

UNIT – III → Planning and Environmental Conservation & Protection**Q.1. What is meant by Ecosystem analysis (understanding)?**

Ans. To study the structure and functions of ecosystems makes the ecosystem analysis (understanding). As the term ecosystem indicates “Eco” meaning environment and system implying an interacting interdependent complex. The term ecosystem was first of all proposed by British ecologist A.G. Tansley in 1935 and defined it as an integrated system resulted from the interaction of living and non – living factors of environment. The living components include light, temperature humidity, water, soil , air, salts etc. in an ecosystem there is an exchange of materials between living and non – living environment in a suitable cyclic manner. In an ecosystem there is a flow of energy from producers to decomposers.

An ecosystem may be as small as pond and as big as forest. A balanced aquarium in the laboratory represents an ecosystem. This ecosystem may be natural or artificial. Natural ecosystems operate themselves under natural conditions without any major interference by man. It may be further of two types; aquatic ecosystem [pond, river, stream, seas, oceans etc.] and terrestrial ecosystem [grassland forest, desert, tundra]. Aquatic ecosystems include fresh water [ponds, rivers, springs, streams, marshes etc] and marine [seas, estuaries etc]. Artificial ecosystems are man-made ecosystems being maintained by artificial means e.g crop land, aquarium etc.

Q.2. Define Ecosystem. Describe the complexity of the ecosystem.

Ans. Ecosystem: It can be defined as an integrated system resulted from the interaction of living and non – living components of the environment.

Different organisms [plants and animals] respond differently to environmental changes either they change their physiology or in behaviour. For long term changes, they adopt. As most ecosystems are complex, we need to understand them, through basic aspect of ecology. Ecosystems consist of complex trophic interactions that vary in time and space. These trophic interactions constitute complex food webs. E.g members of same trophic level may either compete

directly for resource or indirectly through effects of shared predator. Increase in number of species result in an increase in number of interactions in a food web. It has become clear that for understanding food webs, it is essential to include more interactions e.g. to understand herbivores as better one should know plant herbivore interaction.

For proper understanding of food web, it is essential to understand interactions among individual species.

Q.3. How do ecosystems respond to various impacts? How can we predict system response impacts?

Ans. For enhancing the capability of forecasting the effects of group of environmental changes like climatic change, pollution etc and scientific knowledge is needed on ecosystem.

Ecological changes occur, some of which are due to ecological response to climatic change. High CO₂ concentration in the atmosphere and nitrogen deposition changes primary productivity.

Ecosystem structure like species composition, distribution of organisms and ecosystem functioning like photosynthesis, mineralization, nutrient cycling etc. are modified by global changes. These ecosystem changes have the potential to increase or decrease global changes through various feedback mechanism like green house gases etc.

To understand and predict the responses of ecosystem to environmental changes, the study of underlying mechanism is needed which occur to functioning of an ecosystem. Many responses originate at the level of the organisms and cascade through communities and then determine whole ecosystem responses. It is crucial to take into account the responses of the organisms and the community when the dynamics of the response of ecosystem is addressed.

Q.4. How do human beings interact with the environment? Discuss.

Ans. Man has altered the environment for his own benefit by construction of dams, roads, industries etc. protection of wild life habitats and town planning to reserve forest areas are also ways in which people interact with their

environment. Man is totally dependent upon the natural system. Our dependence upon environment is becoming increasingly apparently through four interrelated problems given below:

- a. Population Growth:** there is tremendous population growth particularly in developing countries. About 8.9 billion people will be a great stress on the environment. There will be beyond the capacity of the earth to accommodate so many people.
- b. Decline of ecosystem:** Man has altered the natural nutrient cycles like C,N,S and H₂O and hence resulted in ecological imbalance which is harmful for ecosystem.
- c. Global atmospheric changes:** Due to emission on of greenhouse gases through human activities, climatic changes may occur in future which can prove dangerous.
- d. Loss of biodiversity:** loss of biodiversity due to human activities like deforestation etc. can result in imbalance in any ecosystem which is harmful for living.

Q.5. What are environmental and intra specific interactions (relationships)?

Ans. environmental variables are required in ecosystem modelling. These include nutrients, inhibitors, rainfall, season, microbes, plant and animals lying in the vicinity along with temperature, moisture, pH, soil texture, slopes etc.

There are organisms that are good indicators of changes in the conditions of the ecosystem. Bio indicators (living organisms) are used to monitor the environment. Monitoring keep species that respond rapidly to environmental change like insects, rodents, lichens, amphibians algae etc. can be considered as critical variable which can facilitate impact monitoring, climate change detention whereas the design of adaption, mitigations and preventative interventions that improve generalized resistance can be monitored bt state variables e.g invasion of exotic species.

Q.6. What is inter specific and intra specific interactions (relationships)?

Ans. Inter specific Interaction: The relationship between members of different population is termed as inter specific relationships. These relationships may be vital and lifelong or casual and temporary or in between this range.

Intra specific interaction: Relationship between organisms of the same species are termed as intra specific relationships. This interaction involves association between individuals including social organisation, territorial segregation and communication between individuals.

Q.7. What are the types of inter specific interaction?

Ans. The interspecific interaction is broadly divided into three types;

- i. Positive interaction (probiosis): When the interactions results in a benefit of one or both of the species and harm to neither, the results are termed as positive interaction. It includes commensalism, proto cooperation, mutualism etc.
- ii. Negative interaction (antibiosis): these include the relationships between the two species in which one or both the species are harmed in any way during their life period. Clark in 1954 called such type of association as antagonism. The negative interaction includes predation, parasitism, competition, amensalism etc.
- iii. Neutral interaction (neutralism): Neutralism is a neutral interaction in which neither of species is benefitted nor affected. Here a species may not be affected by the presence of other species in benefitted nor affected. Here a species may not be affected by the presence of other species in its environment e.g rat and rabbit live together in a grass land without affected each other. Similarly fruit eating [frugivorous] and insect eating [insectivores] show neutralism.

Q.8. Write about commensalism, Proto cooperation and mutualism?

Ans. Commensalism: commensalism literally means eating at the same table. It is an interaction in which there is relationship between two species in which

one is benefited and the other is unaffected i.e. neither benefitted nor harmed. The species that derives benefit is called commensal and unaffected species is called as host.

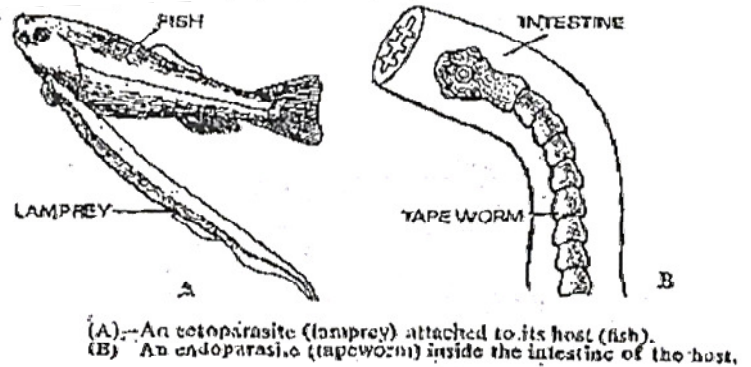
Commensalism which are simply attached to the outer surface of the host are termed as ectocommensals e.g the sucker fish fixes itself to the shark by its sucker and feeds on leftovers and gets protection from predators without harming the shark. Similarly pilot fish follow shark and jackal follows loin and feed on leftovers. The commensal which are found inside the body or host are called as endo commensals e.g the oyster crab lives in the mantle cavity of oyster. In addition to shelter, it also gets food from the host without causing any harm. Similarly a small fish (fierasfer) lives in sea cucumber for shelter and faecal matter.

Protocooperation [or facultative neutralism]: proto cooperation is an association of two species in which both are benefited. However, it is non obligatory as both can survive each other. For example, plover bird enters the mouth of crocodile and eats up leech [which sucks blood of crocodile] the plover bird gets food and crocodile gets rid of leeches which enter its mouth coelenterate sea anemone attaches to the shell of hermit crab. Similarly, tick bird rides on the back of large animals [buffalo, elephant, rhinoceros etc.] the bird picks up the ticks from the animal body, hence obtains its nourishment while s the animal becomes free from these ticks.

Mutualilsm:- This term was first coined by de – berry (1877) and literary means living together. Mutualism is an association of two populations in which there occurs a close and often permanent and obligatory contact and where both the populations are benefited. In such cooperations, each population is completely dependent upon the other. The participating species in mutualism are called mutualists e.g nitrogen fixing bacteria – rhizobium forms nodules on the roots of leguminous plants and live symbiotically with the host. These bacteria obtain carbohydrate (food) and other juices from the plant and inturn fix atmospheric gaseous nitrogen into nitrates for the host plant. Similarly in lichens, algae synthesis food and fungi provide mineral moisture and support. Bacteria (rumenococcus) living in stomach of ruminants gets shelter and food and in turn help in cellulose digestion.

Q.9. Explain Parasitism, competition predation and Amensalism?

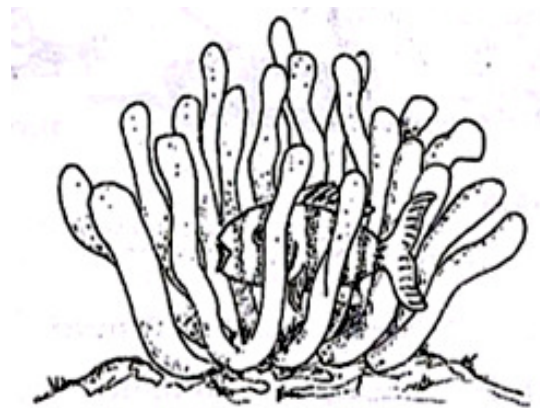
Ans. Parasitism is the case of weak attacking the strong. It is an association between two organisms in which one called parasite (weak) derives its nourishment at the expense of the other called host (strong) parasites may either endo or ecto parasite. The parasite which live within the body of host is called endoparasite. They usually live in alimentary canal, body cavities, blood etc. e.g., *Ascaris lumbricoides*, tape worm etc. the parasites which live on external surface of the host are called ectoparasites w.g., human louse, bed bug lampreys etc. parasites are mostly animals (zoo parasites) however there are some plant parasites (phytoparasites) like *Cuscuta*, sandal wood, *Viscum* etc.



Competition:

The concept of competition was emphasized by Darwin when the two species in the same community require the same resources, as food, shelter, light, water etc. which are in short supply, they interact in such a way that it affects their growth and survival. They are said to be in competition with each other. The competition may be intraspecific competition or interspecific competition. The former case is a competition between the individuals of the same species while as latter case is the competition occurring between populations of different species. Competition is helpful in regulating the population size hence maintain ecological balance.

Gause in 1934 introduced two species of paramecium i.e., *P. aurelia* and *P. caudatum* in one test tube containing fixed amount of food. It was seen that *P. caudatum* could not face the competition and died out.

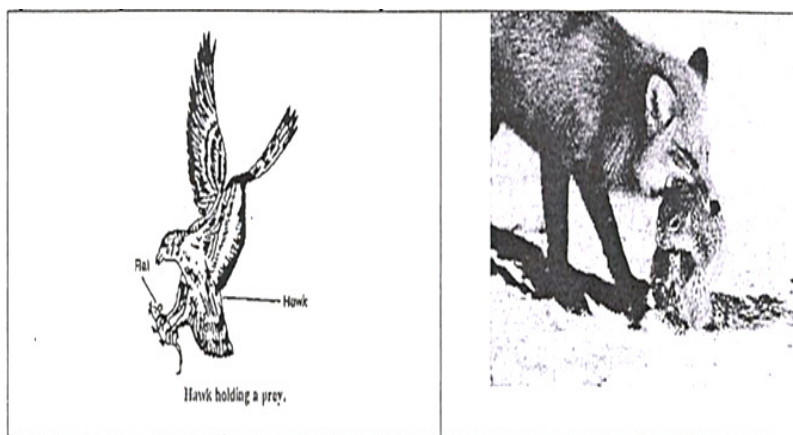


Amensalism (Antibiosis): It is an interaction between two species in which one species causes harm to another

species with its toxic secretion often without gaining any benefit from the interaction. The adversely affected species is called amensal and the affecting species is called inhibitor. e.g., penicillium produces antibiotic-penicillin to check growth of many bacteria (staphylococcus bacterium). Similarly walnut tree produces juglone (a chemical) that inhibits the growth of seedling of some plants like apple, tomato, alfalfa etc. another example of amensalism is – in marine water microbial population called as red tide causes destruction of fish and other animals.

Predation: Predation is commonly associated with the idea of strong attacking the weak. For example, the lion pouncing upon deer, the hawk upon the sparrow or rat. Predation is the association of the two species, one of which captures, kills and eats up the other. The species that captures is called the predator or enemy and the one that is caught is called prey. The predator cannot survive without the prey. For example, lion eats up deer.

Predation keeps the predator and prey populations more or less balanced. Predator population is smaller than prey due to slow rate of breeding. Most of the predatory organisms are animals, but there are some predatory plants also. A number of plants e.g., pitcher plant has pitcher shaped leaves which contain a liquid that attracts, drowns and absorbs insects.



Q.10. What is succession and what are its types?

Ans. Due to change in environmental conditions, one dominant community of the existing communities will be replaced by the another community. This replacement process continues till one of the communities becomes more or less stable. This sequential change of community over a period of time in the same area is known as ecological succession or biotic succession and its final state is termed as climax. Hult (1885) used term succession for the first time for ordinary change in communities, first community inhabited an area is

known as pioneer community, the succeeding ones as transitional communities.

Types of succession or stages of succession:

Ecologists have divided succession into two types which are:

a. Primary succession:

Primary succession means the beginning of succession in any environment which is barren e.g. on a barren rock, in a lake etc. The first group of organisms establishing there are known as pioneers or primary colonizers. It takes longer time usually 1000 years or more to establish as the site is infertile.

b. Secondary Succession:

It takes place in the previously inhibited but somehow disturbed area like overgrazed lands, degraded lands, burnt forests etc. in such sites, growth of some plants like mosses occur followed by herbs, shrubs and finally climax community i.e. forest is produced (it takes 100 - 200) years to produce a forest.

Primary and secondary succession may be of following types on the basis of moisture content.

i. Hydrarch or Hydrosere:

Succession found in water e.g., pond, lake, swamp etc.

ii. Mesarch or Mesosere:

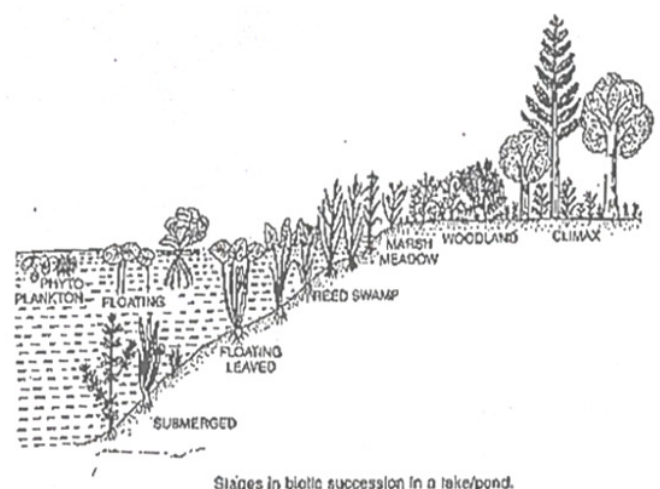
Succession which occurs in an area where adequate moisture is present.

iii. Xeroarch or Xerosere:

Succession which occurs in xeric or dry habitat having little amount moisture.

Q.11. Explain the process of succession in a water body (lake)?

Ans. The pure and clean water bodies like pond and lakes are initially said to be oligotrophic. But soon their water becomes polluted due to various activities of man and then succession sets in. The pond or lake is now said to be eutrophic, in eutrophic lake, a



pioneer community is established which is followed by several other communities and finally a climax community. The lake then changes into a woodland. Presently, our Dal lake suffers from this problem. If the polluting factors of the Dal lake continue sooner or later, the Dal lake will change into dirty swamp and finally into a wooded land and in this way our beautiful Dal lake will disappear from the planet earth.

Q.12. Write an account on indicators of interrelationship?

Ans. In any interrelationship among different organisms, food chain is an indicator which indicates that how food energy is transferred from one organism to another through food chain. Due to the flow of sun's energy, a food chain in an ecosystem get established. Any food chain involve at least three organisms or more e.g.,

Grass → deer → lion

Generally there is a network of food chains resulting in a food web. The food web is a combination of different types of food chains in an ecosystem. The food pyramid is a model, representing the number of organisms consumed at each successive level of pyramid. The size of the level indicates the number of organisms at that level.

Q.13. Write an account on food chain:

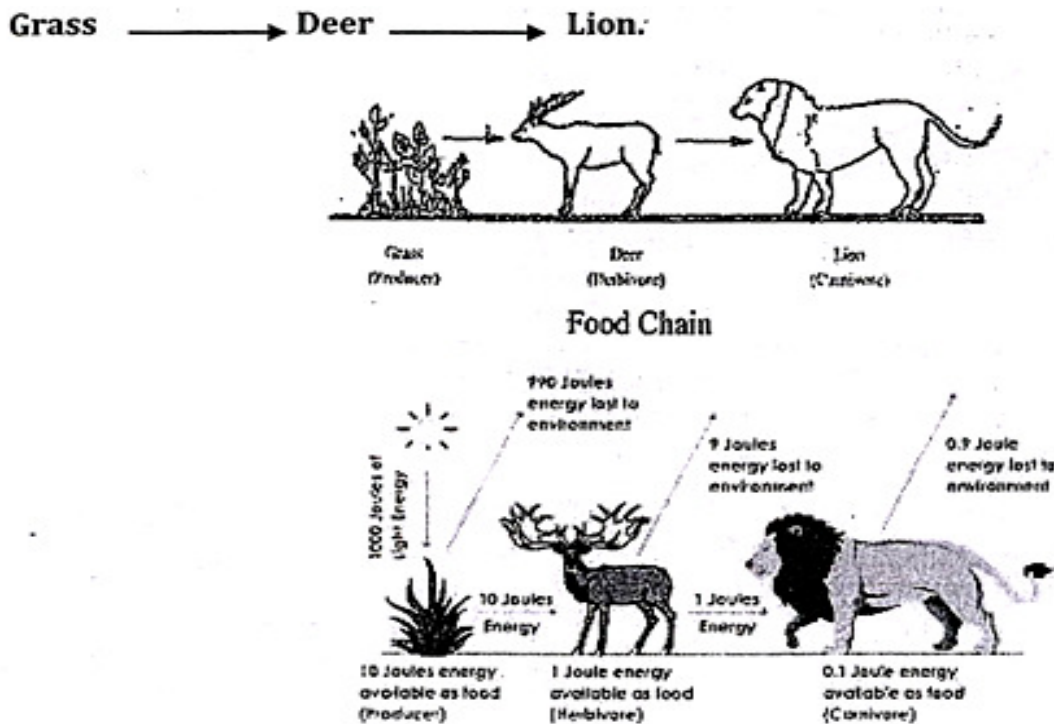
Ans. For existence of life, flow of energy and cycling of materials in necessary. To maintain this flow and recycling of biotic components i.e. producers, consumers, carnivores and decomposers are inter-related and inter-linked with one another. This unbroken linkage is organism becomes food for the other) form food chain.

Characteristics of food chain:

1. A food chain has 2 – 6 tropic levels.
2. It follows 10% law.

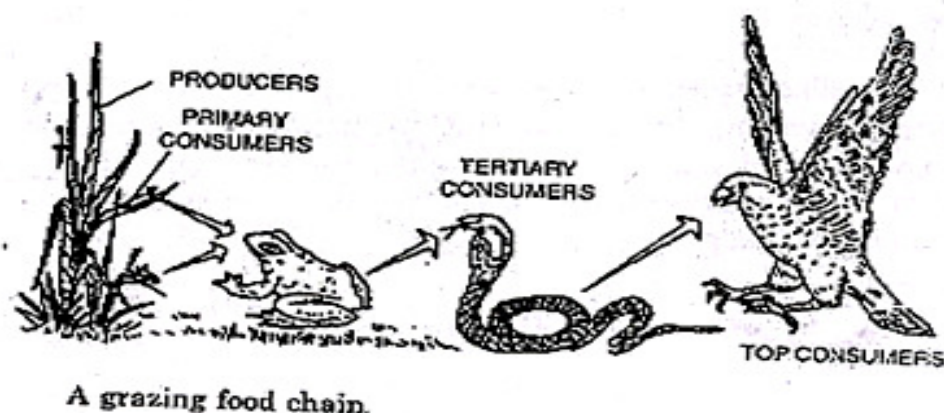
3. A food chain represents single directional (unidirectional) transfer of energy.
4. Each food chain starts with producers and ends with top carnivore.
5. The final link in a food chain is subjected to decomposition.
6. The number of individuals at the successive trophic level goes on decreasing and the size of animals goes on increasing.

In the forest:



In grassland, food chain is as:

Grass → Grasshopper → Frog → Bird → Falcon



In aquatic ecosystem:

Phytoplanktons → Zooplanktons → Small fishes → Large fishes

Q.14. In nature we find two types of food chains:

a. Grazing Food Chain: The type of food chain starts from living green plants goes to grazing herbivores and on the carnivore e.g.

Grass → Rabbit → Fox

b. Detritus Food Chain: This food chain moves from dead organic matter and microorganisms to organisms feeding on them and their predators. Such food chains are thus less dependent on direct solar energy. These food chains help in nutrient cycling. For example

*Mangrove leave → Crabs → Copepods → Insect larva → Shrimps
→ Bivalve Mollusc → Small Game Fish → Large Game Fish
→ Predator.*

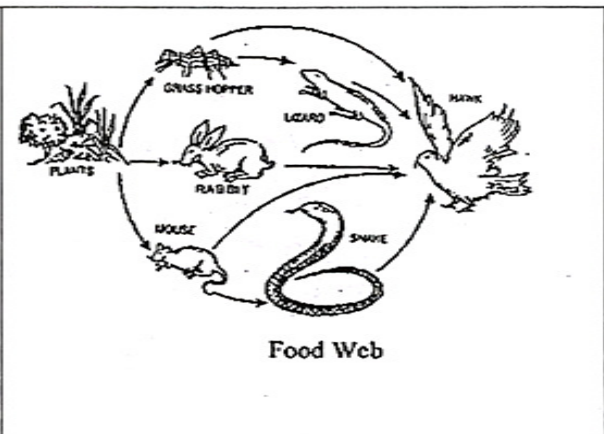
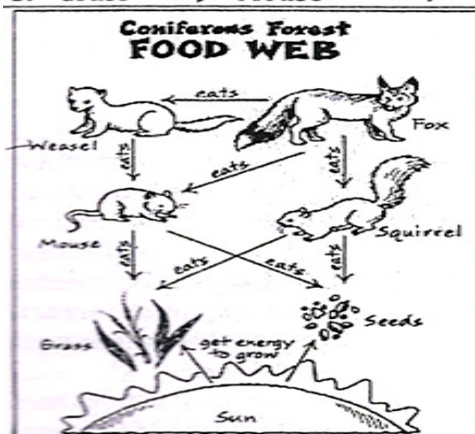
Q.15.Explain Food Web:

Ans. Food chains do not operate in isolated sequence but are rather inter connected with one another. The various interlinked food chains in a community constitute a food web. In simple words, the network of a large number of food chains existing in an ecosystem is called a food web. Food web provides stability to ecosystem and helps an organism to obtain food from alternate source. There can be three food chains in a food web which are as follows:

a. Predatory chain: These begin with plants and proceed small to large animals.

b. Parasitic chain: These proceed form large to small organisms.

1. Grass → Rabbit → Hawk
2. Grass → Grasshopper → Lizard → Hawk
3. Grass → Grasshopper → Hawk
4. Grass → Mouse → Snake → Hawk
5. Grass → Mouse → Hawk

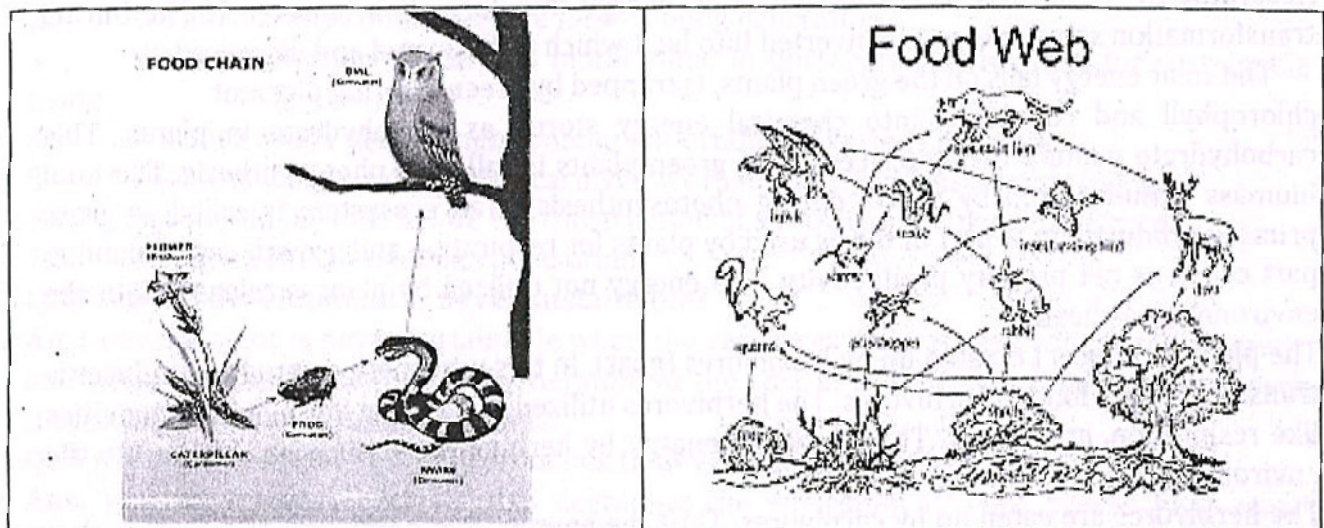


c. Saprophytic chain: These proceed from dead animals to microbes.

Example of food web is as:

In grazing food chain of grassland, in the absence of rabbit, grass may also be eaten by mouse. The mouse in turn may be eaten directly by hawk or by snake first which is then eaten by hawk. Moreover grass is eaten by grasshopper which may be eaten by lizard and which in turn may be eaten by hawk. The below given food web has five types,

- a. It provides stability to the ecosystem.
- b. It provides the alternate sources of food.
- c. It checks the over population of various organisms.
- d. No organism gets starved.



Q.16. Explain trophic levels.

Ans. The entire food chain starting from primary producers and completing with decomposers consists of a number of steps each of which can be regarded as trophic level. In other words, each successive level of nourishment as represented by the links of the food chain is called as trophic level.

Green plants form the base on which food chains built is called primary producers and

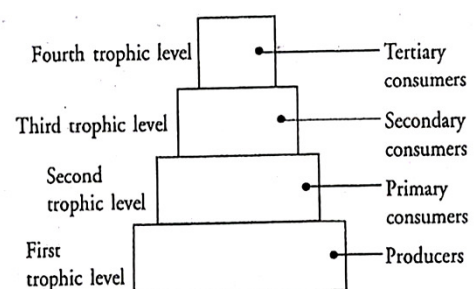


Fig. 5 Trophic levels in a food chain.

constitutes first trophic level. The stored energy of green plants is then utilized by herbivores which constitute the second trophic level – the primary consumer level. Herbivores in turn are eaten by carnivores which constitute the third trophic level – the secondary consumer level. These in turn may be eaten by other carnivores at tertiary level – fourth trophic level. These are in turn eaten by decomposers which constitute fifth trophic level. There is transfer of energy from one trophic level to another.

Q.17. Describe energy flow in an ecosystem.

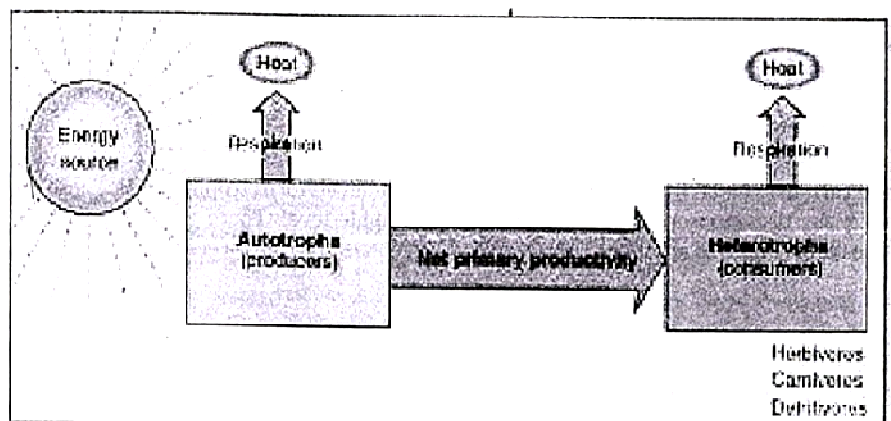
Ans. In any ecosystem there is flow of energy. This flow of energy is based on two important laws of thermodynamics.

According to first law of thermodynamics, energy can neither be created nor destroyed but can be converted from one form to another.

According to second law of thermodynamics, energy transformation is never 100%. During transformation some energy is converted into heat which is dissipated and dispersed.

The solar energy falls on the green plants, is trapped by green coloring pigment chlorophyll and converts it into chemical energy stored as carbohydrate in plants. This carbohydrate manufacturing process by green plants is called as photosynthesis. The total biomass manufactured by plants during photosynthesis in an ecosystem is called as gross primary productivity. A part of this is used by plants for respiration and growth and remaining part called as net primary productivity. The energy not utilized by plant is released into the environment as heat.

The plant (producer) is eaten up by herbivores (goat). In this way energy stored in producer is transferred with food to herbivores. The herbivores utilized this energy for metabolic activities like respiration, growth etc.



the unutilized energy by herbivores is released as heat into the environment.

The herbivores are eaten up by carnivores. Thus the energy from herbivores is transferred to carnivores with food. The carnivores utilized this energy for metabolic activities like growth and respiration. Some of the energy not utilized by carnivores released as heat into the environment. This transfer energy process is repeated by top carnivorous and so on.

Characteristics of energy flow:

- a. Energy flow is unidirectional from sun to the consumers.
- b. There is continuous transfer of energy from one trophic level to the next one.
- c. At each transfer about 80 – 90% energy is lost as heat.
- d. At each transfer, some of the energy is utilized by the living thing for their own metabolic activities.

Q.18. What is the role of system resilience in maintaining the stability in an environment of disturbance?

Or

Write a note on Resilience.

Ans. We know that disturbances occur all the time in an ecosystem. An ecosystem is said to be stable when it maintains its original conditions. Minor disturbances in an ecosystem are easy to handle and are less harmful. On the other hand large scale disturbances cause havoc in an ecosystem. Such disturbances are difficult to repair. When any ecosystem gets disturbed by human activities and it is able to recover its disturbance is and is called as resilience stability. Therefore, resilience is the ability to repair. In other words, resilience can be defined as the ability of a system to maintain its structure and pattern of behaviour in the face of disturbance e.g if we burn, a grassland, it burns easily and it also recovers very quickly and fast in a few months. On the other hand, it is difficult to burn woody forest as the trees have thick and hard bark but if it burns it never recovers. The example above cited shows that grassland has high resilience stability as compared to woody forest.

Q.19. What are Rapid Appraisal methods? Explain with an example.

Ans. Rapid appraisal (RA) is a fast assessment process, which is adopted to enable local experts and citizens to rapidly assess the state of the environment. The R.A has following objectives:-

To ensure a consistent set of data, an environmental data questionnaire is used.

To observe the nature, trends and factors that influence environmental quality, a common frame work for preparing an environmental profile is developed.

Presently RA is applied in antipoverty programmes, disaster management, AISA awareness programmes, natural resource management, solutions for environmental problems etc. RA provides a strategic first step in environment planning and management.

The best example of Rapid Appraisal is participatory rural appraisal [PRA]. It is a method behaviour and approach to the analysis of local problems and their solution with local stake holders. It makes use of a wide range of visualization method for group based analysis to deal with spatial and temporal aspects of social and environment problems. PRA provides a structure and many practical ideas to help to stimulate local participation in the creation and sharing of new insights. PRA is also used to deal with higher level systemic problems.

Q.20. Describe bioindicators for environmental monitoring?

Ans. It is found that certain species of microbes, plants and animals have one or more specific requirement and they become very much limited in their distribution. Thus the occurrence of such species in a particular area indicates special habitat conditions and such species are called bio indicators or biological indicators or ecological indicators. Since they indicate some very specific conditions of the environment.

A number of microbes act as indicators of environmental pollution e.g. E.Coli indicates pollution in marine environment and cyanobacteria indicates soil pesticides. Lichen like *parmelia physodes* is very sensitive to SO₂ and HF

and die at very higher levels of SO_2 . Decreased population of the lichens in an area is thus indicator of air pollution.

Plants like ultricularia, chara, volfia, prefer to grow in polluted waters and hence indicates pollution. An algae cladophora is absent in polluted water. The withered flakes of tobacco plant and chlorotic falkes of pinus needles indicate presence of ozone in the area. Similarly evergreen forests indicate high rainfall in winter and summer xerophytes indicate very low rainfall.

Absence of earthworms in a soil indicates solid radioactive pollution. Absence of fish in a pond or lake indicates acid rain in those water bodies. Some protozoans [Fucilinds] indicate petroleum deposits in the area.

Q.21. “A better quality of life is fundamentally dependent upon the quality of the environment in which we live”. Comment.

Ans. Quality of life simply means degree to which an environment satisfies the needs and expectations of the organisms (man) in which it lives. Better quality of life depends upon the quality of the environment. Under natural conditions organisms live together influencing each other's life directly or indirectly. There are intra specific (e.g social organization, communication etc.) as well as intra specific (Mutualism, parasitism etc) interactions among organisms. The living organisms also interact with abiotic environment and in this way ecosystem comes into existence. In each ecosystem whether small or big lies an ecological balance. The ecological balance is maintained by sustainable development. Sustainable development is the development that meets the needs of the present without compromising the ability of the future generation to meet their needs. If this ecological balance is maintained, the quality of life as well as quality of environment remains upto mark. If ecological imbalance occurs, it destroys quality of life as well as quality of environment. The ecological imbalance occurs due to human activities and interventions like deforestation, habitat destruction, burning, agricultural activities etc the quality of environment have been deteriorated and this in turn affects the quality of

life badly. If these factors are not checked or controlled, the life will perish on the surface of earth.

Q.22. What is the role of beliefs and values in environment?

Ans. Values are generalized principles of behavior and a belief is the feeling of certainty that something exists is true. Belief makes one to adopt the right attitude towards environment. Following are the role of beliefs and values which help in imparting the environmental education.

Social value like love, sympathy, tolerance and justice need to be woven unto environmental education. Value like respect and care towards all forms of life must be nurtured to protect the environment.

Our culture, customs, rituals and religions teach us to act in such a manner as would protect the nature including the environment.

In some religions water bodies lakes, springs etc are considered sacred e.g Pushkar lake in Rajasthan, Mattan spring in J&K (Anantnag district), Khecheopalri lake (Sikkim), similarly in some religion animals like cow (Hindi Religion), Ashoka tree, Bargad tree(as gautam bhudha has worshipped under it.) bel tree (associated with lord shiva), tulsi (with lord Vishnu) etc. in most areas big trees are considered as goddess by villagers. These religious beliefs help inprotecting the water bodies, plants and animals.

Q.23. What are the choices we are left with and what are the technological and ethical solutions we should adhere for sustainable development?

Ans. Various pollution control methods are very expensive as they require detailed processes. Removal of harmful substances, dilution and disposal becomes energy consuming. Small scale industries go for Common Effluent Treatment Plants [CETPs] but these are also dependent on earnest efforts. Many communities have opposed industrialization in their areas. Human activities like mining, dam construction etc. have greater impacts on man and natural populations. Their control and abatement have also to be looked at.

There is need of ethical solution in reducing effluent emission, reduce resource consumption and use mostly renewable resources. So we should be sincere

about pollution control and resource conservation and so for betterment of the people.

Ethical solution also involve participatory planning and informing the public about the impact that the activity is going to have seek their suggestion, implement them and seek their permission, timely inform authorities and public about adoption of practices would also be included in ethical solutions to many of issues brought by technological development. Waste minimization is one of the roads to ethical solutions to many of issues brought by technological development. Waste minimization is one of the roads to ethical solution.

Q.24. What are the strategies you would like to propose for a sustainable living?

Ans. I would like to propose following strategies for sustainable living.

- a. We must use resource in a wise manner.
- b. We must always think and care for incoming generation.
- c. We must develop ethical and moral value in ourselves that is a key for sustainable living
- d. We must aware general public about importance of various resources.
- e. We must conserve our biological diversity that is a key for sustainable living.
- f. EIA should be done before the construction of a project like dam, industry etc.
- g. To have a check on human population.

Q.25. When the development is never sustainable?

Ans. Development is never sustainable when the resources are not used wisely and properly and when we sacrifice our future generation at the cost of present development. Moreover there is degradation of natural systems.

Q.26. Write a note on ecological approaches to development.

Ans. We know that poverty is also degrading the environment. Poor people keep more children so that they become earning hands. This goes against development and environment. Hence the ecological approach to development which focuses on improvement of quality of life of poor people. Through resources generated from the community. One of the ecological approaches to development is environmental impact assessment (EIA). Waste minimization is a technologically and ethically an ecological approach. Sustainable development is also an ecological approach to development.

Q.27. What are the various issues and problems of environment?

Ans. There are a number of environmental issues and problems which become the main focus for all national and international environmental protection agencies in recent past. If these problems are not checked properly, the whole biosphere will change into a blast furnace. Some major issues and problems are:

- a) The climatic system:** These include those issues and problems that are linked with global climate. This result due to emission of greenhouse has emission resulting in global warming which in turn given rise to dangerous results. Worldwide deforestation is also an issue.
- b) Decline of ecosystem:** Natural ecosystem have been significantly altered by man to meet his needs by changing pattern of biogeochemical cycles like N, C and S.
- c) Population explosion:** it is a main issue and problem of environment at present. It is the root cause of all other problems like deforestation, exploitation of natural resources and environmental pollution etc.
- d) Bio – diversity loss:** Biodiversity means total number of organisms (microbes, plants and animals) on the planet earth. It is very important issue. Destruction of bio – diversity results in ecological imbalance which is harmful for survival.

Besides the above mentioned issues and problems of environment the other includes natural resource exploitation, soil pollution, desertification, acid rain, ozone layer depletion etc.

Q.28. What are the various solutions to environmental problem?

Ans. Present environment is full of environmental problems. If these problems are not solved or controlled soon, the planet earth would become a lifeless one. So various proposed solution to environmental problems are as under:

- i. Preservation and conservation of wild life by setting up of national parks, sanctuaries, biosphere reserves, zoos, botanical gardens, gene banks etc.
- ii. Sustainable use of resources and also by adapting 3R^s practice i.e reduce, reuse and recycling.
- iii. The ethical value of environmental protection should guide day to day actions, decisions of individuals, communities, corporations and nations.
- iv. One of the important solution to various problems which are threat to life are to make environmental literate people.
- v. Use eco friendly technology.
- vi. Social impact assessment and environmental impact assessment are important solutions for future environmental problems.

Q.29. What are the issues and problems of a technological Era?

Ans. In technological era, the industrialization, no doubt made our life happy and comfortable, but at the same time brings various issue and problems. Various toxic chemical and effluents released from these industries enter into water, air and soil respectively. These cause a permanent change in environmental resource and loss of biodiversity which in turn results in ecological imbalance. Besides making the land totally infertile and unproductive, the technology eras has brought many diseases by polluting the environment which is the issue and problem at present.

The biggest issue that industrialization brings with it is an increase in poverty, especially among the unskilled persons, since most often the automation

achieved through industrialization is labour saving was done by unskilled persons earlier. Hence their wages drop and simultaneous rise in cost of food and housing and hence made them poor.

Q.30. Explain the understanding interacting problems of the environment?

Ans. The environment in which we live is the soul for our life. Everyone of us had to play a crucial role in this environment. One of the important roles to play is to understand the problems of environment of the locality in which one lives or in total e.g problem like water pollution in the locality or population explosion in the country or situations of the poor. After the complete understanding of the problem (like cause of problem, effects of problem etc) the problem is to be interacted with the people (both men and women) government and NGO's. After it, measures are taken for the eradication of the problem so that the environment may become fit and safe for living.

Q.31. Comment upon identifying variables and determining relationship between variables?

Ans. Variable simply means anything which will vary from time to time. Every variable of the ecosystem is to be identified by ourselves may it be behaviour or any other. Firstly, we have to study the human behaviour which is very important as every problem in the environment is created due to human activities and interventions. We also have to analyse the value of variables and their ecological significance e.g food chain and food webs stabilize the ecosystem and in this way maintain the whole balance.

After analyzing the whole ecosystem we have to determine the relationship between the variables. Under situation, organisms live together influence each other's life directly or indirectly. Such vital processes as growth, nutrition and reproduction depends very much upon the interaction b/w individuals of the same species or b/w those of different species. Further

the relationship between the variables may be positive [beneficial] or negative [harmful] depending upon the type of variable.

Q.32. Give an analysis on symptoms vs problems.

Ans. To achieve better quality of life, there is need of sustainable development. The parameters of quality is not determined by quality of life of one of two persons but is determined by all living species including man and the non – living objects too. Development should not occur from economical point of view but also from ecological point of view.

There should be ecological approach to development which does not neglects economic development. It ensures that present economics is conducive to resource conservation. The biggest challenge in this regard is to be able to measure this quality and express it in mathematical terms. It is measureable but requires braoder formula, more data collection and accurate calculation. This is more beneficial for the results that can be integrated into an ecological index (EI) which will not for a longer period and give the flexibility of trying out long term measures to address issues and problems.

Q.33. What do you mean by research and what is its importance?

Ans. Research in common refers to a search for knowledge and it is an art of scientific investigations. According to Redman and Mory; research is a systematized effort to gain new knowledge. According to Clifford Woody, research comprised of defining and redefining problems, collecting, organising and evaluating data making decisions and reaching conclusions, and at last carefully testing the conclusions to determine whether they fit the formulating hypothesis.

Importance:

Research has a great importance in every field. Research provides the basis of nearly all government policies in our economic system. Research is important in collecting information on the economic and social structure of the country. Research has great importance in solving various operational and planning problems of business and industry. Research indicates scientific and

inductive thinking and it promotes the development of logical habits of thinking and organisation. Research is helpful in studying social relationships and in seeking answers to social problems.

Q.34. Today what are the questions for research for protecting the environment?

Ans. Everyone has a right to formulate questions for research after having complete understanding and knowledge about the changing environment. The environment is common to all so everyone has right to know about every sphere of this changing environment. Mostly the question should be based on the global problems like; if we continue to use natural resource at the same speed at present what would be left for future generation?

The research for environmental studies can be planned under the following headings:-

- a. Searching for problems:** This is the first step in the procedure of environmental research. Sometimes the problems in the environment emerge and sometimes the problems are searched. The nature and dimension of problem is felt. Its effects are being analysed thoroughly. Everyone has to generate problem at their own level.
- b. Searching for solution:** When problems are searched in the environment then a number of solution are analyzed and it is also ensured that upto what extent any proposed solution is going to eradicate the problem. Sometimes new solutions are being searched for. Everyone can plan a research for the eradication of the problem. If everyone of us will do so the environment will be better for living.
- c. Making the hypothesis or specification:** After determining the efficacy the particular solution of a problem, then a hypothesis is generated.

Q.35. What is social Impact Assessment (SIA)? Describe its various elements.

Ans. Social Impact Assessment: The process that is designed to take into account the social effects of a project to be developed. The main

objective is to predict the direct and indirect effects of a proposed project on the social environment.

The various elements of SIA are as follows.

a. Important land marks: The landscape parameters examined most often are visual impacts and transportation infrastructure which are assessed by geographers, landscape planners or urbanists. They mostly stress on mitigation or compensation measures. E.g. Noise levels and odour emission are extensively discussed in SIA.

b. Land use and occupancy patterns: The social scientists often survey for land use and occupancy. This mostly serves to identify who uses the land and resources potentially affected by the proposed project, to clarify identity, environmental step ward ship and ownership issues concerning these lands as well as to document the different types and intensity of resources use.

c. Social and community indicators: In regard to human environment, the main indicators assessed relate to social organization, public services and utilities, social demographic description, important demographic data to look for in a SIA include sex ratio, age structure and immigration and emigration.

Q.36. Describe the basic model for Social Impact A.

Assessment SIA:

Ans. The link between EIA and SIA on social environment resembles biophysical impacts in various ways given below:

a. Social and biophysical impacts vary from desirability i.e. ranging from favour to not favour.

b. It involves duration of impacts in time and space. i.e. it is either short lived or long lived and some communities return to normal quickly and some not.

c. Social impacts also vary in intensity.

d. Both types of impact differ in the degree are likely to be cumulative at one extreme or mutually counter balancing at the other.

Q.37. Discuss various steps involved in Social Impacts Assessment process.

Ans. Social Impacts Assessments involves following steps:

a. Public involvement: It means to develop effective public plan for involvement of effected people. It includes those who live nearby project, people who are forced to migrate etc.

b. Identification of alternative: It means to describe the proposed action or policy change and reasonable alternatives.

c. Baseline conditions: The baseline conditions are the existing conditions and the past trends associated with the human environment in which the proposed activity is to take place.

d. Scoping: It includes identifying the full range of probable social impacts that will be addressed based on discussion or interviews with affected members.

e. Projection of estimated impacts: It investigates probable impacts which will be formulated in terms of predicted conditions without the actions, predicted condition with the actions, and predicted actions that can be interpreted as the difference between the future with and without the proposed action.

f. Predicting Responses to impacts: It includes that the assessor must estimate how the affected people will respond in terms of attitude and action.

g. Indirect and cumulative impacts: Indirect impacts occur later then the direct impacts and cumulative impacts result from the incremental impacts of an action added to the past, present and future actions.

h. Change in alternatives: It recommended new or changed alternative and estimating the likely bad effects.

i. Mitigation: It means to develop a mitigation plan. An SIA not only forecasts impacts, it should identify the means to mitigate adverse impacts.

j. Monitoring: It means to develop a monitoring programme which is capable of identifying deviation from the proposed action.

Q.38. How do we identify probable environmental impacts? Describe various methods used in identification of impacts.

Ans. A number of methods are available for the identification of impacts. To select the more specific impacts we need to have more specific aims. We identify probable environmental impacts by:

- a. To allow comparison of alternative development proposal.
- b. To consider impacts within the constraints of an area's carrying capacity.
- c. To incorporate qualitative as well as quantitative information.

Following are the methods used in identification of impacts:

- i. **Checklists:** It is based on biophysical, environmental, social and economic factors that may be affected by development. They may be simple matrices, time dependent matrices, magnitude matrices and weighted matrices.
- ii. **Quantitative method:** Quantitative methods of impact identification attempt to compare the relative importance of all impacts by weighing standardizing and consented impacts to produce a composite index.
- iii. **Networks:** These recognize that environmental system consists of a complex web of relationships and try to produce a web.
- iv. **Overlay maps:** These are a series of transparencies used identify, predict, assign relative significance to and communicate impacts, normally at a scale larger than local.

Q.39. What do you mean by EIA? Why it is required and what are its key elements.

Or

What is EIA? Describe the process of EIA.

Ans. EIA is a process which attempts to identify, predict and assess the likely consequences of proposed development activities.

The EIA is required to integrate environmental protection and economic decisions at the earliest stages of planning an activity. It aims of environmental protection and sustainable developments.

Key elements of EIA or process of EIA:

Key elements of EIA include:

- a. Scoping:** Identifying key issues and to determine where more detailed information is needed.
- b. Screening:** It decides if a project requires assessment and to what level of detail.
- c. Identifying and evaluating alternatives:** List alternative sites and techniques and the impacts of each.
- d. Mitigating measures dealing with uncertainty:** Reviewing proposed action to prevent the potential consequences of the project.
- e. Issuing environmental statements:** Reporting the findings of the EIA.

Q.40. Impact prediction, evaluation and mitigation step is the heart of EIA process. Comment.

Ans. Prediction: The objective of prediction is to identify the magnitude and other dimensions of identified change in the environment with a project in comparison with the situation without that project. Prediction also identifies the direct and indirect impacts and their duration. It also differentiates qualitative from quantitative impacts.

Evaluation: When impacts are predicted, their relative significance is assessed. Criteria for significance include the magnitude and likelihood of the impact and its spatial and temporal extent, the likely degree of the affected environment, the level of public concern and political bad effects.

Mitigation: It simply means making something less harmful. It is used in order to avoid and minimize the impacts and if possible find a remedy for consequences.

Q.41. Describe various models used in predicting environmental impacts:

Ans. Various models of predicting environmental impacts are given below:

- a. Mechanistic or Mathematical Models:** These models describe cause effects relationship as mathematical functions. It can range from simple direct input-output relationship to more complex dynamic mathematical model with an array of relationship. These models are either deterministic or stochastic.
- b. Mass balance models:** These models establish a mass balance equation for a given entity named as the water stream, a volume of soil etc. inputs to the entity could be water energy, food or chemicals, outputs could be effluent water, waste or diffusion to another entity. Changes in the contents of the entity equals to the sum of the inputs minus the sum of the outputs.
- c. Statistical models:** These models use statistical techniques like regression analysis to describe the relationship between data test hypothesis or extrapolated data. These are mostly used in pollution monitoring study.
- d. Physical image or architectural models:** These models are illustrative or scale models that replicate some elements of the project environmental interaction.
- e. Field and laboratory experimental methods:** These methods use existing data, often supplemented surveys to predict impacts on receptors. E.g. testing of pesticide in a pad.
- f. Analogue models:** These models make predictions based on analogue situations. They include comparing the impacts of proposed development to a similar existing development. These models can be developed from site visits, literature and earaches or monitoring of similar projects.

Q.42. Briefly describe role of participation, presentation and review in a EIA process?

Ans. Role of participation: It ensures the quality, comprehensiveness and effectiveness of EIA. It also ensures that public views are taken into

consideration in the decision making processes. It provides knowledge about the site and also provides mitigation measures.

Role of presentation: It describes proposed activity and the potentially affected environment. It describes practical alternative. It provides mitigation measures of the proposed activity.

Role of review: It assesses the validity and accuracy of information. It also ensures whether there is further need of information or not. It also advises whether a project is allowed or not.

Q.43. How useful is monitoring and auditing after the decision has been taken for any project?

Ans. Useful Monitoring: Monitoring involves the measuring and recording of physical, social and economic variable associated with development impacts. It is very much useful. It provides information on the characteristics and functioning of variable in time and space especially on magnitude of impacts.

It can improve project management. It warns us earlier about harmful effects. It can also provide an accepted database which is used in mediation between interested parties.

Usefulness of Auditing: An environmental audit is a systematic independent internal review to check whether the result of environmental work tally with the targets. It focuses on whether the methods used to achieve goals are effective. Both monitoring and auditing can make important contributions to the better planning and EIA of the future projects. An environmental audit also studies whether there are any deviations between targets and results. It involves comparing the impacts predicted in EIS with those that actually occur after implementation.

Q.44. Describe the process of consideration of alternatives.

Ans. When EIA is done to a project and it is found that it has lot of environmental impacts then feasible alternatives are under taken. The developer on the basis of technical, economical and regulatory grounds rejects

most possible alternatives and this step is called “the heart of the EIA”. Consideration of alternatives begins early in the planning process before the type and scale of development and its location is selected

Q.45. What is the purpose (objective) of EIA?

Ans. The main purpose of EIA is:

- a. To support the goals of environmental protection and conservation and sustainable development.
- b. Integrate environmental concern before doing any development activity.
- c. Predict environmental, social, economic and cultural consequences of any developmental activity and to assess plans to minimize its bad impact.
- d. Involve public and govt. in the review of the proposed activity.

Q.46. Give the main features of environmental impact assessment (EIA)?

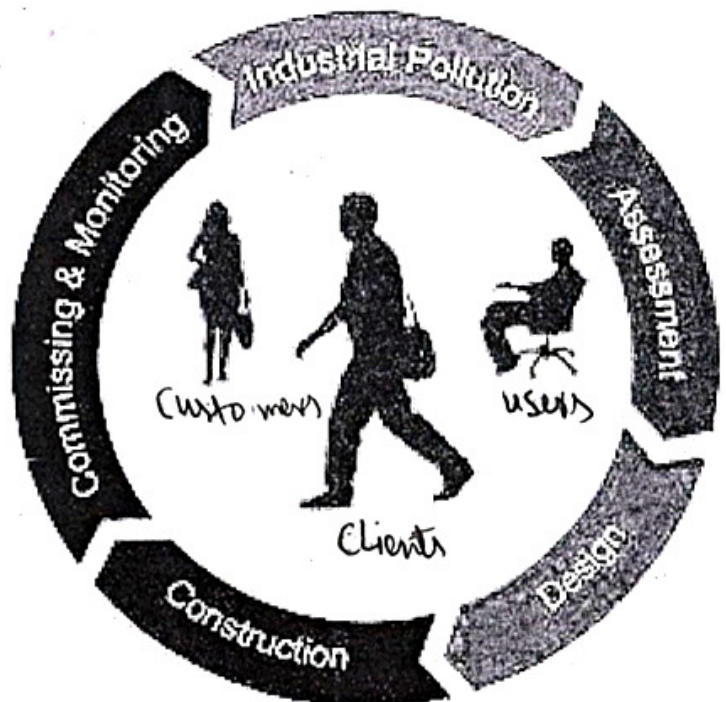
Ans. The main features of EIA are as under:

- a. It is a programme that assesses the effect of any action or project on our environment. Before installing the projects like river valley project, mining projects, industrial projects, their impacts are being thoroughly analyzed on the environment.
- b. This programme can be used to measure the magnitude of effect so that the decision can be taken to install or to reject a project or action.
- c. This plan can help in removing certain projects as are harmful for the environment.
- d. The programme can help in improving the conditions of various projects so that they become environment friendly.
- e. The important feature of this programme is to involve the scientific and technological knowhow in the conservation of environment.

Q.47. EIA is an effective tool and decision making instrument. Discuss.

Ans. EIA can be of great importance as it can provide a planning tool and can be used as decision making instrument it can act as an aid to the formation of development issues. EIA indicates areas where the projects can be modified to minimize the adverse impacts early in planning of a development project. EIA plans out the different aspects of developmental projects with respect to environment. It is used for early warning planning of a wide range of resource and helps in sustainability of environment. EIA reveals a clear cut identification of overall [social environmental as well as economic] impacts of various developmental activities prior to decision making. By EIA, both environmental as well as economic benefits can be achieved.

In a nutshell, EIA is used as an effective tool and decision making instrument as it predicts environmental impacts in beginning in project planning and design to find out ways to minimise the effects.



Short Answer Type Questions

Q1. What is stability? Write a note on ecosystem stability.

Ans. Stability of an ecosystem can be defined as the property of an ecosystem to keep a balance or to develop the forces to restore the condition of the system that gets disturbed from its equilibrium state.

There are two types of ecosystem stabilities:

- a. Resistance Stability:** It is an ability of an ecosystem to resist disturbance and maintained its original state.

b. Resilience Stability: It is an ability of an ecosystem to recover to disturbance.

Q2. Write short note on critical variables and state variables.

Ans. Critical variables: the biological indicators [species] that respond rapidly to environmental change are called as critical variables. These include insects, rodents, algae etc. These are very useful which facilitate impact monitoring and in detecting climatic change.

State Variables: The biological indicators that adapt mitigate and improve generalized resistance are called state variables. These include invasion of exotic species.

Q3. What do you mean by predicting and assessing system response?

Ans. The predicting and assessing system response means the estimation of impacts by the assessor about how the affected people will respond in terms attitude and action after the estimation of direct impacts. Their attitudes before implementation predict their attitudes after wards.

Q4. What is Mitigation?

Ans. Mitigation is repairing, rehabilitating or restoring the effecting environment not merely action taking, limiting proposed action and its implementation. Mitigation is used to in order to avoid lessen and if possible find a solution and cure for significant adverse effect. Through mitigation environment is kept in its original state. Mitigation measures must be planned in an integrated and coherent manner to ensure that they are really effective and also do not conflict with each other.

Q5. Write an account on Ecological Niche.

Ans. Ecological Niche: A habitat is a description of where an organism is found. But its niche is a complete description of how the organism relates to

its physical and biological environment. The term niche is a latin word – nidus meaning nest, first coined by J.Grinnel in 1917 to describe the place of an organism in the environment. Ecological niche includes not only the physical space occupied by an individual but also its functional role in the community. The niche concept was popularized by zoologist G.E Hutchinson. Ecologists defined ecological niche as ‘habitat together with functions performed by a species in ecosystem’. E.g

- a. Niche of a rabbit: Its habitat is grasslands or open woodland. It is herbivore. It eats grass, vegetable (turnip, carrot, lettuce). It digs the soil to make burrow for living; it adds fecal pellets to the soil which may be eaten up by dung beetles. Rabbit may be eaten itself by dog, cat or fox.
- b. Niche of an Ashoka tree: Its habitat is plain it absorbs water sunlight for photosynthesis. It absorbs water and mineral from soil, it supports creepers it provides shelter to many animals. It covers the ground with its fallen leaves etc.

Q6.Difference between Habitat and Ecological niche?

Ans.

Habitat	Ecological Niche
It is the living place of an organism.	It is the position and function of an organism.
It is an “address” of an organism.	It is the “occupation” of an organism.
e.g Habitat of a Rabbit is Grassland.	E.g Niche of Rabbit is that it eats vegetation, make burrows, and fecal matter to the soil and is eaten by fox or dog.

Q7.What is ten percent (10%) law?

Ans. The ten percent [10%] law is given by Lindemann in 1942. According to him, only 10% of the energy entering a particular trophic level of

organisms are available for transfer to the next higher trophic level. Simply, it means energy available at each successive level is 10% of the previous level. Hence there is gradual reduction in the amount of energy available as we go from producer level to the higher trophic level of organisms. All the energy transfers in food chains follow the 10% law. So no transfer of energy is 100%.

Q8. What is cost benefit approach?

Ans. The approach that assumes a common utilitarian ethic with a single evaluation criterion. These expressed in monetary units is called as cost benefit approach. It is based on welfare economics and includes all the relevant costs and benefits to evaluate the net social benefit of the project.

Q9. What is an ecological balance?

Ans. All organisms in a biome depend upon one another in order to survive and control the number of one another. The result of this complete event is a perfect balance in nature. This balance is called ecological balance. Ecological balance is maintained by sustainable development. If the ecological balance is maintained the quality of life as well as quality of environment remains upto the mark. Ecological imbalance leads to destruction of quality of life.

Q10. What are the major variables of trophic interaction in an ecosystem?

Ans. Time and space

Q11. In which type of symbiotic relationship do two different organisms benefit from each other?

Ans. Mutualism

Q12. In which type of relationship one partner is benefitted from the relationship while the other partner is harmed?

Ans. Parasitism

Q13. Give an example of commensalism.

Ans. Shark and sucker fish

Q14. Which is the energy processing and nutrient regenerating unit in the environment?

Ans. Ecosystem

Q15. Define interaction?

Ans. The individuals in a community affect each other in one way or other for food, space etc is called as interaction.

Q16. According to which philosophy all the nation's natural resource should be available for human development and management?

Ans. The "Utilitarian philosophy" of scientific resource development states that all the nation's natural resources should be available for human development and management.

Q17. What are new methods of production and manufacture which concentrate on conserving the resources and the environment?

Ans. Clean technologies are the new method of production and manufacture which concentrate on conserving the resources and the environment.

Q18. Which type of succession starts from the substrata prepared by the already existing living matter?

Ans. Secondary succession.

Q19. Which community dominates for a long period of time and is stable to short – term disturbances?

Ans. Climax community

Q20. Which ecological model represents the number of organisms consumed at each successive level?

Ans. A food pyramid

Q21. What are the two main proposed solution to the environmental problems?

Ans. Proper utilization of resources and preservation of nature.

Q22. What is Mutualism?

Ans. Mutualism is an association between two different species in which both organisms are benefited e.g association between Rhizobium and leguminous plants.

Q23. What is parasite and a host?

Ans. Parasite is an organism which live in or on the body of other species e.g louse, ascaris etc. A host is an organism on which parasite feeds e.g Man, Horse etc.

Q24. What is predator and prey?

Ans. Predator is an organism that captures and kills the other. Prey is an organism that is captured and killed by predator e.g lion eats deer. Here lion is predator and deer is prey.

Q25. Define food chain?

Ans. All those organisms which are attached with one another from the food point of view form a food chain e.g

grass → deer → lion

Q26. What is food web?

Ans. The various interlinked food chains in a community constitute food web.

Q27. Define resilience?

Ans. Resilience can be defined as the ability of the system to maintain its structure and pattern of behaviour in the face of disturbance.

Q28. What is biological indicator?

Ans. The occurrence of some species in a particular area indicate some very specific conditions of the environment are called Biological Indicators.

Q29. What is Eutrophication?

Ans. Eutrophication is a phenomenon in which the productivity of certain water bodies increases as a result of water pollution.

Q30. What is Ecological Succession?

Ans. Ecological succession can be defined as an orderly and progressive replacement of one community by another until a relatively stable community occupies the area.

Q31. Define environmental impact assessment [EIA]?

Ans. EIA is a process which attempts to identify, predict and assess the likely consequences of proposed developed activities.

Q32. What series of transparencies are used to identify, predict, assign relative significance to and communicate impacts, normally at a scale larger than local?

Ans. Overlays model

Q33. What do you mean by planning research?

Ans. planning research is a process of how search for knowledge in a particular are or field is designed like environmental field. It helps us to measure the impacts of anthropogenic activities on environment and enables us to minimize these impacts.

Q34. Which models are particularly effective for describing physical changes such as the flow of water in a river or the floe of energy through the ecosystem?

Ans. Mass balance.

Q35. What is an equation technique that assumes a common utilitarian ethic with a single evaluation criterion, called?

Ans. Cost benefit approach.

Q36. What involves comparing the impacts predicted in the EIS with those that actually occur after implementation?

Ans. Auditing

Q37. Which type of identification techniques is based on a list of biophysical, environmental, social and economic factors that may be affected by development?

Ans. Checklists

Q38. Which quantitative method recognizes that environmental systems consists of a complex web of relationships?

Ans. Networks

Q39. Which models describe cause effect relationship as mathematical functions?

Ans. Mathematical models

Q40. Which models are statistical techniques such as regression analysis to describe the relationship between data, test hypothesis or extrapolated data?

Ans. Statistical models

Q41. Which models compare an unknown environmental impact with a known environmental impact?

Ans. Analogue models