CHAPTER 15

Our Environment

EXAM DRILL

ANSWERS

1. **(d) :** Sunlight, air, temperature, soil, etc., are the abiotic factors of ecosystem whereas producers, consumers, decomposers are the living or biotic components of ecosystem.

2. **(a) :** Ozone layer is found in stratosphere which acts as a shield to protect against harmful UV radiations.

3. **(d) :** Chlorofluorocarbons (CFCs) are the ozone depleting substances.

OR

(c)

4. **(d) :** Decomposers include bacteria and fungi. They degrade dead remains of plants and animals and waste organic matter into simple small organic molecules. So, decomposers are also called saprotrophs.

5. **(d) :** Forests, oceans, ponds, etc., are natural ecosystem whereas gardens, parks, crop fields are the examples of artificial or man-made ecosystem.

OR

(a) : The energy from the sun flows into autotrophs and it passes to herbivores and then to carnivores. The energy does not revert from autotrophs to the solar input or from herbivores back to autotrophs. Hence, the flow of energy is always unidirectional.

6. **(c)** 7. **(d)**

8(i) **(a)**

8(ii) **(b)**

8(iii) Food web is network of food chains interconnected at various trophic levels.

8(iv) Characteristics of food web are :
- It is not straight.
- It provides number of alternate foods to consumers.

9(i) **(b)**

9(ii) **(a)**

9(iii) Harmful effects of thinning of ozone layer are :
- UV radiation damage skin cells causing skin cancer.
- 10 - 25% decline of photosynthesis in plants.

9(iv) Ozone Depleting Substances (ODS) – Methane, Chlorofluorocarbons.

10. Primary consumers or herbivores include all the organisms that utilise plant products. Here, rat is the primary consumer that occupies second trophic level.

11. In a lake, the producers are mainly phytoplanktons, rooted and floating plants. Zooplanktons are the primary consumers. They constitute the second trophic level.

OR

Some animals eat both plants as well as other animals. These are called omnivores, *e.g.*, human beings, dog, crow, etc.

12. Acid rain refers to the precipitation with a pH of less than 5. It is a mixture of H_2SO_4 and HNO_3. SO_2 emitted by the factories can rise in the atmosphere and react with rain water to form H_2SO_4.

13. **(c) :** Manure is partially decomposed organic matter derived from plant and animal wastes which is added to the soil to increase its fertility. Fertilisers are chemical formulations which are either provided directly to plants or added to the soil in order to supply minerals required for optimum growth of plants.

14. **(a) :** Organic wastes are biodegradable and so less harmful in nature unless produced in excess amount.

15. Chlorofluorocarbons are the principal oxygen depleting substance. They are synthetic, harmful chemicals which are widely used in refrigerators and air conditioners as coolants, in fire extinguishers, in aerosol sprayers and as propellants. CFCs are composed of carbon, chlorine and fluorine. When it come in interaction with UV rays, the chlorine atoms get detached and combine with an oxygen atom of ozone molecule and leave behind oxygen molecule (O_2). Thus, ozone gets converted to oxygen due to the presence of atomic chlorine and gets depleted.

16. **(a)** For example, the affluent life style has forced people to start using more of disposable items like paper plates, plastic items, polythene, etc.
Suggestion – We can reuse of polythene bags, plastic containers, etc.
(b) Highest concentration of harmful non-biodegradable chemicals are found in Hawk. The phenomenon exhibited here is biomagnification.

17. Food chain 'A' has minimum trophic levels (three trophic levels).

Longer is the food chain, lesser is the amount of energy at top of the food chain. So, in the food chain 'B' which has five trophic levels, the energy available to eagle (organisms at the top) will be minimum.

18. We can reuse plastic and glass jars of jams and pickles, etc., for the purpose of storage of things like salt, sugar, tea, etc., whereas we can recycle newspapers, plastic of some types, broken glass and metalwares for making fresh paper, plastic, glass and metal objects.

19. Major regulations of Ecological Solid Waste Management Act of 2000 (Republic Act 9003) are:

(i) It provides for the implementation of a systematic, comprehensive and ecologically sound management of solid waste.

(ii) Mandatory segregation of solid waste at the source such as household, institutional, industrial, commercial and agricultural sources.

(iii) Prohibition on non-environmentally acceptable products and packaging.

(iv) Establishment of Materials Recovery Facility in every locality.

(v) Prohibition against the use of open dumps.

20. Differences between production and decomposition are as follows:

S.No.	Production	Decomposition
(i)	It is the phenomenon of synthesis of fresh biomass.	It is the phenomenon of degradation of waste biomass (complex or organic matter) by decomposers.
(ii)	It builds up biomass from inorganic nutrients.	It releases inorganic nutrients from the biomass into the environment.
(iii)	It traps energy.	It releases energy.

21. Longer is the food chain, lesser is the amount of energy at top of the food chain. This is because of 10% (ten percent) law which was proposed by Lindemann in 1942. According to this law, during transfer of energy from lower trophic level to higher trophic level 90% of energy is lost, and only 10% of energy is transferred to next trophic level. As the trophic level increases, the available energy goes on decreasing.

OR

Any precipitation or deposition having a pH lower than 5.6 is called acid rain. Acid rain occurs by the emission of sulphur dioxide and oxides of nitrogen that react with rain water and form acids.

Following measures can be taken to prevent and control acid rain:

(i) Acid rain is mainly caused due to air pollution. Air pollution can be reduced by using pollution-controlling equipment, such as scrubber.

(ii) Other sources for the generation of electricity, such as nuclear fuel or solar power can be used instead of using fossil fuel to reduce the release of oxides of nitrogen and sulphur.

(iii) Cleaner fuels, such as LPG,, CNG, etc., could be used in automobiles.

(iv) Addition of neutralising agents: Powdered lime stone can be sprayed over areas that are prone to acid rain.

22. Yes, a balanced and large aquarium can be a complete ecosystem consisting of both biotic and abiotic components. Water, oxygen supply source, light source are abiotic factors, whereas aquatic plants, small animals and decomposers serve as biotic components.

OR

With the advancement in technology over time, there has been improvement in lifestyle of people. Such changes have also changed their attitudes. When people have more resources at their end they tend to overuse and misuse it thereby generating huge amounts of waste materials. For example, the affluent lifestyle has forced people to start using more of disposable articles, *e.g.*, plastic cups, bags, etc., which keep on accumulating in the environment and lie undecomposed, thereby negatively affecting the environment.

Similarly, excessive use of refrigerators and air conditioners, plastic foams, etc., also release high quantities of CFCs which are responsible for ozone depletion.

23. Major greenhouse gases are CO_2-60%, CH_4-20%, CFCs-14% and N_2O-6%. Out of which CO_2 is present in maximum amount. Source of CO_2 is burning of fossil fuels, volcanic eruptions and respiration process. Due to increased level of CO_2 in the atmosphere global atmospheric temperature during the past century has increased to 0.6%. It is called global warming, which results in melting of polar ice caps and rise in sea level, etc.

OR

Ultimate source of energy is sun. Green plants (producers) produce food by using solar energy. This food

is consumed by herbivores (primary consumers) to get energy. The energy is further transferred to next levels of consumers *i.e.*, secondary consumers and tertiary consumers. During transfer of energy, about 90% of it is wasted or consumed up in respiration and only 10% becomes part of the higher trophic level. The energy cannot be transferred from consumers to producers and even to the sun. Therefore, energy transfer is always unidirectional and non-cyclic accompanied by decrease in usable energy.

24. In the given figure : (1) is T_1 – First trophic level *i.e.*, producers.

(2) is T_2 – Second trophic level *i.e.*, herbivore (Primary consumer).

(3) is T_3 – Third trophic level *i.e.*, small carnivorous bird (Secondary consumers).

(4) is T_4 – Fourth trophic level *i.e.*, large carnivorous bird (tertiary consumers).

25. The problem of waste disposal can be solved and reduced in the following manner:

(i) We should say no to plastic and other non-biodegradable materials and use disposable bags, plates and glasses made of paper and other materials of plant origin which are biodegradable.

(ii) All biodegradable domestic wastes should be dumped either in big pits specially dug up for this purpose or in low lying areas so that land reclamation could be brought about.

(iii) All non-biodegradable wastes such as metal, glass and plastic items should be segregated and handed over to authorities dealing with it. These items can be recycled.

26. Ozone is present in the stratosphere. It protects the earth from harmful ultraviolet radiations (UV). UV ray causes harmful diseases to organisms *e.g.*, skin cancer, cataract in human beings.

Ozone layer is depleting because of chlorofluorocarbon (CFC's) which are used in refrigerants and fire extinguishers.

The precautions taken to preserve the ozone layer is to ban the use of CFC's. Various effective strategies to check the thinning of ozone layer were taken in Montreal protocol, Helsinki protocol, etc.

27. **(a)** The idea of ecological pyramids was developed by Charles Elton (1927). Thus ecological pyramids are often called as Eltonian pyramids. An ecological or Eltonian pyramid is a graphic representation of an ecological parameter like number of individuals present in various trophic levels of a food chain with producers forming the base and top carnivores the tip. Each trophic level represents a functional level. There are three types of ecological pyramids : (i) Pyramid of numbers, (ii) Pyramid of biomass and (iii) Pyramid of energy.

(b) Followings are some of the major adverse effects of biological magnification/biomagnification:

(i) DDT interferes with the egg-shell formation in many birds. The shells remain thin and break by bird's weight during incubation. Dieldrin is about 5 times more toxic than DDT when ingested and 40 times more poisonous when absorbed.

(ii) The chlorinated hydrocarbons are known to affect CNS (central nervous system), cause softening of brain, cerebral haemorrhage, cirrhosis of liver, hypertension, cancer, malformation of sex hormones, etc.

(iii) Biomagnification of mercury into fish through the food chain was responsible for large number of deaths due to Minamata disease in Japan.

(iv) Selenium accumulates in the plants growing on selenium-rich soils. Through food chain, such plants cause stunted growth, loss of appetite, gastro-intestinal disorders, etc., in the animals grazing on such plants.

OR

(a) Lion, tiger, leopard, whale - Top carnivore (Top trophic level)

Spider, cockroach, lizard, wolf, snake, toad, fish, crow, sparrow, crane, duck, peacock - Secondary consumers (IIIrd trophic level).

Crustaceans, grasshopper, deer, rat, squirrel, rabbit, elephant, goat - Primary consumer (IInd trophic level).

Phytoplankton, algae, *Hydrilla*, maize plant, *Nymphaea*, *Spirogyra* - Producers (Ist trophic level).

(b) A straight line sequence of 'who eats whom' or eating and being eaten in an ecosystem is called a food chain. A network of cross connecting food chains involving producers, consumers and decomposers are termed as a food web.

28. **(a)** The amount of ozone in the atmosphere began to drop sharply in the 1980s. This decrease was linked to ozone depleting substances which react with ozone present in the stratosphere and destroy the same. The ozone layer is destroyed by aerosols (certain chemicals released into the air with force in the form of mist or vapour). Major aerosol pollutant present in jet plane

emissions is chlorofluorocarbons. Chlorofluorocarbons (CFCs) are also widely used in refrigerators and in fire extinguishers. Other ozone depleting substances are nitrogen oxide, sulphur dioxide, halon, methyl chloroform, etc.

(b) Sometime back, use of *kulhads* (disposable cups made of clay) was suggested as an alternative of plastic cups. However, making of kulhads on such a large scale would have resulted in the loss of top fertile soil. Therefore, this proposal was set aside.

OR

Managing the solid wastes involves segregation and disposal of solid wastes in scientific way. Segregation involves separation of different types of waste materials. So that, these can be disposed off separately. After segregation the waste materials are transported to the site of disposal *via* big trolleys. The last step is disposal which involves different methods. Some of them are as follows:

(i) Dumping : This is a conventional, inexpensive and widely used method of waste disposal in which solid wastes are dumped into low lying areas. This is known as land filling and such landfills can be used to develop parks. But it is not a good method as it creates pollution of different type.

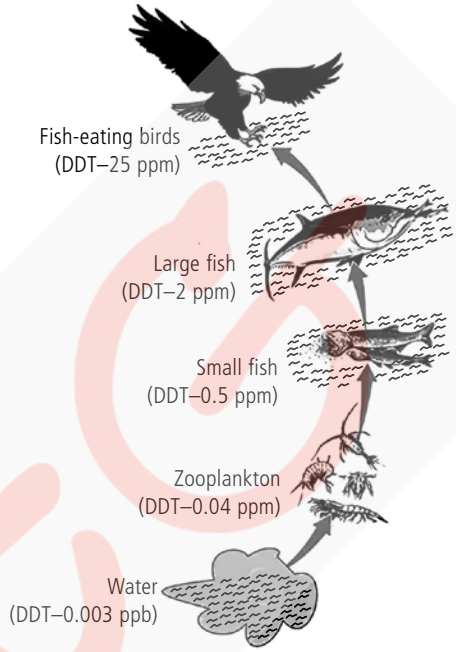
(ii) Composting : Conversion of biodegradable solid wastes like animal excreta, spoiled or left over food, vegetable and fruit peels, garden litter, etc., into manure is known as composting.

(iii) Incineration : It is the process of aerobic burning of the combustible constituents at a very high temperature (more than 1000°C), in the properly constructed hearth of furnaces. This is the ideal method for medical waste disposal.

(iv) Pyrolysis : It is the combustion inside chambers in the absence of oxygen at a high temperature. Industrial gas and other useful substances are produced by this process.

29. A few toxic substances, often present in industrial waste waters, can undergo biological magnification or biomagnification in the aquatic food chain. Biomagnification refers to increase in concentration of two toxicant at successive trophic levels. A fish eating bird have DDT concentration of 25 ppm (parts per million) even though the water contains only 0.003 ppb (parts per billion) concentration of DDT. Here, we can say that the DDT concentration increases from water to the last trophic level.

DDT is a chemical that is used to kill the plant and animal pests. As DDT is non-biodegradable and toxicant, it show biomagnification. Indiscriminate use of DDT could result in biomagnification as shown below.



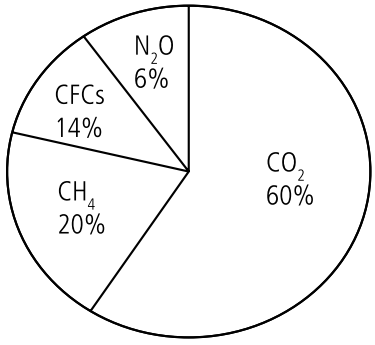
In this manner, the concentration of DDT is increased at successive trophic levels, when it starts at 0.03 ppb in water, it can ultimately reach 25 ppm in fish-eating birds through biomagnification.

OR

(a) Energy flow is the key function of an ecosystem. Green plants capture about 1% of the incident solar energy on the earth to carry out the process of photosynthesis. A part of this trapped energy is used by plants in performing their metabolic activities and some energy is released as heat into the atmosphere. The remaining chemical energy is stored in the plants as photosynthetic products. When plants are eaten up by herbivores, the chemical energy stored in the plants is transferred to these animals. These animals (herbivores) utilise some of this energy for metabolic activities, some energy is released as heat and the remaining energy is stored in their body. The process of energy transfer is similarly repeated with carnivores and with top carnivores and so on. Only 10% of the energy is transferred from one trophic level to the next. Nearly 90% of energy is lost when it moves from one trophic level to the next. This can be explained as follows:

Producers	→ Herbivore	→ Primary carnivore	→ Secondary carnivore
1000 kCal	100 kCal	10 kCal	1 kCal

(b) Relative contributions of different GHGs in global warming are as follows:



30. **(a)** Recycling is the process of converting waste materials into reusable objects to prevent waste of potentially useful materials. Thus, it reduces the consumption of fresh raw materials, energy, air and water pollution. *E.g.*, recycling of paper, glass, plastic, etc.

Paper recycling is done at industry level, school and at home also. Recycled paper is developed by processing of all the waste paper materials collected from different places. Some advantages are :

(i) If we recycle paper, we can reduce the number of trees that are cut to produce papers.

(ii) The garbage constituted by paper can be reduced to a considerable amount.

(iii) Level of pollution can be decreased as papers are biodegradable and there will be less accumulation if papers are recycled.

(b) In any ecosystem, the survival of any species depends on the biotic (living) and abiotic (non-living), components. There should not be any drastic changes in the weather conditions. The ratio between any two successive trophic levels should be maintained properly because only 10 percent of energy flows from one trophic level to another.

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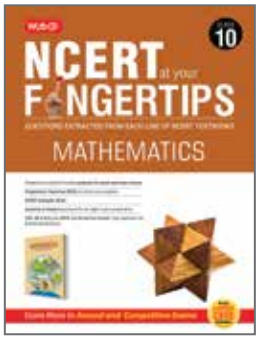

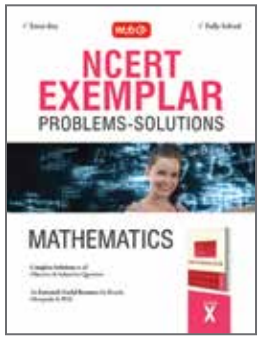

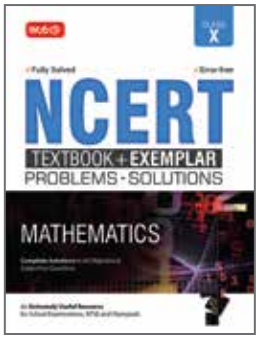

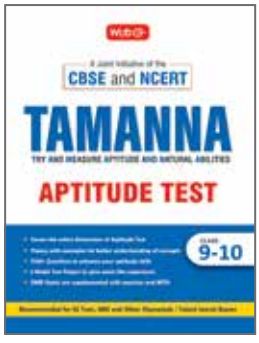

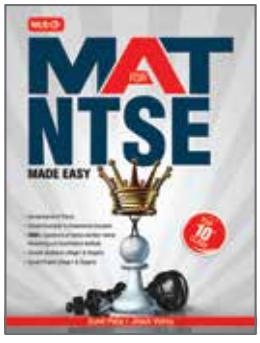

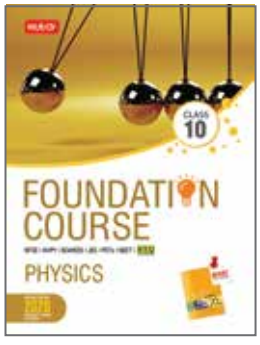

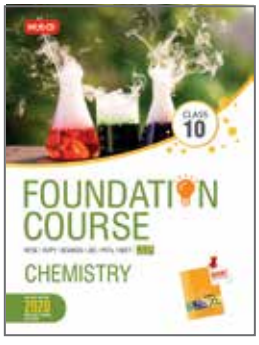

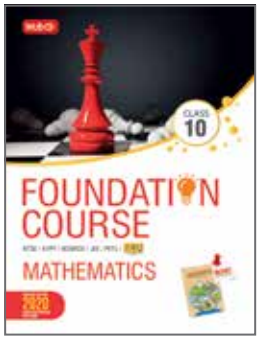

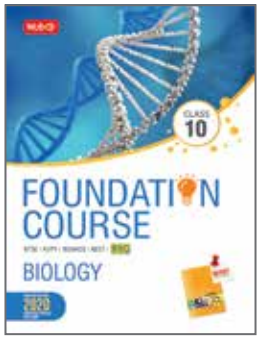

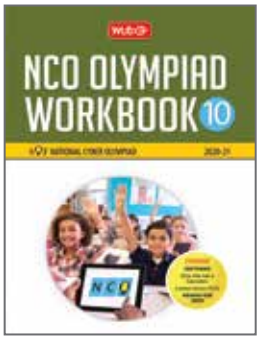

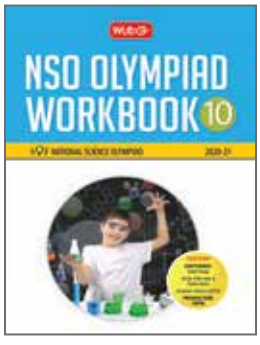

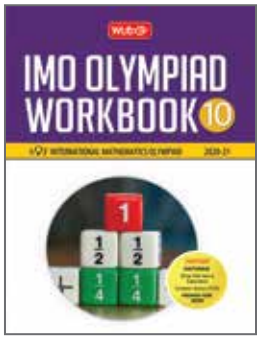

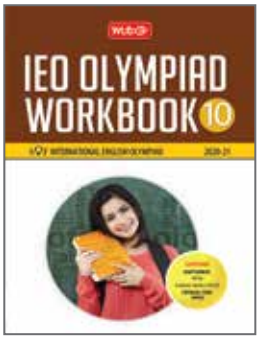

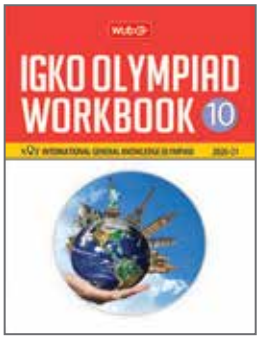

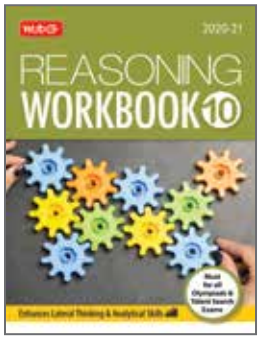

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