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**Course: Introduction to Environment (1421) Semester: Spring, 2023**

**Level: BA. Associate Degree**

**Assignment no 1**

**Q. 1 a. Definitions of Environmental Terms**

i. **Ecofeminism:** Ecofeminism is a philosophical and social movement that highlights the interconnectedness between the oppression of women and the degradation of the environment. It argues that both women and nature have been historically marginalized and exploited by patriarchal systems, and advocates for a holistic approach that recognizes the inherent value of both women and nature.

ii. **Weathering:** Weathering is the process by which rocks and minerals are broken down into smaller particles due to exposure to various weather elements such as wind, water, and temperature changes. It is a natural process that occurs over time and contributes to the formation of soil.

iii. **Greenhouse Effect:** The greenhouse effect is a natural phenomenon where certain gases in the Earth's atmosphere, such as carbon dioxide and methane, trap heat from the sun, preventing it from escaping back into space. This trapped heat warms the planet, making it suitable for life. However, human activities have increased the concentration of these greenhouse gases, leading to enhanced global warming and climate change.

iv. **Lithosphere:** The lithosphere is the outermost solid layer of the Earth, consisting of the crust and the uppermost part of the mantle. It includes various landforms, such as mountains, plains, and plateaus, and is crucial for supporting ecosystems and human activities.

v. **Topography:** Topography refers to the physical characteristics and features of the Earth's surface, including its elevation, slope, and landforms. It is represented on topographic maps and plays a significant role in influencing weather patterns, hydrology, and the distribution of flora and fauna.

vi. **Food Chain:** A food chain is a linear representation of the transfer of energy and nutrients in an ecosystem. It shows the feeding relationships between different organisms, where one organism serves as the food source for another. The chain typically starts with primary producers (plants) and progresses to herbivores, carnivores, and eventually decomposers.

vii. **Soil Organic Matter:** Soil organic matter refers to the decaying plant and animal material present in the soil. It is an essential component of soil fertility and structure, as it enhances water retention, nutrient availability, and microbial activity.

viii. **Fragmentation of Habitat:** Habitat fragmentation is the process of breaking larger habitats into smaller, isolated patches due to human activities such as urbanization, deforestation, and infrastructure development. This fragmentation disrupts ecological connectivity, leading to adverse effects on wildlife populations and biodiversity.

ix. **Infiltration:** Infiltration is the process by which water on the Earth's surface permeates into the soil and recharges groundwater. It is a crucial component of the water cycle and helps maintain soil moisture and aquifer levels.

x. **Ozone:** Ozone is a molecule composed of three oxygen atoms (O<sub>3</sub>). It exists in two regions of the atmosphere: the stratosphere, where it forms the ozone layer that protects the Earth from harmful ultraviolet (UV)

radiation, and the troposphere, where it is considered a pollutant and contributes to smog formation.

### **Q. 1 b. Justifications for Statements**

a. **The increase in CO<sub>2</sub> in the atmosphere can result in global warming.** Justification: CO<sub>2</sub> is a greenhouse gas, which means it traps heat in the Earth's atmosphere. When human activities, such as burning fossil fuels and deforestation, release excessive CO<sub>2</sub>, it intensifies the greenhouse effect, leading to global warming. This causes changes in climate patterns, rising sea levels, and impacts on ecosystems and biodiversity.

b. **Vegetation cover prevents soil erosion.** Justification: Vegetation, such as trees, grasses, and shrubs, plays a critical role in preventing soil erosion. Their root systems bind the soil together, reducing the impact of water runoff and wind. The leaves and canopy also act as a barrier, breaking the force of rainfall and slowing down water flow, thus protecting the topsoil from being washed away.

c. **The top layer of soil is usually darker in color.** Justification: The top layer of soil, known as topsoil, is darker in color due to the accumulation of organic matter, such as decomposed plant material and humus. This organic matter provides nutrients and enhances soil fertility, making it suitable for supporting plant growth.

d. **Most of the gases in the atmosphere are concentrated in the lower atmosphere.** Justification: The lower atmosphere, known as the troposphere, extends from the Earth's surface up to an altitude of about 10 kilometers. It contains about 80% of the total atmospheric mass and the majority of gases, including nitrogen, oxygen, water vapor, and carbon dioxide. This is where weather occurs and where living organisms exist.

e. **A food chain does not exceed more than 3-5 levels.** Justification: In an ecosystem, energy is lost as it moves up the food chain. As a result, there is not enough energy available to sustain more than 3-5 trophic levels efficiently. Higher trophic levels require more energy, and the

energy transfer efficiency decreases with each level, limiting the length of the food chain.

### **Q. 1 c. Water Conservation Practices at Household Level**

1. **Fix Leaks:** Regularly check and repair any leaks in faucets, toilets, and pipes to prevent water wastage.
2. **Install Water-Saving Fixtures:** Install low-flow faucets, showerheads, and toilets to reduce water consumption without compromising functionality.
3. **Collect Rainwater:** Set up rainwater harvesting systems to collect rainwater for use in watering plants and gardening.
4. **Shorter Showers:** Encourage family members to take shorter showers, reducing water usage.
5. **Watering Schedule:** Water plants and gardens early in the morning or late in the evening to minimize evaporation and maximize absorption.

### **Q. 1 d. Hydrological Cycle Diagram**

*[Note: As a text-based AI, I cannot draw diagrams. However, I can describe the Hydrological Cycle (also known as the Water Cycle) to you]*

The Hydrological Cycle represents the continuous movement and distribution of water on Earth. It involves various processes, including evaporation, condensation, precipitation, runoff, infiltration, and transpiration.

1. **Evaporation:** Sunlight heats water bodies (oceans, lakes, rivers), causing water to evaporate into water vapor and rise into the atmosphere.
2. **Condensation:** As the water vapor rises higher into the atmosphere, it cools down and condenses back into tiny water droplets, forming clouds.
3. **Precipitation:** When the cloud droplets become heavy enough, they fall back to the Earth's surface as precipitation, which includes rain, snow, sleet, or hail.
4. **Runoff:** Some of the precipitation flows over the Earth's surface, creating streams, rivers, and eventually reaching the oceans.
5. **Infiltration:** Some of the precipitation seeps into the ground and recharges groundwater, becoming available for plants and wells.

6. **Transpiration:** Plants absorb water through their roots and release it as water vapor through their leaves, contributing to the water vapor content in the atmosphere.

The Hydrological Cycle is a continuous process that ensures the availability of water for various ecosystems and human needs.

## **Q. 2 Scope of Environmental Sciences and Major Environmental Concerns of Pakistan**

**Scope of Environmental Sciences:** Environmental Sciences is an interdisciplinary field that examines the interactions between the environment and human society. It encompasses the study of ecosystems, natural resources, pollution, climate change, conservation, and sustainable development. The scope of environmental sciences includes:

1. **Ecology:** Study of the interrelationships between organisms and their environment.
2. **Environmental Chemistry:** Analysis of chemical processes and pollutants in the environment.
3. **Environmental Biology:** Study of the impact of environmental factors on living organisms.
4. **Environmental Policy and Law:** Examination of regulations and policies for environmental protection.
5. **Environmental Engineering:** Application of engineering principles to address environmental issues.
6. **Climate Science:** Study of climate patterns and climate change phenomena.
7. **Conservation Biology:** Efforts to conserve and protect biodiversity and ecosystems.

**Major Environmental Concerns of Pakistan:** Pakistan faces several significant environmental challenges that threaten the country's ecosystems, public health, and sustainability:

1. **Water Scarcity:** Pakistan experiences water scarcity due to inefficient water management, over-extraction of groundwater, and climate change impacts. The availability of clean drinking water is a major concern.
2. **Air Pollution:** Urban areas suffer from severe air pollution, primarily caused by vehicular emissions, industrial activities, and burning of solid waste.
3. **Deforestation and Habitat Loss:** Rampant deforestation and habitat destruction have led to a loss of biodiversity and wildlife habitats.
4. **Climate Change:** Pakistan is vulnerable to the impacts of climate change, including extreme weather events, glacial melting, and sea-level rise.
5. **Solid Waste Management:** Inadequate waste management systems contribute to the accumulation of solid waste, leading to environmental degradation and health risks.
6. **Water Pollution:** Industrial effluents, agricultural runoff, and untreated sewage pollute water bodies, posing risks to aquatic life and human health.
7. **Energy Crisis:** Pakistan faces an energy crisis, heavily reliant on fossil fuels, which contributes to greenhouse gas emissions and environmental degradation.
8. **Land Degradation:** Soil erosion, salinization, and desertification threaten agricultural productivity and land sustainability.
9. **Loss of Biodiversity:** The loss of natural habitats and wildlife poses significant challenges to biodiversity conservation.

Addressing these environmental concerns requires effective policies, public awareness, sustainable practices, and international cooperation.

### **Q. 3 Positive Interactions Among Organisms in an Ecosystem**

In an ecosystem, organisms extensively interact with each other, forming complex relationships that can be categorized into various types of interactions. Positive interactions are those interactions that benefit one or both interacting species. Some examples include:

1. **Mutualism:** In mutualistic interactions, both species benefit from the association. An example is the relationship between bees and flowers.

Bees obtain nectar and pollen for food, while flowers benefit from pollination, aiding in reproduction.

2. **Commensalism:** In commensal interactions, one species benefits, and the other remains unaffected. For instance, epiphytic plants growing on tree branches benefit from increased access to sunlight, while the tree is not significantly affected.
3. **Facilitation:** Facilitation occurs when one species positively influences the survival or growth of another species without direct interaction. For example, certain plants improve soil conditions, making it more suitable for other plant species to grow nearby.
4. **Ecosystem Engineers:** Some species are ecosystem engineers that modify the environment to benefit other organisms. Beavers are ecosystem engineers as their dam-building activities create new habitats that benefit various aquatic organisms.
5. **Cleaning Symbiosis:** Certain species engage in cleaning symbiosis, where one organism cleans parasites or debris from another organism. Cleaner fish cleaning parasites from larger fish is an example of this positive interaction.
6. **Seed Dispersal:** Animals that eat fruits and disperse seeds through their feces play a crucial role in seed dispersal, facilitating plant growth in new locations.
7. **Pollination:** Animals like bees, butterflies, and birds play a vital role in pollination, facilitating plant reproduction and ensuring genetic diversity.

These positive interactions contribute to the stability and functioning of ecosystems, enhancing biodiversity and supporting ecosystem services.

#### **Q. 4 Structure of the Atmosphere**

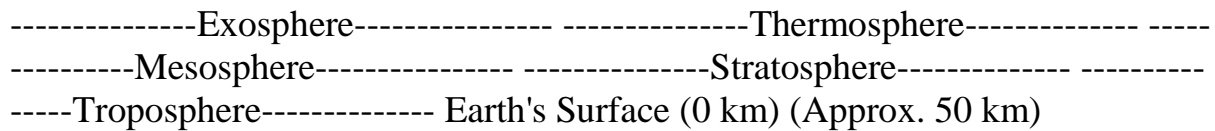
The atmosphere is composed of different layers, each with distinct characteristics. Starting from the Earth's surface and moving upwards, the layers are:

1. **Troposphere:** The troposphere is the closest layer to the Earth's surface, extending to an average height of about 10 kilometers. It contains most of the atmosphere's water vapor, weather phenomena, and the majority of Earth's living organisms.



2. **Stratosphere:** The stratosphere lies above the troposphere, reaching up to about 50 kilometers. It contains the ozone layer, which absorbs harmful UV radiation from the sun.
3. **Mesosphere:** Above the stratosphere is the mesosphere, extending up to about 85 kilometers. Temperatures in the mesosphere decrease with altitude.
4. **Thermosphere:** The thermosphere lies above the mesosphere, and its temperature increases with altitude due to absorption of solar radiation.
5. **Exosphere:** The exosphere is the outermost layer of the atmosphere, where the atmosphere gradually merges with outer space. It contains a low density of gas molecules.

Diagram of the Atmospheric Layers:



Each layer plays a crucial role in regulating the Earth's climate and supporting life on our planet.