ASSIGNMENT No. 01

Introduction to Environment (1421) B.B.A / B.COM

Spring, 2025

Q. 1 Explain the importance and scope of environmental science (20)

The sum total of all surroundings of a living organism, including natural forces and other living things, which provide conditions for development and growth as well as of danger and damage. The field defines the term environment very broadly including all that is natural on the planet as well as social settings, built environments, learning environments and informational environments. When solving problems involving human-environment interactions, whether global or local, one must have a model of human nature that predicts the environmental conditions under which humans will behave in a decent and creative manner. With such a model one can design, manage, protect and/or restore environments that enhance reasonable behavior, predict what the likely outcome will be when these conditions are not met, and diagnose problem situations.

Scope of environmental science:

Environment is nothing but the nature composed of both biotic and abiotic factors. It has profound effect over the living organisms. It also exerts influence over their metabolic activities. It causes even evolution to occur as the environment is dynamic and ever changing. Its scope is so wide that it has got relation with every science and scientific aspects in general and biology in particular. Its study makes the man to understand its importance. He would be able to take necessary steps to protect it though nature can take care of the human beings. Environmental Science will be a growing field for the future with the growing concerns about our global warming and climate changes. Other fields such as ecology, botany, and meteorology besides all other major branches of the science, arts and commerce.

Major aspect and importance:

- is concerned with the day today interaction with the surroundings with which human being is closely associated.
- is related to many branches of the science and is an interdisciplinary problems.
- is concerned with the importance of wild life its protection
- explains the significant role of biodiversity in establishing ecological balance
- deals with different types of ecosystems, biotic and abiotic factors and their role in the significance and sustenance of ecosystems.
- is concerned with different types of food chains, food webs, productivity, biomass, carrying capacity of ecosystems.
- deals with various types of interrelationships existing between living and non living organisms and also between different types of living organisms such as symbiosis, mutualism, commensalism, parasitism, competition, antibiosis etc.,
- gives information relating to population explosion, growth and development, impact of population growth on the resource consumption and national economy.
- Explains the coexistence of both living and non living organisms and their contribution to the nature for its sustenance.
- Deals with relation with ethos and the impact of ethical principles in the conservation of wild life, biodiversity and environment.
- Explains the significance of forests and their products in the human routine and in country's economy.
- Gives information about water conservation, watershed management and the importance of water as a universal solvent and the importance of the same in various physiological, biochemical, internal systems and external environment.

Consequences of the Environmental Degradation

The world faces a broad range of environmental problems, including pollution, habitat destruction, loss of biodiversity, scarcity of water, overfishing, agricultural land degradation, over-exploitation of natural resources and overproduction of greenhouse gases leading to climate change. The list of consequences is even longer. Environmental degradation by its essential nature results in a planet less suited to supporting life. Environmental problems endanger public health and have undesirable long-term economic consequences. In their worst manifestations, unaddressed environmental problems can render large areas of the planet unsuitable for human habitation.

Loss of Biodiversity

A global loss of biodiversity has accelerated since the age of industrialization, approaching 1,000 times the normal rate for extinctions on the planet. The acceleration of extinctions is almost certain to continue, due primarily to habitat loss, pollution, over-harvesting, and the introduction of invasive species. Biodiversity provides innumerable services to humanity, including air and water quality, pollination, and agricultural productivity. Currently between 10 and 30 percent of land animals are threatened with extinction, and 75 percent of fisheries are over-exploited. Loss of biodiversity, and the complex ecological systems it supports, is irretrievable. The human population sits at the pinnacle of a food and sustenance chain that is breaking at ever faster rates of speed.

Economic Impacts of Environmental Degradation

The world economy rests on the back of the environment. Over-harvesting of natural resources leads to scarcity. Pollution of air and water leads to deteriorating public health and requires additional expenditures to treat it. Pollution also renders land and water unsuitable for economic activity, whether agriculture, fisheries or tourism. Environmental degradation by definition means a loss of common resources, including forests, rivers and streams, topsoil and local biodiversity. When common resources are lost due to over-exploitation or pollution, human communities lose the future opportunity for economic use.

Public Health

According to the World Health Organization, one-quarter of global disease, and one-third of childhood disease, is a result of environmental hazards. Environmental toxins caused by pollution are a major culprit. Water-born illnesses such as diarrhea afflict millions in developing countries, and are compounded by problems of food scarcity. Approximately one in eight people lacks access to safe water. Air pollution causes respiratory illness. Pollution also leads to increased rates of cancer throughout the developing and developed world.

Environmental Catastrophes

Environmental catastrophes often occur due to neglect, whether through lack of adequate regulation and enforcement, or through willful violation of environmental standards. The BP Gulf oil spill was only the latest of many such catastrophes. The Chernobyl nuclear accident caused widespread human health problems and the evacuation of a large area in Ukraine. The Bhopal chemical disaster in India killed over 3500 people. Other environmental disasters include the pollution of the Niger delta in Nigeria, the Fukushima nuclear following the 2011 earthquake and tsunami and the environmental threat to the Great Barrier Reef in Australia.

Scope of Environmental Science as an Interdisciplinary and Multidisciplinary Subject

Interdisciplinary Nature: Environmental science is inherently interdisciplinary. It integrates knowledge from various fields to address complex environmental issues. The scope of environmental science includes:

- **Ecology**: Studying ecosystems and the interactions between organisms and their environments.
- **Chemistry**: Analyzing pollutants and their impact on the environment.
- **Geology**: Understanding earth processes and how they affect environmental conditions.
- **Biology**: Exploring the impact of environmental changes on living organisms.
- **Meteorology**: Examining weather patterns and their effects on the environment.

Multidisciplinary Approach: Environmental science also draws on multiple disciplines to tackle broader issues:

- **Economics**: Assessing the economic implications of environmental policies and practices.
- **Sociology**: Understanding how societal behaviors and structures affect and are affected by environmental issues.
- **Political Science**: Analyzing the role of government policies and international agreements in environmental protection.
- **Engineering**: Developing technologies and solutions to mitigate environmental problems, such as pollution control and sustainable energy systems.
- **Public Health**: Investigating the impact of environmental factors on human health and developing strategies to address related health issues.

Integration in Policy and Practice

Policy Development: Environmental science informs policy-making by providing evidence-based recommendations for sustainable practices and regulations. Effective policies often require a comprehensive understanding of ecological, economic, and social factors.

Education and Awareness: Environmental science promotes education and awareness, encouraging informed decision-making and responsible behavior. Integrating environmental science into educational curricula helps build a knowledgeable and proactive society.

Sustainable Development Goals (SDGs): Environmental science plays a crucial role in achieving SDGs by addressing goals related to clean water, climate action, life on land, and life below water. The interdisciplinary approach ensures that all relevant factors are considered in planning and implementation.

Research and Innovation: The field drives research and innovation in areas such as renewable energy, waste management, and conservation. Multidisciplinary collaboration fosters the development of new technologies and strategies to address pressing environmental challenges.

Challenges and Future Directions

Complexity of Environmental Issues: The complexity of environmental issues necessitates a broad and integrated approach. Understanding the interplay between different factors requires collaboration across disciplines and sectors.

Data Integration: Combining data from various sources and disciplines can be challenging. Effective integration is crucial for accurate assessment and decision-making.

Policy Implementation: Translating scientific knowledge into effective policies and practices involves navigating political, economic, and social challenges. Collaboration between scientists, policymakers, and stakeholders is essential.

Global Perspective: Environmental issues are often global in scope, requiring international cooperation and solutions. The interdisciplinary and multidisciplinary approach helps address these challenges on a global scale.

Future Research: Ongoing research in environmental science will continue to explore new frontiers, such as the impacts of climate change, biodiversity loss, and resource depletion. The integration of emerging technologies and methods will enhance our ability to address environmental challenges.

Conclusion

The domino effect highlights the interconnectedness of environmental, economic, and social systems. In Pakistan, this effect underscores the importance of addressing environmental issues comprehensively to support sustainable development. Environmental science, with its interdisciplinary and multidisciplinary nature, plays a vital role in understanding and addressing these complex challenges. By integrating knowledge from various fields and fostering collaboration.

Q. 2 Describe the different levels of organization in nature, from individual organisms to the biosphere with examples of each level. (20)

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nutrient upt

gans that work together to perform co
nimals, examples include the digestive syste
nutrients, and eliminates waste, and the circulatory
blood and nutrients throughout the body. In plants, the roo
tem work together to secure the plant in the soil while allowing
ering and photosynthesis.

ons

population is defined as a group of individuals of the same species tha
ecific area and interact with one another. An example would be a
xodonta africana) in a savanna ecosystem. Populations are
density, distribution, and dynamics, and they are aff
death rates, immigration and emigration.

nities

es consist of multiple popu
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…ization, encompassing all…
…l living organisms and their rela…
…osphere, hydrosphere, and lithosphere.
…ing system that supports life in diverse forms,
…m to towering trees in rainforests and the vast array of
…us environments. This interconnected web of life is essential
…m and sustainability.

…w in Levels of Organization

…ch level of organization, energy flows through biological systems, driv…
processes such as metabolism, growth, and reproduction. In ecosystems…
…marily comes from the sun and is captured by primary producers…
…ts through photosynthesis. This energy is then transferred…
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Q. 3 What is the composition of the Earth's atmosphere, and how does it support life? (20)

According to NASA, the earth's atmosphere is divided into four major sections or "spheres." The lower atmosphere is known as the troposphere and extends up to nine miles into the air. All of the air that directly supports life on earth is found in the troposphere. All weather activity also occurs in this layer, which primarily consists of nitrogen and oxygen.

Nitrogen

The lower atmosphere is approximately 78 percent nitrogen. The primary purpose of atmospheric nitrogen is to dilute the oxygen in the air. Nitrogen is not combustible, but oxygen is. The presence of nitrogen helps stabilize this combustibility. Nitrogen is odorless, tasteless and colorless. It is not poisonous, but it cannot sustain life on its own. Atmospheric nitrogen cannot be processed directly by plants and animals. It is pulled from the atmosphere by a specific type of bacteria, which then deposits it in the soil where it becomes a vital mineral in plant growth.

Oxygen

The lower atmosphere is roughly 21 percent oxygen. Oxygen is the essential element that sustains life on earth. Plants produce oxygen through photosynthesis, a process that uses sunlight to convert water and carbon dioxide into glucose. Animals breathe in this oxygen, which, among other things, allows the body to process food for energy.

Water Vapor

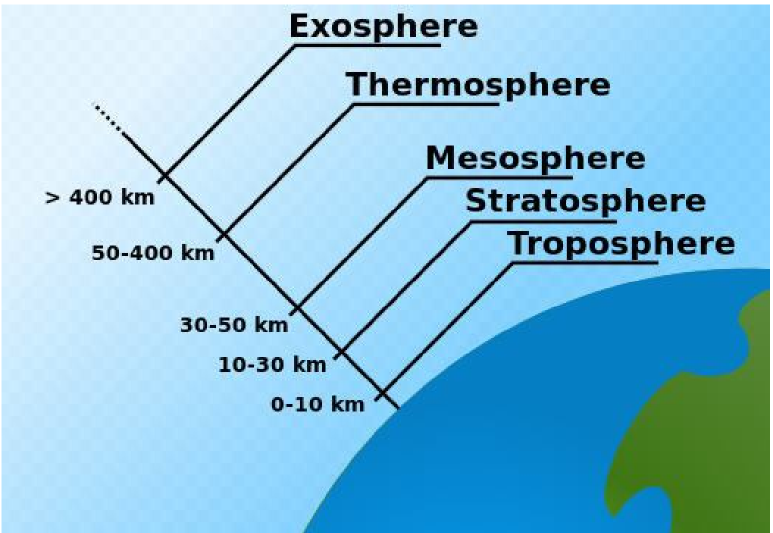
One of the most physically obvious components of the earth's lower atmosphere is water vapor. Depending on its intensity, water vapor can comprise up to 4 percent of the atmosphere. Water vapor causes the air to feel "muggy" on humid days. It also is visible in the form of fog and clouds. The condensation of water vapor in the air causes precipitation, which is also vital to live on earth.

Trace Gases

The remaining percentage of the atmosphere is made up of argon, carbon dioxide, neon, helium, methane, hydrogen, nitrous oxide and ozone. The most common of these gases is argon, which makes up 0.93 percent of the lower atmosphere. The least common is ozone, which occupies only four parts per million in the lower atmosphere or 0.000004 percent. The majority of ozone in the earth's atmosphere is found above the lower atmosphere in the stratosphere.

Composition and Layers of the Atmosphere

The atmosphere surrounding the Earth is made up of many gases, the most prevalent of which are nitrogen and oxygen. It also contains water vapor, dust and ozone. The lowest layer of the atmosphere is the troposphere. The higher up you go in the troposphere, the lower the temperature. Above the troposphere is the stratosphere, the area where planes fly. The temperature increases as you move up through this layer because of ozone, which absorbs solar radiation. Above the stratosphere is the mesosphere; here, the temperature decreases. Above the stratosphere is the thermosphere, where it is hot and the air is thin. Finally, there is the exosphere, where satellites orbit.



Ozone

Ozone is concentrated mainly in the stratosphere, where it absorbs solar radiation, protecting Earth's living organisms from the ultraviolet light from the sun. UV radiation is harmful; without the atmosphere's ozone, living organisms could not exist on Earth. UV light causes cancer and cataracts, and it damages DNA. In recent years, the ozone layer has decreased, a cause for concern.

Greenhouse Effect

The greenhouse effect refers to the ability of some components of the atmosphere--primarily carbon dioxide--to absorb and trap heat. While too much heat is a problem--consequences being a change in weather and climate, and a rise in sea levels--the greenhouse effect is a necessary protector of life on Earth. It lets the atmosphere function like a blanket, allowing for temperatures hospitable to the planet's life. People exhale carbon dioxide and release it into the atmosphere when burning fossil fuels and plants. Plants absorb carbon dioxide as part of photosynthesis, keeping the carbon and releasing oxygen. The moon, which has no atmosphere, has an average temperature of 0 degrees Fahrenheit (-18 degrees Celsius).

Mitigating Risk from Meteorite Impact

There are a lot of rocks and dust moving about the solar system, some of them quite large. These bodies are called meteoroids. When these meteoroids hit the Earth, sometimes causing damage, they're called meteorites. Luckily, the atmosphere protects the Earth from meteorite impact. Almost all meteoroids crash into the atmosphere at extremely high speeds, disintegrating and creating a glow that can be seen as a streak in the sky. These bodies are called meteors.

Preventing Rapid Burning

Because of the atmosphere's proportion of gases, the Earth's surface and its living creatures are protected from rapid combustion--burning. Burning requires oxygen, which is the second most prevalent gas in the atmosphere, making up almost 21 percent of its composition in the form of O_2. Nitrogen, luckily, is the most prevalent gas, making up over 78 percent of the atmosphere in the form of N_2. The nitrogen dilutes the oxygen, and Earth's surface avoids the negative consequences of oxygen's usefulness as a component of fire. (Oxygen itself is not combustible, but it reacts with other things to produce fire.)

Q. 4 Describe what are the major types of rocks, and how are they formed. (20)

Rocks are categorized into three distinct types based on their method of formation. The three types are igneous, sedimentary, and metamorphic. Early in Earth's history, all rock was igneous, having formed from the cooling of melt on the surface.

Igneous rock:

An igneous rock is simply a rock that has solidified from magma or lava upon cooling. Igneous rocks can be intrusive (solidified from magma underground) or extrusive (solidified from lava at or near the surface). The bulk of Earth's crust is formed from igneous rock. Examples of igneous rock include basalt, obsidian, rhyolite, granite, diorite, gabbro, and pumice.

Sedimentary rock:

A sedimentary rock is one that is formed by the accumulation of small to large sediment particles derived from all three types of rock and in some cases organic material, and undergoes compaction, cementation, or evaporation from/precipitation from a saturated mineral solution. Sedimentary rock is classified as organic, (derived from organisms), clastic (formed from any size particle of preexisting rock), or non-clastic (also referred to as chemical), where the sedimentary rock is formed from the evaporation of a solution that is saturated with mineral compounds. Examples of organic sedimentary rocks are coal and limestone. Examples of clastic sedimentary rocks are conglomerate and shale. Examples of non-clastic or chemical sedimentary rocks are rock gypsum and rock salt.

Metamorphic rock:

A metamorphic rock is an igneous, sedimentary, or another metamorphic rock that has either been squeezed by incredible pressures deep underground and/or has been exposed to very high temperatures, altering its structure, mineral alignment, or chemical composition. Metamorphic rocks are classified as contact (from proximity to a magmatic intrusion) or regional (resulting from deep burial and pressures from plate collisions Metamorphic rock is also classified as foliated or non-foliated, foliation being the parallel alignment of the constituent minerals in bands that are perpendicular to the applied pressure. Metamorphic rocks can also be described by the grade of metamorphism which has taken place from low to high, high being the closest to the next stage in the rock cycle, melting. Examples of metamorphic rock are slate, quartzite, marble, phyllite, schist, and gneiss.

Sedimentary rock formation:

Sedimentary rock formation begins with igneous, metamorphic, or other sedimentary rocks. When these rocks are exposed at the earth's surface they begin the long slow but relentless process of becoming sedimentary rock.

Weathering:

All rocks are subject to weathering. Weathering is anything that breaks the rocks into smaller pieces or sediments. This can happen by the forces of like wind, rain, and freezing water.

Deposition:

The sediments that form from these actions are often carried to other places by the wind, running water, and gravity. As these forces lose energy the sediments settle out of the air or water. As the settling takes place the rock fragments are graded by size. The larger heavier pieces settle out first. The smallest fragments travel farther and settle out last. This process of settling out is called deposition.

Erosion:

The combination of weathering and movement of the resulting sediments is called erosion.

Lithification:

Lithification is the changing of sediments into rock. There are two processes involved in this change. They are compaction and cementation.

Compaction:

Compaction occurs after the sediments have been deposited. The weight of the sediments squeezes the particles together. As more and more sediments are deposited the weight on the sediments below increases. Waterborne sediments become so tightly squeezed together that most of the water is pushed out. Cementation happens as dissolved minerals become deposited in the spaces between the sediments. These minerals act as glue or cement to bind the sediments together. The process of sedimentary rock formation takes millions of years to complete only to begin a new cycle of rock formation.

Q. 5 Describe what is soil erosion and how it degrades the environment (20)

Soil texture and structure are closely related, but there are a few important differences between the two. Obtain a soil analysis from your local university extension before you plant your garden in order to familiarize yourself with its structure and texture and determine whether you need to make any improvements to the soil. Does this Spark an idea?

Soil Structure

Soil structure refers to the way that soil particles are combined into aggregates. There are five basic types of soil structures. Granular soils are optimal for plant growth, since the particles are loose but also retain water well. Other soil structures include platy soil, blocky soil, prismatic soil and structure less soil. These soil structures are less beneficial for plant growth, since they provide less efficient water retention and aeration to plant roots. Soil structure is usually easy to change through cultivation practices like tilling.

Soil Texture

Soils textures are commonly described as sandy, silt, loam or clay. Whereas soil structure refers to how the soil particles are put together, soil texture refers to the type of particles that make up a given soil. Sand particles are large and porous, whereas clay particles are very small and tend to stick together when wet. Loam soil contains an almost equal balance of sand, silt and clay and is ideal for most plants.

What is soil erosion?

Soil erosion is when the soil is blown away by the wind or washed away by the rain. Soil erosion is common in areas with steep slopes, where trees have been cut down, in droughts when crops and other vegetation grows poorly and in rural areas which are overpopulated. Nepal, in the Himalayan Mountains, has severe problems caused by increased population density and steep slopes.

Soil erosion can be reduced by building terraces on hillsides, irrigation schemes to overcome droughts, planting more trees to bind the soil together and make wind breaks, and using fertilisers in overpopulated areas to make the soil more fertile. It is very important that the farming techniques used do not damage the structure of the soil, as this makes it easily eroded. Good farming techniques include contour ploughing, crop rotation and keeping the soil rich in humus.

An example of poor techniques was the "Dust Bowl" in the mid-western states of the U.S.A. in the 1930's. Farmers exhausted the soil by monoculture and left the soil bare after harvesting. Soil erosion is a problem of the developed world as well as the developing.

Land use: Humans play a major role in soil erosion through their use and abuse of natural resources, for example deforestation, grazing, arable land use, faulty farming systems, high crop intensity, housing construction, mining etc.

Climate: The two most important climatic factors having a direct effect on erosion are precipitation and wind velocity. Other climatic factors have an indirect effect on soil erosion, such as water balance, evapotranspiration, temperature and relative humidity. Indirect factors affect the erosivity of rainfall by altering the soil moisture regime and the proportion of rainfall that may become surface runoff. For erosion control it is necessary to investigate physical characteristics of rainfall, including the amount, distribution, intensity, energy load, seasonality and variability of rainfall and the formation and course of surface runoff.

Soil: The susceptibility of a soil to erosion is influenced by its physical, hydrological, chemical and mineralogical properties as well as its soil profile characteristics. Important soil physical and hydrological properties that affect the resistance of a soil to erosion include texture, structure, water retention and transmission properties.

Hydrology: Infiltration, surface detention, overland flow velocity, and subsurface water flow are important soil erosion components of the hydrological cycle. The different types of flow and their velocities may be turbulent or laminar, steady or unsteady, uniform or non-uniform and influence the extent of erosion

Landforms: Slope gradient, slope length and shape of slope are the important variables of landform that affect erosion processes for all types of soil erosion, e.g., splash, sheet, rill, and gully erosion.