



ABES Engineering College, Ghaziabad
B. Tech Even Semester Sessional Test-1

Printed Pages: 01
Session: 2023-24

Semester: II

Course Code: BAS204

Course Name: Environment and Ecology

Maximum Marks: 30

Roll No.:

Time: 1Hr.15 min.

Instructions:

1. Attempt All sections.
2. If require any missing data, then choose suitably.

Q. No.	Question	Marks	CO	KL	PI
Section-A		Total Marks: 20			
1	Attempt ANY ONE part from the following	<i>Same K Levels Questions</i>			
a)	Explain the flow of energy through the various components of ecosystem. What is its importance for an ecosystem?	3+2	CO1	K2	9.1.1
b)	What are the different pillars of sustainable development? Explain the obstacles in the path of sustainable development.	3+2	CO1	K2	7.2.2
2	Attempt ANY ONE part from the following	<i>Same K Levels Questions</i>			
a)	Discuss the structure of atmosphere with the help of temperature profile diagram.	3+2	CO1	K2	6.1.1
b)	Give an overview on the impacts of industries and mining on environment.	2+3	CO1	K2	8.2.2
3	Attempt ANY ONE part from the following	<i>Same K Levels Questions</i>			
a)	What is an ecosystem? Explain in detail the biotic and abiotic components of an ecosystem.	2+6+2	CO1	K2	9.1.1
b)	Describe the process of Environmental Impact Assessment with the help of flow chart.	10	CO1	K2	3.2.3
Section-B		Total Marks: 10			
4	Attempt ANY ONE part from the following	<i>Same K Levels Questions</i>			
a)	Define natural resources. Discuss the classification of natural resources based on their development.	2+3	CO2	K2	9.1.1
b)	Differentiate between dental and skeletal fluorosis. Discuss the Nalgonda process for removal of fluoride from drinking water.	2+3	CO2	K2	8.2.2
5	Attempt ANY ONE part from the following	<i>Same K Levels Questions</i>			
a)	Describe water borne and water induced diseases with suitable examples.	2.5 +2.5	CO2	K2	4.3.4
b)	What is arsenicosis? Explain the methods for removal of arsenic from drinking water.	2+3	CO2	K2	8.2.2

CO Course Outcomes mapped with respective question

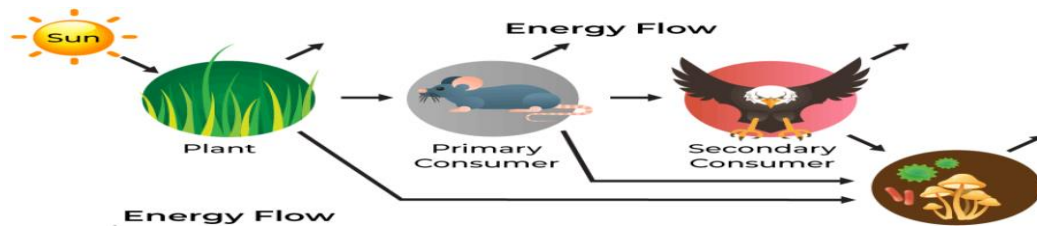
KL Bloom's knowledge Level (K1, K2, K3, K4, K5, K6)

K1-Remember, K2-Understand, K3-Apply, K4-Analyze, K5-Evaluate, K6-Creat

SOLUTION ST-1

1. a) **Explain the flow of energy through the various components of ecosystem. What is its importance for an ecosystem?** (3+2)

Ans. Energy flow in an ecosystem is defined as the movement or transfer of energy from one trophic level to another in an ecosystem. The energy that is passed is in the form of chemical energy. Energy flows through an ecosystem in a one-way direction, typically starting from the sun and moving through various trophic levels.



The direction of the energy flow in an ecosystem is unidirectional. It flows from the primary source of energy i.e. the sun's light energy to producers or autotrophs which then transferred to the consumers. The producer uses the solar energy to produce organic food which flows through a series of trophic levels. Each trophic level captures a portion of this energy for its metabolic needs, while the rest is passed to the next level. The flow of energy follows the following pathway;

Solar Energy → Producer (autotrophs) → Consumer (herbivores) → Consumer (carnivores) → Consumer (higher levels of carnivores). Only ten percent of energy is transferred from one trophic level to another. The ten percent rule of transfer of energy from one trophic level to the next is being credited to Raymond Lindeman (1942).

Importance of Energy Flow: Energy flow is the phenomenon that is responsible to sustain life on this planet. All the biotic components in this ecosystem need energy for their survival. If the energy flow in an ecosystem is disturbed, then it leads to ecological imbalance.

- b) **What are the different pillars of sustainable development? Explain the obstacles in the path of sustainable development.** (3+2)

Ans. **Role of the pillars of sustainable development:**

- 1) **Environmental Pillar:** The environmental pillar emphasizes the need to protect the natural environment, including ecosystems, biodiversity, land resources etc. By protecting the environment, we can ensure the availability of resources and maintain the Earth's ability to support life.
- 2) **Economic Pillar:** The economic pillar focuses on fostering economic growth and development that is both inclusive and environmentally sustainable. It recognizes the importance of economic prosperity in improving living standards and reducing poverty.
- 3) **Social Pillar:** The social pillar addresses the need for social equity, justice, and inclusivity in development. It emphasizes that all members of society should have access to basic services such as education, healthcare, clean water, and sanitation.
- 4) **Institutional Pillar:** It is related to good governance e.g., policies etc.

Obstacles in the Path of Sustainable Development:

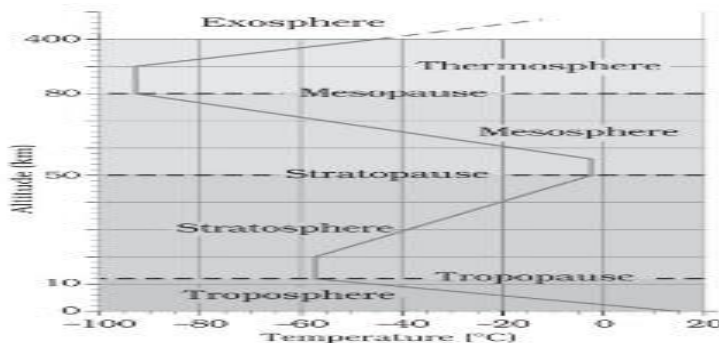
1) **Short-Term Economic Interests:** One of the significant obstacles to sustainable development is the focus on short-term economic gains over long-term benefits. Some industries and practices prioritize immediate profits, disregarding the potential negative impacts on the environment and society.

2) **Population Growth and Consumption Patterns:** Rapid population growth and unsustainable consumption patterns put immense pressure on natural resources. Meeting the demands of a growing population while minimizing the ecological footprint is a critical challenge.

3) **Lack of Political Will:** The lack of political will and commitment to implement necessary policies can hinder progress towards sustainability.

2. a) Discuss the structure of atmosphere with the help of temperature profile diagram.(3+2)

Ans.



1. **Troposphere (Tropos Meaning Turning):** Troposphere is the region nearest to the earth's surface and extends up to an altitude of 11 km. Temperature ranges from 15°C to -56.5°C in troposphere. The top of troposphere is called tropopause. The decrease of temperature with increasing altitude in the troposphere is called positive lapse rate.
2. **Stratosphere:** The region above the tropopause is known as stratosphere (11 km to 50 km with temperature range from -56°C to -2°C). In this zone, the temperature-altitude curve shows a warming trend with increasing altitude, i.e., it exhibits a negative lapse rate. Ozone in stratosphere acts as a protective shield for life on earth. At starting it has uniform temperature forming isothermal layer.
3. **Mesosphere:** Mesosphere is the coldest region above stratopause that extends from 50 km to 85 km. In this zone, temperature again decreases (from -2°C to -92°C) with height, that is, it exhibits a positive lapse rate. Important components are O₂ and NO₂. The region above the mesosphere is called mesopause.
4. **Thermosphere:** Thermosphere is the hottest region (85 km to 500 km, temperature ranges from -92°C to 1200°C) above mesopause, where temperature rises rapidly with increasing altitude, exhibiting a negative lapse rate.
5. **Exosphere:** The outermost layer of the atmosphere and the layer above the thermosphere is the exosphere. Exosphere is derived from the Greek word, where 'exo' means outer or external. The region where the exosphere ends, space begins

2b. Give an overview on the impacts of industries and mining on environment.(2+3)

Ans. Industrialization contributes major part for the economic development and prosperity of a country. On one hand it provides employment opportunities and wealth generation while on other hand it leads to following environmental deterioration:

1. It leads to the depletion of natural resources. It leads to air pollution, water pollution and soil pollution.
2. Global warming, climatic changes are the major consequences of industrialization.
3. It causes acid rain and leads to the degradation of land quality.
4. It leads to the generation of hazardous waste whose safe disposal becomes a big problem.
5. These industries are responsible for the following adverse diseases and ill effect like silicosis and pneumoconiosis, tuberculosis, skin diseases and deafness.

Impacts of Mining (mineral extraction): Positive socio-economic impacts involve employment and mineral wealth but the negative socio-economic impacts are as

1. Pollution of surface and ground water sources due to release of harmful trace elements e.g., cobalt
2. Soil is degraded, loss of biodiversity and changes of extinction of wild-life.
3. Pollution of air due to emission of mine dust, harmful gasses and transport vehicles.
4. Accidental hazards during the operations and stress on local servicers including water supplies, and solid waste management.

5. Resettlement & Rehabilitation problems for those who have lost their habitats.

3 a) **What is an ecosystem? Explain in detail the biotic and abiotic components of an ecosystem.(2+6+2)**

Ans. An ecosystem is a community of living organisms (plants, animals and microbes) in conjunction with the nonliving components of their environment (things like air, water and mineral soil), interacting as a system.

Abiotic components are the physical and/or the chemical factors that act on the living organisms at any part of their life. These are also called as the ecological factors. The physical and chemical factors are characteristic of the environment. Light, air, soil, and nutrients, etc. form the abiotic components of an ecosystem.

The **biotic component** comprise of

1. Producers: These are autotrophic organisms that can synthesize their food by using inorganic molecules like water and carbon dioxide. Green plants and blue-green algae are major producers in an ecosystem that perform photosynthesis to form their food. Producers are the **suppliers of energy** in an ecosystem. They act as food for primary consumers.

2. Consumers: These are the heterotrophic organisms that cannot synthesize their food. They depend on other organisms to fulfilling their food needs. These are categorized into primary consumers, secondary consumers, tertiary consumers etc or herbivores, carnivores, and omnivores based on their position in the food chain. Consumers help in the **circulation of energy** in an ecosystem.

3. Decomposers: These are the small microscopic organisms (saprotrophic organisms) like fungi and bacteria that perform the function of decomposition.

b) Describe the process of Environmental Impact Assessment with the help of flow chart. (5+5)

Ans. EIA is designed to identify the potential risks of a project (e.g., infrastructure development such as a dam) to environment and human well-being and identify measures to eliminate and/or mitigate these risks. The steps are as

Screening: Determines whether the environmental and social impacts of a proposed development project would be significant enough to develop an EIA.

Scoping: Establish the boundaries of the EIA, set the basis of the analyses that will be conducted at each stage, describe the project alternatives and consult the affected public.

Impact assessment & Mitigation: Evaluate the socioeconomic and environmental impacts of the planned project and its alternatives, and then identify the mitigation measures to reduce those impacts

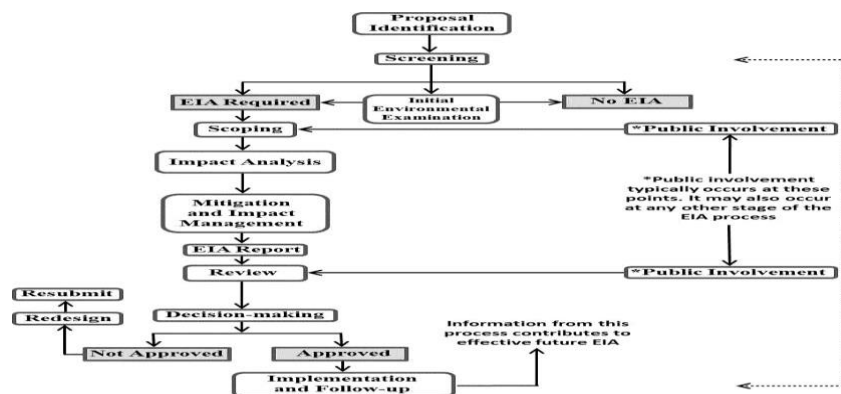
Impact Management: Prepare the plans required for addressing mitigation measures and other project risks, such as technological failures and natural disasters.

The EIA Report: Pull together all the research and work done during the previous steps into a comprehensive, structured document, ensuring that the EIA report contains all the key components.

Review : Designated authorities review the EIA report to determine if the planned project will get a license or if it requires amendments.

Management & Monitoring: Ensure that the mitigation measures, priorities listed in the Environmental Management Plan, and contingency plans are properly implemented and effectively address the project's impacts.

Need of EIA: To ensure environmental security and to reduce the wealth gap among the countries.



4 a) Define natural resources. Discuss the classification of natural resources based on their development. (2+3)

Ans. Anything which may have some functions not only to satisfy human demand at a given end but also to ensure preservation of biosphere should be considered as resource. – Earth Summit (1992)

Classification of Natural Resources Based On Development

Potential Resources: These are resources that are known to exist, have not been quantified and can be used for future use. For instance, wind energy exists in certain areas but has not been used to generate energy.

Example: wind energy, solar energy etc.

Reserved Resources: They are natural resources that have been identified and quantified but have not been harnessed because they are being reserved for future use. **Example:** water in dams

Stock Resources: These are resources that have been discovered, quantified but have not been harnessed due to insufficient technologies. **Example:** Hydrogen.

Actual Resources: These are resources that have been discovered, quantified, harnessed, and are being used. **Examples:** Crude oil, forest.

4 b) Differentiate between dental and skeletal fluorosis. Discuss the Nalgonda process for removal of fluoride from drinking water. (2+3)

Ans. Fluoride is an essential element required by our body in daily diet or drinking water. The maximum tolerance level in human body is 1.5 mg/L.

The difference between dental and skeletal fluorosis is as:

- Dental Fluorosis -Teeth discolouration, Damage to enamel, Mottling of teeth.
- Skeletal Fluorosis - Deformation of bones, Stiffening of bones & joints, Back pain, gastrointestinal effects & diarrhea.

The Nalgonda Technique: The technology was developed by National Environmental Engineering Research Institute (NEERI), Nagpur in 1961. It can remove more than 90% of fluoride in water. The process uses aluminum sulfate (a coagulant normally used for water treatment) to flocculate fluoride ions present in the drinking water.

- Nalgonda Technique involves addition of Aluminium salts, lime and bleaching powder followed by rapid mixing, flocculation, sedimentation, filtration and disinfection.
- Aluminium salt may be added as aluminium sulphate (alum) or aluminium chloride or combination of these two. It is responsible for removal of fluoride from water

5 a) Describe water borne and water induced diseases with suitable examples. (2.5+2.5)

Ans. These are illnesses caused by microscopic organisms (or pathogens) like viruses, bacteria &

protozoa that are ingested through contaminated water or by coming in contact with feces. Water borne diseases are of following types

1. Waterborne microbial diseases: Diseases caused by drinking water containing pathogens. e.g., Cholera, diarrhea etc.
2. Waterborne chemical diseases: Diseases caused by drinking water containing chemicals. e.g., Arsenicosis, fluorosis etc

Water induced Diseases : Standing water can act as breeding sites for mosquitoes, and therefore enhance the potential for exposure of the population to infections such as dengue (caused by Aedes), malaria (caused by Anopheles) and other vector borne water induced diseases.

The risk of outbreaks is greatly increased by complicating factors, such as changes in human behavior (increased exposure to mosquitoes while sleeping outside, a temporary pause in disease control activities, overcrowding), or changes in the habitat which promote mosquito breeding (landslide, deforestation, river damming, and rerouting).

b) What is arsenicosis? Explain the methods for removal of arsenic from drinking water. (2+3)

Ans. Permissible limit is 0.01mg/L. Excess of it may lead to a disease known as arsenic poisoning or arsenicosis, Keratosis, diffuse melanosis with cancer of skin, bladder, kidney or lung or diseases of skin (colour changes, and hard patches on palms and soles), or blood vessels of legs and feet.

Arsenic is introduced into soil and groundwater during weathering of rocks and minerals followed by subsequent leaching and runoff. It can also be introduced into soil and groundwater from anthropogenic sources.

Remedial measures:

Various treatment methods have been adopted to remove arsenic from drinking water. These methods include

- 1) Distillation: involves boiling water having arsenic and then condensing the steam back into water.
- 2) Iron oxide adsorption: It is a technology that uses granular iron oxide to remove arsenic from water
- 3) Coagulation with filtration: uses coagulants (usually iron oxide) to clump arsenic particles together.
- 4) Reverse osmosis: uses pressure to force water through a semi-permeable membrane.
- 5) Ion-Exchange method is also used.