-B are almost completely absorbed by Earth's atmosphere, if the ozone layer is intact.
* DNA and proteins of living organisms are damaged by UV rays as they potentially absorb it.
* The high energy of UV rays breaks the chemical bond in these molecules.
* UV - B damages DNA and mutation may occur.
* It causes ageing of skin.
* Damage skin cells and causes skin cancers.
* In human eye cornea absorb UV - B radiation and high dose of UV - B causes inflammation of cornea called snow-blindness, cataract etc. Such exposes may damage cornea.

Prevention:

* **Montreal Protocol** was signed at Montreal (Canada) in 1987 to control emission of ozone depleting substances.
* Many efforts are being made to reduce emission of ozone depleting substances.

DEGRADATION BY IMPROPER RESOURCE UTILIZATION AND MAINTENANCE

* **Soil erosion :** The removal of top fertile layer due to human activities
* **Reasons:**
  - Over cultivation • Unrestricted grazing
  - Deforestation • Poor irrigation practices

Water logging and soil salinity:

* Irrigation with proper drainage, leads to water logging in the soil.
* Draws salt to the surface of the soil.
* The salt starts collecting at the roots of the plants.
* The salt damages the roots and crop productions.

DEFORESTATION

* Conversion of forested areas to non-forested one.
* Almost 40% forests have been lost in the tropics, compared to only 1 per cent in the temperate region.
* In India, at the beginning of the twentieth century, forests covered about 30 per cent of the land. By the end of the century, it shrunk to 19.4 per cent, whereas the National Forest Policy (1988) of India has recommended 33 per cent forest cover for the plains and 67 per cent for the hills.

How deforestation does occurs:

Slash and burn agriculture/jhum cultivation

* Farmers cut down the trees of the forest and burn the plant remains.
* Ash is used as fertilizer and land is used for farming or cattle grazing
* Later, Land is left uncultivated for several years for replenishment of minerals
* Human settlements
* Forest fires
* Hydroelectric projects.
* Over-grazing by livestock.
* Demand for wood.

Effects of deforestation

* Leads to global warming due to excess carbon-dioxide
* Loss of biodiversity
* Damage to hydrological cycle
* Leads to soil erosion
* Desertification of land

Reforestation

* Restoring forest that was existing earlier. E.g. Observing Van-Mahotsavas
* It also occurs naturally.
* Aforestation Developing a forest in a new area where no such forest existed in that area.

A case study of people's participation in forest conservation

* A king of Jodhpur wanted to arrange wood for his new palace in 1731.
  Few Bishnois hugged the trees and asked to cut them first rather than cutting trees. 365 persons lost their lives in this act. A small temple is now present there in remembrance of this act
* **Amrita Devi Bishnois** Wild Life Protection Award is instituted for individuals of rural areas who take keen interest in protecting wild life.
* **Chipko movement :**It was started by local women of Garhwali; they hugged the trees to protect them from the axes of contractors.
* **Joint forest management (JFM) :**
  - Introduced by Government of India in 1980.
  - Local communities worked with the government to save the forest.
  - Communities get forest products for encouragement.

CONCEPT REVIEW

* **Effluents :** Something flowing over a large body of water (may be sewage or industrial effluents).
* **Biological magnification :** The non biodegradable pollutant like Al, Hg, Fe, D.D.T., pesticides, phenolic compound ABS (Alkyl benzene sulphonate) are not decomposed by microorganisms.
  They get accumulated in tissue in increasing concentration along the food chain this is called biological magnification. The highest concentration occurs in top consumer.
* **Eutrophication :** The process of nutrient enrichment of water and consequent loss of species diversity (or death of aquatic animals) is referred to as eutrophication and lake is known as eutrophic lake. In this process presence of nutrients in lake stimulates growth of algae (algal bloom) increase organic loading and bring about reduction in the oxygen content of water causing death of aquatic animals.

* **Planktons :** Free floating, passively drifting organisms in a water body (may be phytoplankton/zooplankton).
* **Reforestation :** Process of restoring a forest that was removed at some point of time in the past.
* **Slash and Burn Agriculture (Jhum Cultivation) :** Farmers cut down trees and burn the plant remains. Ash is used as a fertiliser and the land is then used for farming or cattle grazing.
* **Stratosphere :** Part of atmosphere between vertical height of 10-60 km, lacks dust and moisture, having ozone. Oxygen-ozone inter conversion occurs at expanse of UV radiations.
* **Troposphere :** Part of atmosphere between 10 km of vertical height, life supporting region, temperature falls with rise in height, warm air cools as it rises and causes rain etc.
* Photo chemical smog occurs at high temperature over cities and towns. It is formed by the reaction of two air pollutants nitrogen oxides (mainly NO_2) and hydrocarbons (HC) that react with one another in the presence of UV radiations of sunlight to produce ozone (O_3) and PAN (peroxy acetyl nitrate) which constitute the photochemical smog.
* Biochemical oxygen demand [BOD] is the amount of oxygen taken up by the micro organisms present in water BOD is measured by keeping a sample of water containing known amount of oxygen for 5 days at 20°C in the dark. At end of this period the oxygen content is again measured. A high BOD indicates intense level of microbial pollution.

IMPORTANT POINTS

* Major aerosol pollutant in jet plane emission is fluorocarbon.
* Ultraviolet radiations are lethal because of inactivation of proteins, nucleic acids and pigments.
* SO_2 polloution is indicated by *Usnea* (lichens).
* Carbon monoxide dissolved more rapidly in blood haemoglobin than oxygen.
* DDT is nondegeradable pollution.
* 2, 4-D and pesticides causes water pollution.
* Green house gases include CO_2, CFC, CH_4 and N_2O.
* World environment day is 5th June.
* Eutrophication causes reduction in dissolved oxygen.
* Water pollution causes jaundice.
* Ozone day is 16th September.
* SO_2 pollution causes destruction of chlorophyll.
* Depletion of ozone layer is due to oxides of nitrogen.
* Acid rain is caused by SO_2 and SO_3.
* Pollution indicator is Lichen.
* Bhopal tragedy occured in 1984.
* Environmental protection Act was passed in 1986.
* Montreal protocol which calls for appropriate action to protect the ozone layer from human activities was passed in year 1987.
* BOD of eutrophied lake will be higher.
* In vehicles, catalytic converter are used to convert CO to CO_2.
* Thickness of ozone layer is measured in Dobson unit (1 Du = 1ppb)

Year	Ozone thickness of ozone
1979	225 Du.
1985	136 Du.
1994	94 Du.

* Ozone hole occurs mainly during spring time (Feb. - Apr.) and lowest during (July - October)
* B.O.D. of Eutrophic lake is very high.
* Carbon monoxide (CO) accounts for about 50% of total air pollution .
* Sulphur dioxide (SO_2) accounts for 6% of total air pollution.
* Particulate matter accounts for 10 -15% of total air pollution.
* First Earth Summit of United Nations Conference on Environment and Development (UNCED) was held at Rio-de-Janerio (Brazil) in 1992.
* First International Conference on "Environment and Development" was held at Stockholm in 1972.
* Second International Conference on "Environment and Development " was held at New Delhi in 1985.
* Cyclon collector is used for minimising air pollution.

* Drinking water rich in nitrates cause methaemo-globenemia.
* Faecal pollution is indicated by *Escherichia coli*. **MPN** is Most Probable Number of *E-coli*. It is indicator of water pollution.
* Algal Genus Index – High organic pollution is indicated by presence of 20 or more genera of algae in a water body. Growth of less than 5 genera of algae is indication of clear water. It is called as **Algal Genus Index** (AGI)
* Water (Prevention and control of pollution) Act, 1974. It has been amended in 1988.
* Maize (*Zea mays*) is sensitive indicator of fluoride pollution.
* Reed plants yellow iris are used to purify water. This method of purifying water is called "Green method of water cleaning". Yellow iris plant is less affected by herbicides, so reed beds are highly effective in those areas where pesticides are in use and provides microbiological methods of pesticie detoxification. These plants filter out the particulate matter, while the microbes living in association with the plants, decompose the organic wastes.
* C.O.D. (Chemical Oxygen Demand) – It is amount of oxygen required to oxidise all pollutant materials is one litre of water at 20°C in five days. The value of COD is much higher than BOD.
* B.O.D. of pure drinking water - Less than 1ppm or mg/l.
* Soil salinity can be measured by conductivity meter.
* D.O. is measured by oximeter.
* B.O. D. $\propto$ input of organic wastes
* Daphnia is the indicator of B.O.D.
* C.O.D. value is always higher than B.O.D. value.

QUESTION BANK

EXERCISE - 1 (LEVEL-1) [NCERT EXTRACT]

SECTION - 1 (VOCABULARY BUILDER)

Choose one correct response for each question.

For Q.1-Q.5

Match the column I with column II.

Q.1

	Column I	Column II
a.	Primary pollutant	i. DDT
b.	Secondary pollutant	ii. CO_2
		iii. O_3
		iv. SO_2
		v. PAN

Codes :

(A) (a) – i, ii, iii, (b) – iv, v
(B) (a) – i, ii, iv, (b) – iii, v
(C) (a) – ii, iii, iv, (b) – i, v
(D) (a) – iii, v, (b) – i, ii, iv

Q.2

	Column I	Column II
a.	Suspended solids	i. Nitrates, ammonia, phosphate, sodium and calcium
b.	Colloidal materials	ii. Faecal matter, bacteria, paper and cloth fibres
c.	Dissolved materials	iii. Sand, slit and clay.

Codes :

(A) (a) – (i), (b) – (ii), (c) – (iii)
(B) (a) – (ii), (b) – (iii), (c) – (i)
(C) (a) – (iii), (b) – (i), (c) – (ii)
(D) (a) – (iii), (b) – (ii), (c) – (i)

Q.3

	Column I	Column II
a.	Biodegradable organic matter	i. Terror of Bengal
b.	DDT	ii. BOD
c.	Phosphates	iii. Biomagnification
d.	Water hyacinth	iv. Eutrophication

Codes :

(A) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)
(B) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)
(C) (a) – (iii), (b) – (iv), (c) – (i), (d) – (ii)
(D) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)

Q.4

	Column I	Column II
a.	Catalytic converter	i. Particulate matter
b.	Electrostatic precipitator	ii. Carbon monoxide and nitrogen oxides
c.	Scrubber	iii. Aerosol and smoke
d.	Particulate pollutant	iv. Sulphur dioxide

Codes :

(A) (a) – (i), (b) – (iv), (c) – (iii), (d) – (ii)
(B) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii)
(C) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)
(D) (a) – (iv), (b) – (ii), (c) – (i), (d) – (iii)

Q.5

	Column I	Column II
a.	Environment Protection Act	i. 1974
b.	Air Prevention & Control of Pollution Act	ii. 1987
c.	Water Act	iii. 1986
d.	Amendment of Air Act to include noise	iv. 1981

Codes :

(A) (a) - iii, (b)-iv, (c)-i, (d)-ii
(B) (a) - i, (b)-iii, (c)-ii, (d)-iv
(C) (a) - iv, (b)-i, (c)-ii, (d)-iii
(D) (a) - iii, (b)-iv, (c)-ii, (d)-i

SECTION - 2 (BASIC CONCEPTS BUILDER)

For Q.6 to Q.22 :

Choose one word for the given statement from the list.

Eutrophication, Classical, Negative, 1974, Biomagnification, 1981, 1986, 1987, 1980, Montreal Protocol, Canada

Q.6 Increase in concentration of a toxicant at successive trophic levels is called _____.

Q.7 _____ smog occurs at low temperature and contains H_2S and SO_2.

Q.8 The Air (Prevention and Control of Pollution) Act came into force in year _____, but was amended in _____ to include noise as an air pollutant.

Q.9 Reduction in soil productivity due to erosion and over-use is called ____ soil pollution.

Q.10 Recognising the deleterious affects of ozone depletion, an international treaty, known as _____, was signed at _____.

Q.11 Domestic sewage is rich in nitrogen and phosphorus which cause ____ and algal blooms.

Q.12 The Government of India has passed The Water (Prevention and Control of Pollution) Act, in year _____.

Q.13 The Government of India has passed. The Environment (Protection) Act, in yaer _____

Q.14 The Government of India in ____ has introduced the concept of Joint Forest Management .

Q.15 Primary pollutants are emitted directly in the environment from some definite sources. **[True / False]**

Q.16 Cotton dust produces lung fibrosis called siderosis. **[True / False]**

Q.17 According to CPCB, particulate size 2.5 μm or less in diameter are responsible for causing the greatest harm to human health. **[True / False]**

Q.18 Methane is a Compressed Natural Gas (CNG). **[True / False]**

Q.19 World's most problematic aquatic weed is Eichornia. **[True / False]**

Q.20 DDT does not cause biomagnification. **[True / False]**

Q.21 Methane and carbon dioxide are green house gases. **[True / False]**

Q.22 Algal blooms impart a distinct colour to water due to their pigments. **[True / False]**

SECTION - 3 (ENHANCE PROBLEM SOLVING SKILLS)

Choose one correct response for each question.

PART - 1 : AIR POLLUTION

Q.23 Which method is used to control pollutants of particulate nature?
(A) Solvent recovery system
(B) Thermal oxidisers
(C) Electrostatic precipitator
(D) Scrubber

Q.24 The post Bhopal gas disaster analysis showed that the accident took place, when the leakage of a tank started, containing
(A) methyl isocyanide
(B) methyl isocyanate
(C) ethyl isocyanide
(D) ethyl isocyanate

Q.25 According to the Central Pollution Control Board (CPCB),particles that are responsible for causing great harm to human health are of diameter.
(A) 2.50 micrometers (B) 5.00 micrometers
(C) 10.00 micrometers (D) 7.5 micrometers

Q.26 In scrubber, the following is a point source of pollution –
(A) Spray of water (B) Spray of lime
(C) Both (A) and (B) (D) Spray of hot Water

Q.27 Photochemical smog pollution do not contain
(A) ozone (B) nitrogen dioxide
(C) carbon dioxide (D) PAN

Q.28 Catalytic converters are fitted into automobiles to reduce emission of harmful gases. Catalytic converters change unburnt hydrocarbons into:
(A) carbon dioxide and water
(B) carbon mono oxide
(C) methane
(D) carbon dioxide & methane

Q.29 Among the following which one causes more indoor chemical pollution?
(A) burning coal
(B) burning cooking gas
(C) burning mosquito coil
(D) room spray

Q.30 Major cause of air pollution in big cities is –
(A) domestic exhaust
(B) burning of cooking gas
(C) thermal power plant
(D) automobile exhaust

Q.31 Why is it necessary to remove sulphur from petroleum products?
(A) To reduce the emission of sulphur dioxide in exhaust fumes.
(B) To increase efficiency of automobiles engines.
(C) To use sulphur removed from petroleum for commercial purposes.
(D) To increase the life span of engine silencers.

Q.32 Which method is used for the removal of sulphur dioxide and ammonia from the Polluted air?
(A) Electrostatic precipitator
(B) Wet scrubbers
(C) Gravitational method
(D) Absorption

PART - 2 : WATER POLLUTION

Q.33 Biomagnification is highest in
(A) producers
(B) primary consumers
(C) Secondary consumers
(D) decomposers

Q.34 High amount of *Escherichia coli* in water indicates
(A) hardness of water
(B) industrial pollution
(C) sewage pollution
(D) pollution due to electromagnetic radiation

Q.35 Which one of the following impurities is easiest to remove from waste-water?
(A) Bacteria (B) Colloids
(C) Dissolved solids (D) Suspended solids

Q.36 Biological Oxygen Demand (BOD) is a measure of –
(A) industrial wastes poured into water bodies
(B) extent to which water is polluted with organic compound.
(C) amount of carbon monoxide inseparably combined with haemoglobin.
(D) amount of oxygen needed by green plants during night.

Q.37 A lake with an inflow of domestic sewage rich, in organic waste may result in –
(A) drying of the lake very soon due to algal bloom.
(B) an increased production of fish due to lot of nutrients.
(C) death of fish due to lack of oxygen.
(D) increased population of aquatic food web organisms.

Q.38 Nuisance growth of aquatic plants and bloom-forming algae in natural waters is generally due to high concentrations of:
(A) carbon (B) sulphur
(C) calcium (D) phosphorus

Q.39 Nutrient enrichment of a lake will cause –
(A) eutrophication (B) stratification
(C) biomagnificain (D) bioaccumulation

Q.40 Algal bloom in a lake –
(A) Increases CO_2 level
(B) Leads to oxygen depletion
(C) Kills fishes
(D) All of these

Q.41 Which of the following causes biomagnification?
(B) Mercury
(C) DDT (D) Both B & C

Q.42 Addition of phosphate and nitrates/fertiliser into water and that water ultimately draining into lake firstly affects –
(A) growth of aquatic organisms in lake
(B) eutrophication of lake
(C) the enviroment of lake
(D) organic remains deposited on the lake bottom.

Q.43 Cleaning of waste water in Arcata Marsh involves
(A) only conventional method of sewage treatment
(B) removal of dissolved heavy metals through biological process
(C) filteration, chlorination like chemical processes
(D) enhance the need for chemical fertilisers

Q.44 The green scum seen in the fresh water bodies is:
(A) blue green algae (B) red algae
(C) green algae (D) both (A) and (C)

Q.45 Eutrophicated lake has BOD –
(A) lower
(B) higher
(C) dependent on climate
(D) may be lower or higher

Q.46 Algal blooms impart a distinct colour to water due to:
(A) their pigments
(B) excretion of coloured substances
(C) formation of coloured chemicals in water facilitated by physiological degradation of algae.
(D) absorption of light by algal cell wall.

Q.47 The term 'Terror of Bengal' is used for –
(A) *Eichhornia crassipes*
(B) decreased biological oxygen demand
(C) biomagnification
(D) algal bloom

PART - 3 : AGRO-CHEMICALS AND RADIOACTIVE WASTES

Q.48 Three mole island and chernobyl disasters are associated with accidendtal leakage of –
(A) Radioactive wastes (B) Industrial wastes
(C) Muncipal wastes (D) Hospital wastes

Q.49 Non-biodegradable pollutants are created by:
(A) nature
(B) excessive use of resources
(C) humans
(D) natural disasters

Q.50 What steps should be taken before the disposal of nuclear waste ?
(A) Nuclear waste should be pretreated.
(B) It should be stored in shielded containers.
(C) It should be buried about 500 m deep with in rock.
(D) All of the above

PART - 4 : GREENHOUSE EFFECT

Q.51 'Bad' Ozone is formed in
(A) atmosphere (B) ionosphere
(C) stratosphere (D) troposphere

Q.52 Ozone depletion is occuring widely in –
(A) ionosphere (B) stratosphere
(C) Both (A) and (B) (D) troposphere

Q.53 CO_2, CH_4, N_2O & CFCs are called greenhouse gases because they absorb and emit
(A) UV rays (B) heat rays
(C) X-rays (D) gamma rays

Q.54 The thickness of ozone in a column of air from the ground to the top of the atmosphere is measured in terms of –
(A) Decible units (B) Pascal units
(C) Svedberg units (D) Dobson units

Q.55 If global warming continues, the organism which may face more severe threat it is –
(A) cow (B) dog
(C) snow leopard (D) dolphin

Q.56 Global agreement in specific control strategies to reduce the release of ozone depleting substances, was adopted by –
(A) Rio de Janerio Conference
(B) Montreal Protocol
(C) Kyoto Protocol
(D) Vienna Convention

Q.57 Good Ozone is formed in
(A) atmosphere (B) ionosphere
(C) stratosphere (D) troposphere

Q.58 The two gases making highest relative contribution to the greenhouse gases are
(A) CO_2 and N_2O (B) CO_2 and CH_4
(C) CH_4 and N_2O (D) CFCs and N_2O

Q.59 El Nino effect is closely associated with
(A) global warming (B) acid rain
(C) greenhouse gases (D) All of these

PART - 5 : DEFORESTATION

Q.60 Soil erosion can be prevented by
(A) increasing bird population
(B) afforestation
(C) removal of vegetation
(D) overgrazing

Q.61 The concept of Joint Forest Management (JFM) involves
(A) work in close association with the local communities for protecting and managing forests on mutual benefits.
(B) conservation of forest and agricultural land by the NGOs.
(C) conservation of forest and agricultural land by the state government.
(D) conservation of forest and agricultural land by the local communities.

Q.62 Amrita Devi Bishnoi wildlife protection award is given to the individuals or communities from
(A) Rural areas (B) Urban areas
(C) NGOs (D) Hilly areas

Q.63 One of the chief causative factor of desertification is
(A) overgrazing
(B) human developmental activities
(C) irrigated agriculture
(D) population

Q.64 Chipko movement was started in Garhwal, Himalayas in
(A) 1973 by Shri Sunder Lal Bahuguna
(B) 1973 by a Bishnoi Woman Amrita Devi
(C) 1974 by Shri Sunder Lal Bahuguna
(D) 1974 by a Bishnoi Woman Amrita Devi

EXERCISE - 2 (LEVEL-2)

Choose one correct response for each question.

Q.1 Photochemical smog formed in congested metropolitan cities mainly consists of
(A) ozone, peroxyacetyl nitrate and NO_x
(B) smoke, peroxyacetyl nitrate and SO_2
(C) hydrocarbons, SO_2 and CO_2
(D) hydrocarbons, ozone and SO_x

Q.2 Biological Oxygen Demand (BOD) is a measure of –
(A) industrial wastes poured into water bodies.
(B) extent to which water is polluted with organic compounds.
(C) amount of carbon monoxide inseparably combined with haemoglobin.
(D) amount of oxygen needed by green plants during night.

Q.3 Greenhouse effect means
(A) increase in the temperature of earth due to high concentration of NO_2.
(B) increase in the temperature of earth due to high concentration of SO_2.
(C) increase in the temperature of earth due to low concentration of CO_2.
(D) increase in the temperature of earth due to high concentration of CO_2.

Q.4 Catalytic converter is used in automobiles –
(A) to remove lead (B) for converting NO_x
(C) to remove H_2O (D) all of these

Q.5 Which one of the following is a correct option with reference to pathogenic bacteria and DDT?
(A) Bacteria can undergo multiplication and DDT is degraded by living cells.
(B) Bacteria can be degraded by certain living cells and DDT cannot be degraded by living cells.
(C) Bacteria can undergo biological magnification and DDT can be degraded by living cells.
(D) Bacteria can undergo biological magnification and DDT can not be degraded by living cells.

Q.6 The term 'Terror of Bengal' is used for
(A) *Eichhornia crassipes*
(B) decreased biological oxygen demand
(C) biomagnification
(D) algal bloom.

Q.7 The thickness of the ozone in a column of air from ground to top of the atmosphere is measured in terms of -
(A) Decibel (B) Dobson
(C) Deby (D) Dalton

Q.8 Which among the following is not the influence of UV-B on human health-
(A) Aging of skin
(B) Inflammation of cornea
(C) Cancer of skin
(D) Depigmentation

Q.9 What was the main step taken in Delhi to control air pollution after Public interest litigation (PIL) filed in Supreme court.
(A) Reduction in vehicles
(B) Use of CNG in buses instead of Diesel
(C) Use a catalytic convertor
(D) Plantation

Q.10 In 1984, the Bhopal gas tragedy took place because methyl isocyanate
(A) reacted with DDT (B) reacted with NH_3
(C) reacted with CO_2 (D) reacted with H_2O

Q.11 Which gas of the atmospheric holds up ultraviolet rays
(A) O_2 (B) O_3
(C) N_2 (D) CH_4

Q.12 5^{th} June is celebrated as
(A) Water Day
(B) World Earth Day
(C) World Environment Day
(D) Conservation Day

Q.13 Pollutants from man's activities like effluents from industries and homes can radically accelerate the aging of lake, that is known as -
(A) Cultural Eutrophication
(B) Accelerated Entrophication
(C) Rising Eutrophication
(D) Both (A) & (B)

Q.14 Which of the following devices is best for reducing emissing of poisonous gases -
(A) Scrubber
(B) Catalytic convertors
(C) Electrostatic precipitators
(D) Filters

Q.15 Which is not associated with catalytic convertors
(A) Conversion of unburnt hydrocarbon to CO_2 & H_2O
(B) Conversion of CO to CO_2
(C) Conversion of NO_x to N_2
(D) Conversion of SO_2 to S

Q.16 Motor vehicles equipped with catalytic convertor should use unleaded petrol because -
(A) Lead in petrol inactivates the catalyst.
(B) Lead in petrol deposited in the catalytic convertor.
(C) Lead in petrol start to burn along petrol.
(D) Lead in petrol leads to checking burning of petrol.

Q.17 The Specific intensity of noise, which may damage ear drums and causes permanently impairing hearing ability
(A) Equal and less than 150 dB
(B) Equal and more than 150 dB
(C) More than 200 dB
(D) More than 100 dB

Q.18 Harmful effects of air polluntants depends on-
(A) Concentration of pollutants
(B) Duration of exposure
(C) Organism
(D) All the above

Q.19 All the buses of Delhi were converted to run on CNG. by The end of 2002. Why CNG is better than Diesel-
(A) CNG burns most efficiently
(B) little of it is left unburnt
(C) Donat inactivate catalyst of catalytic convertor
(D) Both (A) and (B)

Q.20 In India, the Air (prevention and contral of pollution) act, came in to force in -
(A) 1972 (B) 1981
(C) 1987 (D) 1992

Q.21 About highly sewage polluted water, what is true
(A) High DO & BOD
(B) High DO & Less BOD
(C) Low DO & Low BOD
(D) Low DO & High BOD

Q.22 Which one of the following is not a device used to control a particulate matter?
(A) Arresters (B) Scrubbers
(C) Filters (D) Incinerator

Q.23 Pollution is undesirable changes in physical, chemical and biological properties. Which among the following is not air pollution induced plant injury -
(A) Reduced growth and yield
(B) Premature death of plant
(C) Clogging of Stomata
(D) Oxygen binding ability

Q.24 Open dumps often serve as breeding ground for rats and flies and not burnt to completion. Which among the following were adopted as the substitute for open burining dumps -
(A) Eco san (B) Electronic Burners
(C) Sanitary Landfills (D) Solar Burners

Q.25 Which among the following was developed by company of Ahmed Khan by a fine powder of recycled modified plastic -
(A) Polysterene (B) Polyblend
(C) Polyethylene (D) Polyplastic

Q.26 Which of the following material takes the longest time for biodegradation?
(A) Cotton (B) Paper
(C) Bone (D) Jute

Q.27 Which among the following is a cyclical, zero waste procedure, where waste products from one process are cycled in as nutrients for other processes-
(A) Integrated organic farming
(B) Integrated remeday for plastic waste
(C) Integrated waste water treatment
(D) Snstainable waste Treatment

Q.28 Noise as one of the important air pollutant is not responsible for -
(A) Sleeplessness
(B) Increase heart beating
(C) Altered breathing pattern
(D) Decreased oxygen carrying capacity

Q.29 One greenhouse gas contributes 14% to total global warming and another contributes 6%. These are respectively identified as
(A) N_2O and CO_2 (B) CFCs and N_2O
(C) CH_4 and CO_2 (D) CH_4 and CFCs.

Q.30 To safe gaurd our water resources, water (prevention and control of pollution) act was came in force -
(A) 1971 (B) 1972
(C) 1974 (D) 1981

Q.31 The unique idea of integrated organic farming was executed by-
(A) Ramesh Chandra Dagar
(B) Ahmed Khan
(C) Amrita Devi
(D) Sunderlal Bahuguna

Q.32 Montreal Protocol was comes in action from-
(A) 1987 (B) 1988
(C) 1989 (D) 1992

Q.33 Realising the significance of participation by local communities, the goverment of India in 1980s has introduced the concept of -
(A) Integrated forest management [IFM]
(B) Joint forest management [JFM]
(C) Realised Forest Management [RFM]
(D) Actual Forest Management [AFM]

Q.34 What percentage of solar radiation is reflected in the outer space by trophosphere –
(A) 10% (B) 17%
(C) 35% (D) 90%

Q.35 Electrostatic precipitators can remove how much percentage of particutate matter present in exhaust from a thermal power plant -
(A) 90% (B) 95%
(C) 99% (D) 100%

Q.36 Air (Prevention and control of pollution) act 1981 was amended in 1987 to include _____ as an air pollutant. -
(A) Particulated matter
(B) Hydro carbons
(C) Noise
(D) Radio active pollutants

Q.37 Scrubber is one of the device used to remove air pollutants. Which of the following gaseus pollutant can be remove through it -
(A) NOx (B) SO_2
(C) CO (D) CO_2

Q.38 Green house gases include –
(A) CO_2, CFC, CH_4 & NO_2
(B) CO_2, O_2, N_2, NO_2 & NH_3
(C) CH_4, N_2, CO_2 & NH_3
(D) CFC, CO_2, NH_3 & N_2

Q.39 In B.O.D. test oxygen plays an important role to
(A) Destroy inorganic matter
(B) Destroy pollution
(C) Destroy waste organic matter
(D) None of these

Q.40 Photochemical Smog is related to the pollution of –
(A) Soil (B) Water
(C) Air (D) Noise

Q.41 Major aerosol pollutant in jet emission is –
(A) Sulphur dioxide (B) Carbon monoxide
(C) Methane (D) Fluorocarbon

Q.42 Which one of the following is a major pollutant of automobiles gases?
(A) Carbon monoxide (B) Oxides of nitrogen
(C) Oxides of sulphur (D) Carbon dioxide

Q.43 The oxygen concentration at the floor of the deep ponds and lakes is very low because of the –
(A) over-hanging column of water
(B) lesser amount of sunlight
(C) decomposers
(D) large number of annual inhabitants

Q.44 Jhum cultivation refers to
(A) cultivation of neem tress
(B) cultivation of medicinal plants
(C) tribal methods of shifting cultivation
(D) cultivation of timber plants

Q.45 Why CNG is considered as good fuel over diesel/ petrol?
I. CNG burns most efficiently without leaving any unburnt remnant behind.
II. CNG is cheaper than petrol or diesel.
III. CNG cannot be siphoned off by thieves and adulterated like petrol or diesel.
Which of the statements given above are correct?
(A) I and II (B) I and III
(C) II and III (D) I, II and III

Q.46 Choose the incorrect statement.
(A) The Montreal protocol is associated with the control of emission of ozone depleting substances
(B) Methane and carbon dioxide are green house gases
(C) Dobson units are used to measure oxygen content
(D) Use of incinerators is crucial to disposal of hospital wastes

Q.47 Arrange the following options in ascending order of their BOD value.
I. Sample of highly polluted pond water.
II. Sample from unpolluted pond water.
III. Distilled water.
(A) III, I, II (B) II, III, I
(C) III, II, I (D) I, III, II

Q.48 Consider the following statements about Ramesh Chandra Dagar's work in the field of organic farming.
I. Ramesh Chandra Dagar's work includes bee-keeping, dairy management, water harvesting, composting and agriculture in a chain of processes.
II. In this process there is no need to use chemical fertilisers for crops as cattle excreta is used as manure.
III. Crop waste is used for making compost which is used as natural fertiliser.
IV. Compost generates natural gas which is used for energy needs of farm.
Which of the statements given above are correct?
(A) I, II and III (B) I, III and IV
(C) II, III and IV (d) I, II, III and IV

Q.49 The loudness of a sound that a person can withstand without discomfort is about
(A) 150 dB (B) 215 dB
(C) 30 dB (D) 80 dB

Q.50 Which one of the following is a most efficient device to eliminate particulate matter from the industrial emission?
(A) Cyclonic separators
(B) Trajectory separators
(C) Pyrolysis
(D) Electrostatic precipitator

EXERCISE - 3 (LEVEL-3)

Choose one correct response for each question.

Q.1 Match the items in column I and column II and choose the correct option:

	Column I	Column II
a.	UV	(i) Biomagnificatron
b.	Biodegradable Organic matter	(ii) Eutrophication
c.	DDT	(iii) Snow blindness
d.	Phosphates	(iv) BOD

The correct match is:

(A) a ii, b i, c iv, d iii (B) a iii, b ii, c iv, d i
(C) a iii, b iv, c i, d ii (D) a iii, b I, c iv, d i

Q.2 Green house effect leads to deleterious changes in the environment and resulting in odd climatic changes. Which among the followingis not the control measure of it -

(A) Cutting down the use of fossil fuel.
(B) Improving efficiency of energy usage.
(C) Increasing deforestration.
(D) Slowing down the human population.

Q.3 Choose the correct statements regarding catalytic converters.

I. These are fitted into automobiles for reducing emission of poisonous gases like NO_2 and CO.
II. They have expensive metals like platinum, palladium and rhodium as catalysts.
III. As the exhaust emission passes through catalytic converter nitric oxide splits into nitrogen and oxygen; carbon monoxide is oxidised to carbon dioxide and unburnt hydrocarbons get burnt completely into CO_2 and H_2O.
IV. Motor vehicles fitted with catalytic converter should use unleaded petrol because lead in the petrol inactivates the catalyst.

(A) I, II and IV (B) II, III and IV
(C) I, III and IV (D) I, II, III and IV

Q.4 Which of the following are correctly matched?

I. Arsenic poisoning - Black foot disease
II. Secondary treatment - Biological process
III. Pyrolysis – Solid soil waste disposal
IV. *Tubifex* – Water pollution indicator
V. Biomagnification - Degradable pollutants

(A) I, II, III and V (B) I, III, IV and V
(C) II, III, IV and V (D) I, II, III and IV

Q.5 Choose the correct statements regarding the biomagnification of DDT in an aquatic food chain.

I. Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.
II. High concentrations of DDT disturb calcium metabolism in birds, which causes thinning of eggshell and their premature breaking.
III. River water may have a very low concentration of DDT, but the carnivorous fish in that river may contain high concentration of DDT, which is still suitable for consumption by human beings.

(A) I and II (B) I and III
(C) II and III (D) I, II and III

Q.6 Match Column - I with Column - II and select the correct option.

	Column - I		Column - II
a.	Ahmed Khan	i.	Spreading information and help on the practice of integrated organic farming.
b.	Ramesh Chandra Dagar	ii.	Protecting wildlife
c.	Amrita Devi Bishnoi	iii.	A plastic sack manufacturer of Bangalore developed polyblend.

(A) a - iii, b-i, c - ii (B) a - ii, b-i, c - iii
(C) a - i, b - ii, c - iii (D) a - iii, b - ii, c - i

Q.7 Acid rains are produced by excess

(A) release of carbon monoxide by incomplete combustion.
(B) formation of CO_2 by combustion and animal respiration
(C) production of NH_3 by industry and coals gas
(D) NO_2 and SO_2 from burning fossil fuels

Q.8 Match the List-I with List-II.

	List-I	List-II
(a)	Dust	(i) Small gas borne particles resulting from combustion.
(b)	Mist	(ii) Black carbon
(c)	Smoke	(iii) Suspended small liquid droplets.
(d)	Atmospheric Brown cloud	(iv) Solid suspended particles

(A) (a) - (iv), (b) - (iii), (c) - (ii), (d) - (i)
(B) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)
(C) (a) - (ii), (b) - (i), (c) - (iii), (d) - (iv)
(D) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv)

Q.9 Match Column-I with Column-II.

	Column-I	Column-II
a.	Chipko movement	(i) Medha Patkar
b.	Narmada Bachao Andolan	(ii) AI Gore
c.	Climate Change	(iii) Rachel Carson
d.	Silent Spring	(iv)Sundarlal Bahuguna

(A) a - (i), b - (ii), c - (iii), d - (iv)
(B) a - (ii), b - (iii), c - (iv), d - (i)
(C) a - (iv), b - (i), c - (ii), d - (iii)
(D) a - (iii), b - (iv), c - (i), d - (ii)

For Q.10-Q.11

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false
(D) Both A and R are false

Q.10 **Assertion (A) :** Methane component of greenhouse gases contributing to global warming is about 20%.
Reason (R) : Introduction of multi-point fuel injection engines in automobiles has decreased methane content in the exhausts.

Q.11 **Assertion (A) :** Inhabitants close to very busy airports are likely to experience health hazards.
Reason (R) : Sound level of jet aeroplanes usually exceeds 160dB.

Q.12 Identify the correctly matched pair.
(A) Kyoto Protocol - Climate change
(B) Montreal Protocol - Global warming
(C) Basal Convention - Biodiversity conservation
(D) Ramsar Convention - Greenhouse effect

Q.13 Match the column

	Column I	Column II (sources)
a.	Nitrous oxide (N_2O)	i. Secondary pollutant from car exhausts
b.	Chlorofluoro carbons (CFCs)	ii. Combustion of fossil fuels, wood, etc
c.	Methane(CH_4)	iii. Denitrification
d.	Ozone (O_3)	iv. Refrigerators, aerosol and sprays
e.	Carbon dioxide (CO_2)	v. Cattle, rice fields and toilets

Codes
(A) (a)-(iii), (b)-(iv), (c)–(v), (d)-(i), (e)-(ii)
(B) (a)-(v), (b)-(i), (c)–(iii), (d)-(iv), (e)-(ii)
(C) (a)-(iv), (b)-(v), (c)–(i), (d)-(ii), (e)-(iii)
(D) (a)-(iii), (b)-(i), (c)–(iv), (d)-(v), (e)-(ii)

EXERCISE - 4 (PREVIOUS YEARS AIPMT/NEET EXAM QUESTIONS)

Choose one correct response for each question.

Q.1 Kyoto Protocol was endorsed at **[NEET 2013]**
(A) CoP - 4 (B) CoP - 3
(C) CoP - 5 (D) CoP - 6

Q.2 Global warming can be controlled by – **[NEET 2013]**
(A) Increasing deforestation, reducing efficiency of energy usage.
(B) Reducing deforestation cutting down use of fossil fuel.
(C) Reducing reforestation, increasing the use of fossil fuel.
(D) Increasing deforestation slowing down the growth human population.

Q.3 The Air Prevention and Control of Pollution Act came into force in : **[NEET 2013]**
(A) 1990 (B) 1975
(C) 1981 (D) 1985

Q.4 A location with luxuriant growth of lichens on the trees indicates that the – **[AIPMT 2014]**
(A) Trees are very healthy
(B) Trees are heavily infested
(C) Location is highly polluted
(D) Location is not polluted

Q.5 The zone of atmosphere in which the ozone layer is present is called – **[AIPMT 2014]**
(A) Ionosphere (B) Mesosphere
(C) Stratosphere (D) Troposphere

Q.6 A scrubber in the exhaust of a chemical industrial plant removes – **[AIPMT 2014]**
(A) Gases like sulphur dioxide.
(B) Particulate matter of the size 5 micrometer or above.
(C) Gases like ozone and methane.
(D) Particulate matter of the size 2.5 micrometer or less.

Q.7 The UN Conference of Parties on climate change in the year 2011 was held in : **[AIPMT 2015]**
(A) SouthAfrica (B) Peru
(C) Qatar (D) Poland

Q.8 Which of the following is not one of the prime health risks associated with greater UV radiation through the atmosphere due to depletion of stratospheric ozone? **[AIPMT 2015]**
(A) Reduced Immune System
(B) Damage to eyes
(C) Increased liver cancer
(D) Increased skin cancer

Q.9 High value of BOD (Biochemical Oxygen Demand) indicates that : **[AIPMT 2015]**
(A) water is highly polluted.
(B) water is less polluted.
(C) consumption of organic matter in the water is higher by the microbes.
(D) water is pure.

Q.10 Rachel Carson's famous book "Silent Spring" is related to: **[AIPMT 2015]**
(A) Noise pollution
(B) Population explosion
(C) Ecosystem management
(D) Pesticide pollution

Q.11 Acid rain is caused by increase in the atmospheric concentration of: **[RE-AIPMT 2015]**
(A) SO_3 and CO (B) CO_2 and CO
(C) O_3 and dust (D) SO_2 and NO_2

Q.12 Eutrophication of water bodies leading to killing of fishes is mainly due to non-availability of – **[RE-AIPMT 2015]**
(A) light (B) essential minerals
(C) oxygen (D) food

Q.13 The UN conference of Parties on climate change in the year 2012 was held at: **[RE-AIPMT 2015]**
(A) Doha (B) Lima
(C) Warsaw (D) Durban

Q.14 Which of the following are most suitable indicators of SO_2 pollution in the environment? **[RE-AIPMT 2015]**
(A) Conifers (B) Algae
(C) Fungi (D) Lichens

Q.15 Increase in concentration of the toxicant at successive trophic levels is known as : **[RE-AIPMT 2015]**
(A) Biodeterioration (B) Biotransformation
(C) Biogeochemical (D) Biomagnification

Q.16 Depletion of which gas in the atmosphere can lead to an increased incidence of skin cancers **[NEET 2016 PHASE 1]**
(A) Nitrous oxide (B) Ozone
(C) Ammonia (D) Methane

Q.17 A river with an inflow of domestic sewage rich in organic waste may result in **[NEET 2016 PHASE 1]**
(A) Drying of the river very soon due to algal bloom.
(B) Increased population of aquatic food web organisms.
(C) An increased production of fish due to biodegradable nutrients.
(D) Death of fish due to lack of oxygen.

Q.18 Biochemical Oxygen Demand (BOD) may not be a good index for pollution for water bodies receiving effluents from **[NEET 2016 PHASE 2]**
(A) Domestic sewage (B) Dairy industry
(C) Petroleum industry (D) Sugar industry

Q.19 A lake which is rich in organic waste may result in – **[NEET 2016 PHASE 2]**
(A) Increased population of aquatic organisms due to minerals.
(B) Drying of the lake due to algal bloom.
(C) Increased population of fish due to lots of nutrients.
(D) Mortality of fish due to lack of oxygen.

Q.20 The highest DDT concentration in aquatic food chain shall occur in **[NEET 2016 PHASE 2]**
(A) Phytoplankton (B) *Seagull*
(C) Crab (D) Eel

Q.21 Which of the following in sewage treatment removes suspended solids? **[NEET 2017]**
(A) Tertiary treatment
(B) Secondary treatment
(C) Primary treatment
(D) Sludge treatment

Q.22 Which one of the following statements is not valid for aerosols? **[NEET 2017]**
(A) They are harmful to human health.
(B) They alter rainfall and monsoon patterns.
(C) They cause increased agricultural productivity.
(D) They have negative impact on agricultural land.

Q.23 World Ozone Day is celebrated on **[NEET 2018]**
(A) 16th September (B) 21st April
(C) 5th June (D) 22nd April

Q.24 Which of the following is a secondary pollutant? **[NEET 2018]**
(A) SO_2 (B) CO_2
(C) CO (D) O_3

Q.25 In stratosphere, which of the following elements acts as a catalyst in degradation of ozone and release of molecular oxygen? **[NEET 2018]**
(A) Fe (B) Cl
(C) Carbon (D) Oxygen

Q.26 Match the items given in Column I with those in Column II and select the correct option given below **[NEET 2018]**

Column-I	Column-II
a. Eutrophication	i. UV-B radiation
b. Sanitary landfill	ii. Deforestation
c. Snow blindness	iii. Nutrient enrichment
d. Jhum cultivation	iv. Waste disposal

(A) a-iii, b-iv, c-i, d-ii (B) a-i, b-iii, c-iv, d-ii
(C) a-ii, b-i, c-iii, d-iv (D) a-i, b-ii, c-iv, d-iii

Q.27 Which of the following pairs of gases is mainly responsible for green house effect? **[NEET 2019]**
(A) Ozone and Ammonia
(B) Oxygen and Nitrogen
(C) Nitrogen and Sulphur dioxide
(D) Carbon dioxide and Methane

Q.28 Which of the following protocols did aim for reducing emission of chlorofluorocarbons into the atmosphere? **[NEET 2019]**
(A) Montreal Protocol (B) Kyoto Protocol
(C) Gothenburg Protocol (D) Geneva Protocol

Q.29 Polyblend, a fine powder of recycled modified plastic, has proved to be a good material for **[NEET 2019]**
(A) Making plastic sacks
(B) Use as a fertilizer
(C) Construction of roads
(D) Making tubes and pipes

Q.30 Which of these following methods is the most suitable for disposal of nuclear waste? **[NEET 2019]**
(A) Shoot the waste into space.
(B) Bury the waste under Antarctic ice-cover.
(C) Dump the waste within rocks under deep ocean.
(D) Bury the waste within rocks deep below the Earth's surface.

ANSWER KEY

EXERCISE-1 (SECTION-1&2)

(1) (B) **(2)** (D) **(3)** (B) **(4)** (B)
(5) (A) **(6)** Biomagnification
(7) Classical **(8)** 1981,1987 **(9)** Negative
(10) Montreal Protocol, Canada **(11)** Eutrophication
(12) 1974 **(13)** 1986 **(14)** 1980s
(15) True **(16)** False **(17)** True
(18) True **(19)** True **(20)** False.
(21) True **(22)** True

EXERCISE - 1 [SECTION-3]

Q	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
A	C	B	A	C	C	A	A	D	A	B	C	C	D	B	C	D	A	D	D	A	B
Q	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
A	D	B	A	A	A	C	D	D	B	B	D	C	B	C	B	A	B	A	A	B	C

EXERCISE - 2

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
A	A	B	D	B	B	A	B	D	B	D	B	C	D	B	D	A	B	D	D	B	D
Q	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
A	D	D	C	B	C	A	D	B	C	A	C	B	C	C	C	B	A	C	C	D	A
Q	43	44	45	46	47	48	49	50													
A	B	C	D	C	C	D	D	D													

EXERCISE - 3

Q	1	2	3	4	5	6	7	8	9	10	11	12	13
A	C	C	D	D	A	A	D	A	C	B	A	A	A

EXERCISE - 4

Q	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
A	B	B	C	D	C	A	A	C	A	D	D	C	A	D	D	B	D	C	D	B	C	C	A	D	B
Q	26	27	28	29	30																				
A	A	D	A	C	D																				

SOLUTIONS

EXERCISE-1

(1) (B) **(2)** (D) **(3)** (B) **(4)** (B)
(5) (A) **(6)** Biomagnification
(7) Classical **(8)** 1981,1987 **(9)** Negative
(10) Montreal Protocol, Canada **(11)** Eutrophication
(12) 1974 **(13)** 1986 **(14)** 1980s
(15) True **(16)** False **(17)** True
(18) True **(19)** True **(20)** False.
(21) True **(22)** True **(23)** (C)

(24) **(B).** It is presumed that the scientific reason for the accident at Bhopal was that water entered the tank where about 40 cubic meters of methyl isocyanate was stored, When water and MIC mixed, an exothermic chemical reaction started, producing a lot of heat. As a result, the safety valve of tank burst due to the increase in pressure.

(25) **(A).** According to Central Pollution Control Board (CPCB) particulate size 2.5 micrometers or less in diameter (PM 2.5) are responsible for causing the greatest harm to human health.
These fine particulates can be inhaled deep into the lungs and can cause breathing and respiratory symptoms, irritation inflammations and damage to the lungs and premature deaths. Failure of testosterone secretion causes eunuchoidism.

(26) **(C).** Spray of water or lime.

(27) **(C).** Some sulphates and nitrates can also be formed in photochemical smog due to oxidation of sulphur containing component (SO_2, H_2S) and NO_x (N_2O_5, NO_2) but it does not contain CO_2, Photochemical smog materials cause damage to plants, human health harzards and corrosion problems.

(28) **(A).** Catalytic converters are fitted into automobiles for reducing of poisonous gases emission. Rhodium and Platinum-Palladium are examples of catalyst used in catalytic converters. They convert unburnt hydrocarbons into carbon dioxide and water and carbon monoxides to CO_2 and nitric oxide to N_2 gas.

(29) **(A).** Among the given four options, both burning of coal and burning of mosquito coil will cause chemical pollution, but burning of coal will cause more pollution. The main ingredient in mosquito coils is pyrethrum C (a natural extract from the chrysanthemum flower). At high doses, it is responsible for various respiratory disorders. The coal leads to release of a wide array of air pollutants (CO_x, SO_x, NO_x etc.). Among these CO is very dangerous, it interfer with breathing process. People are generally advised not to sleep with coal burning in the closed room.

(30) (D)

(31) **(A).** By removing sulphur from petrol and diesel, the emission of SO_2 can be reduced in exhaust. SO_2 is a very harmful air pollutant. It can damage the vegetation by causing chlorosis. It can cause acid rain (by forming H_2SO_3 and H_2SO_4), damaging buildings and plants. In human beings it can cause irritation in eyes and damage to respiratory system (e.g. bronchitis).

(32) **(B).** A scrubber can remove gases like sulphur dioxide. In a scrubber, the exhaust is passed through a spray of water or lime.

(33) **(C).** Biomagnification is defined as increase in concentration of toxicants at successive trophic levels.
Toxic substances cannot be metabolised or excreted therefore they get accumulated in an organism and passed onto higher trophic levels.

(34) **(C).** The presence of *E. coli* bacteria indicates possible sewage contamination of water because *E. coli* is found only in the mammalian intestinal tract including that of humans. *E. coli* bacteria belong to the coliform bacteria group. Coliforms found in mammals are called faecal coliforms. Most coliforms are *E. coli*. So, *E. coli* tests are used as an indicator of faecal coliforms.

(35) **(D).** Suspended solids are relatively easier to remove from waste water. They constitute mainly sand, silt and clay. Most of these solids tend to settle if waste water is left undisturbed for sometime. They can be separated easily by physical means. Dissolved solids, both organic and inorganic (nitrates, phosphates etc) as well as bacteria and colloids are relatively difficult to separate.

(36) **(B).** Extent to which water is polluted with organic compound.

(37) **(C).** Due to addition of domestic wastes (sewage, phosphates, nitrates, etc) water body become rich in nutrients. With the addition of nutrients, there is stimulated luxuriant growth of algae in water leads to algal blooms. The algal blooms compete with other aquatic plants for light and photosynthesis. Thus, oxygen level is depleted. Moreover, these blooms also release some toxic chemicals, which kill fish and other animals.

(38) **(D).** Phosphorous in the form of phosphates as well as nitrates act as nutrients for the bloom-forming algae. Increased growth of algae because of these pollutants added to water bodies by human activities is called as cultural eutrophication. This literally, chokes the water body and lead to death of the organisms.

Decomposition of these algae as well as dead water organisms, further deplete the dissolved oxygen content in water.

(39) **(A).** Eutrophication is increase in amount of nutrients water due to detergents, pesticides etc., and it leads to organic loading, depletion of O_2 etc.

(40) (D)

(41) **(D).** Biomagnification refer to increase in concentration of toxicant at successive trophic levels. This happens because a toxic substance accumulated by an organism cannot be metabolised or excreted, and is thus passed on to the next higher trophic level. This phenomenon is well-known for mercury and DDT.

(42) **(A).** Addition of phosphate and nitrate in waler or lake firstly affect the growth of organisms. Large algae in presence o nitrate and phosphate grows very fast and occupy a large area.

As the overload of aquatic organisms increase, the organic remain start depositing at the bottom of lake and over century pile up the lake and ultimately converting into land. So eutrophication is natural ageing of lake by nutrient enrichment of its water.

(43) **(B).** Cleaning of waste water in Arcata marsh involves removal of dissolved heavy metals through biological process.

(44) **(D).** The green scum seen in water bodies includes both green algae as well as blue-green algae. The excessive growth of such bloom forming algae is mainly because of presence of phosphates or nitrates in the water body (eutrophication). Such algal blooms can choke the water body. Green algae and blue-green algas (cyanobacteria) both are photosynthetic and decrease the dissolved oxygen content of water body. This kills much of flora and fauna of that water body. Later on, when micro-organisms decompose these algae, further reduction in dissolved oxygen occurs.

(45) **(B).** Eutrophication is increase in amount of nutrients in water due to detergents, pesticides, etc., and it leads to organic loading, depletion O_2 etc.

Eutrophicated lake (polluted water) has higher Biochemical Oxygen Demand (BOD), it is the amount of O_2 in mg required to decompose organic matter present in one litre of heavily Polluted water.

(46) **(A).** Algal blooms are considered as pollutants of water, as they have very damaging effects on flora and fauna of that water body. They mostly consist of green algae and blue-green algae. The colour imparted by them depends on the colour of major pigment in them. For e.g., chlorophyll imparts the characteristic green colour.

(47) **(A).** Water hyacinth (*Eichhornia crassipes*) also called 'Terror of Bengal' is one such plant that sometimes chokes ponds, lakes and rivers resulting in imbalance of ecosystem dynamics of water-bodies.

(48) (A)

(49) **(C).** Non-biodegradable pollutants are created by humans which effects our environment adversely. They have the tendency to accumulate, as they are not degraded or broken down naturally into harmless compounds e.g. DDT (dichlorodiphenyl trichloroethane), BHC (Benzene hexachloride), polythene bags, etc.

(50) **(D).** Nuclear waste should be pre-treated and stored in shielded containers and then buried about 500 m deep within rocks.

(51) **(D).** Bad ozone is formed in troposphere. It is harmful to plants and animals. Good ozone is formed in the stratosphere and absorbs harmful UV radiation from the sun.

(52) **(B).** Ozone depletion is occuring widely in the stratosphere, the depletion is particularly marked over the Antarctic region. This has resulted in formation of a large area of thinned ozone layer, commonly called as the ozone hole.

(53) **(B).** The gases responsible for the greenhouse effect are CO_2, CH_4, N_2O, CFCs etc. The earth's atmosphere with high concentration of greenhouse gases is transparent to incoming short wave solar radiations but absorbs outgoing long wave infra-red radiations, particularly earth's thermal radiation (heat rays), trapping heat near the earth's surface. In this way, the earth's atmosphere works very much like a greenhouse by warming the interior.

(54) **(D).** The thickness of ozone in a column of air from the ground to the top of the atmosphere is measured in terms of Dobson units (DU).

(55) **(C).** If global warming continues, then all the polar ice and glaciers will melt first. Hence, in the given option, snow leopard is the organism, which will face moreover threat due to destruction of habitat and other influences of ecological imbalance.

(56) **(B).** The Montreal Protocol on substances that deplete the ozone layer is a landmark international agreement designed to protect the stratospheric ozone layer. The treaty was originally signed in 1987 (effected in 1989) and substantially amended in 1990 and 1992. The Montreal Protocol stipulates that the production and consumption of compounds that deplete ozone in the stratosphere chlorofluorocarbons (CFCs), halons, carbon tetrachloride and methyl chloroform-are to the phased out by 2000 (2005 for methyl chloroform).

(57) (C) **(58)** (B)

(59) **(A).** El nino effect is closely associated with global warming. Rise in temperature leads to deleterious changes in the environment and results in odd climatic changes (eg. El Nino effect)

(60) **(B).** Afforestation is the process of establishing a forest on land that is not a forest or has not been a forest for a long time by planting trees or their seeds.
Soil erosion occurs when the soil is blown away by the wind or washed away by the rain. Roots of trees/plants hold the soil. Thus, when more trees are planted their roots don't allow the soil to be blown or washed away and prevent soil erosion.

(61) **(A).** In 1980, the Government of India has introduced the concept of 'Joint Forest Management (JFM)' to work closely with the local communities for protecting and managing forests on mutual benefits.

(62) (A) **(63)** (B) **(64)** (C)

EXERCISE-2

(1) **(A).** Photochemical smog is the chemical reaction of sunlight, nitrogen oxides and volatile organic compounds in the atmosphere, which leaves airborne particles and ground-level ozone.This noxious mixture of air pollutants may include the following:
(i) Aldehydes (ii) Nitrogen oxides, particularly nitric oxide and nitrogen dioxide. (iii) Peroxyacyl nitrates (iv) Tropospheric ozone (v) Volatile organic compounds

(2) **(B).** Biochemical oxygen demand (BOD) is the amount of dissolved oxygen needed (i. e., demanded) by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period.

(3) **(D).**

(4) **(B).** A catalytic converter is a device that uses a catalyst to convert three harmful compounds in car exhaust into harmless compounds. The three harmful compounds are: Hydrocarbons (in the form of unburned gasoline). Carbon monoxide (formed by the combustion of gasoline). Nitrogen oxides (created when the heat in the engine forces nitrogen in the air to combine with oxygen)

(5) **(B).** Dichloro diphenyl trichloroethane (DDT):Being non-biodegradable it persists in nature and climbs up the food chain by accumulating in body fat (in which it is soluble), causing widespread poisoning of birds and other small animals and plants.

(6) **(A).** The plant Eichhornia crassipes is nicknamed as the "Terror of Bengal" because it grows at an alarming rate and spreads on the surface of the water body. This cut out of the light and it also causes an increase in the oxygen demand. Thus, causing the death of fishes and other aquatic organisms.

(7) **(B).** One Dobson Unit (DU) is defined to be 0.01mm thickness at STP (standard temperature and pressure). Ozone layer thickness is expressed in terms of Dobson units, which measure what its physical thickness would be if compressed in the Earth's atmosphere.

(8) **(D).** Depigmentation is the lightening of the skin, or loss of pigment.

(9) (B)

(10) **(D).** The disaster happened because water entered a tank containing Methyl isocyanate.

(11) (B)

(12) **(C).** 5th June is celebrated as World Environment Day.

(13) (D) **(14)** (B) **(15)** (D)

(16) (A) **(17)** (B) **(18)** (D)

(19) (D) **(20)** (B) **(21)** (D)

(22) **(D).** Incinerator is a device used for destruction of waste material (and not particulate matter) by heat application. Thus, all combustible waste materials are burnt and reduces their harmful effects.

(23) (D) **(24)** (C) **(25)** (B)

(26) **(C).** Bones are made up of proteins (mainly collagen), inorganic minerals (calcium, hydroxyapatite) and organic ground substance. Out of these four options bone degradation will take the longest time. Collagen, because of its unique structures in one of the most resistant proteins to degradation. Inorganic ions like Ca^{2+}, further strengthen the bones.

(27) (A) **(28)** (D) **(29)** (B)

(30) (C) **(31)** (A)

(32) **(C).** The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion. It was agreed on 16 September 1987, and entered into force on 1 January 1989, followed by a first meeting in Helsinki, May 1989.

(33) **(B).**

(34) **(C).** The budget of solar radiation is as follows:

percent Reflected	35
Absorbed by atmosphere	17.5
Scattered to the Earth from blue sky	10.5
Scattered to the Earth from clouds	14.5
Radiation going directly to Earth's surface	22.5

(35) (C) **(36)** (C) **(37)** (B) **(38)** (A)

(39) (C) **(40)** (C) **(41)** (D)

(42) **(A).** 80% of automobiles exhaust is carbon monoxide. It is a colourless, odourless gas. When inhaled, this gas combines with blood haemoglobin about 200 times faster than does oxygen & results in oxygen deficiency.

(43) **(B).** The oxygen concentration at the floor of the deep ponds and lakes is very low because of the lesser amount of sunlight.

(44) **(C).** Jhum cultivation, commonly called as slash and burn agriculture in the north eastern states of India, has also contributed to deforestation. In jhum cultivation, the farmers cut down the trees of the forest and burn the plant remains. The ash is used as a fertiliser and the land is then used for farming or cattle grazing. After cultivation, the area is left for several years so as to allow its recovery. The farmers then move on to other areas and repeat this process.

(45) (D)

(46) **(C).** Dobson units (DU) are used to represent the concentration or thickness of ozone (O_3) in our atmosphere. 100 = 1ppb (parts per billion). Thickness of ozone is more over equators than over poles. Ozone layer in stratosphere protects us from the harmful effects of UV radiation (Including skin cancer, inflammation of cornea etc).

(47) **(C).** Biochemical oxygen demand is the oxygen in milligrams required for five days in one litre of water at 20°C for the micro-organisms to metabolise organic waste. BOD increases with increase of pollution.

(48) (D) **(49)** (D)

(50) **(D).** Electrostatic Precipitator (ESP) is the most efficient device to eliminate the submicron particulates from the industrial emissions, In this device, the particulates are first charged and then collected on an electrode or hanging the pipes, Then these are removed by hanging the pipe with hammers.

EXERCISE-3

(1) (C) **(2)** (C) **(3)** (D)

(4) (D) **(5)** (A) **(6)** (A)

(7) **(D).** R August (1872) coined the term acid rain, which have a pH of less than 5. Acid rain is caused by large scale emission of nitrogen oxides (NO_x), SO_2 and HCl from thermal power plants, industries and automobiles.

(8) (A)

(9) **(C).** Sunderlal Bahuguna is a noted Garhwali environmentalist, Chipko movement leader and a follower of Mahatma Gandhi's philosophy of Non-violence & Satyagraha. Narmada Bachao Andolan (NBA) is a social movement consisting of adivasis, farmers, environmentalists and human rights activists against a number of large dams being built across the Narmada River.Narmada Bachao Andolan, with its leading spokespersons Medha Patkar and Baba Amte, received the Right Livelihood Award in 1991. Silent Spring is a 1962 environmental science book by Rachel Carson.

(10) **(B).** Carbon dioxide (CO_2) contributes about 60% of the total global warming and share of methane (CH_4) and Chlorofluorocarbons (CFCs) is 20% and 14% respectively, N_2O also contributes 6% in total global warming. Efficient engine such as multipoint fuel, injection engine can reduce the unburnt hydrocarbon (methane) into auto-emissions.

(11) **(A).** Noise level up to 64 dB (decibel) is well tolerated. Prolonged exposure to noise level to 80 dB or more leads to loss of hearing ability, fatigue, nervousness, fever, hypertension, gastric disorder, increase in cholesterol level and dilation of pupil of the eye. As the jet aeroplanes have the noise up to 150-160 dB or more, the inhabitants in the vicinity of busy airports are likely to experience above health hazards. Maximum noise level is recorded in rockets, i.e., 180dB.

(12) **(A).** Ramsar convention was regarding wetlands. Basal convention is regarding the control of transboundary movement of hazardous water and their disposal (but not including radioactive waste). The Montreal Protocol was signed in 1987 to curb the emission of ozone depleting substances.

(13) (A)

EXERCISE-4

(1) **(B).** Kyoto protocol is an international treaty to reduce emission of greenhouse gases which has adopted at the third session of the conference of parties (CoP-3) to the UNFCCC (United Nations Framework

Convention on Climate Change) in 1997, in Kyoto, Japan.

(2) **(B).** In options (A), (C) and (D) CO_2 concentration increases but it decreases in option (B).

(3) **(C).**
* Air Prevention and Control of Pollution Protection Act - 1981
* Environmental Protection Act-1986
* Water (Prevention and Control of Pollution) Act-1974.

(4) **(D).** Lichens are very good pollution indicators, they do not grow in polluted areas.

(5) **(C).** Good ozone is found in the upper part of the atmosphere called the stratosphere and it acts as a shield absorbing UV rays from the sun.

(6) **(A).** A scrubber can remove gases like SO_2 in which the exhaust is passed through a spray of water or lime.

(7) **(A).** The UN conference of parties on climate change in the year 2011 from 28th November to 1st December was held at Durban, South Africa.

(8) **(C).** Increased liver cancer is not related with depletion of stratospheric ozone.

(9) **(A).** BOD is the measure or oxygen required for chemical breakdown of organic pollutants or wastes. High value of BOD in a water source indicates, high level of pollutants. Highly polluted water bodies has increased demand of BOD.

(10) **(D).** Silent spring documents the detrimental effect of indiscriminated use of pesticides, on the environment and both its components. The book spurred the authorities and caused a reversal in pesticide usage policies also, ensuring a nationwide ban on DDT use in agricultural fields. Environmental protection agencies and acts were created as the result of jarring awareness caused by the book.

(11) **(D).** The main contribution in acid rain is 60-70% SO_2 and 20-30% NO_2.

(12) **(C).** During eutrophication of water bodies, BOD level increases due to rapid growth of microbes.

(13) **(A).** The United Nations Climate change conferences are yearly conferences and are known as Conference of the Parties (COP). In 2012 it was held in Doha, Qatar.

(14) **(D).** Lichens do not grow in SO_2 polluted regions therefore they indicate SO_2 pollution in air. Phycobionts of lichen are sensitive to SO_2.

(15) **(D).** Increase in concentration of toxic substances in successive trophic level is known as Biomagnification.

(16) **(B).** Ozone is found in the upper part of the atmosphere called stratosphere and it acts as a shield absorbing ultraviolet radiation from sun and so its depletion can lead to incidence of skin cancers.

(17) **(D).** A river with an inflow of domestic sewage rich in organic waste will reduce the dissolved oxygen (DO) and may result in death of fish due to lack of oxygen.

(18) **(C).** Biochemical oxygen demand (BOD) is not a good index for pollution for water bodies receiving effluents from petroleum industry as the generated waste is mostly non-biodegradable in nature.

(19) **(D).** Micro-organisms involved in biodegradation of organic matter consume oxygen as a result there is a sharp decline in oxygen causing mortality of fish and other aquatic creatures.

(20) **(B).** Maximum DDT concentration occurs in fish eating birds like *seagull* due to biomagnification. This happens because a toxic substance accumulated by an organism cannot be metabolised or excreted, thus passed to higher trophic level.

(21) **(C).** Primary treatment is a physical process which involves sequential filtration and sedimentation.

(22) **(C).** Aerosols can cause various problems to agriculture through its direct or indirect effects on plants. However continually increasing air pollution may represent a persistent and largely irreversible threat to agriculture in the future.

(23) **(A).** World Ozone day is celebrated on 16th September.
5th June - World Environment Day
21st April - National Yellow Bat Day
22nd April - National Earth Day.

(24) **(D).** O_3 (ozone) is a secondary pollutant. These are formed by the reaction of primary pollutant.
CO – Quantitative pollutant
CO_2 – Primary pollutant
SO_2 – Primary pollutant.

(25) **(B).** UV rays act on CFCs, releasing Cl atoms, chlorine reacts with ozone in sequential method converting into oxygen. Carbon, oxygen and Fe are not related to ozone layer depletion.

(26) **(A).**

(27) **(D).** Relative contribution of various greenhouse gases to total global warming is
CO_2 = 60% ; CH_4 = 20%
CFC = 14% ; N_2O = 6%
Therefore CO_2 and CH_4 are the major greenhouse gases.

(28) **(A).** To control the deleterious effect of the stratospheric ozone depletion an international treaty was signed at Montreal, Canada in 1987. It is popularly known as Montreal protocol.

(29) **(C).** Polyblend is a fine powder of recycled modified plastic waste. The mixture is mixed with bitumen that is used to lay roads.

(30) **(D).** Storage of nuclear waste should be done in suitably shielded containers and buried within rocks deep below the earth's surface (500 m deep)