KARPAGAM ACADEMY OF HIGHER EDUCATION

COURSE NAME: Environmental and Agricultural Microbiology

CLASS: I M.Sc Microbiology UNIT-I **BATCH-2019-2021**

COURSE CODE: 19MBP204

Semester – II19AEC201 ENVIRONMENTAL STUDIES (3H –3C)

Instructional Hours / week: L: 3 T: 0P: 0 **Marks:** Internal: **40** External: **60** Total:**100**

End Semester Exam: 3Hours

Course Objectives

- To create the awareness about environmental problems among people.
- To develop an attitude of concern for the environment.
- To motivate public to participate in environment protection and improvement.

Course Outcomes (COs)

1. Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.
2. Master core concepts and methods from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies and institutions.
3. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales.
5. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
6. Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.
7. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as interdisciplinary scholars and/or practitioners.

Unit I – INTRODUCTION - ENVIRONMENTAL STUDIES & ECOSYSTEMS

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem.Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. Forest ecosystem, GrasslandEcosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit II - NATURAL RESOURCES - RENEWABLE AND NON-RENEWABLE RESOURCES

Natural resources - Renewable and Non – Renewable resources. Land resources and land use change, Land degradation, soil erosion and desertification. Forest resources -Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.Water resources- Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water.Use of alternate energy sources, growing energy needs, case studies.Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

Unit III - BIODIVERSITY AND ITS CONSERVATION

Levels of biological diversity - genetic, species and ecosystem diversity.Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. Bio-geographical classification of India.Biodiversity patterns (global, National and local levels).Hot-spots of biodiversity.India as a mega-diversity nation.Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV - ENVIRONMENTAL POLLUTION

Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution.Nuclear hazards and human health risks.Solid waste management and control measures of urban and industrial wastes.Role of an individual in prevention of pollution.Case studies.

Unit V - SOCIAL ISSUES AND THE ENVIRONMENT

Concept of sustainability and sustainable development.Water conservation -Rain water harvesting, watershed management.Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture.Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act).International agreements (Montreal and Kyoto protocols).Resettlement and rehabilitation of projectaffected persons.Disaster management (floods, earthquake, cyclones and landslides).Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Roleof Indianand other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Human population growth: Impacts on environment, human health and welfare.

Suggested Readings

1. Anonymous. 2004. A text book for Environmental Studies, University Grants Commission and Bharat Vidypeeth Institute of Environmental Education Research, New Delhi.
2. Anubha Kaushik., and Kaushik, C.P. 2004. Perspectives in Environmental Studies. New Age International Pvt. Ltd. Publications, New Delhi.

3. Arvind Kumar. 2004. A Textbook of Environmental Science. APH Publishing Corporation, New Delhi.
4. Daniel, B. Botkin., and Edward, A. Keller. 1995. Environmental Science John Wiley and Sons, Inc., New York.
5. Mishra, D.D. 2010. Fundamental Concepts in Environmental Studies. S.Chand & CompanyPvt. Ltd., New Delhi.
6. Odum,E.P., Odum, H.T. and Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
7. Rajagopalan, R. 2016.Environmental Studies: From Crisis to Cure, Oxford University Press**.**
8. Sing, J.S., Sing. S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand & Publishing Company, New Delhi.
9. Singh, M.P., Singh, B.S., and Soma, S. Dey. 2004. Conservation of Biodiversity and Natural Resources.Daya Publishing House, New Delhi.
10. Tripathy. S.N.,and Sunakar Panda. (2004). Fundamentals of Environmental Studies (2^{nd}ed.). Vrianda Publications Private Ltd, New Delhi.
11. Verma, P.S., and Agarwal V.K. 2001. Environmental Biology (Principles of Ecology).S.Chand and Company Ltd, New Delhi.
12. Uberoi, N.K. 2005. Environmental Studies. Excel Books Publications, New Delhi.

KARPAGAM ACADEMY OF HIGHER EDUCATION

Coimbatore - 641021.

(For the candidates admitted from 2019 onwards)

LECTURE PLAN

DEPARTMENT OF MICROBIOLOGY

STAFF NAME: Dr.M.Kalpana devi

SUBJECT NAME: ENVIRONMENTAL STUDIES SUB.CODE: 19AEC101

SEMESTER: I CLASS: I BSc MB

S.No.	Lecture Duration (Period)	Topics to be Covered	Support Materials
Unit - I			
1.	1	Environment Definition, scope and importance	T4 : 1-4,T2:1,
2.	1	Components of environment	T1:1,2
3.	1	Ecosystem Definition, Concept, Scope, importance	T4 :65-66,T2:55,56, T4:52,53
4.	1	Structure of ecosystem	T4 :66-68
5.	1	Functions of ecosystem	T4 :68,76-78
6.	1	Energy flow through the ecosystem	T4 :76-78
7.	1	Ecological succession	T4 :84-87
8.	1	Food chains and food webs	T4 :69-72
9.	1	Classification of ecosystem.	T4 :76

10.	1	Recapitulation and Discussion of important questions	
		Total No. of Hours Planned for Unit-I	**10**
		Unit - II	
1.	1	Natural resources and associated problems.	T4:6-9
2.	1	Forest resources	T4: 9-12
3.	1	Water resources	T4 : 13-22,T2:37-40
4.	1	Mineral resources	T4 : 23-28, T2: 43-48
5.	1	Food resources	T4: 30-36
6.	1	Energy resources	T4: 38-52,T2:32-35
7.	1	Land resources : Use and over-utilization, exploitation	T4: 40-43
8.	1	Role of an individual in conservation of natural resources.	T4: 59-61
9.	1	Equitable use of resources for sustainable lifestyles.	T4: 62-63
10	1	Ill-effects of fire works	T4: 64-66, T2:47-49
11	1	Recapitulation and Discussion of important questions	
		Total No. of Hours Planned for Unit-II	**11**
		Unit - III	
1.	1	Introduction, definition: genetic, species and ecosystem diversity.	T4 : 98,99, T3: 75-78
2.	1	Biogeographical classification of India.	T4:100-101

3.	1	Value of biodiversity: consumptive use, productive use	T4: 101-102
4.	1	Value of biodiversity: social, ethical, aesthetic and option values.	T4 :102,103
5.	1	Biodiversity at global, National and local levels	T4 :104-107, R1: 23-29
6.	1	India as a mega-diversity nation. Hot-spots of biodiversity.	T4 :107-111
7.	1	Threats to biodiversity: habitat loss, poaching of wildlife,	T4:111-112
8.	1	Man-wildlife conflicts	T4: 112-114
9.	1	Endangered and endemic species of India	T4 :115-118, T3: 92-98
10	1	Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.	T4 :119-121
11.	1	Recapitulation and Discussion of important questions	
		Total No. of Hours Planned for Unit-III	**11**
		Unit - IV	
1.	1	Definition, Causes, effects and control measures of Air pollution	T4:123-127
2.	1	Water pollution	T4: 132-135
3.	1	Soil pollution	T4: 141-143
4.	1	Marine pollution	T4:140,141
5.	1	Noise pollution	T4: 127-132
6.	1	Thermal pollution	T4:136-139

7.	1	Nuclear hazards	T4: 143,144
8.	1	Solid waste management: Causes, effects and control measures of urban and industrial wastes	T4:145-148 R3: 163-169
9.	1	Role of an individual in prevention of pollution	T4:148-150
10	1	Pollution case studies	T4:150-153
11	1	Disaster management: Foods, earthquake, cyclone and landslides.	T4:154-158
12	1	Recapitulation and Discussion of important questions	
		Total No. of Hours Planned for Unit-IV	**12**
		Unit - V	
1.	1	From unsustainable to sustainable development. Urban problems related to energy.	T4:161-165
2.	1	Water conservation, rain water harvesting, watershed management.	T4: 165-171, R2:143-145
3.	1	Resettlement and rehabilitation of people; its problems and concerns.	T4:171-172
4.	1	Environmental ethics: Issues and possible solutions.	T4: 173-177
5.	1	Climate change, global warming, acid rain, ozone layer depletion	T4:178-180, R2: 157-163
6.	1	Nuclear accidents and holocaust. Case studies. Wasteland reclamation.	T4: 181-189
7.	1	Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act.	T4:192-195

8.	1	Water (Prevention and Control of Pollution) Act. Wildlife Protection Act	T4: 196-201
9.	1	Issues involved in enforcement of environmental legislation, Public awareness. Population growth, variation among nations.	T4:204-213
10.	1	Population explosion—Family Welfare Programme. Environment and human health. Human rights	T4:216-223
11.	1	Value education. HIV/AIDS. Women and Child Welfare.	T4:225-229
12.		Role of Information Technology in environment and human health.	T4: 230-233
13.	1	Recapitulation and Discussion of important questions	
14.	1	Recapitulation and Discussion of previous semester question papers	
15.	1	Recapitulation and Discussion of previous semester question papers	
16.	1	Recapitulation and Discussion of previous semester question papers	
Total No. of Hours Planned for Unit-V			**16**
Total No. of Hours Planned			**60**

Textbook:

P.S.Verma, V.K.Agarwal. 2001. Environmental Biology (Principles of Ecology); S.Chand and Company Ltd., New Delhi.

Anubha Kaushik, C.P.Kaushik, 2004. Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, New Delhi.

Reference book

Singh, M.P., B.S. Singh and Soma S. Dey, 2004. Conservation of Biodiversity and Natural Resources. Daya Publishing House, Delhi.

Environment Definition, Scope and importance; Ecosystem, Structure and functions of ecosystem.Energy flow, Food chains and food webs, Ecological succession. Classification of ecosystem. Forest ecosystem, GrasslandEcosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Ecosystem

An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. By feeding on plants and on one-another, animals play an important role in the movement of matter and energy through the system. They also influence the quantity of plant and microbial biomass present. By breaking down dead organic matter, decomposers release carbon back to the atmosphere and facilitate nutrient cycling by converting nutrients stored in dead biomass back to a form that can be readily used by plants and other microbes.

Ecosystems are controlled by external and internal factors. External factors such as climate, the parent material which forms the soil and topography, control the overall structure of an ecosystem, but are not themselves influenced by the ecosystem.

Ecosystems are dynamic entities—they are subject to periodic disturbances and are in the process of recovering from some past disturbance. Ecosystems in similar environments that are located in different parts of the world can end up doing things very differently simply because they have different pools of species present. Internal factors not only control ecosystem processes but are also controlled by them and are often subject to feedback loops.

Resource inputs are generally controlled by external processes like climate and parent material. Resource availability within the ecosystem is controlled by internal factors like decomposition, root competition or shading. Although humans operate within ecosystems, their cumulative effects are large enough to influence external factors like climate.

Biodiversity affects ecosystem functioning, as do the processes of disturbance and succession.

Ecosystems provide a variety of goods and services upon which people depend.

History

The term ecosystem was first used in 1935 in a publication by British ecologist Arthur Tansley. Tansley devised the concept to draw attention to the importance of transfers of materials between organisms and their environment.He later refined the term, describing it as "The whole system, ... including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment".Tansley regarded ecosystems not simply as

natural units, but as "mental isolates".[9] Tansley later defined the spatial extent of ecosystems using the term ecotope.

G. Evelyn Hutchinson, a limnologist who was a contemporary of Tansley's, combined Charles Elton's ideas about trophic ecology with those of Russian geochemist Vladimir Vernadsky. As a result, he suggested that mineral nutrient availability in a lake limited algal production. This would, in turn, limit the abundance of animals that feed on algae. Raymond Lindeman took these ideas further to suggest that the flow of energy through a lake was the primary driver of the ecosystem. Hutchinson's students, brothers Howard T. Odum and Eugene P. Odum, further developed a "systems approach" to the study of ecosystems. This allowed them to study the flow of energy and material through ecological systems.

Processes

Rainforest ecosystems are rich in biodiversity. This is the Gambia River in Senegal's Niokolo-Koba National Park.

Flora of Baja California Desert, Cataviña region, Mexico

Biomes of the world

Ecosystems are controlled both by external and internal factors. External factors, also called state factors, control the overall structure of an ecosystem and the way things work within it, but are not themselves influenced by the ecosystem. The most important of these is climate. Climate determines the biome in which the ecosystem is embedded. Rainfall patterns and seasonal temperatures influence photosynthesis and thereby determine the amount of water and energy available to the ecosystem.

Parent material determines the nature of the soil in an ecosystem, and influences the supply of mineral nutrients. Topography also controls ecosystem processes by affecting things like microclimate, soil development and the movement of water through a system. For example, ecosystems can be quite different if situated in a small depression on the landscape, versus one present on an adjacent steep hillside.

Other external factors that play an important role in ecosystem functioning include time and potential biota. Similarly, the set of organisms that can potentially be present in an area can also significantly affect ecosystems. Ecosystems in similar environments that are located in different

parts of the world can end up doing things very differently simply because they have different pools of species present. The introduction of non-native species can cause substantial shifts in ecosystem function.

Unlike external factors, internal factors in ecosystems not only control ecosystem processes but are also controlled by them. Consequently, they are often subject to feedback loops.While the resource inputs are generally controlled by external processes like climate and parent material, the availability of these resources within the ecosystem is controlled by internal factors like decomposition, root competition or shading. Other factors like disturbance, succession or the types of species present are also internal factors.

Primary production

Global oceanic and terrestrial phototroph abundance, from September 1997 to August 2000. As an estimate of autotroph biomass, it is only a rough indicator of primary production potential and not an actual estimate of it.

Main article: Primary production

Primary production is the production of organic matter from inorganic carbon sources. This mainly occurs through photosynthesis. The energy incorporated through this process supports life on earth, while the carbon makes up much of the organic matter in living and dead biomass, soil carbon and fossil fuels. It also drives the carbon cycle, which influences global climate via the greenhouse effect.

Through the process of photosynthesis, plants capture energy from light and use it to combine carbon dioxide and water to produce carbohydrates and oxygen. The photosynthesis carried out by all the plants in an ecosystem is called the gross primary production (GPP) half of the GPP is consumed in plant respiration.The remainder, that portion of GPP that is not used up by respiration, is known as the net primary production (NPP). Total photosynthesis is limited by a range of environmental factors. These include the amount of light available, the amount of leaf area a plant has to capture light (shading by other plants is a major limitation of photosynthesis), rate at which carbon dioxide can be supplied to the chloroplasts to support photosynthesis, the availability of water, and the availability of suitable temperatures for carrying out photosynthesis.

Energy flow

Main article: Energy flow (ecology)
See also: Food web and Trophic level
Energy and carbon enter ecosystems through photosynthesis, are incorporated into living tissue, transferred to other organisms that feed on the living and dead plant matter, and eventually released through respiration.

The carbon and energy incorporated into plant tissues (net primary production) is either consumed by animals while the plant is alive, or it remains uneaten when the plant tissue dies and becomes detritus. In terrestrial ecosystems, roughly 90% of the net primary production ends up being broken down by decomposers. The remainder is either consumed by animals while still alive and enters the plant-based trophic system, or it is consumed after it has died, and enters the detritus-based trophic system.

In aquatic systems, the proportion of plant biomass that gets consumed by herbivores is much higher. In trophic systems photosynthetic organisms are the primary producers. The organisms that consume their tissues are called primary consumers or secondary producers— herbivores. Organisms which feed on microbes (bacteria and fungi) are termed microbivores. Animals that feed on primary consumers—carnivores—are secondary consumers. Each of these constitutes a trophic level.

The sequence of consumption—from plant to herbivore, to carnivore—forms a food chain. Real systems are much more complex than this—organisms will generally feed on more than one form of food, and may feed at more than one trophic level. Carnivores may capture some prey which are part of a plant-based trophic system and others that are part of a detritus-based trophic system (a bird that feeds both on herbivorous grasshoppers and earthworms, which consume detritus). Real systems, with all these complexities, form food webs rather than food chains.

Decomposition
See also: Decomposition
The carbon and nutrients in dead organic matter are broken down by a group of processes known as decomposition. This releases nutrients that can then be re-used for plant and microbial production and returns carbon dioxide to the atmosphere (or water) where it can be used for photosynthesis. In the absence of decomposition, the dead organic matter would accumulate in an ecosystem, and nutrients and atmospheric carbon dioxide would be depleted. Approximately 90% of terrestrial net primary production goes directly from plant to decomposer.

Decomposition processes can be separated into three categories—leaching, fragmentation and chemical alteration of dead material. As water moves through dead organic matter, it dissolves and carries with it the water-soluble components. These are then taken up by organisms in the soil, react with mineral soil, or are transported beyond the confines of the ecosystem (and are considered lost to it). Newly shed leaves and newly dead animals have high concentrations of water-soluble components and include sugars, amino acids and mineral nutrients. Leaching is more important in wet environments and much less important in dry ones.

Fragmentation processes break organic material into smaller pieces, exposing new surfaces for colonization by microbes. Freshly shed leaf litter may be inaccessible due to an outer layer of cuticle or bark, and cell contents are protected by a cell wall. Newly dead animals may be covered by an exoskeleton. Fragmentation processes, which break through these protective layers, accelerate the rate of microbial decomposition. Animals fragment detritus as they hunt for food, as does passage through the gut. Freeze-thaw cycles and cycles of wetting and drying also fragment dead material.

The chemical alteration of the dead organic matter is primarily achieved through bacterial and fungal action. Fungal hyphae produce enzymes which can break through the tough outer structures surrounding dead plant material. They also produce enzymes which break down lignin, which allows them access to both cell contents and to the nitrogen in the lignin. Fungi can transfer carbon and nitrogen through their hyphal networks and thus, unlike bacteria, are not dependent solely on locally available resources.

Decomposition rates vary among ecosystems. The rate of decomposition is governed by three sets of factors—the physical environment (temperature, moisture, and soil properties), the quantity and quality of the dead material available to decomposers, and the nature of the microbial community itself. Temperature controls the rate of microbial respiration; the higher the temperature, the faster microbial decomposition occurs. It also affects soil moisture, which slows microbial growth and reduces leaching. Freeze-thaw cycles also affect decomposition—freezing temperatures kill soil microorganisms, which allows leaching to play a more important role in moving nutrients around. This can be especially important as the soil thaws in the spring, creating a pulse of nutrients which become available.[19]

Decomposition rates are low under very wet or very dry conditions. Decomposition rates are highest in wet, moist conditions with adequate levels of oxygen. Wet soils tend to become

deficient in oxygen (this is especially true in wetlands), which slows microbial growth. In dry soils, decomposition slows as well, but bacteria continue to grow (albeit at a slower rate) even after soils become too dry to support plant growth.

Further information: Decomposition § Rate of decomposition
Nutrient cycling
See also: Nutrient cycle, Biogeochemical cycle, and Nitrogen cycle

Biological nitrogen cycling
Ecosystems continually exchange energy and carbon with the wider environment. Mineral nutrients, on the other hand, are mostly cycled back and forth between plants, animals, microbes and the soil. Most nitrogen enters ecosystems through biological nitrogen fixation, is deposited through precipitation, dust, gases or is applied as fertilizer.

Since most terrestrial ecosystems are nitrogen-limited, nitrogen cycling is an important control on ecosystem production.

Until modern times, nitrogen fixation was the major source of nitrogen for ecosystems. Nitrogen-fixing bacteria either live symbiotically with plants or live freely in the soil. The energetic cost is high for plants which support nitrogen-fixing symbionts—as much as 25% of gross primary production when measured in controlled conditions. Many members of the legume plant family support nitrogen-fixing symbionts. Some cyanobacteria are also capable of nitrogen fixation. These are phototrophs, which carry out photosynthesis. Like other nitrogen-fixing bacteria, they can either be free-living or have symbiotic relationships with plants. Other sources of nitrogen include acid deposition produced through the combustion of fossil fuels, ammonia gas which evaporates from agricultural fields which have had fertilizers applied to them, and dust. Anthropogenic nitrogen inputs account for about 80% of all nitrogen fluxes in ecosystems.

When plant tissues are shed or are eaten, the nitrogen in those tissues becomes available to animals and microbes. Microbial decomposition releases nitrogen compounds from dead organic matter in the soil, where plants, fungi, and bacteria compete for it. Some soil bacteria use organic nitrogen-containing compounds as a source of carbon, and release ammonium ions into the soil. This process is known as nitrogen mineralization. Others convert ammonium to nitrite and nitrate ions, a process known as nitrification. Nitric oxide and nitrous oxide are also produced during

nitrification. Under nitrogen-rich and oxygen-poor conditions, nitrates and nitrites are converted to nitrogen gas, a process known as denitrification.

Other important nutrients include phosphorus, sulfur, calcium, potassium, magnesium and manganese.[21][18] Phosphorus enters ecosystems through weathering. As ecosystems age this supply diminishes, making phosphorus-limitation more common in older landscapes (especially in the tropics).[21] Calcium and sulfur are also produced by weathering, but acid deposition is an important source of sulfur in many ecosystems. Although magnesium and manganese are produced by weathering, exchanges between soil organic matter and living cells account for a significant portion of ecosystem fluxes. Potassium is primarily cycled between living cells and soil organic matter.

Function and biodiversity
Main article: Biodiversity
See also: Ecosystem diversity

Loch Lomond in Scotland forms a relatively isolated ecosystem. The fish community of this lake has remained stable over a long period until a number of introductions in the 1970s restructured it's food web.

Spiny forest at Ifaty, Madagascar, featuring various Adansonia (baobab) species, Alluaudia procera (Madagascar ocotillo) and other vegetation.
Biodiversity plays an important role in ecosystem functioning. The reason for this is that ecosystem processes are driven by the number of species in an ecosystem, the exact nature of each individual species, and the relative abundance organisms within these species.[24] Ecosystem processes are broad generalizations that actually take place through the actions of individual organisms. The nature of the organisms—the species, functional groups and trophic levels to which they belong—dictates the sorts of actions these individuals are capable of carrying out and the relative efficiency with which they do so.

Ecological theory suggests that in order to coexist, species must have some level of limiting similarity—they must be different from one another in some fundamental way, otherwise one species would competitively exclude the other.[25] Despite this, the cumulative effect of additional species in an ecosystem is not linear—additional species may enhance nitrogen retention, for example, but beyond some level of species richness, additional species may have little additive effect.[24]

The addition (or loss) of species which are ecologically similar to those already present in an ecosystem tends to only have a small effect on ecosystem function. Ecologically distinct species, on the other hand, have a much larger effect. Similarly, dominant species have a large effect on ecosystem function, while rare species tend to have a small effect. Keystone species tend to have an effect on ecosystem function that is disproportionate to their abundance in an ecosystem. Similarly, an ecosystem engineer is any organism that creates, significantly modifies, maintains or destroys a habitat.

Dynamics

Ecosystems are dynamic entities. They are subject to periodic disturbances and are in the process of recovering from some past disturbance. When a perturbation occurs, an ecosystem responds by moving away from its initial state. The tendency of an ecosystem to remain close to its equilibrium state, despite that disturbance, is termed its resistance. On the other hand, the speed with which it returns to its initial state after disturbance is called its resilience.Time plays a role in the development of soil from bare rock and the recovery of a community from disturbance.

From one year to another, ecosystems experience variation in their biotic and abiotic environments. A drought, an especially cold winter and a pest outbreak all constitute short-term variability in environmental conditions. Animal populations vary from year to year, building up during resource-rich periods and crashing as they overshoot their food supply. These changes play out in changes in net primary production decomposition rates, and other ecosystem processes. Longer-term changes also shape ecosystem processes—the forests of eastern North America still show legacies of cultivation which ceased 200 years ago, while methane production in eastern Siberian lakes is controlled by organic matter which accumulated during the Pleistocene.

Disturbance also plays an important role in ecological processes. F. Stuart Chapin and coauthors define disturbance as "a relatively discrete event in time and space that alters the structure of populations, communities, and ecosystems and causes changes in resources availability or the physical environment".[27] This can range from tree falls and insect outbreaks to hurricanes and wildfires to volcanic eruptions. Such disturbances can cause large changes in plant, animal and microbe populations, as well soil organic matter content. Disturbance is followed by succession, a "directional change in ecosystem structure and functioning resulting from biotically driven changes in resources supply."

The frequency and severity of disturbance determine the way it affects ecosystem function. A major disturbance like a volcanic eruption or glacial advance and retreat leave behind soils that lack plants, animals or organic matter. Ecosystems that experience such disturbances undergo primary succession. A less severe disturbance like forest fires, hurricanes or cultivation result in secondary succession and a faster recovery.More severe disturbance and more frequent disturbance result in longer recovery times.

A freshwater lake in Gran Canaria, an island of the Canary Islands. Clear boundaries make lakes convenient to study using an ecosystem approach.

Ecosystem ecology

Ecosystem ecology studies the processes and dynamics of ecosystems, and the way the flow of matter and energy through them structures natural systems. The study of ecosystems can cover 10 orders of magnitude, from the surface layers of rocks to the surface of the planet.

There is no single definition of what constitutes an ecosystem. German ecologist Ernst- Detlef Schulze and coauthors defined an ecosystem as an area which is "uniform regarding the biological turnover, and contains all the fluxes above and below the ground area under consideration." They explicitly reject Gene Likens' use of entire river catchments as "too wide a demarcation" to be a single ecosystem, given the level of heterogeneity within such an area.Other authors have suggested that an ecosystem can encompass a much larger area, even the whole planet.Schulze and coauthors also rejected the idea that a single rotting log could be studied as an ecosystem because the size of the flows between the log and its surroundings are too large, relative to the proportion cycles within the log. Philosopher of science Mark Sagoff considers the failure to define "the kind of object it studies" to be an obstacle to the development of theory in ecosystem ecology.

Ecosystems can be studied through a variety of approaches—theoretical studies, studies monitoring specific ecosystems over long periods of time, those that look at differences between ecosystems to elucidate how they work and direct manipulative experimentation. Studies can be carried out at a variety of scales, ranging from whole-ecosystem studies to studying microcosms or mesocosms (simplified representations of ecosystems).American ecologist Stephen R. Carpenter has argued that microcosm experiments can be "irrelevant and diversionary" if they are not carried out in conjunction with field studies done at the ecosystem scale. Microcosm experiments often fail to accurately predict ecosystem-level dynamics.

The Hubbard Brook Ecosystem Study started in 1963 to study the White Mountains in New Hampshire. It was the first successful attempt to study an entire watershed as an ecosystem. The study used stream chemistry as a means of monitoring ecosystem properties, and developed a detailed biogeochemical model of the ecosystem. Long-term research at the site led to the discovery of acid rain in North America in 1972. Researchers documented the depletion of soil cations (especially calcium) over the next several decades.

Human activities

Human activities are important in almost all ecosystems. Although humans exist and operate within ecosystems, their cumulative effects are large enough to influence external factors like climate.

Ecosystem goods and services

The High Peaks Wilderness Area in the 6,000,000-acre (2,400,000 ha) Adirondack Park is an example of a diverse ecosystem.

Main articles: Ecosystem services and Ecological goods and services

See also: Ecosystem valuation and Ecological yield

Ecosystems provide a variety of goods and services upon which people depend.[37] Ecosystem goods include the "tangible, material products" of ecosystem processes such as food, construction material, medicinal plants.[38] They also include less tangible items like tourism and recreation, and genes from wild plants and animals that can be used to improve domestic species.[37]

Ecosystem services, on the other hand, are generally "improvements in the condition or location of things of value".[38] These include things like the maintenance of hydrological cycles, cleaning air and water, the maintenance of oxygen in the atmosphere, crop pollination and even things like beauty, inspiration and opportunities for research.[37] While ecosystem goods have traditionally been recognized as being the basis for things of economic value, ecosystem services tend to be taken for granted.[38]

Ecosystem management

Main article: Ecosystem management

When natural resource management is applied to whole ecosystems, rather than single species, it is termed ecosystem management.Although definitions of ecosystem management abound,

there is a common set of principles which underlie these definitions.[40] A fundamental principle is the long-term sustainability of the production of goods and services by the ecosystem;[40] "intergenerational sustainability [is] a precondition for management, not an afterthought".[37]

While ecosystem management can be used as part of a plan for wilderness conservation, it can also be used in intensively managed ecosystems[37] (see, for example, agroecosystem and close to nature forestry).

Threats caused by humans

As human population and per capita consumption grow, so do the resource demands imposed on ecosystems and the effects of the human ecological footprint. Natural resources are vulnerable and limited. The environmental impacts of anthropogenic actions are becoming more apparent. Problems for all ecosystems include: environmental pollution, climate change and biodiversity loss. For terrestrial ecosystems further threats include air pollution, soil degradation, and deforestation. For aquatic ecosystems threats include also unsustainable exploitation of marine resources (for example overfishing of certain species), marine pollution, microplastics pollution, water pollution, and building on coastal areas.[41]

Society is increasingly becoming aware that ecosystem services are not only limited but also that they are threatened by human activities. The need to better consider long-term ecosystem health and its role in enabling human habitation and economic activity is urgent. To help inform decision-makers, many ecosystem services are being assigned economic values, often based on the cost of replacement with anthropogenic alternatives. The ongoing challenge of prescribing economic value to nature, for example through biodiversity banking, is prompting transdisciplinary shifts in how we recognize and manage the environment, social responsibility, business opportunities, and our future as a species.

Food Chain and Food Web

Food chain is a linear sequence of organisms which starts from producer organisms and ends with decomposer species. Food web is a connection of multiple food chains. Food chain follows a single path whereas food web follows multiple paths. From the food chain, we get to know how organisms are connected with each other. Food chain and food web form an integral part of this ecosystem. Let us take a look at the food chain and a food web and the difference between them.

Food Chain

In scientific terms, a food chain is a chronological pathway or an order that shows the flow of energy from one organism to the other. In a community which has producers, consumers, and

decomposers, the energy flows in a specific pathway. Energy is not created or destroyed. But it flows from one level to the other, through different organisms.

A food chain shows a single pathway from the producers to the consumers and how the energy flows in this pathway. In the animal kingdom, food travels around different levels. To understand a food chain better, let us take a look at the terrestrial ecosystem.

Food chain in a Terrestrial Ecosystem

The sun is the source of energy, which is the initial energy source. This is used by the producers or plants to create their own food, through photosynthesis and grow. Next up, in this chain is another organism, which is the consumer that eats this food, taking in the energy.

The primary consumers are the organisms that consume the primary producers. In a terrestrial ecosystem, it could be a herbivore like a cow or a goat or it could even be a man. When a goat is consumed by man, he becomes the secondary consumer.

As the energy goes one level up, the food chain also moves up. Each level in the food chain is called a trophic level. The different trophic levels are Primary producers, primary consumers, secondary consumers, tertiary consumers and quaternary consumers.

Example of food chain

Grass (Producer) ——Goat (Primary Consumer) —— Man (Secondary consumer)

When dead organic matter becomes the starting of a food chain, then it is called the *detritus food chain* (DFC). The decomposers, which are the fungi and bacteria, feed on the organic matter to meet the energy requirements. The digestive enzymes secreted by the decomposers help in the breakdown of the organic matter into inorganic materials.

Food Web

Many interconnected food chains make up a food web. When you look at the larger picture, a food web shows a realistic representation of the energy flow through different organisms in an ecosystem.

Sometimes, a single organism gets eaten by many predators or it eats many other organisms. This is when a food chain doesn't represent the energy flow in a proper manner because there are many trophic levels that interconnect. This is where a food web comes into place. It shows the interactions between different organisms in an ecosystem.

The following diagram shows the energy flow between various organisms through a food web.

Possible questions:

PART B(2 Marks)

1.Define ecological succession.
2. Define environment.
3. List out the types of different food chain.
4. Write a note on structure of ecosystem.

5. List out the functions of ecosystem.

PART – C (8 marks)

1. Write short notes on the classification of Ecosystem.
2. Define Ecosystem and explain the scope and importance of ecosystem.
3. Explain in Ecosystem food chain and food web.
4. Explain structure the structure and functions of ecosystem.
5. Discuss in detail about forest resourses.
6. Give a detailed account on land degradation and desertification.

	UNIT - I	Option A	Option B	Option C	Option D	Answers
1	Which country has the maximum number of tube-wells in the world ?	America	Australia	China	India	India
2	Which of the following is not an air pollutant ?	Smoke	Carbon Dioxide	Nitrogen Gas	Sulphur Dioxide	Nitrogen Gas
3	Which part of plant evaporates water ?	Stomata	Fruit	Branch	Root	Stomata
4	Which energy is converted into electrical energy by a solar cell ?	Chemical Energy	Nuclear Energy	Solar Energy	Magnetic Energy	Solar Energy
5	Carrier of Dengue disease is	Aedes Mosquito	Culex Mosquito	Housefly	Anopheles Mosquito	Aedes Mosquito
6	Wildlife Week is celebrated on	1st October to 7th October	15th October to 2 1st October	1st June to 7th June	15th June to 21st June	1st October to 7th October
7	In which state of matter, the distance between the molecules is minimum ?	Solid	Liquid	Gas	Plasma	Solid
8	Maximum amount of gas found in air is	Oxygen	Carbon Dioxide	Hydrogen	Nitrogen	Nitrogen
9	Which state of India is known as 'Tiger State'?	Gujarat	West Bengal	Madhya Pradesh	Assam	Madhya Pradesh
10	Habitat of Dog Fish is	River	Pond	Lake	Sea	Sea
11	Which of the following has maximum speed ?	Air	Water Current	Sound	Light	Light
12	Tobacco addiction is caused due to	Cocaine	Caffeine	Nicotine	Histamine	Nicotine
13	Ozone layer is found in	Thermosphere	Stratosphere	Troposphere	Mesosphere	Stratosphere
14	Full form of CNG is	Common National Gas	Compressed Natural Gas	Common Natural Gas	Cirtified Natural Gas	Compressed Natural Gas
15	Renewable source of energy is	Coal	Petroleum	Plants	Uranium	Plants
16	Sugar is form of _____	Protein	Carbohydrate	Fat	Water	Carbohydrate

17	The mosquito repellent (coils, mats and liquids) that we generally use in our homes are:	Pesticides	Fertilizers	Sedatives	Insecticides	Insecticides
18	Which of the following plays an important role in the cause of rainfall	Evaporation	Condensation	Both evaporation & condensation	Filtration	Both evaporation & condensation
19	The process of solid changing into liquid upon the supply of heat is called:	Condensation	Evaporation	Melting	Boiling	Melting
20	During summer the earth is	Closer to the sun	Away from the sun	Closer to the moon	Away from the moon	Closer to the sun
21	During breathing which gas is most required by us?	Hydrogen	Oxygen	Carbondioxide	Nitrogen	Oxygen
22	Paper is mainly made up of:	Cellulose & starch	Polythene & cotton	Bamboo & grass	Sunflower & Maize	Bamboo & grass
23	Which one is non luminous	Moon	Sun	Star	Comet	Moon
24	When some sugar is dissolved in a glass of water, the water level:	Increases	Decreases	Remains the same	None of the above	Remains the same
25	Non-green plants like mushroom can't make their own food because:	They are too small	They lack chlorophyll	They lack photo-tropism	They lack roots to suck water	They lack chlorophyll
26	The nature of relationship between condensation & evaporation is:	They are the same	They are opposite	They are similar but not in all respects	None of the above	They are opposite
27	In which one of the following sound travels fast	Solid	Air	Water	Vacuum	Solid
28	What type of radiation is trapped on the earth's surface by the green house effect?	UV rays	? -rays	X-rays	IR rays	UV rays

29	Ame of extremely effective firs extinguishing agent is	helium	halons	halogens	argon	halons
30	Gas molecules that absorb thermal infrared radiation and are present in large quantity to change climate system are known as	alpha radiations	beta radiations	ozone gases	greenhouse gases	greenhouse gases
31	Chemical substance used in industry for cold cleaning, adhesives and vapor degreasing is	methyl chloroform	carbon tetrachloride	halons	hydrocarbons	methyl chloroform
32	Layer of atmosphere in which Ozone layer	Exosphere	Mesosphere	Troposphere	Stratosphere	Stratosphere
	lies is					
33	Greenhouse gases which is present in very high quantity is	Propane	Ethane	Carbon dioxide	Methane	Carbon dioxide
34	Exchange of outgoing and incoming radiations that keep Earth warm is known as	Greenhouse effect	Radiation effect	Infrared effect	Ozone layer depletion	Greenhouse effect
35	Wavelength of infrared radiations is	Zero	Finite	Shorter	Longer	Longer
36	Montreal protocol to reduce production of chlorofluorocarbons was assigned in	1977	1992	1987	1982	1987
37	Number of atoms in ozone molecules are	2	3	4	1	3
38	Layer which saves life from harmful effects of UV radiations is known as	Ozone layer	Alpha layer	Gamma layer	Infrared layer	Ozone layer
39	Higher energy level and shorter wavelengths are features of	Beta radiation	Alpha radiation	Ultraviolet radiation	Infrared radiation	Ultraviolet radiation
40	Chemical released by chlorofluorocarbons that causes depletion of ozone layer in atmosphere is	Nitrogen	Sulphuric aci	Chlorine	Sodium chloride	Chlorine
41	Methyl chloroform, carbon tetrachloride, hydro fluorocarbons and chlorofluorocarbons are mainly known as	Mesosphere building substances	Troposphere building substances	Ozone building substances	Ozone depleting substances	Ozone depleting substances

42	When chlorofluorocarbons are released in atmosphere, chlorine chemical destroys the	Beta molecules	Helium molecules	Argon molecules	Ozone molecules	Ozone molecules
43	Color of ozone molecule is	Blue	White	Pale yellow	Pale green	Blue
44	Wavelength of ultraviolet radiations is	Shorter	Longer	Zero	Finite	Shorter
45	Lower energy level and longer wavelengths are features of	Ultraviolet radiation	Infrared radiation	Beta radiation	Alpha radiation	Infrared radiation
46	Most serious group of chemicals emitted in British Columbia that causes depletion of ozone layer are	Noble gases	Halons	Halogens	Helium	Halons
47	Height of ozone above surface of Earth is	30 to 50 km	10 to 20 km	15 to 30 km	50 to 70 km	15 to 30 km
48	Name of protocol signed to reduce	UVB protocol	Montreal	UVA protocol	UVR protocol	Montreal
	production of chlorofluorocarbons is		Protocol			Protocol
49	One which is not considered as naturally occurring greenhouse gas is	Carbon dioxide	Methane	Nitrous oxide	Ethane	Ethane
50	Burning of fossil fuels	Decrease greenhouse gases	Increases greenhouse gases	Increased level of oxygen	Increased level of ethane	Increases greenhouse gases
51	Annual ozone hole is located on continent	Antarcti	South Ameri	North Ameri	Afri	Antarcti
52	Chemical group Halons are emitted in	Montreal	Icelan	British Columbi	Greenland	British Columbi
53	How much of the net irrigated well irrigation?	20%	60% (	45%	30%	30%
54	When an ant bites a person, which irritating chemical it (ant) injects into his (person) body?	Acetic acid	Citric acid	Tartaric acid	Formic acid	Formic acid
55	The soil of India’s eastern and western coast is–	Alluvial	Black cotton	Red rocky	Laterite	Laterite

56	Nitrous oxide (commonly called laughing gas) has been a matter of concern to environmentalist recently because–	it is thought to cause cancer at low concentration	it produce photochemical smog	it is a green house gas	None of the above	it is a green house gas
57	Which one of the following is not a Biosphere Reserve?	Agasthy amalai	Nallambalai	Nilgiri	Panchmarhi	Nallambalai
58	The most harmful environmental pollution from nuclear reactor is–	radioactivity	particulate formation	thermal pollution	(noise pollution	thermal pollution
59	What unit of solar energy does the earth intercept?	2,200 millionth	2,000 millionth	2,100 millionth	2,300 millionth	2,000 millionth
60	Which of the following is used as a moderator in nuclear reactor?	Thorium	Graphite	Radium	Ordinary water	Graphite
61	Which of the following is not a primary pollutant?	SO_2	Volcanic ash	O_3	CO_2	O_3

Natural resources - Renewable and Non – Renewable resources. Land resources and land use change, Land degradation, soil erosion and desertification. Forest resources -Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.Water resources- Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water.Use of alternate energy sources, growing energy needs, case studies.Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.

Natural Resources

Natural resources are resources that exist without actions of humankind. This includes all valued characteristics such as magnetic, gravitational, electrical properties and forces etc. On earth it includes: sunlight, atmosphere, water, land(includes all minerals) along with all vegetation, crops and animal life that naturally subsists upon or within the heretofore identified characteristics and substances.[1][2][3][4]

Particular areas such as the rainforest in Fatu-Hiva are often characterized by the biodiversity and geodiversity existent in their ecosystems. Natural resources may be further classified in different ways. Natural resources are materials and components (something that can be used) that can be found within the environment. Every man-made product is composed of natural resources (at its fundamental level). A **natural resource** may exist as a separate entity such as fresh water, air, and as well as a living organism such as a fish, or it may exist in an alternate form that must be processed to obtain the resource such as metal ores, rare earth metals, petroleum, and most forms of energy.

There is much debate worldwide over natural resource allocations, this is particularly true during periods of increasing scarcity and shortages (depletion and overconsumption of resources).

Natural resources are resources that are not man made. They are materials or substances occurring in nature which can be exploited for economic gain.

Classification

There are various methods of categorizing natural resources, these include source of origin, stage of development, and by their renewability.

On the basis of origin, natural resources may be divided into two types:

- *Biotic* — Biotic resources are obtained from the biosphere (living and organic material), such as forests and animals, and the materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter.
- *Abiotic* – Abiotic resources are those that come from non-living, non-organic material. Examples of abiotic resources include land, fresh water, air, rare earth metals and heavy metals including ores such as gold, iron, copper, silver, etc.

Considering their stage of development, natural resources may be referred to in the following ways:

- *Potential resources* — Potential resources are those that may be used in the future—for example, petroleum in sedimentary rocks that, until drilled out and put to use remains a *potential* resource
- *Actual resources* — Those resources that have been surveyed, quantified and qualified and, are currently used—development, such as wood processing, depends on technology and cost
- *Reserve resources* — The part of an actual resource that can be developed profitably in the future
- *Stock resources* — Those that have been surveyed, but cannot be used due to lack of technology—for example, hydrogen

Many natural resources can be categorized as either renewable or non-renewable:

- *Renewable resources* — Renewable resources can be replenished naturally. Some of these resources, like sunlight, air, wind, water, etc, are continuously available and their quantity is not noticeably affected by human consumption. Though many renewable resources do not have such a rapid recovery rate, these resources are susceptible to depletion by over-use. Resources from a human use perspective are classified as renewable so long as the rate of replenishment/recovery exceeds that of the rate of consumption. They replenish easily compared to Non-renewable resources.
- *Non-renewable resources* – Non-renewable resources either form slowly or do not naturally form in the environment. Minerals are the most common resource included in this category. By the human perspective, resources are non-renewable when their rate of consumption exceeds the rate of replenishment/recovery; a good example of this are fossil fuels, which are in this category because their rate of formation is extremely slow (potentially millions of years), meaning they are considered non-renewable. Some resources actually naturally deplete in amount without human interference, the most notable of these being radio-active elements such as uranium, which naturally decay into heavy metals. Of these, the metallic minerals can be re-used by recycling them,[5] but coal and petroleum cannot be recycled.[6] Once they are completely used they take millions of years to replenish.

Extraction

Resource extraction involves any activity that withdraws resources from nature. This can range in scale from the traditional use of preindustrial societies, to global industry. Extractive industries are, along with agriculture, the basis of the primary sectorof the economy. Extraction produces raw material, which is then processed to add value. Examples of extractive industries are hunting, trapping, mining, oil and gas drilling, and forestry. Natural resources can add substantial amounts to a country's wealth,[7] however, a sudden inflow of money caused by a

resource boom can create social problems including inflation harming other industries ("Dutch disease") and corruption, leading to inequality and underdevelopment, this is known as the "resource curse".

Extractive industries represent a large growing activity in many less-developed countries but the wealth generated does not always lead to sustainable and inclusive growth. People often accuse extractive industry businesses as acting only to maximize short-term value, implying that less-developed countries are vulnerable to powerful corporations. Alternatively, host governments are often assumed to be only maximizing immediate revenue. Researchers argue there are areas of common interest where development goals and business cross. These present opportunities for international governmental agencies to engage with the private sector and host governments through revenue management and expenditure accountability, infrastructure development, employment creation, skills and enterprise development and impacts on children, especially girls and women.[8] A strong civil society can play an important role in ensuring effective management of natural resources. Norway can serve as a role model in this regard as it has good institutions and open and dynamic public debate with strong civil society actors that provide an effective checks and balances system for government's management of extractive industries.

Depletion of resources

In recent years, the depletion of natural resources has become a major focus of governments and organizations such as the United Nations (UN). This is evident in the UN's Agenda 21 Section Two, which outlines the necessary steps for countries to take to sustain their natural resources.[10] The depletion of natural resources is considered a sustainable developmentissue.[11] The term sustainable development has many interpretations, most notably the Brundtland Commission's 'to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs',[12] however in broad terms it is balancing the needs of the planet's people and species now and in the future.[10] In regards to natural resources, depletion is of concern for sustainable development as it has the ability to degrade current environments[13] and potential to impact the needs of future generations Depletion of natural resources is associated with social inequity. Considering most biodiversity are located in developing countries depletion of this resource could result in losses of ecosystem services for these countries. Some view this depletion as a major source of social unrest and conflicts in developing nations.

At present, there is particular concern for rainforest regions that hold most of the Earth's biodiversity. According to Nelson[19] deforestation and degradation affect 8.5% of the world's forests with 30% of the Earth's surface already cropped. If we consider that 80% of people rely on medicines obtained from plants and ¾ of the world's prescription medicines have ingredients

taken from plants, loss of the world's rainforests could result in a loss of finding more potential life saving medicines.The depletion of natural resources is caused by 'direct drivers of change'such as Mining, petroleum extraction, fishing and forestry as well as 'indirect drivers of change' such as demography (e.g. population growth), economy, society, politics and technology. The current practice of Agriculture is another factor causing depletion of natural resources. For example, the depletion of nutrients in the soil due to excessive use of nitrogen[19] and desertification. The depletion of natural resources is a continuing concern for society. This is seen in the cited quote given by Theodore Roosevelt, a well-known conservationist and former United States president, who was opposed to unregulated natural resource extraction.

Protection

In 1982, the UN developed the World Charter for Nature, which recognized the need to protect nature from further depletion due to human activity. It states that measures must be taken at all societal levels, from international to individual, to protect nature. It outlines the need for sustainable use of natural resources and suggests that the protection of resources should be incorporated into national and international systems of law. To look at the importance of protecting natural resources further, the World Ethic of Sustainability, developed by the IUCN, WWF and the UNEP in 1990,set out eight values for sustainability, including the need to protect natural resources from depletion. Since the development of these documents, many measures have been taken to protect natural resources including establishment of the scientific field and practice of conservation biology and habitat conservation, respectively.

Conservation biology is the scientific study of the nature and status of Earth's biodiversity with the aim of protecting species, their habitats, and ecosystems from excessive rates of extinction.[It is an interdisciplinary subject drawing on science, economics and the practice of natural resource management. The term conservation biology was introduced as the title of a conference held at the University of California, San Diego, in La Jolla, California, in 1978, organized by biologists Bruce A. Wilcox and Michael E. Soulé.

Habitat conservation is a land management practice that seeks to conserve, protect and restore, habitat areas for wild plants and animals, especially conservation reliant species, and prevent their extinction, fragmentation or reduction in range.

Management

Natural resource management is a discipline in the management of natural resources such as land, water, soil, plants, and animals—with a particular focus on how management

affects quality of life for present and future generations. Hence, sustainable development is followed according to judicial use of resources to supply both the present generation and future generations.

Management of natural resources involves identifying who has the right to use the resources and who does not for defining the boundaries of the resource. The resources are managed by the users according to the rules governing of when and how the resource is used depending on local condition.

A "...successful management of natural resources depends on freedom of speech, a dynamic and wide-ranging public debate through multiple independent media channels and an active civil society engaged in natural resource issues...", because of the nature of the shared resources the individuals who are affected by the rules can participate in setting or changing them. The users have rights to devise their own management institutions and plans under the recognition by the government. The right to resources includes land, water, fisheries and pastoral rights. The users or parties accountable to the users have to actively monitor and ensure the utilisation of the resource compliance with the rules and to impose penalty on those peoples who violates the rules. These conflicts are resolved in a quick and low cost manner by the local institution according to the seriousness and context of the offence. The global science-based platform to discuss natural resources management is the World Resources Forum, based in Switzerland.

Possible Questions:

PART A (2 Marks)

1. Differentiates Renewable and non Renewable resources.
2. Write a note soil erosion.
3. Explain land degradation.
4. List out the alternate energy sources.
5. Brief notes on dam building on environment.

PART B (6 Marks)

1. Explain in detail about equitable use of resources for sustainable lifestyles.
2. Give a detail account on Natural resources.
3. Give a detail account on biodiversity and tribal population.
4. Elaborate role of individuals in conservation of natural resources.
5. Give an account on causes and impacts of mining and dam building.

	UNIT - II	Option A	Option B	Option C	Option D	Answers
1	Plants get their nitrogen from–	rain	the soil	the air	the bedrock	the soil
2	The lowest temperature of air is recorded at–	midnight		just after sunset	2 m	just before sunrise
3	Radioactivity is measured by–	Geiger-Muller counter	Polarimeter	Calorimeter	Colorimeter	Geiger-Muller counter
4	Gandhi Sagar Dam is a part of which one of the following?	Chambal Project	Kosi Project	Damodar Valley Project	Bhakra Nangal Project	Damodar Valley Project
5	Pollination by wind is called–	Autogamy	Entomophily	Anemophily	Ornithophily	Anemophily
6	Which state has the largest area under tank irrigation?	Tamil Nadu	Odisha	West Bengal	Karnataka	Tamil Nadu
7	Amongst the following Indian States which one has the minimum total forest cover?	Sikkim	Goa	Haryana	Kerala	Haryana
8	Of the total water on the Earth, fresh water reserves constitue approximately–	70%	27.00%	10%	89.00%	27.00%
9	Which state has the largest proportion of net irrigated area under canal irrigation?	Punjab	Uttar Pradesh	Maharashtra	Jammu and Kashmir	Jammu and Kashmir
10	Which of the following statement about Fjord is incorrect?	Most Fjords were formed due to raise in sea level after the melting of Pleistocene ice	It is an emergent coast that was originally submerged	It is a long narrow inlet of the sea bound by steep slopes	It is a glaciated valley that has been inundated by the sea	It is a glaciated valley that has been inundated by the sea
11	Residence time of water molecule in the ocean is:	35 years	35 million years	35 years	35000 years	35 years
12	Hyperplasia means	excessive motility of a muscle	Voracious eating	Abnormal increase in number of cells	An increase in size of a cell	Abnormal increase in number of cells

13	Carbon dioxide absorbs radiation in the range:	55 and 7 microns	Greater than 27 microns	8 to 13 microns	01 to 30 microns	55 and 7 microns
14	Sodium is usually estimated by which of the following analytical technique:	Flame Photometry	Coulometry	High pressure liquid chromotography	Visible spectrophotometry	Flame Photometry
15	Which combination of the following elements constitutes a major portion of earth crust:	Oxygen and Silicon	Oxygen and Iron	Silicon and Iron	Aluminium and Iron	Oxygen and Silicon
16	Assertion (: Chlorofluorocarbons deplete ozone Reason (R): These compounds contain Chlorine, Bromine and Fluorine	Both (and (R) are true and (R) is the correct explanation of (	Both (and (R) are true but (R) is not the correct explanation of (	(is true but (R) is false	(is false but (R) is true	(is true but (R) is false
17	Maximum Density of water is at:	4°C	0°C	100°C	272°C	4°C
18	The cause of lung cancer Mesothalemia is:	Asbestos	Arsenic	Mercury	Chromium	Arsenic
19	Which of the following pattern of evolution accounts for all the diversity present on earth today?	Microevolution	Megaevolution	Biodiversity	Speciation	Biodiversity
20	Group of individuals of the same species that share common attributes are called:	Community	Population	Ecotype	Society	Ecotype
21	Which one of the following is the correct food chain?	Algae -> Daphnia -> Dragon Fly Nymph -» Newt -» Grass Snake	Daphnia -» Dragon Fly Nymph -> Newt -» Algae -> Grass Snake	Grass Snake -> Newt -» Dragon Fly Nymph Daphnia Algae	Newt -» Grass Snake -» Dragon Fly Nymph -» Algae -> Daphnia	Algae -> Daphnia -> Dragon Fly Nymph -» Newt -» Grass Snake
22	Assertion (: Monsoonal rainfall is very high both on the west coast and northeast Indi Reason (R): The duration of monsoon over west coast and northeast India is longer than other parts of Indi	Both (and (R) are true and (R) is the correct explanation of (	Both (and (R) are true but (R) is not the correct explanation of (	(is true but (R) is false	(is false but (R) is true	Both (and (R) are true but (R) is not the correct explanation of (

23	Which one of the following statements regarding El-NINO is NOT true?	It is an extension of equatorial current towards the western coast of South Ameri	It is an occasional warm current leading to an increase of about 10°C in subsurface water temperature	It develops as temporary replacement of usual cold Peruvian Current	It causes an increase in plankton thriving in cold Peruvian current	It is an extension of equatorial current towards the western coast of South Ameri
24	The process of alluviation indicates	Removal of particles from the upper layer of soil	Removal of particles from lower layer of soil	Deposition of soil particles in sub-soil layer	Transportation of soil particles in the B-horizon	Deposition of soil particles in sub-soil layer
25	Which one of the following is the cleanest source of energy?	Hydropower	Fossil fuel	Nuclear power	Wind energy	Wind energy
26	The global warming efficiency of a CFC molecule in relation to a CO-, molecule is higher by a factor of:	125	25	20,000	1500	125
27	Arsenic problem in India is primarily due to:	Overexploitation of arsenopyrite in the hinterland	Overexploitation of coal in Bihar and Bengal	Overexploitation of ground water in the affected areas	Overexploitation of surface water in the affected areas	Overexploitation of ground water in the affected areas
28	Acid rain is caused by	CO and CO2 ,	SO 2 ,and 0 2	S0 2 and NO" 2	NO 2 and O 2	S0 2 and NO" 2
29	What will be the outcome of Eutrophication of surface waters?	Overproduction of biomass	Decrease in nitrogen concentration	Decrease in phosphorus concentration	Decrease in both nitrogen and phosphorus concentrations	Overproduction of biomass
30	Assertion (: Negatively charged soil particles attract positive ions like Ca++ and Mg ++ Reason (R): The attraction keeps the ions at soil level for ready availability	Both (and (R) are true and (R) is the correct explanation of (	Both (and (R) are true but (R) is not the correct explanation of (	(is true but (R) is false	(is false but (R) is true	Both (and (R) are true and (R) is the correct explanation of (
31	Cost Benefit analysis is required in case of proposals involving clearance of forest land:	Greater than 1Oha but less than 20ha	Greater than 20ha	Greater than 5ha but less than 1Oha	Greater than 40ha only	Greater than 1Oha but less than 20ha

32	Ecologically sensitive and important areas, breeding and spawning grounds of marine life et, are categorized in coastal Regulation Zone as:	CRZ - IV	CRZ - II	CRZ-III	CRZ-I	CRZ-I
33	A management tool comprising a systematic, periodic and objective evaluation of how well an environmental organization, management and equipment are performing is known as:	Raw material balance	Input - output analysis	Acturities at site	Environmental audit	Environmental audit
34	The least preferred technique in the disposal of municipal solid waste is	incineration	composting	land filling	Bricketting	Bricketting
35	Bacterial decomposition of biological material under aerobic condition is	Fermentation	Fertilization	Contamination	Composting	Fermentation
36	When you go for shopping, what are you expected to do to save environment?	Shop for products that have as little packaging as possible	In any store, use a bag even it is not neede	Do not reduce the frequency of shopping	Buy paper towels and napkins	Shop for products that have as little packaging as possible
37	In the analysis of 15 water samples, Ca and Mg gave a correlation of +095 It means:	Ca came from soil and Mg came from biota	Ca and Mg both came from the same type of water	Ca and Mg are both cogenetic	Ca and Mg came from different sources	Ca and Mg came from different sources
38	If a piece of metal weighs 102g in air, 86g in water and 78g in another liquid, then what will be the specific gravity of the liquid?	1	15	2	3	2
39	Climatic stress is caused by insufficient and/or excessive regime of	Temperature	Humidity	Solar radiation	All the above	All the above
40	The chemical that is used to ripen mangoes is	Calcium sulphide	Calcium carbide	Calcium carbonate	Calcium chloride	Calcium carbide
41	Organisms that generate energy using light are	oligotrophs	chaemorganotrophs	chaemolithotrophs	photoautotrophs	photoautotrophs

42	Land use pattern is usually studied by the following technique	Aerial photography	Satellite imaging	Satellite imaging and G I S	Satellite imaging, G I S and G P S	Satellite imaging
43	To conserve coral reefs the Govt, of India declared one of the following as Marine Park	Gulf of Kutch	Lakshadweep islands	Gulf of Mannar	Andaman Islands	Lakshadweep islands
44	Which one of the following does not contribute to conservation of water?	Waste water treatment	Waste land development	Water shed protection	Rain water harvesting	Waste land development
45	Particle size in soil can be classified as clay: 1-4 micron Silt: 4-62 micron Sand: 62-1000 micron; Boulder: >1000 micron It is hence correct to suggest that in nature particle size distribution follows	Binomial distribution	Lognormal distribution	Linear distribution	Normal distribution	Normal distribution
46	The phenomenon of occurrence of additional species found in the ecotone or transitional zone between adjoining ecosystems is known as ----------	Edge effect	Root effect	Raman effect	Leaf effect	Edge effect
47	The complex network of interconnected food chains is called ----------	Trophic level	Food web	Ecological pyramid	Food chain	Food web
48	Each organism in an ecosystem is at a specific feeding stage called as the ----	Climax level	Producer level	Trophic level	Consumer level	Trophic level
49	The area to which a species is biologically adapted to live is known as----------	Niche Habitat Succession	Habitat	Succession	All the above	Habitat
50	Official date of Earth Day is on ---------- ----------	April 22	March 21	May 22	March 22	April 22
51	All forms of water that comes down on Earth, including rain, show, hail et is known as----------	Calcification	Fixation	Precipitation	Floculation	Precipitation
52	The forests in the Arctic are called ---------- ----------	Savanna	Tundra	Prairies	thar	Tundra
53	The ocean cover ---------- percentage of Earth's surface	51%	61%	71 %	2%	71 %

54	The salt-tolerant trees growing in shallow marine sediment or estuaries known as ----------	Mangroves	Xerophytes	Epiphytes	Endophytes	Mangroves
55	The largest brackish water lake situated in Asia is in Oriss Which is the lake ?	Chilka lake	Vembanad lake	Woolar lake	Chembarambakkam lake	Chilka lake
56	Ramsar Convention refers to the conservation of ----------	Deserts	Wetlands	Agriculture lands	Grass land	Wetlands
57	The World Wetlands Day is celebrated on ----------	February 02	February 28	June 05	June 22	February 02
58	National Maritime Day of India is celebrated on ----------	October 16	April 05	March 21	March 22	April 05
59	The animal which consumes decaying organic matter is ----------	Carnivore	Detrivore	Herbivore	omnivore	Detrivore
60	Ganga Action Plan in India was launched in the year ----------	1988	1985	1980	1982	1985
61	What is the name of the action plan for sustainable development in the twenty first century framed in the Rio Declaration on Environment & Development (1992) ?	Action 21	Agenda 21	Rio 21	Rio 22	Agenda 21

Levels of biological diversity - genetic, species and ecosystem diversity.Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value. Bio-geographical classification of India.Biodiversity patterns (global, National and local levels).Hot-spots of biodiversity.India as a mega-diversity nation.Endangered and endemic species of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Biodiversity and Conservation Methods

The term biodiversity was coined as a contraction of biological diversity by E.O. Wilson in 1985. Biodiversity may be defined as the variety and variability of living organisms and the ecological complexes in which they exist. In other words, biodiversity is the occurrence of different types of ecosystems, different species of organisms with the whole range of their variants and genes adapted to different climates, environments along with their interactions and processes.
Biodiversity includes the genetic variability (for which different varieties of spices have appeared in the course of evolution) and diversity of life forms such as plants, animal microbes, etc. living in a wide range of ecosystems.

Contents:

1. Types of Biodiversity
2. Biodiversity of India
3. Importance of Biodiversity
4. Uses of Biodiversity
5. Threats to Biodiversity
6. Conservation of Biodiversity

The diversity may be interspecific (within species) and interspecific (in between the species) but these are well supported by ecosystem. It is seen that the diverse living forms of the ecosystem are modulated with the global environmental changes.

1. Types of Biodiversity:

There are three interrelated hierarchical levels of biodiversity namely, genetic diversity, species diversity and community or ecosystem diversity.

1. Genetic diversity:

It describes the variation in the number and types of genes as well as chromosomes present in different species. The magnitude of variation in genes of a species increases with increase in size

and environmental parameters of the habitat.

The genetic variation arises by gene and chromosome mutation in individuals and in sexually reproducing organisms and it is spread in the population by recombination of genetic materials during cell division after sexual reproduction.

Genetic diversity has the following importance:

(i) It helps in speciation or evolution of new species;

(ii) It is useful in adaptation to changes in environmental conditions;

(iii) It is important for agricultural productivity and development.

2. Species diversity:

It describes the variety in the number and richness of the spices with in a region. The species richness may be defined as the number of species per unit area. The richness of a species tells about the extent of biodiversity of a site and provides a means for comparing different sites.

The species richness depends largely on climatic conditions. The number of individuals of different species with in a region represents species evenness or species equitability. The product species richness and species evenness give species diversity of a region. When a species is confined entirely to a particular area, it is termed as endemic species.

3. Ecosystem diversity:

It describes the assemblage and Interaction of spices living together and the physical environment a given area. It relates varieties of habitats, biotic communities ecological processes in biosphere. It also tells about the diversity within the ecosystem. It is referred as Land escape diversity because it includes placement and size of various ecosystems.

For example, the landscapes like grass lands, deserts, mountains etc. show ecosystem diversity. The ecosystem diversity is due to diversity of niches, trophic levels and ecological processes like nutrient cycling, food webs, energy flow, role of dominant species and various related biotic interactions. Such type of diversity can generate more productive and stable ecosystems or communities capable of tolerating various types of stresses e.g. drought, flood etc.

According to Whittaker (1965), the community diversities are of three types:

(i) α-Diversity:

It tells the species diversity in a given community.

It depends upon species richness and evenness.

(ii) β-Diversity:

It describes a range of communities due to replacement of species which arises due to the presence of different microhabitats, niches and environmental conditions.

(iii) γ -Diversity:

It describes diversity of habitat over a total land escape or geographical area.

2. Biodiversity of India:

As per available data, the varieties of species living on the earth are 1753739. Out of the above species, 134781 are residing in India although surface area of India is 2% of the earth's surface. Wild life Institute of India has divided it into ten biogeographical regions and twenty five biotic provinces.

Biogeographical regions are:

(i) Trans Himalayas,
(ii) Gangetic plain,
(iii) Desert,
(iv) Semiarid zone;
(v) Western Ghats;
(vi) Deccan peninsula,
(vii) North eastern zone,
(viii) Coastal lands
(ix) Himalayas,
(x) Islands.

India is one of the twelve mega diversity nations of the world due to the following reasons:

(i) It has 7.3% of the global fauna and 10.88% of global flora as per the data collected by Ministry of Environment and forest.
(ii) It has 350 different mammals, 1200 species of birds- 453 different reptiles, 182 amphibians and 45,000 plants spices.
(iii) It has 50,000 known species of insects which include 13,000 butterflies and moths.
(iv) It has 10 different biogeographical regions and 25 biotic provinces having varieties of lands and species.
(v) In addition to geographical distribution, geological events in the land mass provide high level of biological diversity.
(vi) Several crops arose in the country and spread throughout the world.
(vii) There is wide variety of domestic animals like cows, buffaloes, goats, sheep, pigs, horses etc.
(viii) The marine biota includes sea weeds, fishes, crustaceans, molluses, corals, reptiles etc.
(ix) There are a number of hot spots (namely Eastern Ghats, Western Ghats, North Eastern hills etc.).

3. Importance of Biodiversity:

The living organisms on earth are of great diversity, living in diverse habitats and possessing diverse qualities and are vital to human existence providing food, shelter, clothing's, medicines etc.

The biodiversity has the following importance's:

1. Productive values:

Biodiversity produces a number of products harvested from nature and sold in commercial markets. Indirectly it provides economic benefits to people which include water quality soil protection, equalisation of climate, environmental monitoring, scientific research, recreation etc.

2. Consumptive value:

The consumptive value can be assigned to goods such as fuel woods, leaves, forest products etc. which may be consumed locally and do not figure in national and international market.

3. Social value:

The loss of biodiversity directly influences the social life of the country possibly through influencing ecosystem functions (energy flow and biogeochemical cycle). This be easily understood by observing detrimental effects of global warming and acid rain which cause an unfavorable alteration in logical processes.

4. Aesthetic value:

Aesthetic values such as refreshing fragrance of the flowers, taste of berries, softness of mossed, melodious songs of birds, etc. compel the human beings to preserve them. The earth's natural beauty with its colour and hues, thick forest, and graceful beasts has inspired the human beings from their date of birth to take necessary steps for its maintenance. Similarly botanical and zoological gardens are the means of biodiversity conservation and are of aesthetic values.

5. Legal values:

Since earth is homeland of all living organisms, all have equal right to coexist on the surface of earth with all benefits. Unless some legal value is attached to biodiversity, it will not be possible to protect the rapid extinction of species.

6. Ethical value:

Biodiversity must be seen in the light of holding ethical value. Since man is the most intelligent amongst the living organisms, it should be prime responsibility and moral obligation of man to preserve and conserve other organisms which will directly or indirectly favour the existence of the man.

7. Ecological value:

Biodiversity holds great ecological value because it is indispensable to maintain the ecological balance. Any disturbance in the delicately fabricated ecological balance maintained by different organisms, will lead to severe problems, which may threaten the survival of human beings.

8. Economic value:

Biodiversity has great economic value because economic development depends upon efficient and economic management of biotic resources.

In the day to day life, human beings are maintaining their lifestyle at the sacrifice of surrounding

species which come from diversity of plants and animals struggling for their existence.
So, it is highly essential for the human beings to take care of their surrounding species and make optimum use of their service, for better economic development. Thus, it is rightly told, survival of the man depends upon the survival of the biosphere.

4. Uses of Biodiversity:

Biodiversity has the following uses for the development humanity:
(i) It provides food of all types.
(ii) It provides fibers, sources for the preparation of clothes.
(iii) It provides different types of oil seeds for the preparation of oils.
(iv) It provides new varieties of rice, potato etc. through the process of hybridization.
(v) It provides different drugs and medicines which are based on different plant products.
(vi) It is very essential for natural pest control, maintenance of population of various species, pollination by insects and birds, nutrient cycling, conservation and purification of water, formation of soil etc. All these services together are valued 16.54 trillion dollars per year.

5. Threats to Biodiversity:

Biodiversity is considered as a reservoir of resources to be used for the manufacture of food, medicine, industrial products, etc. But with an increased demand of rapid population growth, biodiversity is gradually depleting. A number of plants" and animal species have already become extinct and many are endangered.

The different factors responsible for causing threat to biodiversity are as follows:

1. Habitat destruction:

The primary cause of loss of biodiversity is habitat loss or destruction which is resulted due to the large industrial and commercial activities associated with agriculture, irrigation, construction of dams, mining, fishing etc.

2. Habitat fragmentation:

With increased population, the habitats are fragmented into pieces by roads, fields, canals, power lines, towns etc. The isolated fragment of habitats restricts the potential of species for dispersal and colonization. In addition, the habitat fragmentation also brings about microclimatic changes in light, temperature, wind etc.

3. Pollution:

The most dreaded factor inducing loss of biodiversity is environmental pollution which include air pollution, Water pollution, industrial pollution, pollution due to chemical Pastes, pesticides radioactive materials etc.

4. Over exploitation:

The natural resources are over exploited to meet growing rural poverty, intensive technological growth and globalization of economy. All these factors together may be responsible for the extinction of a number of species.

5. Introduction of exotic species:

The introduction of exotic species are due to:

(i) horticulture
(ii) agriculture;
(iii) European colonisation and
(iv) accidental transport.

It is seen that some exotic species may kill or eat the native species thereby causing its extinction.

6. Diseases:

Since the animals are more vulnerable to infection, the anthropological activities may increase the incidence of diseases in wild species, leading to their extinction.

7. Shifting or Jhum cultivation:

The shifting or Jhum cultivation by poor tribal people greatly affects the forest structure which is a store house of biodiversity.

8. Poaching of wild life:

A number of wildlife species are becoming extinct due to poaching and hunting.

Table: Endangered and Endemic Species of India

Category	**Enlisted species**	**Highly endangered Species.**
1. Higher plants	15,000	135
2. Mammals	372	69
3. Reptiles and amphibians	580	22
4. Birds	1175	40
5. Fishes	1693	—

6. Conservation of Biodiversity:

Biodiversity is being depleted by the loss of habitat, fragmentation of habitat, over exploitation of resources, human sponsored ecosystems, climatic changes, pollution invasive exotic spices, diseases, shifting cultivation, poaching of wild life etc.

Since the human beings are enjoying all the benefits from biodiversity, they should take proper care for the preservation of biodiversity in all its form and good health for the future generation i.e., the human being should prevent the degradation and destruction of the habitats thereby

maintaining the biodiversity at its optimum level.

Conservation of biodiversity is protection, upliftment and scientific management of biodiversity so as to maintain it at its threshold level and derive sustainable benefits for the present and future generation. In other words, conservation of bio-diversity is the proper management of the biosphere by human beings in such a way that it gives maximum benefits for the present generation and also develops its potential so as to meet the needs of the future generations.

Mainly the conservation of biodiversity has three basic objectives:

(a) To maintain essential ecological processes and life supporting systems.

(b) To preserve the diversity of species.

(c) To make sustainable utilisation of species and ecosystems.

Strategies for Conservation of Biodiversity:

The following strategies should be undertaken in order to conserve biodiversity:

(1) All the possible varieties (old or new) of food, forage and timber plants, live stock, agriculture animals and microbes should be conserved.

(2) All the economically important organisms in protected areas should be identified and conserved.

(3) Critical habitats for each species should be identified and safeguarded.

(4) Priority should be given to preserve unique ecosystems.

(5) There should be sustainable utilisation of resources.

(6) International trade in wild life should be highly regulated.

(7) The poaching and hunting of wildlife should be prevented as far as practicable.

(8) Care should be taken for the development of reserves and protected areas.

(9) Efforts should be made to reduce the level of pollutants in the environment.

(10) Public awareness should be created regarding biodiversity and its importance for the living organisms.

(11) Priority should be given in wildlife conservation programme to endangered species over vulnerable species and to vulnerable species over rare species.

(12) The habitats of migratory birds should be protected by bilateral and multilateral agreement.

(13) The over exploitation of useful products of wild life should be prevented.

(14) The useful animals, plants and their wild relatives should be protected both in their natural habitat (in-situ) and in zoological botanical gardens (ex-situ)

(15) Efforts should be made for setting up of National parks and wild life sanctuaries to safeguard the genetic diversity and their continuing evolution.

(16) Environmental laws should be strictly followed.

Conservation Methods:

There are two types of conservation methods namely in-situ and ex-situ conservations. Let us discuss the different conservation methods along with their importance.

(a) In situ conservation:

The conservation of species in their natural habitat or natural ecosystem is known as in situ conservation. In the process, the natural surrounding or ecosystem is protected and maintained so that all the constituent species (known or unknown) are conserved and benefited. The factors which are detrimental to the existence of species concerned are eliminated by suitable mechanism.

The different advantages of in situ conservation are as follows:

(a) If is a cheap and convenient way of conserving biological diversity.

(b) It offers a way to preserve a large number of organisms simultaneously, known or unknown to us.

(c) The existence in natural ecosystem provides opportunity to the living organisms to adjust to differed' environmental conditions and to evolve in to a better life form.

The only disadvantage of in situ conservation is that it requires large space of earth which is often difficult because of growing demand for space. The protection and management of biodiversity through in situ conservation involve certain specific areas known as protected areas which include national parks, Sanctuaries and Biosphere reserves.

1. Protected areas:

The protected areas are biogeographical areas where biological diversity along with natural and cultural resources are protected, maintained and managed through legal and administrative measures. The demarcation of biodiversity in each area is determined on the basis of climatic and physiological conditions.

In these areas, hunting, firewood collection, timber harvesting etc. are prohibited so that the wild plants and animals can grow and multiply freely without any hindrance. Some protected areas are: Cold desert (Ladakh and Spiti), Hot desert (Thar), Saline Swampy area (Sunderban and Rann of Kutch), Tropical moist deciduous forest (Western Ghats and north East) etc. Protected areas include national parks, sanctuaries and biosphere reserves. There are 37,000 protected areas throughout the world. As per World Conservation Monitoring Centre, India has 581 protected areas, national parks and sanctuaries.

2. National parks:

These are the small reserves meant for the protection of wild life and their natural habitats. These are maintained by government. The area of national parks ranges between 0.04 to 3162 km. The boundaries are well demarcated and circumscribed. The activities like grazing forestry, cultivation and habitat manipulation are not permitted in these areas. There are about 89 national parks in India.

Some important national Parks of India are:

(i) Biological Park, Nandankanan, Orissa,

(ii) Corbett national Park Nainital, U.P. (First national Park)
(iii) Koziranga national Park, Jorhat, Assam
(iv) Tudula national Park, Maharashtra
(v) Hazaribagh national Park, Hazaribagh, Bihar
(vi) Band havgarh national park, M.P.
(vii) Bandipur national park, Karnataka.
(viii) Kanha National Park, M.P.
(ix) Reibul Lamjao National Park, Manipur
(x) Nawgaon National Park, Maharashtra

3. Sanctuaries:

These are the areas where only wild animals (fauna) are present. The activities like harvesting of timbers, collection of forest products, cultivation of lands etc. are permitted as long as these do not interfere with the project. That is, controlled biotic interference is permitted in sanctuaries, which allows visiting of tourists for recreation. The area under a sanctuary remains in between 0.61 to 7818 km.

Some important sanctuaries of Orissa are as follows:

(i) Nandankanan Zoological Park
(ii) Chandaka Elephant reserve
(iii) Simlipal Tiger Reserve
(iv) Bhitarkanika Wild life Sanctuary
(v) Gharial project at Tikarpada
(vi) Chilika (Nalaban) Sanctuary

4. Biosphere reserves:

Biosphere reserves or natural reserves are multipurpose protected areas with boundaries circumscribed by legislation. The main aim of biosphere reserve is to preserve genetic diversity in representative ecosystems by protecting wild animals, traditional life style of inhabitant and domesticated plant/ animal genetic resources. These are scientifically managed allowing only the tourists to visit.

Some importance of biosphere reserves are as follows:

(a) These help in the restoration of degraded ecosystem.
(b) The main role of these reserves is to preserve genetic resources, species, ecosystems, and habitats without disturbing the habitants.
(c) These maintain cultural, social and ecologically sustainable economic developments.
(d) These support education and research in various ecological aspects,

Some important biosphere reserves are:

Simlipal, (Orissa), Sunderban (West Bengal), Kanha (M.P Kaziranga (Assam) etc. The biosphere reserve net work was introduced by UNESCO 1971.

TABLE 5.2 : BIOSPHERE RESERVES OF INDIA

S. No.	Date notified	Name of the site	Area in sq.km.	Location (state)
1.	0.1.08.86	Nilgiri	5,520	Parts of Wynad, Nagarhole, bandipur and Mudumalai, Nilambur, Silent Valeey, and the Siruvani Hills (Tamil Nadu, Kerala and Karnataka)
2.	18.01.88	Nanda Devi	5,860.69	Parts o the Chamoli, Pithoragarh, and Almorae dis tricts Uttaranchal)
3.	01.09.88	Nokrerk	820	Part of Gora Hills (Meghalaya)
4.	14.03.89	Manas	2,837	Parts of the Kokrajhar, Bongaigaon, Parpeta, Nalbari, Kamprup, and Daarang districts (Assam)
5.	29.03.89	Sunderbans	9,630	Parts of the Brahamaputra and Ganga deltas (West Bengal)
6.	18.02.89	Gulf of Mannar	10,500	Indian part of Gulf of Mannar between India and Sri Lanka (Tamil Nadu)
7.	06.01.89	Great Nicobar	885	Southernmost islands of the Andaman and Nicobar islands.
8.	21.06.94	Similpal	4,374	Partof Mayurbhanj district (Orissa)
9.	29.07.97	Dibru-Saikhowa	765	Parts of the Dibrugarh and Tinsukia districts (Assam)
10.	02.09.98	Dehang Debang	5,112	Parts of Siang and Debang Valley (Arunachal Pradesh).
11.	03.03.99	Pachmarhi	4,926.28	Part of the Betul, Hoshangabad, and Chindwara dis tricts (Madhya Pradesh)
12.	07.02.00	Kanchanjanga	2,619.92	Part of Kanchanjanga Hills (Sikkim)

(b) Ex-situ conservation:

Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas like zoo, gardens, nurseries etc. That is, the conservation of selected plants and animals in selected areas outside their natural habitat is known as ex-situ conservation.

The stresses on living organisms due to competition for food, water, space etc. can be avoided by ex-situ conservation there by providing conditions necessary for a secure life and breeding.

Some important areas under these conservation are:

(i) Seed gene bank,

(ii) Field gene bank;

(iii) Botanical gardens;

(iv) Zoos.

The strategies for ex-situ conservations are:

(i) Identification of species to be conserved.

(ii) Adoption of Different ex-situ methods of conservation.

(i) Long-term captive breeding and propagation for the species which have lost their habitats permanently.

(ii) Short-term propagation and release of the animals in their natural habitat

(iii) Animal translocation
(iv) Animal reintroduction
(v) Advanced technology in the service of endangered species.

The different advantages of ex-situ conservation are:

(a) It gives longer life time and breeding activity to animals.
(b) Genetic techniques can be utilised in the process.
(c) Captivity breed species can again be reintroduced in the wild.

Some disadvantages of this method are:

(a) The favourable conditions may not be maintained always.
(b) Mew life forms cannot evolve.
(c) This technique involves only few species.

Hot Spots:

Hot spots are the areas with high density of biodiversity or mega diversity which are most threatened at present. There are 16 hot spots in world, out of which two are located in India namely North-East Himalayas and Western Ghats.

The hot spots are determined considering four factors:

(i) Degrees of endemism;
(ii) Degree of expectation
(iii) Degrees of threat to habitat due to its degradation and fragmentation and
(iv) Number of Species diversity.

The global hot spot and endemic species present within them are:

(1) North East Himalayas (3,500);
(ii) Western Ghats (1,600);
(iii) Cape region of South Africa (6,000);
(iv) Upland Western Amazonia (5,000);
(v) Madagascar (4,900);
(vi) Philippines (3,700)
(vii) Boreo (3, 500);
(viii) South West Australia (2,830);
(ix) Western Ecuador (2,500);
(x) Colombian Choco (2,500);
(xi) Peninsular Malaysia) (2, 400);
(xii) Californian Floristic Province (2,140);
(xiii) Central Chile (1,450);
(xiv) Eastern Arc. Mts (Tanzania) (535);
(xv) South West Srilanka (500);

(xvi) South west Tvorie (200).

Different mechanisms involved in the conservation of biodiversity is shown in Figure

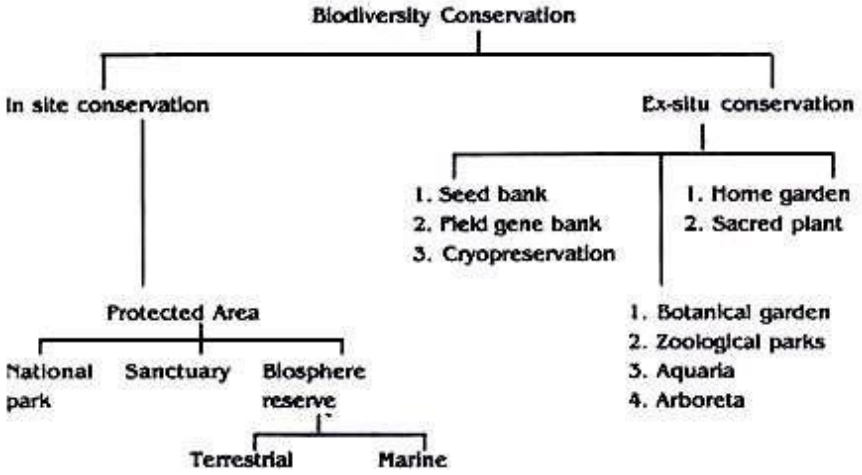


FIG. 5.1 : SCHEME SHOWING BIODIVERSITY CONSERVATION MANAGEMENT SYSTEMS.

Possible Questions:

Part B (2Marks)

1. Write about the levels of biodiversity.
2. A. Explain the value of Biodiversity.
3. Mention any two approaches of biodiversity conservation.
4. Define the ecosystem diversity.
5. Elaborate "India as a Mega-diversity nation".

Part C (6 Marks)

1. Elaborate the Endangered and Endemic Species of India.
2. Explain the man and wildlife conflicts.
3. Discuss in detail about the threats to biodiversity.
4. Explain the biogeographical classification of India.
5. Elaborate the Endangered and Endemic Species of India.
6. List and explain in detail about threats to biodiversity.

KARPAGAM ACADEMY OF HIGHER EDUCATION

COURSE NAME: Environmental Studies **COURSE CODE: 19AEC201**

CLASS: I B.Sc Microbiology UNIT-III **BATCH-2019-2022**

	UNIT – III	Option A	Option B	Option C	Option D	Answers
1	The area where all the living organisms interact with each other and their environment is ----------	biosphere	exosphere	mesosphere		biosphere
2	An ecosystem gradually merges with an adjoining one through a transitional zone called the ----------	ecological niche	ecological footprint	ecotone		ecotone
3	Green revolution is associated with ----------	sericulture	agriculture	fish culture		agriculture
4	The first protected area in India is ----------	Silent valley	Corbett National Park	Bandipur sanctuary		Silent valley
5	The Indian Parliament passed the Biodiversity Bill in the year	2000	2005	2002		2002
6	World Water Day is celebrated on ----------	May 22	June 05	March 22		March 22
7	The components of LPG are ----------	Methane & Hexane	Propane & Butane	Ethane & Methane		Propane & Butane
8	Which chemical was responsible for Bhopal gas tragedy?	Methyl Iso Cyanate	Benzene Hexa Chloride	Tri Nitro Toluene		Methyl Iso Cyanate
9	Major consumer of wood from forest is ----------	Thermal Power Plant	Paper Industry	Chemistry Industry		Paper Industry
10	Green Revolution in India was initiated by ----------	MSSwaminathan	Sunderlal Bahugana	Kurien		MSSwaminathan
11	The Unit of measurement of intensity of sound is in ----------	decibels	lux	parsec		decibels
12	A combination of smoke, fog and chemical pollutants seen in industrialized cities is known as ----------	Sol	Smog	Fallout		Smog

13	Enrichment of water body by nutrients like phosphorus and nitrogen is called	Succession	Eutrophication	Stratification		Eutrophication
14	The violent tropical storms in the Indian Ocean are known as --------	Typhoon	Cyclones	Hurricane		Cyclones
15	The worst nuclear accident happened to date is occurred at ----------	Chernobyl in 1986	Three Mile Power Plant in 1979	Sellafield in 1957		Chernobyl in 1986
16	Major cause of Ozone depletion is due to which chemical ?	Chlorofluorocarbons	Polyphenols	Dioxins		Chlorofluorocarbons
17	The legally binding international agreement to reduce Greenhouse gases by 5% 2012 is ------	Vienna convention	Montreal Protocol	Kyoto Protocol		Kyoto Protocol
18	The portion of the earth and its environment which can support life is known as	Crust	Biosphere	Exosphere		Biosphere
19	Public awareness of environment creates ----------	Environment protection	Environment degradation	Environmental improvement	Environmental cultivation	Environment protection
20	Salim Ali centre for ornithology and history is located at ---------	Pune	Hyderabad	Kerala	Coimbatore	Coimbatore
21	Wild life protection act was formulated during the period of ----------	Mrs Indira Gandhi	Lal Bahadur Shasthri	Rajiv Gandhi	Morarji Desai	Mrs Indira Gandhi
22	What is troposphere?	Portion of air	Portion of water	Lowest layer of atmosphere where we survive	Portion of sky	Lowest layer of atmosphere where we survive
23	How is the atmosphere, hydrosphere and lithosphere connected ?	Hydrological cycle	Nitrogen cycle	Oxygen cycle	Carbon cycle	Carbon cycle
24	The main energy source for the environment is ----------	Solar energy	Chemical energy	Bioelectric energy	Electrical energy	Solar energy
25	What is the meaning of the word “endemic”	Rare and occur only in a few location	Rare and occur everywhere	Abundant and seen everywhere	Abundant and only in few locations	Rare and occur only in a few location
26	Which gas is likely to be reduced in the atmosphere by deforestation?	Carbon dioxide	Nitrogen	Oxygen		Oxygen

27	What are rodenticides ?	that kill fishes	that kill insects	that kill rats	that kill crocos	that kill rats
28	Which of the following enhances soil fertility ?	Crop rotation	Improved methods of agriculture	Using new seed verities	Irrigation	Crop rotation
29	Salinization is ----------	Accumulation of	Accumulation of	Accumulation of	Accumulation	Accumulation of
		salts in water	salts in food	salts in body animals	of salts in animals	salts in water
30	What is oil slick ?	Boiled oil	Cooled oil	Thin film of oil in sea water	Oil in deep sea	Oil in deep sea
31	Cigarette smoking exposes one to ----------	Sulphur dioxide	Carbon dioxide	Nitrogen peroxide	Carbon monoxide	Carbon monoxide
32	“Ozone Hole” is a ----------	Hole in the atmosphere	Destruction of ozone layer	Hole in hydrosphere		Destruction of ozone layer
33	Euro II standard refers to ----------	Lowering sulfur content in fuel	Increasing sulfur content in fuel	Lowering carbon content in fuel		Lowering sulfur content in fuel
34	Noise is ----------	Huge sound	Sound of vehicles	Undesirable and unwanted sound	Sound of crackers	Undesirable and unwanted sound
35	What is ‘temporary threshold shift’ ?	Hearing loss due to excessive noise	Noise that is untolerable	Tolerable noise		Hearing loss due to excessive noise
36	Acid is an example of ----------	Corrosive waste	Infectious waste	Radioactive waste	Ignitable waste	Corrosive waste
37	Vermi composting is a natural method of	Producing compost manure	Producing worms	Managing waste it creates	Destroying worms	Managing waste it creates
38	The intensity of earthquake is measured in ----------	Beaufort scale	Richter scale	Mohs scale		Richter scale
39	Which of the below is most responsible for world water crisis ?	Dams	Floods	Drought	Population growth	Population growth
40	Phagotropic mode of nutrition is found in ----------	Products	consumers	decomposers	all of these	consumers

41	Energy is returned to the atmosphere in the form of	potential energy	metabolic energy	heat	vapours	heat
42	The conversion of ammonia to nitrate is known as ----------	ammonification	nitrification	denitrification	all of these	nitrification
43	The study of individual organism is known as	syn ecology	population ecology	autecology	human ecology	autecology
44	The resources that can be replaced by natural ecological cycle is called	renewable	non-renewable	exhaustible	natural	renewable
45	Natural earthquakes are caused by ----------	earth's crust	deep seas	peak mountains	forests	earth's crust
46	Any unfavorable alteration of the environment may be called as	eutrophication	environment pollution	biomagnigication	bioaccumulation	environment pollution
47	The presence of solid, liquid or gaseous compounds, which may not be normally present, or in excess concentration in the atmosphere is called	air pollution	water pollution	soil pollution	radioactive pollution	air pollution
48	The place where the river meets the sea is called	estuaries	oceans	lake	wetlands	estuaries
49	The historical monument that is affected by acid rain is	Taj Mahal	Pyramid of Egypt	Pisa Tower	Golden Temple	Taj Mahal
50	The expansion on POLI is	physical quality of life index	population quotient of life in India	poor quality of life in India	poverty, quality of life in India	population quotient of life in India
51	The presence of which is necessary for photosynthesis	Chloroform	Chlorophyll	Phosphorus	Polymer	Chlorophyll
52	The Primary Consumers are also called as 6	Herbivores	Carnivores	Enzymes	None of these	Herbivores
53	Forest is an example of	Marine ecosystem	Limnic ecosystem	Artificial Ecosystem	Terrestial Ecosystem	Terrestial Ecosystem
54	The amount of solar radiation reaching the surface of the earth is called	Solar flux	reflected light	minerals	solvents	Solar flux

55	Snake is an example of	Primary Carnivores	Secondary Carnivores	Herbivores	None of these	Secondary Carnivores
56	The forests which occur in law rain fall area is	Evergreen forests `	deciduous forests	Coniferous forests	all the above	deciduous forests
57	All the genes of a population is called	gene poll	gene	ecosystem	population	gene poll
58	The destruction of habitat of plants and animals is called	endemism	endangered species	habitant loss	flood	habitant loss
59	Zoos are examples for	insitu conservation	in vivo conservation	exsitu conservation	exvivo conservation	exsitu conservation
60	Acid rain contains	Sulphuric acid	Hydrochloric acid	Oxalic acid	Acetic acid	Sulphuric acid
61	Organ affected by pneumonia	Liver	Kidney	Heart	Lungs	Lungs
62	Which year was declared as the 'Water Year' by Indian government	2010	2004	2007	2000	2007

Unit IV
Environmental Pollution

Environmental Pollution - Definition, causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution.Nuclear hazards and human health risks.Solid waste management and control measures of urban and industrial wastes.Role of an individual in prevention of pollution.Case studies.

ENVIRONMENTAL POLLUTION

Definition

Pollution may be defined as an undesirable change in the physical, chemical or biological characteristics of our air, water and land that may or will harmfully affect human life, the lives of the desirable species, our industrial processes, living conditions and cultured assets, or that may or will waste or deteriorate our raw material resources.

Types of environmental pollution

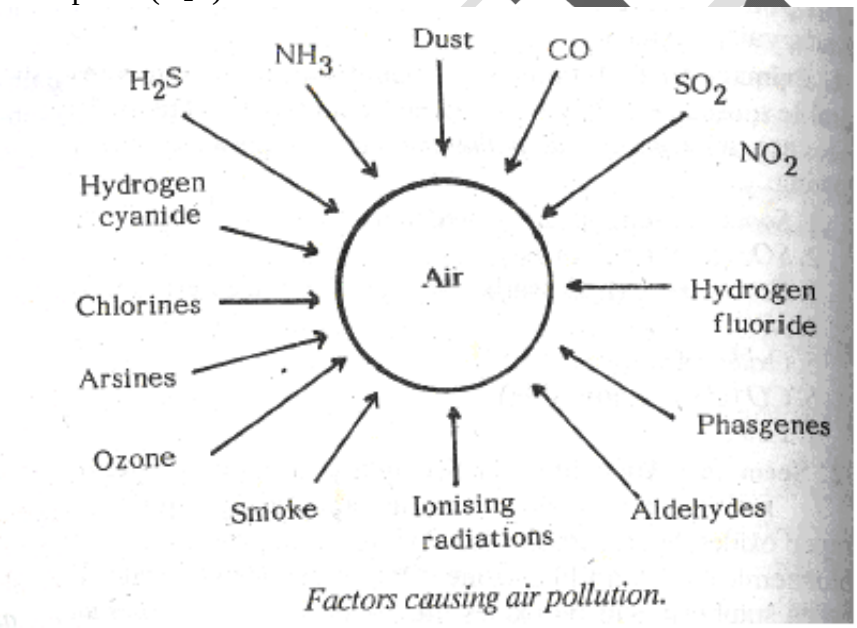
- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

AIR POLLUTION

- Air pollution refers to the undesirable change occurring in air causing harmful effects on man and domesticated species.

Air pollutants

- Dust
- Smoke
- Sulphur oxides (CO)
- Nitrogen oxides (SO_2)
- Ammonia (NH_3)
- Nitrogen dioxide(NO_2)
- Hydrogen cyanide
- Hydrogen fluorides
- Hydrogen sulphide (H_2S)
- Chlorines
- Phosgenes
- Arsines
- Aldehydes
- Ozone
- Ionizing radiations
- CO_2



Factors causing air pollution.

Air pollutants are two types

- Primary air pollutants
- Secondary air pollutants

Primary Air Pollutants

- Air is polluted by poisonous gases and undesirable substances.
- They are released by burning fossil fuels.
- These substances are called primary air pollutants.
- The tissues present in the tip of dusheri mango turns black when they are exposed to sulphur dioxide (SO_2) fumes.

The primary pollutants are following

- Soot released from unburned fuel
- SO_2
- Benzopyrene (hydrocarbon) released from cigarette smoke.
- NH_3
- Oxides of nitrogen
- CO (carbon monoxide)
- Lead

Secondary Air Pollutants

- Secondary air pollutants are poisonous nitrogen oxides, hydrocarbons and O_2 interact to produce more powerful photochemical oxidants like ozone (O_3), peroxyacetyl nitrate (PAN), Aldehydes, sulphuric acid, peroxides, etc.
- All these constitute photochemical smog.

CAUSES OF AIR POLLUTION

Agriculture

- Hydrocarbons released by plants, pollen grains, insecticides etc. cause air pollution.

Dust

- Dust in the air is increased by dust storms, wind, volcanoes, automobiles, etc.

Industries

- The Combustion of fossil fuels like coal, petroleum, etc. in industries is the main source of pollution.

Automobiles

- The combustion of petrol and diesel in automobiles releases harmful gases into the air.
- They also produce dust.

Ionising Radiations

- Ionizing radiations include alpha particle, beta particles and gamma rays.
- They are released into the air from testing atomic weapons and atomic explosions.

Freons

- Use of freons and other chlorine-flourine-carbons as refrigerants, coolants and as filling agents in aerosol pachages cause pollution.

Aerosols

- Aerosols are small particles of all sorts of solid or liquid substances suspended in the air.
- They block the stomata of plants and prevent he gaseous exchanges between plants and atmosphere.
- They may also change the climate of an area.

Biological indicators

- Some plants are sensitive to certain air pollutants.
- These plants are used to indicate the presence of these substances.
- These plants are called biological indicators

Example

- Pinto beans and petunias are used to indicate the presence of peroxy acetyl nitrate (PAN).
- Tobacco and annual blue-grass plants are used to show the presence of ozone (O_3).

ECOLOGICAL EFFECTS OF AIR POLLUTION

Death

When air is polluted with poisonous gases, death comes as a result immediately. Bopha episode is a good example.

Bhopal episode

- On 2nd December 1984about 3000 human beings died about 5000 paralysed and thousands of cattle, bird, dogs and cats died in one night at Bhopal.
- This mass death is due to the leakage of methyl isocyanate (toxic gas) into the air from art insecticide plant managed by Union Carbide.

Chlorosis

- The disappearance of chlorophyll is called Chlorosis.
- It is caused by SO_2 and fluorides present in the air.

Necrosis

- The breakdown of cells is called necrosis.
- It is caused by SO_2, nitrogen dioxide, ozone and fluorides.

Green house effect

- CO_2 is released into the air by the combustion of fuels.
- It is estimated that CO_2 content of the is increasing at the rated 0.4% per annum.
- This will result in an appreciable warming up of the ear.
- This is called green house effect.
- It is very likely that this will cause the melting of polar ice caps resulting in a rise of nearly 60 feet on the sea level.
- Coastal regions and low lying areas allover the world will be go under water.

Crop losses

- Heavy loss of crop plants is caused by smog.
- Smog denotes a combination of smoke and fog.
- The important components of s ozone and PAN (Peroxyacetyl nitrate).
- They damage leafy vegetables, cereals, textile crops, ornamental plants, fruits and forest trees.

Respiratory disorders

- Excessive ethylene accelerates respiration causing premature senescence (old age) and abscission (accumulation of yellow fluid (pus) in the body).
- Aldehydes irritate nasal and respiratory tracts.
- Chlorine and phosgenes (carbonyl chloride) cause pulmonary oedema.

Nausea

- H_2S smells like rotten eggs and nausea.

Vomiting

- SO_2 causes vomiting.

Jaundice

- Arsines induce RBC breakdown and jaundice.

Oxygen carrying capacity

- CO reduces O_2 carrying capacity of RBC by its permanent combination with haemoglobin.

Coughing

- Coughing is induced by phosgenes (carbonyl chloride).

Headache

- SO_2 causes headache.

Cancer

- Cancer is caused by air pollutants like ash, soot, smoke. chromium, nickel and radioactive elements.

Mutation

- Radioactive elements produce mutation.

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- Ozone produces chromosomal aberrations.

Cardiac diseases

- Cadmium causes high blood pressure and heart diseases.

Pneumonia

- Pneumonia is caused by breathing in too much of manganese particles.

Depletion of Ozone Umbrella

- Intheatmosphere, about 30km above the surface of the earth, the ozone molecules (O_3) form an umbrella.
- It prevents the penetration of harmful ultra violet radiation from the sun and thus protects the life of the earth.
- It is now feared that there is danger of appearing holes on the ozone umbrella.
- This is caused by the use of freons and other chlorine-fluorine-carbons as refrigerents, coolants in domestic refrigerators and otter cold storage facilities, and as filling agents in foam plastics and in aerosol packages.
- Reaching ozone umbrella, they destroy ozone molecules as a result of photochemical reactions.
- Over the past 16 years, the density of the ozone layer has been diminishing at an average rate of 3%.
- It is calculated that the depletion of ozone layer by I% results in an increase in the incidence of skin cancer by 5% to 7%.

Acid Rains

- One of the major environmental issues facing human society at the National and International level is the problem of acid.
- The rainwater is always slightly acidic as CO_2 in the atmosphere gets dissolved in it.
- However during recent years, it has been noted a further lowering of pH of rainwater often as 2.4.
- This lowering of pH is due to the dissolution of acids in the rain water.
- Precipitation of oxides of sulphur and nitrogen with rain is termed acid rain.
- Acid rain is caused by air pollution.
- When atmospheric air contains sulphur dioxide (SO_2) and oxides of nitrogen such as nitrous oxide (N_2O) and nitric oxide (NO), they dissolve in rainwater forming sulphuric acid and nitric acid.
- The rain water falls as acid rain.
- The main source of oxides of sulphur and nitrogen is the burning of fossil fuels in power plants based on coal and oil contribute more than 60% of all sulphur oxides and 25 to 20% of nitrogen oxides in the atmosphere.
- Automobiles make a sustainable contribution in large cities.
- Ozone is now recognized as a major factor in the formation of acid rain.

- Acid rain affects both materials and organisms.
- It attacks building materials principally sandstone, limestone, marble, steel and nickel.
- In plants, it leads to Chlorosis (gradual yellowing in which the chlorophyll making mechanism is impeded) or depigmentation of leaves.
- Acid rain increases the acidity of lakes and rivers.
- Vast tracts of forests and lakes in Europe and North America have been destroyed by acid.

- Acidity kills fish, bacteria and algae and the aquatic ecosystem collapses into sterility leaving a crystal clear but ultimately a dead lake

CONTROL OF AIR POLLUTION

- The emission of exhaust from automobiles can be reduced by devices, such as positive crankcase ventilation valve and catalytic converter.
- Electrostatic precipitators can reduce smoke and dust from industries.
- Later birds, cats and dogs which me the marine animals died.
- Finally many men who ate fish, crabs and shell fish died.
- Their initial symptoms of Minamata disease include the numbness of limbs, lips and tongue, impairment of motor control, deafness and blurring of vision.
- Finally it affects and destroys the brain.
- As a result of the attack of Minamata disease about 17 persons died and 23 became permanently disabled in the year 1953, in Japan.

Diarrhoea

- It is caused by mercury, cadmium and cobalt.

Mortality of Plankton and Fish

- Chlorine which is added to water control the growth of algae and bacteria in the cooling system of power stations may persist in streams to cause the mortality of plankton and fish.

Reduction in Productivity

- Intensive agriculture increases the amount of silt in lakes and rivers.
- Silt prevents the penetration of light to depths and thus reduces primary production.

Siltation

- Siltation is a phenomenon by which the gills of fish deposited with silt.
- This causes heavy mortality among fishes.

Poor Oxygenation

- Oil present on the surface of water prevents water oxygenation.
- This reduces respiration and metabolism in aquatic organisms.

Poor Photosynthesis

- Oil-pollution prevents photosynthesis in phytoplankton.

Red Tide

- When coastal waters are enriched with nutrients of sewage dinoflagellates multiply rapidly and form bloom.
- This blooming lat. liberate into the water toxic metabolic by-products which can result in a large scale death of marine fishes.
- This is called red tide.

Biochemical Oxygen Demand

- Sewage enriches the water with nutrients.
- This causes rapid growth of plankton and algae.
- This leads to oxygen depletion in water.
- The oxygen depletion causes the death of algae.
- They decay and decomposition of algae consumes more oxygen from water.
- Biochemical Oxygen Demand or biological oxygen demand (BOD) is the amount of oxygen required by the microorganisms in water.
- BOD is higher in polluted water (sewage) and lesser in drinking water.
- Increased BOD lowers the contents of dissolved O_2 in water causing the suffocation and death of aquatic flora and fauna.

Water-borne diseases

- Disease like jaundice, cholera, typhoid, diarrhoea, etc. are transmitted through water contaminated with sewage.

Methaemoglobinema

- The nitrate used in fertilizers enters the intestine of man through drinking water.
- In the intestine it is converted into nitrite.
- Nitrite is absorbed into the blood where it combines with haemoglobin to form methaemoglobin: Methaemoglobin cannot transport oxygen.
- This leads to suffocation and breathing troubles, especially in infants.
- This disease is called methaemoglobinema.
- Gaseous pollutants arising from industries can be removed by differential solubility of gases in water.
- A finepray of water in the device called scrubber can separate many gases like NH_3, SO_2, etc. from the emitted exhaust.
- Certain gases can be removed by filtration or absorption through activated carbon.

- Certain gases can be made chemically inert by chemical conversion.
- At the Government level pollution can be controlled by framing legislations.

WATER POLLUTION

- Water is the soul of nature; its pollution will perish the world.
- Water pollution refers to the undesirable change occurring in water which may harmfully affect the life activities of man and domesticated species.

Water pollutants

The common water pollutants are as follows

- Domestic sewage
- Industrial effluents
- Pesticides
- Herbicides
- Fertilizers
- Bacteria and viruses
- Plankton blooms
- Heavy metals like mercury
- Temperature
- Silt
- Radioactivity
- Oils, etc.

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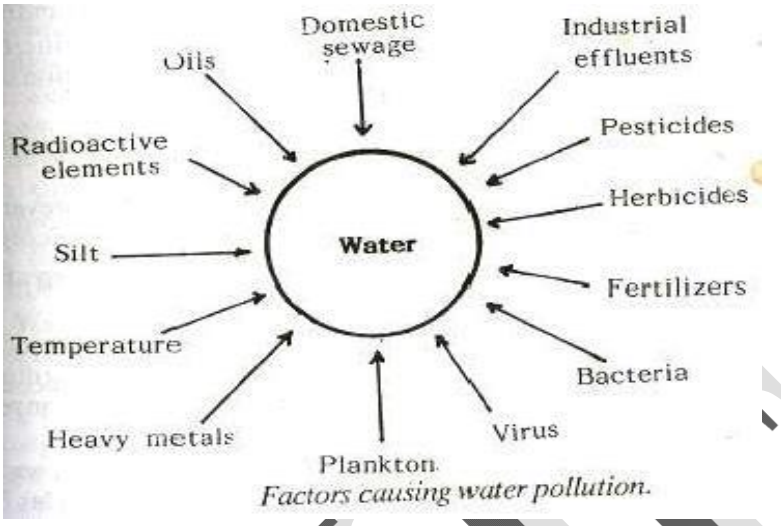


Factors causing water pollution.

CAUSES OF WATER POLLUTION

Domestic sewage

- Domestic sewage consists of human faeces, urine, and the dirty used-up water in houses.
- It contains a large number of pathogenic bacteria and virus.
- The sewage is released into the rivers on the banks of which most of the cities are situated.

Industrial effluents

- All industrial plants produce some organic and inorganic chemical wastes.
- Those nonusable chemicals are dumped in water as a means of getting rid of them.
- The industrial wastes include heavy metals (Hg, Cu, lead zinc etc), detergents, petroleum, acids, alkalies, phenols, carbonate, alcohol cyanides, arsenic, chlorine, etc.

Thermal Pollution

- Many industries use water for cooling.
- The resultant warm water is discharged into rivers.
- This brings about thermal pollution.

Agricultural pollution

- The fertilizers used for crops are washed into ponds and rivers.

Pesticides

- Pesticides are used to control pests in fields and houses.
- They include DDT, BHC, endrin etc.

Radioactive wastes

- Liquid radioactive wastes are released into the sea around nuclear installations.
- The oceanic currents carry the radioactive contaminants everywhere.
- Oil pollution
- Oil is a source of pollution in sea-water.
- Oil pollution is due to ship accidents, loading and discharging of oil at the harbour, oil refineries and off-shore oil production.

Retting

- The process of decaying coconut husk to get fibre for making coir is called retting.
- Retting releases H_2S.
- It makes water polluted.

ECOLOGICAL EFFECTS OF WATER POLLUTION

Minamata disease

- This disease is caused by mercury poisoning.
- It is characterized by crippling and death.
- This disease appeared in a coastal town, Minamata, in Japan.
- The primary cause for this disease was a p industry which was started on the san coast of Japan in 1905.
- From this factory a by-product called mercury was disposed into the sea.
- This mercury cumulated in marine animals.

Eutrophication

- Domestic sewage and fertilizers add large quantities of nutrients such as nitrates and phosphates to the fresh water ecosystems.
- The rich supply of these nutrients makes blue green algae, green algae and other phytoplankton to grow abundantly.
- This increased productivity of lakes and ponds brought about by nutrient enrichment is known as eutrophication.
- As the algae use O_2 of the water for respiration, the O_2 is depleted from the water.
- The rapid growth also consumes all the nutrients of the water.
- The depletion of O_2 and nutrients lead to the death of algae and other phytoplankton.
- As other organisms, such as zooplankton and fishes of the water, depend on the blue green algae and phytoplankton for their food, they also die.
- This eutrophication leads to the complete depletion of the fauna from the ecosystem.

CONTROL OF WATER POLLUTION

Sewage Treatment

Pollution control by sewage treatment includes the following steps

- Sedimentation
- Dilution
- Storage

(i) Sedimentation

- When sewage is allowed to stand, the suspended particles settle to the bottom.
- So by sedimentation the suspended particles are removed from sewage.

(ii) Dilution

- The sewage can be diluted with water.
- This increases the O_2 contents and reduces BOD and CO_2.

(iii) Storage

- The diluted sewage is stored in a pond.
- This facilities the growth of microorganisms.
- This renders further oxidation of sewage.

Waste stabilization pond or oxidation pond

- The national Environmental Engineering Research Institute (NEERI) at Nagpur has devised a very economical method for the treatment of industrial and domestic effluents.
- Domestic and industrial wastes are stored in a dilute condition in shallow ponds called oxidation or stabilization ponds.
- After a few days micro-organisms and algae flourish.
- The micro-organisms decompose the organic wastes by oxidation, and the water is purified.
- This water is rich in nitrogen, phosphorus, potassium and other nutrients.
- This water can be used for fish agriculture etc.

Recycling

- Pollution can be prevented to a certain extent by reutilizing the wastes.
- This is called recycling.

Example

- The dung of cows and buffaloes can be used for the production of gobargas.
- Sewage can be used for irrigation fish culture after treatment in oxidation pond.
- Certain pollutants from industrial effluents can be removed by filtration and selective absorption.

- Excessive use of pesticides and herbicides should be avoided.
- At the Government level, legislations should be framed to control water pollution.

SOIL POLLUTION

- The contamination of soil by human and natural activities which may cause harmful effects on living beings.

Causes

- Industrial waste
- Urban waste
- Agricultural practices
- Radioactive pollutants
- Biological agent

Effects

- Affect human health
- Affect soil fertility
- Reduce soil productivity
- Cause abnormalities

Control measures

- Properly collect solid waste
- Microbial degradation
- Recovery of products from waste
- For methane generation, use cattle dung
- For biogas generation, use biodegradable organic waste

NOISE POLLUTION

- The word noise has a Latin origin nausea meaning a feeling of sickness at the stomach with an urge to vomit.
- Noise is defined as unwanted sound or sound without value.
- Noise pollution is the unwanted sound dumped into the environment.
- Noise is measured by the unit decibel (dB).
- One decibel is equal to the faintest sound that can be heard by the human ears.
- Some people feel discomfort with the sound of 85dB.
- But more people do not feel discomfort with the sound of 115 dB.
- Pain is usually felt at 145dB.

Causes of Noise Pollution

- Scooters

- Motor bikes
- Cars
- Tempos
- Vans
- Buses
- Trucks
- Tractors
- Aircrafts
- Supersonic aircrafts
- Motor boats
- Ships
- Loud speakers
- Loud pop-music
- Social gatherings
- Machines of factories
- Mills
- Industries
- Kitchen appliances
- Fire crackers and generators are some of the chief sources of pollutions.

ECOLOGICAL EFFECTS OF NOISE POLLUTION

- Noise diminishes the power of hearing.
- It gives pain to the ear.
- It interferes with communication-systems.
- It causes stress.
- It causes fright.
- It increases the rate of heart beat.
- It causes the constriction of blood vessels.
- It increases blood pressure.
- It causes head-ache.
- It causes the dilation of pupil of the eye.
- It causes emotional upsets and
- It causes deafness.
- Noise causes physical or mental fatigue and lack of concentration.
- In industrial situations this effect results in lowered efficiency, reduced work rate and higher chances for accident.
- Noise disturbs sleep.
- High frequency or ultrasonic sound can affect the semicircular canals of the internal ear and cause nausea and dizziness.

CONTROL OF NOISE POLLUTION

Noise pollution can be controlled in the following ways

- Legislations should be framed.
- The sources that generate unwanted sound should be reduced.
- Noisy automobiles should be condemned.
- Wheels of automobiles should be oiled properly.
- Industrialists must take up necessary steps to control noise.
- Loudspeakers should be set at a low sound.
- Trees absorb noise and thus reduce noise pollution. So thick vegetation must be grown around industries, cities and on the sides of roads.
- Noise-producing machines should be placed in closed rooms.
- Residential houses should be constructed far away from in factories and airports.

THERMAL POLLUTION

- Increase or decrease in the temperature of water, air and land by human activity is called thermal pollution.

Sources of thermal pollution

CO_2

- CO_2 is produced during the combustion of fuel in houses, factories, power stations, etc.
- It is also released by plants and animals in the process of respiration.
- The CO_2 contents of the atmosphere has gone up by 15% in the past 100 years.
- It is estimated that by the year 2000 AD the increase in the CO_2 contents of the air will be nearly 25%.
- This will result in an appreciable warming up of the earth.
- This is called green house effect.
- It is very likely that this will cause the melting of polar ice caps.
- This will result in an ice caps will lead to rise of nearly 60 feet in sea level.
- As a result coastal areas and low-lying areas all over the world will be flooded and will go under water.

Hot water

- Power stations, industries and nuclear reactors use large quantities of water for cooling purposes.
- The resulting hot waters are released into the rivers.

ECOLOGICAL EFFECTS OF THERMAL POLLUTION

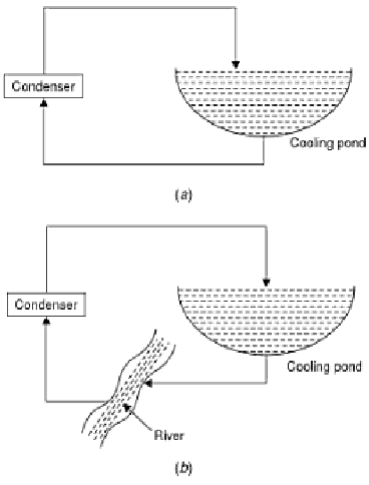
- When the temperature of the earth increases, ice caps melt. This will flood the coastal and low lying areas of land.
- A rise of 10°C in temperature increases the rate of exchange of salts between the organisms and the environment. This will accelerate the entry of toxins into the body from the external medium.

CONTROL OF THERMAL POLLUTION

- Cooling ponds
- Spray Ponds
- Cooling towers

Cooling Ponds

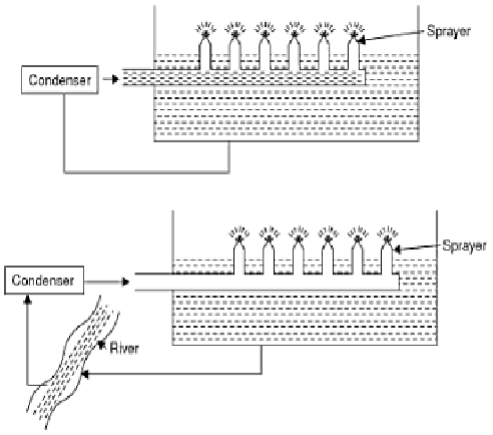
- Water from condensers is stored in ponds where natural evaporation cools the water which can then be recirculated or discharged in nearby water body.



Dissipation of heat by cooling ponds

Spray Ponds

- The water from condensers is received in spray ponds.
- Here the water is sprayed through nozzles where fine droplets are formed.
- Heat from these fine droplets is dissipated to the atmosphere.

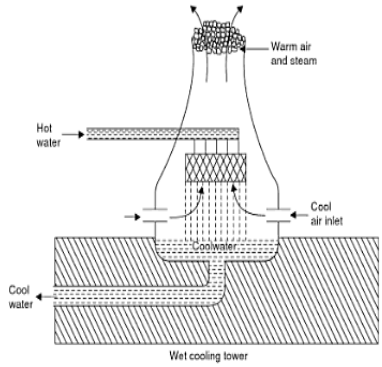


Dissipation of heat by spray ponds.

Cooling Towers

(i) Wet cooling tower

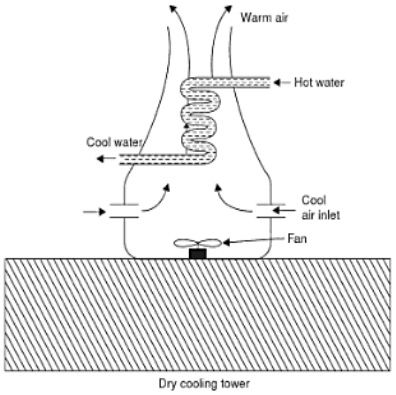
- Hot water is sprayed over baffles.
- Cool air entering from sides takes away the heat and cools the water.
- This cool water can be recycled or discharged.
- Large amount of water is lost through evaporation and in the vicinity of wet cooling tower extensive fog is formed which is not good for environment and causes damage to vegetation.



Wet cooling tower

(ii) Dry cooling tower

- The heated water flows in a system of pipes.
- Air is passed over these hot pipes with fans.
- There is no water loss in this method but installation and operation cost of dry cooling tower is many times higher than wet cooling tower.



POSSIBLE QUESTIONS
PART A
ONE MARK
ONLINE EXAMINATION

PART B (2 MARKS)

1. Write short notes on human health.
2. Write a note on EP Act.
3. Define global warming.
4. Write briefly different phases of value of education.
5. Write short notes on RIO-summit.
6. What is green house effect?
7. Write short notes on deforestation.
8. Brief out energy policy act.
9. Write short notes on disposal of solid wastes.
10. What are the causes of earthquake?
11. Write short notes on preventive measures of disease.
12. List out any two causes of solid waste management.

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PART- C(6 MARKS)

1. Explain in detail about environment and human health
2. Give a detailed account on landslides and its disaster and rehabilitation management.
3. Discuss the causes, effects and control measures of solid waste management.
4. Explain in detail cyclone and its disaster management
5. Explain in detail about the value of education.
6. Write in detail the causes of earthquake and its disaster and rehabilitation management.
7. Give an detailed account on global warming and its causes
8. Discuss in detail about disaster and rehabilitation management for floods.
9. Give a detailed account on global warming and its causes.
10. Explain in detail about the disaster management.
11. Discuss in detail any two natural disasters and its consequence.

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KARPAGAM ACADEMY OF HIGHER EDUCATION

COURSE NAME: Environmental Studies **COURSE CODE: 19AEC201**

CLASS: I B.Sc Microbiology UNIT-IV **BATCH-2019-2022**

	UNIT – IV	Option A	Option B	Option C	Option D	Answers
1	Organ affected by pneumonia	Liver	Kidney	Heart	Lungs	Lungs
2	……is a marine tortoise which shows the unique phenomenon arribada	Olive Ridley	Star tortoise	Travancore tortoise	Star fish	Olive Ridley
3	Green revolution is associated with ----------	sericulture	agriculture	fish culture	horticulture	agriculture
4	The first protected area in India is ----------	Silent valley	Corbett National Park	Bandipur sanctuary	Birds sanctuary	Silent valley
5	Largest reptile in the world	Dragon	Anaconda	Crocodile	Fish	Anaconda
6	Snow leopard is found in which National Park ?	Kaziranga	The Great Himalayan	Bharatpur	Goa	The Great Himalayan
7	Point Calimere sanctuary is situated in which state?	Tamilnadu	Kerala	Karnataka	Andhra	Tamilnadu
8	Which chemical was responsible for Bhopal gas tragedy?	Methyl Iso Cyanate	Benzene Hexa Chloride	Tri Nitro Toluene	Cyanate	Methyl Iso Cyanate
9	Major consumer of wood from forest is ----------	Thermal Power Plant	Paper Industry	Chemistry Industry	Wine industry	Paper Industry
10	Green Revolution in India was initiated by ----------	MSSwaminathan	Sunderlal Bahugana	Kurien	Dr Abdul kalam	MSSwaminathan
11	The Unit of measurement of intensity of sound is in ----------	decibels	lux	parsec	Meter	decibels
12	A combination of smoke, fog and chemical pollutants seen in industrialized cities is known as ----------	Sol	Smog	Fallout	smoke	Smog

13	Enrichment of water body by nutrients like phosphorus and nitrogen is called	Succession	Eutrophication	Stratification	Entrophication	Eutrophication
14	The violent tropical storms in the Indian Ocean are known as --------	Typhoon	Cyclones	Hurricane		Cyclones
15	The worst nuclear accident happened to date is occurred at ----------	Chernobyl in 1986	Three Mile Power Plant in 1979	Sellafield in 1957	All the above	Chernobyl in 1986
16	Major cause of Ozone depletion is due to which chemical ?	Chlorofluorocarbons	Polyphenols	Dioxins	toxin	Chlorofluorocarbons
17	The movement ' Beej Bachao Andolan' was aimed for the conservation of -----	Trees	Shrubs	Crops	herbs	Crops
18	Who had stated in the Stockholm conference in 1972 that poverty was the greatest polluter?	Indira Gandhi	Mahatma Gandhi	Rajiv Gandhi	Subase Chandra bose	Indira Gandhi
19	The movement 'Pani Panjayath' was initiated to conserve waters in the drought prone areas of..... state	Tamilnadu	Rajasthan	Maharashtra	Subase Chandra bose	Rajasthan
20	Salim Ali centre for ornithology and history is located at ---------	Pune	Hyderabad	Kerala	Coimbatore	Coimbatore
21	Wild life protection act was formulated during the period of ----------	Mrs Indira Gandhi	Lal Bahadur Shasthri	Rajiv Gandhi	Morarji Desai	Mrs Indira Gandhi
22	What is troposphere?	Portion of air	Portion of water	Lowest layer of atmosphere where we survive	Portion of sky	Lowest layer of atmosphere where we survive
23	Founder of 'Shantinikethan' a University that taught an environment based education	Mahathma Gandhi	Chandi Prasad Bhat	Rabindranatha Tagore	Nabikal	Chandi Prasad Bhat
24	Which state proposed a ban on all types of polythene packing for the first time in India?	Himachal Pradesh	Madhya Pradesh	Kerala	Tamil Nadu	Kerala
25	Founder of 'Shantinikethan' a University that taught an environment based education	Mahathma Gandhi	Chandi Prasad Bhat	Rabindranatha Tagore	Subase Chandra bose	Chandi Prasad Bhat

26	Which gas is likely to be reduced in the atmosphere by deforestation?	Carbon dioxide	Nitrogen	Oxygen		Oxygen
27	What are rodenticides ?	that kill fishes	that kill insects	that kill rats	that kill crocos	that kill rats
28	Which of the following enhances soil fertility ?	Crop rotation	Improved methods of agriculture	Using new seed verities	Irrigation	Crop rotation
29	Salinization is ----------	Accumulation of	Accumulation of	Accumulation of	Accumulation	Accumulation of
		salts in water	salts in food	salts in body animals	of salts in animals	salts in water
30	What is oil slick ?	Boiled oil	Cooled oil	Thin film of oil in sea water	Oil in deep sea	Oil in deep sea
31	Cigarette smoking exposes one to ----------	Sulphur dioxide	Carbon dioxide	Nitrogen peroxide	Carbon monoxide	Carbon monoxide
32	“Ozone Hole” is a ----------	Hole in the atmosphere	Destruction of ozone layer	Hole in hydrosphere		Destruction of ozone layer
33	Euro II standard refers to ----------	Lowering sulfur content in fuel	Increasing sulfur content in fuel	Lowering carbon content in fuel		Lowering sulfur content in fuel
34	Noise is ----------	Huge sound	Sound of vehicles	Undesirable and unwanted sound	Sound of crackers	Undesirable and unwanted sound
35	What is ‘temporary threshold shift’ ?	Hearing loss due to excessive noise	Noise that is untolerable	Tolerable noise		Hearing loss due to excessive noise
36	Acid is an example of ----------	Corrosive waste	Infectious waste	Radioactive waste	Ignitable waste	Corrosive waste
37	Vermi composting is a natural method of	Producing compost manure	Producing worms	Managing waste it creates	Destroying worms	Managing waste it creates
38	The intensity of earthquake is measured in ----------	Beaufort scale	Richter scale	Mohs scale	None of the above	Richter scale
39	Which of the below is most responsible for world water crisis ?	Dams	Floods	Drought	Population growth	Population growth

40	Phagotropic mode of nutrition is found in ----------	Products	consumers	decomposers	all of these	consumers
41	Energy is returned to the atmosphere in the form of	potential energy	metabolic energy	heat	vapours	heat
42	The conversion of ammonia to nitrate is known as ----------	ammonification	nitrification	denitrification	all of these	nitrification
43	The study of individual organism is known as	syn ecology	population ecology	autecology	human ecology	autecology
44	The resources that can be replaced by natural ecological cycle is called	renewable	non-renewable	exhaustible	natural	renewable
45	Natural earthquakes are caused by ----------	earth's crust	deep seas	peak mountains	forests	earth's crust
46	Any unfavorable alteration of the environment may be called as	eutrophication	environment pollution	biomagnigication	bioaccumulation	environment pollution
47	The presence of solid, liquid or gaseous compounds, which may not be normally present, or in excess concentration in the atmosphere is called	air pollution	water pollution	soil pollution	radioactive pollution	air pollution
48	The place where the river meets the sea is called	estuaries	oceans	lake	wetlands	estuaries
49	The historical monument that is affected by acid rain is	Taj Mahal	Pyramid of Egypt	Pisa Tower	Golden Temple	Taj Mahal
50	The expansion on POLI is	physical quality of life index	population quotient of life in India	poor quality of life in India	poverty, quality of life in India	population quotient of life in India
51	The presence of which is necessary for photosynthesis	Chloroform	Chlorophyll	Phosphorus	Polymer	Chlorophyll
52	The Primary Consumers are also called as 6	Herbivores	Carnivores	Enzymes	None of these	Herbivores
53	Forest is an example of	Marine ecosystem	Limnic ecosystem	Artificial Ecosystem	Terrestial Ecosystem	Terrestial Ecosystem

54	The amount of solar radiation reaching the surface of the earth is called	Solar flux	reflected light	minerals	solvents	Solar flux
55	Snake is an example of	Primary Carnivores	Secondary Carnivores	Herbivores	None of these	Secondary Carnivores
56	The forests which occur in law rain fall area is	Evergreen forests `	deciduous forests	Coniferous forests	all the above	deciduous forests
57	All the genes of a population is called	gene poll	gene	ecosystem	population	gene poll
58	The destruction of habitat of plants and animals is called	endemism	endangered species	habitant loss	flood	habitant loss
59	Zoos are examples for	insitu conservation	in vivo conservation	exsitu conservation	exvivo conservation	exsitu conservation
60	Acid rain contains	Sulphuric acid	Hydrochloric acid	Oxalic acid	Acetic acid	Sulphuric acid

Concept of sustainability and sustainable development.Water conservation -Rain water harvesting, watershed management.Climate change, global warming, ozone layer depletion, acid rain and its impacts on human communities and agriculture.Environment Laws (Environment Protection Act, Air Act, Water Act, Wildlife Protection Act, Forest Conservation Act).International agreements (Montreal and Kyoto protocols).Resettlement and rehabilitation of projectaffected persons.Disaster management (floods, earthquake, cyclones and landslides).Environmental Movements (Chipko, Silent valley, Bishnois of Rajasthan). Environmental ethics: Roleof Indianand other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi). Human population growth: Impacts on environment, human health and welfare.

Social Issues and the Environment

From Unstable to Sustainable Development

It is well recognised now that rich nations of the world consume resources, especially non-renewable natural resources like coal and oil at a break-neck pace. The consequence of this resource use is the promotion of unfettered consumption and greed which, in turn, has begun to create global energy shortages, pollution, global warming, among other myriad problems.

It is now recognised that this model of growth and development is unsustainable and must be addressed. The World Commission on Environment and Development defines Sustainable Development as *Development that meets the needs of the present generation without compromising the needs of the future generation to meet their needs*.

Sustainable development requires that for any activity that brings about economic growth, the corresponding environmental impact must be studied and negative aspects addressed. Especially major projects like large dams, mining industries and major highways should be restrained. This, in turn, requires that unfettered consumption by people be checked. Further, Environmental Impact Assessment (EIA) must be conducted on every major public and industrial or commercial project before proceeding.

Urban Problems Related to Energy

Mankind has designed cities as a marker of development, but by their very design the energy needs in urban agglomerations are typically very high. For example, in India, housing made out of traditional material like mud and straw can handle hot temperature

better but such material are routinely discarded in favour of brick and mortar as soon as some development takes place.

In modern housing, the use of brick, concrete, aluminum and glass makes buildings hot and requires large number of fans or huge air–conditioning units. High-rise buildings also consume huge amount of electricity to operate lifts, pump water and for illumination.

Modern cooking is done with kerosene, natural gas, LPG or electricity. This consume large amount of fossil fuels. Urban transport requires that large number of cars to be on the road thereby creating, congestion, and waste of time, air pollution and respiratory diseases. Instead, efficient public transit systems like metros should be used so that transportation is fuel-efficient.

Water Conservation, Rain Water Harvesting and Watershed Management

It is often said nowadays that water will be the focus of the next global crisis. Clean, usable water has become a scarce item in the 21st century. There are several reasons for this. Modern agriculture based on HYV seeds require massive amount of irrigation water. This has, in turn, required the building of very large dams on important rivers and massive water reservoirs. Dams and irrigation tamper with river courses leaving downstream areas nearly dry.

This has coupled with increasing deforestation. Deforestation increases surface run offs decreasing recharging of ground water. Agricultural needs have also caused much withdraw log ground water. Excessive use of ground water for irrigation and urban use causes the water table to drop.

Urban and industrial effluents have often not been cleaned up. Instead they have been discharged indiscriminately. These effluents pollute water bodies, lake and rivers. In addition, urban agglomerations generate massive amount of waste water from sewage, washing and other urban uses. All this is leading to a rising demand and falling supplies of usable water and massive water shortage.

The solution lies in conserving water, water recycling, harvesting of rain water and managing local watersheds more efficiently. For example, one can use drip irrigation to supply water directly to the root of plants so one needs less water to grow food.

Urban life wastes lots of water. Water wastage should be prevented. We all can do a little bit. The Pani Panchayet movement initiated by Vilasrao Salunkhe can be used to manage local watersheds better. Also, collecting rainwater in terraces and roofs and using them at source should be encouraged.

Resettlement and Rehabilitation of people: Its problems and Concerns

Large public and private projects like mines, highways or even the notification of a National Park will displace large number of people. It is expected that such people would be given good, arable land for resettlement. In an overpopulated country such as ours there

is never enough arable land available.

Also, resettlements seldom take place in practice and may sometimes take decades. Often only wasteland is offered in place of arable land to the displaced people.

Large Dams have been one of the greatest causes behind the eviction of people. Tehri Dam, when finished will submerge Tehri town and 100 villages. The building of the dam has been opposed by the local people. Tribal people are often the most significant victims of eviction. Narmada Bachao Andolon is the greatest example of a battle by indigenous people over land for a largedam.

Environmental Ethics: Issues and Possible Solutions

Environmental ethics deal with rights of people and other living beings that are fundamental to their existence. We pose the question: Should there be huge disparity in the use of natural resources between rich nations and poor nations and between rich people and poor people? Many of us would like to answer "no". Incomes and consumptions must be made more equitable through the sharing of Gross National Products. Tribal persons and women are particularly vulnerable when it comes to the control of natural resources for individual use.

People with traditional life styles like fishermen and artisans have a right to live in the way they choose. Even when nature is "recreated" the poor are often excluded. All creatures big and small, living on land or in water animals, and plants have a right to exist and should not be slaughtered to serve human needs.

Climate Change and Global Warming

About seventy percent of solar energy reaching the earth's surface is absorbed. The rest is reflected back. This keeps the earth warm and fit for life. Green house Gases such as Carbon Dioxide traps heat. As we burn more fossil fuels like oil and coal to make electricity, the amount of carbon dioxide in air rises. This traps more heat and the temperature of the earth rises. This results in melting of polar caps and glaciers. Average sea level rises and low-lying land goes under water.

Sudden changes in climate may also happen. Hurricanes and typhoons may suddenly occur in regions where they are unexpected. This increases desertification, food shortage and vector-borne diseases. Human activities involving industrialisation and population growth has greatly increased energy demand in the last 100 years. This has resulted in massive increase in fossil fuel consumption, petroleum and coal.

Burning of fossil fuels result in Carbon Dioxide emissions. CO_2 and other Green House Gases have increased by 31% in this period. The only way this carbon dioxide can be sequestered in the forest, but with increasing deforestation, this CO_2 has nowhere to go. This is the main reason behind Global Warming and rise in earth's temperature.

Acid Rain

Burning of fossil fuels result in the release of Oxides of Sulphur (SO_X) and Nitrogen (NO_X). These react with water vapour in the air to form Sulphuric or Nitric Acid. They are carried up in the atmosphere and return to the earth in the form of Acid Rain. Acid rain dissolves and washes away nutrients in the soil. It also washes away the nutrients needed by plants. Acid rain affects rivers and wetlands, aquatic life disrupts food chains and destroys entire ecosystems.

Depletion of Ozone Layer

Ozone (O_3) is a poisonous gas and a dangerous pollutant at ground level. A layer of ozone (in a mixture with oxygen) exists in the stratosphere 20 to 50 km above earth's surface. Ozone molecules reflect the Ultraviolet rays (UV) coming from the sun and protects life on earth.

Chemical such as Chlorofluorocarbons (CFC) from refrigerators and aerosol propellants release chlorine that combines with ozone. Thus only oxygen is left in the ozone layer and there is nothing to stop the UV rays. This causes skin cancer, cataracts and other diseases.

Thinning of the ozone layer has been noticed over Antarctica and Australia. Mankind agreed at Montreal (1987) to ban CFC as a result of which the ozone layer is being regenerated.

Nuclear Accidents and Holocausts

Nuclear energy is a clean and cheap substitute to energy from fossil fuels. Though greatly beneficial to mankind this form of energy has many problems. When accidents happen at Nuclear power plants massive radioactivity is released. This can causes huge loss of human life, long term illness like cancer, thyroid disorders, tumours, etc.

Accidents at Three Mile Island (USA-1979) and Chernobyl (USSR-1986) are important examples. Disposal of Nuclear Waste also remains a major problem. Nuclear weapons used in war cause holocausts. Hiroshima and Nagasaki (Japan 1945) are examples.

Wasteland Reclamation

Loss of trees and vegetation cover causes soil to erode. Cultivable land can turn into wasteland in this way. Reclaiming wasteland for cultivation and other good uses remain a priority. Wasteland can be reclaimed by reducing the salt content. This can be done by leaching and flushing using Gypsum, Urea, Potash, and Compost. Agriculture can be mixed with forestry through an integrated system. Certain indigenous tree species that adopt to alkaline soil can be used to reclaim wasteland.

Consumerism & Waste Products:

Reduce, Reuse, Recycle

Current consumption patterns involving high degree of consumerism and this is very wasteful. Goods produced for one time use create massive amounts of solid waste. Packaging material for white goods are resource intensive, wasteful and contribute to solid waste. For example, two hundred billion plastic cups, cartons, cans and bottles are thrown away every year. Clearly, reduction or ban on certain types of plastic items can be a solution. Therefore, recycling as much as we can must be practiced. Reduction of gross consumerist life styles must be encouraged.

Environmental Laws

The Environmental (Protection) Act -1986

This Act was passed to give Government a comprehensive power to take action in environmental matters. It gave power to the Central Pollution Control Boards (CPCB) and State Pollution Control Boards (SPCBs) to set permissible limits for air pollution, water pollution and release of hazardous substances.

Other important laws in this area are Air (Prevention and control of pollution) Act 1981and the water (Prevention and control of pollution) Act 1974. The earliest law was the Wildlife (Protection) Act 1972. This act established National Park and Wildlife Sanctuaries. This act launched Project Tiger and prevented trade in animal body parts. Forest (conservation Act) 1980/1988 is also important.

Enforcement of Environmental Legislation

All major Development projects- government or private – need an Environmental Impact Assessment by a competent organisation. It lists local flora, fauna, people and ecosystems that may be affected. Citizens actions and action groups can act as watch-dogs against willful environmental damage by resorting to prayers, petitions, media publicity, dharnas or Public Interest Litigation (PIL). Public awareness at the local level is extremely important. Events commemorating World Environment Day, Earth Day, Wet land Day contribute to this end.

Role of Information Technology in Environment and Human Health

When you talk about information technology, it has a significant hand in improving the status in the fields of environmental education and human health as compared to that of the other respective areas such as business, economics, and culture or politics. The emerging growth of the internet services and facilities, geographic information system or GIS, and the data that gets transmitted through satellites, etc. have generated a higher affluence of the updated information on several aspects of the environment as well as health. When you look for the variety of software in the market, you will come across a number of them that created for the health and environment studies in a better way. They are quite user-friendly and certainly help a learner to understand the respective subject with ease.

Database on the Environment System

Understanding the meaning of database is super easy and straightforward; it is a collection of connected data on some subjects. It comes in a computerized form, and you can retrieve the data at any hour of the day whenever needed. The information of database can easily extract in a computer. When it comes to comprehensive databases, things that include in it are wildlife database, forest cover database, and conservation database, etc. the databases are also available for some diseases which include malaria, fluorosis, HIV/AIDS, etc.

- National management information system (NMIS).
- Environmental information system (ENVIS).
- Remote sensing and geographical information system (GIS).
- Geographical information system (GIS).
- The World Wide Web (WWW).

National Management Information System (Nmis)

According to NMIS of the department of science and technology, it can understand that it has a database compilation that base on research and development projects, as well as information that is related to research scientists and personnel, are included.

Environmental Information System (Envis)

According to the ministry of environment and forests, the government of India has developed an information system known as ecological information system or ENVIS. It has its headquarters based in Delhi and has its branches all over India. ENVIS established back in 1982, and since then, its main aim is to provide environmental information to all the decision makers, engineers, scientists, and policy planners that reside in all over the country. The centers of ENVIS implement the work hours in generating a new network for databases in areas such as clean technologies, pollution control, biodiversity, wildlife, environmental management, remote sensing, and renewable energy.

Remote Sensing And Geographical Information System (Gis)

The process of remote sensing that accesses through satellites can be used to get through the ongoing alterations in the environment as well as to predict the natural hazards before time such as floods, droughts, volcanic eruptions, starvation, etc. It is one of the most useful techniques in exploring the availability of mineral deposits, crude oil, and locating other geothermal powerhouses.

Geographical Information System (GIS)

GIS or geographic information system consider as one of the most effective tools in the entire environmental management topic. It is a process of superimposing different thematic maps with the help of digital data on a large scale of interconnected aspects. The different

thematic maps that contain digital information and database on various elements such as forest land, water resources, soil type, cropland, industrial growth, human settlement, and industrial growth, etc. are placed in a layered prospectus in the computer with the help of software.

GIS also helps in identifying some deadly and chronic diseases that come from the infested areas which are very much prone to vector-borne diseases such as schistosomiasis, malaria, etc. based on the geographical map of that area. There are some distribution information centers (DICs) in India that are interrelated with each other and with the central information network getting its access to the international database.

They are also capable of availing information and facts about the atmospheric phenomena such as the upcoming monsoon, inversion phenomena, the depletion of the ozone layer, smog, etc. It is the reason why remote sensing and GIS play a significant role in resource mapping, management, planning, environmental conservation, and environmental impact assessment as well.

The World Wide Web (WWW)

With the availability of resources on every aspect, things like classroom activities, digital files of photos, web-exercises, animations, PowerPoint lecture presentations, and quiz competitions have proved to be more helpful for both the students as well as the teachers who pursue environmental studies.

Features of Online Learning Centre Websites

Student-Friendly Aspects:

It includes tips how to study smartly, detailed information and hyperlinks on every important topic, practice quiz, web exercises, case studies, key-terms, career information, current affairs, an interactive encyclopedia, environmental maps, current articles, and tips to contact your elected officials.

Teacher-Friendly Aspects:

It includes additional case studies, solutions to critical thinking, questions, answers to web exercises, editing facility to imply or delete the items and make multiple versions of the same test, etc.

Seeking Online Help for Information on Health

The online portals provide a wide range of information on various subjects such as human health and environment. You can access help from the national institute of occupational health as it avails electronic information on the professional and fundamental health of people who work in hazardous working conditions such as industries, etc. and provide safety measures as well.

Conclusion

The field of information technology has been increasing rapidly with an explosion of some

applications and new avenues that are opening along with an active role in the field of education, planning, and management of health and environment. Information technology has been playing a significant role in the areas of biometrics, genome sequencing, gene engineering, online medical transcription, maintaining the DTA database for the betterment of human health, biotechnology, etc. The field also helps in identifying some deadly and chronic diseases that come from the infested areas which are very much prone to vector-borne diseases such as schistosomiasis, malaria, etc. based on the geographical map of that area.

P0ssible Questions

PART A(2 Marks)

1. Explain Enforcement of Environmental Legislation
2. What is the role of Information Technology in Environment and Human Health?
3. Define Environmental Ethics
4. Discuss about Nuclear Accidents and Holocausts
5. Write about acid rain.
6. Discuss about Women and Child Welfare.
7. Write about wildlife protection act.

PART-C(6MARKS)

1. Discuss in detail about urban problem related to energy.
2. Explain in detail about Environment and human health.
3. Discuss in detail resettlement and rehabilitation of people and its problems
4. Explain in detail about Watershed management.
5. Explain in detail about role of environmental protection Act.
6. Discuss in detail about value education of HIV

KARPAGAM ACADEMY OF HIGHER EDUCATION

COURSE NAME: Environmental Studies **COURSE CODE: 19AEC201**

CLASS: I B.Sc Microbiology UNIT-V **BATCH-2019-2022**

	UNIT – V	Option A	Option B	Option C	Option D	Answers
1	The Expansion of SPCA	Society for the protection of Common Animals	Society for the Prevention of Cruelty to Animals	Society for the Prohibition of Cruelty to Animals		Society for the Prevention of Cruelty to Animals
2	The projects that already exist but require expansion must also apply for clearance is called……	Green-field projects	brown-field projects	blue-field projects		brown-field projects
3	Expansion of PCB	Pollution Control Board	Population Control Board	Protection and Conservation of Biodiversity		Pollution Control Board
4	In which year Silent Valley was declared as National Park ?	1988	1982	1984		1984
5	One of the most commonly used pesticide	Lacto Bacillus	Bacillus Thuringiensis	Rhizobium		Bacillus Thuringiensis
6	'Smog' is a mixture of	Smoke and Fog	Snow and Fog	Snow and Dust Sulpher Dioxide and Fog		Smoke and Fog
7	The Anthrax disease is caused by	Virus	Bacteria	Protozoa Helminthes		Bacteria
8	A Hawk that eats a frog is a	Producer	Primary Consumer	Secondary consumer	Tertiary consumer	Tertiary consumer
9	Moisture in the air is known as	Water	Fog	Snow	Humidity	Humidity
10	Zoological Survey of India is at	Delhi	Mumbai	Calcutta		Calcutta
11	World Forest day is celebrated on	21st March	(5th June	(Ist Dec	(7th June	21st March
12	An example of lotic water	Pond	River	Lake	Reservoir	River
13	Superbugs are	Synthetic bug	Bacteria	Radio nucleotide	Industries	Bacteria

14	Torrey Cannon is famous for	Gulf of War	Industries	Electric Potential	Oil Spillage	Oil Spillage
15	Red Sea is named after	Red algae	Blue green algae	Oil spillage	Brown Algae	Red algae
16	Aquatic life is damaged by	Sound pollution Air Pollution		Thermal Pollution	All of these	Thermal Pollution
17	Minamata disease is caused by	Air Pollution Water Pollution		Marine pollution	All of these	Marine pollution
18	Complex interlinked food chains are called	Food Web	Food net work	Trophic levels	Food pyramid	Food Web
19	…… is an evergreen forest of Kerala	Silent Valley	Muthanga	Wayanad	Muthumala	Silent Valley
20	Acid rain mainly result from	Sulpher dioxide	Carbon dioxide	Carbon monoxide	Amonia	Sulpher dioxide
21	Ozone depletion is caused by	Co2	CCL	CFCs	CO	CFCs
22	Which among the following is an example for ex-situ conservation	Zoological parks	Wild life sanctuaries	National Parks	Reserve Forests	Zoological parks
23	The World Biophilia was coined by	Dr Hackel	Dr Johanssen	Dr Benjamine	Dr Earnest Wilson,(answer, Edward O Wilson)	Dr Earnest Wilson,(answer, Edward O Wilson)
24	The book silent spring was written by	Madhav Gandgil	Anil Agarwal	Racihel Carson	EO Wilson	Racihel Carson
25	The Chipko movement is started by	Engler	Sunderlal Bahuguna	Medha Padkar	None of these	Sunderlal Bahuguna
26	World Ozone day is	March 16	June 5	September 16	November 16	September 16
27	Which of the following is a part of the Carbon Cycle	Animal respiration	Plant respiration	Production of sugars in plants	Production of proteins in animals	
28	Abiotic is a	Living component	Non living component	Both living and non living	None of these components	Non living component
29	Biome refers to	Flora of an area	Fauna of an area	Large community of Plants	None of these & animals	Large community of Plants

30	BOD of a river water is found very high This means water	is clear	is highly polluted	contain Algae	contain many dissolved minerals	is highly polluted
31	Lotic eco system refers to	static water system	Ecosystem of flowing water	Ecosystem of estuaries	Deep marine water system	Ecosystem of flowing water
32	The Red Data book which lists endangered species is maintained by	UNO	WHO	ICUN	WWF	ICUN
33	Which of the following is a	Western Ghats	Nandadevi	Eastern Ghats	Aravalli	Western Ghats
	biodiversity hot sport in India ?					
34	Global warming is caused by	GHGs	CFCs	CH4	No2	CFCs
35	The Salim Ali Bird Sanctuary is located at	Pondicherry	Thattakad	Anakkatti	Kalakkad	Thattakad
36	First Biosphere reserve in India	Nilgiri	Agastyamala	Eravikulam	Chinnar	Nilgiri
37	Flag ship species of Choolannur sanctuary	Tiger	Peacock	Elephant	Rhino	Peacock
38	Utilisation of natural resources in moderate manner remaining something for the next generation is termed as	Resettlement	Sustainable development	Rehabilitation	Mutual development	Sustainable development
39	Autotrophs are……	Consumers	Herbivores	Saprophytes	Producers	Producers
40	Organisms which depend on Producers are called	Autotrophs	Saprophytes	Consumers	Xerophytes	Consumers
41	The source of atmospheric oxygen is	Nitrogen cycle	Photosynthesizing from Green Plants	Water	Carbon Cycle	Photosynthesizing from Green Plants
42	Plants which grow in shade are called	Sciophytes	Heliophytes	Oxylophytes	Epiphytes	Sciophytes

43	Who coined the slogan of 'Chipko Movement' Ecology is permanent economy"	Jawaharlal	Salim Ali	Sunderlal Bahuguna	Rachel Carson	Sunderlal Bahuguna
44	Herpetology is a branch of Science which deals with	Aves	Mammals	Reptiles	Fishes	Reptiles
45	" Silent Spring" is a well known book written by	John Miller	Charles Darwin	Rachel Carson	Aldoleopold	Rachel Carson
46	The build up of Co2 is known as	Global warming	Green House effect	Fossil fuels	Ozone	Global warming
47	Bears are usually hunted and killed for their	Teeth	Skin	Gall bladder	Nails	Gall bladder
48	The capacity to do work is termed as	Power	Force	Strength	Energy	Energy
49	Coral reefs is India can be seen in	Himalayan region	Andaman and Nicobar Islands	Uttarpradesh	Maharashtra	Andaman and Nicobar Islands
50	The 'Marble Cancer' shown by Taj Mahal was due to	Global Warming	Exposure to carbon dioxide	Marble degradation	Fungal growth	Marble degradation
51	The darkening of the skin due to arsenic poisoning is called	Black syndrome	Diffiuse melanosis	Skin scaling	None of these	Diffiuse melanosis
52	Boron, Zinc and Manganese are usually referred to as	Micro materials	Macro materials 20	Soil Vitamins	MBZ nutrients	Micro materials
53	The noise pollution is measured in terms of	decibel	Dobson units	Hertz	Candela	decibel
54	Incineration of Municipal waster involves	Oxidation	Deduction	Redox action	disintegration	Deduction
55	The word Tsunami is derived from two Japanese words	tsu(big) and nami(flow)	tsu(harbour) and nami(wave)	Tsu (big wave) and nami(wave)	None of the above	tsu(harbour) and nami(wave)
56	The 3 R principle in waste management involves	Reduce, Regain, Reuse	Reduce, Reuse, Recycle	Reduce, Reform, Reset	Reduce, Retain, Regain	Reduce, Reuse, Recycle

57	Which of the following is an extinct species	Tiger	Lion	Dodo	Ostrich	Dodo
58	'Project Tiger' was launched in the year	1973	1972	1991	1992	1972
59	The famous Minamata disease in Japan is due to the accumulation of in fishes	Cadmium	Mercury	Zinc	Lead	Mercury
60	The term 'Ecology' was coined by	G Tansley	Earnest Hackel	Aristotle	Linnaeus	Earnest Hackel
61	Nitrogen gas returns to the atmosphere by the action of	Nitrogen fixing bacteria	Denitrifying bacteria	Nitrifying bacteria	Nitrate fertilizers 21	Denitrifying bacteria
62	Photosynthesis is found in	Producers	Decomposers	Consumers	None of these	Producers
63	Phytoplankton is	Producers of forest	Producers of lakes	Consumers of Ocean	Omnivores	Producers of lakes
64	The only ape found in India	Gorilla	Chimpanzee	Haddock gibbon	Oranguttan,(answer Hoolok Gibbon)	Oranguttan,(answer Hoolok Gibbon)
65	Soil pollution is caused by	Aerosol	Ozone	Acid rain	PAN	Acid rain