3RD SEM./COMMON /ALL Branches 2020(W) NEW

TH 5 Environmental Studies

Time- 3 Hrs

Full Marks: 80

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

2 x 10

1. Answer **All** questions

   a. Define Environment.

   b. Define deforestation.

   c. What do you mean by decomposers?

   d. What are hot spots of biodiversity?

   e. Define eco system.

   f. Write down psychological effect of noise pollution.

   g. What is solid waste management?

   h. Define green house effect.

   i. What are the major reasons of population explosion?

   j. What is Draught?

2. Answer **Any Six** Questions 6 x 5

   a. What are causes of deforestation.

   b. What are the environmental effects of mining.

   c. Give a brief description about structures of a pond eco –system.

   d. Discuss about 3R in controlling environmental pollution.

   e. What is global warming ? Write down the effects of global warming?

   f. Discuss about rain water harvesting?

   g. What is the role of an individual in controlling pollution of environment?

3 What is the need of land resources? Write the main reasons of degradation of land? 10

4 What are the changes made in agriculture? Write down the impacts of modern agriculture on environment? 10

5 What are ecological pyramids? Explain the pyramid of number and pyramid of energy? 10

6 Explain the sources of solid waste and solid waste management? 10

7 Write short notes on 10

   a. World food problem

   b. Acid rain

Unit-5

ENVIRONMENTAL POLLUTION

Our Biosphere includes atmosphere, hydrosphere and lithosphere. Thus it provides air, water and soil to the living organisms for their existence. When air, water and soil become polluted, all forms of life in the biosphere come across harmful effects which disturbs the survival of all living organisms.

This disturbance in any component causes harmful effects on the environment; This is called environmental pollution.

Types of Environmental Pollution -

↳ Based on part of env. being polluted, they are 4 Types.
Air Pollution, water pollution, Marine pollution, Soil pollu

↳ Based on nature of pollutant →
CO_2 pollut~, Smoke pollut~, Noise pollut~, Radio-active pollut~
Thermal pollut~ (heat) - dueto T^r change in natural water bodies caused by human activity.

↳ Natural Pollution → oil and natural gas, gases released from volcanic eruptions, Lava from volcanoes, Dust from dust storms.

↳ Man-made pollution → i) Smoke and dust particles from Chimneys, industries, automobile exhausts, marine exhausts. ii) Deforestation, iii) Nuclear explosions, iv) pesticides, fertilizers etc. v) Medical waste & garbage. etc.

TYPES OF POLLUTANTS :-

i) gaseous → Oxides of Nitrogen (NO, NO_2), Sulphur compounds (SO_2, H_2S), carbon compounds (CO_2, CO), O_3, halogens (Cl, Br, I) etc.

ii) Solid wastes → industrial waste, ash, garbage.
iii) Metals → Hg, Pb, Fe, Zn, Ni, Sn, Cd, Cr etc.
iv) Radioactive waste → nuclear ash from reactor.
v) Agrochemicals → Pesticides, herbicides, fungicides, fertilizers etc.

AIR POLLUTION :-

The introduction of any substance into the atmosphere in such a conc^n that may cause discomfort, disease or death to humans, damage to other living creatures or organisms such as food crops or damage the natural environment or built environment is referred to as air pollution.

AIR POLLUTANTS :-

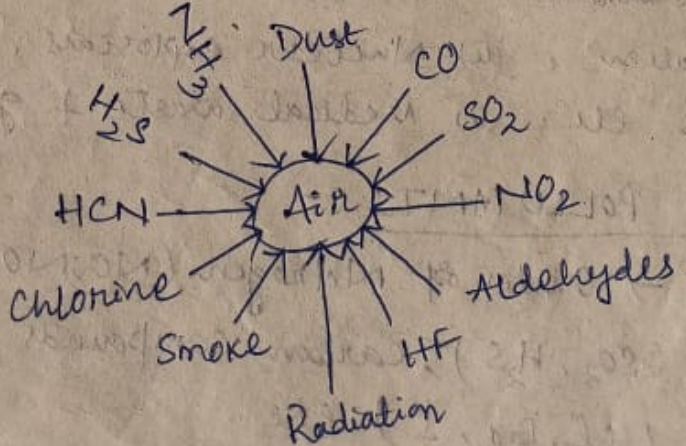
↳ A substance in the air that may tend to be injurious to human beings or other living organisms and to environment, is known as air pollutant.

↳ Pollutants can be solid particles, liquid or gases.

↳ But basically there are 2 types of pollutants -

(i) Particulate (small discrete masses of solid/liq)

(ii) Gaseous (CO, SO_2 and HC vapours etc.)



cooking using fossil fuel, coal, wood etc.

↳ Mobile sources → This source of A.P. refers to emission of pollutants from automobiles, such as - cars, buses, trucks.
The main pollutants emitted from automobiles are - SO_2, oxides of Nitrogen (NO_x), Carbon monoxide (CO) etc.

↳ Non - Point sources →
Emission from loading / unloading, open stone crushing, open refuse burning, agricultural activities (e.g. spreading of pesticides), construction and demolition of buildings, bridges, roads etc. are the non-point source.
The pollutants emitted are - dust, smoke, SO_2, CO, H_2S etc.

PRIMARY POLLUTANTS :-

These are emitted into the atmosphere directly from the identifiable sources and present in the atmosphere in the same chem form as at the time of emission from the sources.
Ex - CO gas from a motor vehicle exhaust
SO_2 released from factories, Nitrogen oxides (especially NO) etc.

SECONDARY AIR POLLUTANTS :-

These are not emitted directly. They're formed in the air when primary pollutants react with each other.
Ex - O_3, NO_2, H_2SO_4, etc.
The dangerous pollutants are known as - criteria pollutants and include O_3, SO_2, NO_2, CO, Pb etc.

and

CAUSE OF AIR POLLUTION :-

↳ A.P. is caused from different sources. There are 2 sources - (i) Natural (ii) Man-made.
↳ Natural sources of A.P. includes - volcanic eruptions forest fires, desert storm
↳ Manmade / anthropogenic sources arise due to human activities and these are further divided into 4 categories ie (i) industrial, (ii) Domestic (iii) Mobile and (iv) Non-Point.
↳ Industrial Source - Diff. types of industries emit various types of pollutants.
Ex - Smoke, SO_2 etc.
↳ Domestic Source - This type of air pollutant includes residential heating and

EFFECTS OF AIR POLLUTION

(1) Effects of Air pollution on Human Health →

↳ Air borne materials like pollens, fungi, bacteria cause allergy, asthma, lungs cancer.

↳ The presence of SO_2 in the atmosphere causes cardiac (heart), respiratory diseases to man.

↳ The presence of CO in the air causes headache, Paralysis and even death in human beings. CO combines with Hb of blood reducing its oxygen carrying capacity; hence create difficulty in breathing.

↳ The excess of CO_2 in the atmosphere causes suffocation.

↳ Radioactive pollutants causes genetic effects on future generations.

(2) Effects of Air pollution on Animals →

Particulates like Fluorine coming from industries, Pb from automobile exhaust, As from ,, released in the atmosphere may deposit on plants. when animals fed upon these plants, get affected with As Poisoning.

Acid rain cause harm to aquatic animals.

(3) Effect of Air pollution on Plants →

↳ SO_2 causes Chlorosis (loss of chlorophyll and yellowing of the leaf) due to bleaching action on leaf surface.

↳ NO_2 causes premature leaf fall and suppressed plant growth; hence reduces the yield of crops.

↳ Acid rain damages crops and forests, causes harm to plants living in water.

Effects on Air Pollution on Materials :-

↳ SO_2, acid rain damages the building materials.
↳ SO_2, H_2S etc discolour the paints.
↳ SO_2 and acid gases damage leather.

CONTROL OF AIR POLLUTION :-

Pollution Control Devices

Devices for Particulate control
- i) Settling chamber
- ii) cyclone separator
- iii) Bag house filter
- iv) Electrostatic precipitator

Devices for gaseous contaminants control
- i) Wet Scrubber
- ii) Dry Scrubber.

↳ Smoke control → By following correct method of firing and maintaining high temp during combustion of fuel, smoke can be reduced.
↳ By using good quality fuel (CNG / LPG) and Pollution free fuel (alcohol, hydrogen) in automobiles, air pollution can be controlled.
↳ Emission from automobiles and vehicles may be minimized by using efficient engines, cleaner fuels and catalytic converter.
↳ Afforestation → plantation of trees at the road side and mining areas helps to consume CO_2 by photosynthesis and to release O_2 into the atmosphere.
↳ Conventional fuels (eg- firewood, coal, oil) are to be replaced by electricity and natural gas.

GROUND WATER POLLUTION -

- Ground water and surface water are interrelated.
- Ground water aquifer may be contaminated from certain sources that may not directly affect the surface water bodies.
- A spot or ongoing releases of chem^l into the soil may not be point source but can contaminate the aquifer below; this is called **Toxic Plume**.
- Hence the source of ground water pollution is different from that of the surface water pollution.

CLASSIFICATION OF WATER POLLUTANTS :-

(1) ORGANIC POLLUTANTS →

- Insecticides (DDT), fungicides, herbicides and other chem^l compounds.
- Detergents and soaps.
- Industrial wastes e.g- waste from sugar, paper, textile industries.
- wastes from toilets, kitchen, and cosmetic products.

(2) INORGANIC POLLUTANTS →

- Ammonia from food processing waste.
- Industrial discharge (SO_2) from plants causing acidic solution.
- Heavy metals from motor vehicles and drainage.
- Chem^l waste as industrial by-products.

(3) PATHOGENIC POLLUTANTS →

Pathogens → bacteria, viruses, worms, protozoa etc.
These causes various diseases.

(ii) Water-borne Diseases →
When water becomes polluted by sewage, W.b.d like Cholera, typhoid, Jaundice, diarrhea, etc. are caused by drinking such polluted water.

(iii). Depletion of O_2 → P and NO_3^{2-} from fertilizers and detergents and sewage, contaminates the Surface water and promote the rapid growth of Plankton & algae which consume O_2, reducing the DO (Dissolved O_2) level of water and killing fish and other aquatic organisms.

(iv). Biochemical Oxygen Demand (BOD) →
BOD is the amount of O_2 required by aerobic (O_2 loving) micro-organisms in water to decompose the organic substances in sewage. Thus it measures the organic pollution.
→ Therefore, the more organic material there in the sewage, the higher is the B.O.D.
→ It is higher in polluted water and lesser in drinking water.
→ DO is the important factor that determines the water quality.
The higher the DO content, better is the water quality.
→ Increased BOD lowers the DO content (∵ micro-organisms ~~lowers~~ consumes the DO in their metabolism)

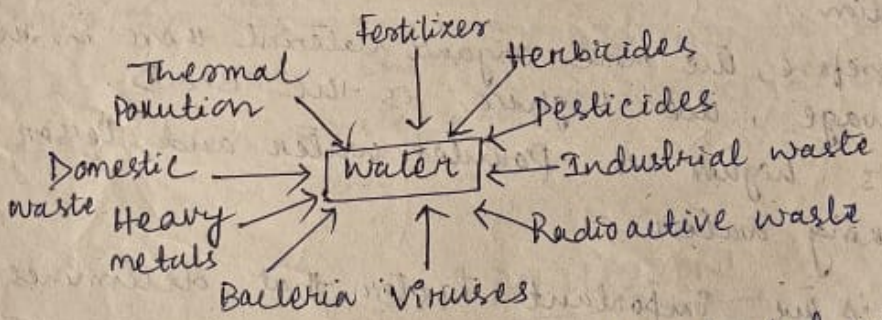
(v) Drinking water contaminated with organochlorines affects the hormonal balance in human beings. It may also cause cancer.

RADIOACTIVE POLLUTANTS :-

- Mining and processing of ores.
- Nuclear Power plant wastes
- Radioactive wastes from Hospitals
- Use of Radioactive isotopes in medical, research applications.

CAUSE OF WATER POLLUTION

- Water Pollutants maybe natural or man-made.
- Man is the main cause of water pollution when domestic wastes (sewage), industrial wastes and agricultural wastes are discharged into the water bodies (river, lake, sea, Pond etc.), water become Polluted.



- Causes of water pollution broadly divided into 2 types. (i) Natural and (ii) Man-made.
- Mostly freshwater ecosystem gets unbalanced due to human activities that includes discharge of domestic sewage, agricultural residues (pesticides, herbicides, fungicides), industrial wastes.

EFFECTS OF WATER POLLUTION

(1) Harmful effects on freshwater species → Insects, fish, amphibians, Plants, fungi, bacteria, algae and viruses become affected by W.P. in freshwater ecosystem.

② Effects on Industrial pollutants →

↳ Metallic pollutants – Metals like Cd, As, Cr, Ni, Pb etc. are toxic to both plants and humans.
↳ Ecological imbalance.
↳ Release of pollutant gases.
↳ Reduced vegetation.

③ Effects of Urban pollutants –

Urban solid wastes – garbage, rubbish, building materials etc. cause obstruction in daily life.
↳ Foul smell and release of gases.
↳ Public health problems.
↳ Waste Management problem.

CONTROL OF SOIL POLLUTION

↳ Bio-fertilizers and manures can be applied to reduce chem' fertilizer and pesticide use.
↳ By Reduce, Reuse and Recycle. The prod^n of solid wastes can be minimized.
↳ Reforesting → Control of land loss and soil erosion can be achieved by restoring forests and.
↳ Crop rotation or mixed cropping can increase the soil fertility and eliminate weed so that the use of weedicides and herbicides can be reduced.
↳ Proper methods should be followed for management of solid waste disposal.
↳ Industrial wastes can be treated physically, chemically and biologically until they are less hazardous.
↳ Composting of bio-degradable solids.

CONTROL OF WATER POLLUTION

- Taking bath and washing clothes directly in water bodies (ponds, tanks, streams) which supplies drinking H_2O to humans and animals should be prohibited.
- Separate ponds and tanks should be arranged for H_2O supply to the cattle and other animals.
- Household or business may have an individual septic tank to treat waste water on site and then to discharge into the soil.
- Thermal pollution from runoff can be controlled by storm water Management facilities that absorb the runoff or direct it into ground water.
- water contaminated with Hg, NH_3, P compounds can be treated using various techniques – adsorption, ion-exchangers, electro dialysis, reverse osmosis before discharging into the water bodies.
- Strict legislation should be enacted for industries to treat their waste water before discharging into the rivers and seas.

SOIL POLLUTION

Soil Pollution is d.as. the contamination caused by Toxic compounds, chem's, radioactive materials or disease causing agents which are harmful to Plant growth and animal health.

TYPES OF SOIL POLLUTION :-

- Agricultural soil Pollution < pollⁿ of surface soil / pollⁿ of underground soil.
- Pollution due to urban activities.
- " " industrial and solid wastes.
- Natural land pollution.

CONTROL OF MARINE POLLUTION

↳ Untreated garbage, sewage and solid wastes should not be dumped into the sea.
↳ Industrial wastes should be treated before their release into the sea.
↳ Discharge of excess of fertilizers and pesticides into the sea should be prohibited.
↳ People should be educated how to prevent marine pollution.
↳ At Govt. level, adequate legislation should be made to control marine pollution.

NOISE POLLUTION

It is defined as a displeasing sound that disrupt the activity or mental balance of human being or animal life.

CAUSE OF NOISE POLLUTION

(1) Industrial Sources →

↳ Textile mills
↳ Printing press
↳ Steel rolling mills.
↳ Gas welding workshops.

(2) Transportation Sources →

↳ Trains
↳ Motor vehicles
↳ Aeroplanes.

(3) Household sources →

↳ Domestic gadgets → grinder, washing machines, air cooler etc.
↳ Indoor noise – crying of infants, banging of doors, loud speaking, collision of utensils. etc

MARINE POLLUTION

It is the contamination resulting in undesirable change that is happening to the salt water ecosystem; such as - ocean, rivers, which directly affects the living organisms and the water quality.

CAUSE OF MARINE POLLUTION

↳ Industrial and storm drain runoff is a major cause of marine pollution.

↳ Wastes starting from plastic bags to pesticides reach ocean either by dumping or from runoff through drains and rivers.
These wastes include oil or petroleum products, fertilizers, garbage, toxic chem', heavy metals etc.

↳ Man-made radio active materials are also directly ~~dis~~ disposed to sea.

EFFECTS OF MARINE POLLUTION

↳ Most of the coastal fisheries are stopped.

↳ Because of Oil pollution, DO is reduced.
Also oil kills lichens, algae, Phytoplankton, aquatic plants and Marine biota.

↳ The oil pollution prevents the light penetration into the sea water as a result of which plankton growth and photosynthesis are reduced.

↳ People eating contaminated sea products suffer from infectious diseases like cholera, dysentry etc.

↳ The beneficial uses of Marine water (fishing) is totally reduced.

CONTROL

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(4) Agricultural Machines –
↳ Tractors ↳ Tubewells, etc

(5) Public Meetings / Festivals –
↳ Loud speaker.
↳ Bursting of crackers.

(6) Defence Equipment sources –
↳ Military battle tanks
↳ Bomb explosion etc.

(7) Civil Engg. sources –
↳ Construction work / road / building work etc.
↳ Stone crushers.

EFFECTS OF NOISE POLLUTION

(1) Physical Effects
↳ Annoyance and aggression
↳ Damage to ear drum.
↳ permanent deafness

(2) Psychological Effects
↳ Depression
↳ Sleep disturbance
↳ frustration
↳ Irritation
↳ Hypertension

(3) Physiological Effects
↳ Cardiovascular effects
↳ Rise in B.P.
↳ High stress level
↳ Muscular pain
↳ Memory loss

NUCLEAR HAZARDS

N.h refers to the r.a. pollution which affects the living organisms through air, soil and water.

CAUSE OF NUCLEAR HAZARDS

(1) Natural sources → cosmic rays which are fast moving, highly energetic rad^n reach the earth from outer space; which is a major hazard in space.

(2) Man-made sources →

↳ waste material obtained in the mining and processing of r.a. ores

↳ waste material obtained from the use of r.a. isotopes in medical, industrial and research applications.

↳ from the diagnostic use of X-rays;

↳ Nuclear wastes produced during the use of radioactive materials in nuclear weapons - U-235, Pu-239 etc.

EFFECTS OF NATURAL HAZARDS

↳ All living organisms are affected by radiation pollution. The effects maybe cause, somatic (individual) or genetic damage.

↳ Exposure to high rad^n doses (10,000 rad^n) kills the organisms by damaging tissues of heart, brain etc. Tumors, cancer, developmental changes are long range eff. of N.P.

↳ Decreased enzyme activity in aquatic organisms can lead to their inability to breakdown lipids, which leads to malnutrition.

↳ Due to increased bacterial activity at higher Temp^s the BOD exerted is high and hence DO depletion takes place.

EFFECTS OF THERMAL POLLUTION

↳ The elevated temp^r typically decreases the level of DO in water. The decreased DO level can harm aquatic animals such as - fish, amphibians, etc.

↳ Due to increased bacterial activity at higher Tempr, the BOD exerted is high and hence DO depletion takes place. This leads to change in water quality.

↳ At high temp^r, fish spawning cycle maybe disturbed and fish maybe highly susceptible to diseases.

CONTROL OF THERMAL POLLUTION

a) Industrial waste water →
Thermal pollution from industries canbe controlled with:

(i) Cooling Ponds → the man-made waterbodies designed for cooling by evaporation and radiation.

(ii) Cooling ~~water~~ towers which transfer waste heat to the atmosphere by means of evaporation or heat transfer.

(iii) Cogeneration Process → waste heat is recycled for domestic and industrial heating Process.

↳ Discharge of r.a. wastes into water bodies leads to food chain poisoning as a result of which men consuming products of the water bodies meet fatal end.

↳ Exposure to low doses (100 – 250 rads) doesn't cause the death of men but the dose can impair the functioning of body organs causing vomiting, loss of hair, etc.

CONTROL OF NUCLAR HAZARDS :—

↳ Radiation exposure protection – care should be taken to get protected from rad^n exposure.

↳ Leakages from nuclear reactors, transport and use of radioactive fuels, fission products and r.a. isotopes are to be totally stopped.

↳ R.a. contamination Protection :– must be careful to get protected from r.a. contamination.

↳ collection and storage: R.a. wastes should be converted into harmless materials and stored in deep layers of soil where their harmful effects can be decayed gradually.

WATER POLLUTION

Classification of water Bodies →

On the basis of the dissolved salt conc^n in water, there are 2 classes of water bodies.
↳ Freshwater bodies and (when salt conc^n is less than 5PPt)
↳ Marine water bodies. (when salt conc^n ≥ 35 PPt)

Fresh water body
- Surface water bodies (Ex- Pond, Lake, stream rivers)
- Ground water bodies

↳ **CATAGORIES OF WATER POLLUTION** – Surface water pollution

Depending upon the sources of water pollution, it is of 2 types

① **POINT SOURCES:-**

→ When water gets contaminated during its flow in a pipe or when present in a ditch from a single, identifiable source is called the point source water pollution.

→ This includes domestic sewage, sewage from a specific industry or discharge from a city storm drain.

→ Since these sources are identifiable, they can be easily monitored.

② **NON-POINT SOURCES :-**

When the source of pollution is not originated from a single discrete source, that is called non-point source pollution (NPS)

ex- leaching out of N compounds from fertilized agricultural lands, water pollution by agricultural run off, acid rain; mining work, runoff from roads, etc.

TYPES OF SOIL POLLUTANTS

- Domestic wastes, such as - garbage, rubbish goods.
- Human and animal excreta
- Chem' pollutants such as - soap, detergents, dyes, polymer, cement etc.
- Synthetic organic compounds - insecticides, pesticides, herbicides
- Industrial pollutants →

CAUSE OF SOIL POLLUTION

Direct Causes

- Application of pesticides.
- Direct discharge of industrial, agricultural, domestic wastes, sewage to the soil.
- Soil erosion
- Dumping of large quantities of solid wastes. (Both bio-degradable, Non-
- Disposal of radioactive materials.
- Mining and deforestation.

Indirect Causes

- Leaching of wastes from landfills
- Acid rain.

Effects of soil pollution

(1) Effects on Agriculture →

- Reduced soil fertility → Fertilizers (K) decreases the nutrient, in soil and carotene in vegetables and fruits.
- Reduced nitrogen fixation.