

OBJECTIVE BOTANY

Ecology and Phytogeography

for

M.Sc. (Semester II) Paper 3

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UNIT 01

Introduction : Ecology and Environment

Syllabus: Introduction of ecologist, recent developments, opportunities, institutions and journals

Ecologist

An **ecologist** is a scientist who studies **ecology**, which is the branch of biology concerned with the relationships between organisms and their environment. Ecologists examine how organisms interact with each other, their physical surroundings, and the ecosystems they inhabit. This includes studying topics such as biodiversity, ecosystem services, energy flow, nutrient cycling, and the effects of human activity on the environment.

In the Indian context, ecologists play a vital role in addressing numerous environmental challenges facing the country. India, being a highly biodiverse and ecologically rich country, has diverse ecosystems ranging from the Himalayas, forests, and wetlands to marine and desert ecosystems. As a result, there is an increasing demand for ecologists in India to study and address critical ecological issues such as:

- Habitat degradation
- Biodiversity conservation
- Climate change
- Environmental pollution
- Sustainable development
- Conservation of endangered species and ecosystems

Famous International Ecologists

Eugene Odum (USA)

- Considered the "**Father of modern ecology.**"
- Pioneered the concept of ecosystems in ecological studies.

Rachel Carson (USA)

- Marine biologist and author of **Silent Spring**, which helped launch the environmental movement.

Aldo Leopold (USA)

- Author of A Sand County Almanac and proponent of the "land ethic" concept in conservation.

G. Evelyn Hutchinson (UK/USA)

- Known as the "Father of modern limnology" (study of inland waters).
- Contributed significantly to population ecology and ecological niches.

David Attenborough (UK)

- Though more of a natural historian and broadcaster, his ecological documentaries have had massive global influence.

Jane Goodall (UK)

- Primatologist and ecologist known for her work on chimpanzee behavior and conservation.

Famous Indian Ecologists

Prof. Ramdeo Misra (1908–1998)

- Often called the “**Father of Indian Ecology**”.
- Laid the foundation for ecological research and environmental education in India.
- Established **India’s first school of ecology at Banaras Hindu University (BHU)**.
- Conducted pioneering work on tropical ecology, plant succession, and ecosystem analysis in Indian contexts.

Salim Ali (1896–1987)

- Known as the “**Birdman of India**.”
- Pioneering **ornithologist** and ecologist.
- Conducted systematic bird surveys across India.
- Key figure in the establishment of **Bharatpur Bird Sanctuary and BNHS (Bombay Natural History Society)**.

Madhav Gadgil

- Chaired the Western Ghats Ecology Expert Panel (Gadgil Committee Report).
- Founder of the **Centre for Ecological Sciences at IISc, Bangalore**.
- Advocate of ecological sustainability and community-based resource management.

Raman Sukumar

- Expert in **elephant ecology** and human-wildlife conflict.
- Professor at the Indian Institute of Science, Bangalore.
- Contributed to climate change and tropical forest research.

K. Ullas Karanth

- Leading **wildlife ecologist and conservationist**.
- Known for pioneering **tiger population estimation** using camera traps and capture-recapture methods.
- Works with the Wildlife Conservation Society (WCS) India Program.

A. R. Rahmani

- **Ornithologist** and conservation biologist.
- Former director of the Bombay Natural History Society (BNHS).
- Worked extensively on threatened bird species and wetland ecosystems.

Kartik Shanker

- **Marine ecologist** specializing in sea turtles and marine biodiversity.
- Faculty at Indian Institute of Science (IISc), founder of Dakshin Foundation.
- Promotes conservation through community-based marine projects.

Ravi Chellam

- Wildlife biologist known for work on **Asiatic lions** and protected area management.
- Involved in policy and science-based conservation strategies.

Radhika Murthy

- Works on community conservation, protected area governance, and ecological justice in India, especially the **Western Ghats**.

Bittu Sahgal

- Environmental activist and founder of **Sanctuary Asia magazine**.
- Promotes awareness and policy changes on wildlife conservation and habitat protection.

Recent Developments in Ecology in India

India's ecology research has seen several notable developments in recent years, largely driven by the urgency of environmental conservation and sustainability in the face of climate change, urbanization, and deforestation. Some key areas of recent development include:

1. Biodiversity Conservation:

- India is home to a significant portion of the world's biodiversity, and ecological studies have focused on conserving both terrestrial and aquatic ecosystems. **The National Biodiversity Action Plan (NBAP)** has been a cornerstone for biodiversity conservation in India.
- Conservation efforts have been focused on protecting endangered species, including the **tiger, Asian elephant, and Ganges river dolphin**, as well as the management of protected areas like national parks and wildlife sanctuaries.

2. Impact of Climate Change:

- Ecologists in India have been studying the impacts of climate change on agriculture, forest ecosystems, water resources, and human health. Research on the **Himalayan glaciers and monsoon variability** is crucial for understanding how climate change affects India's water supply and agriculture.
- The **Indian Network for Climate Change Assessment (INCCA)** was established to monitor and assess the impact of climate change on India's ecosystems and biodiversity.

3. Urban Ecology:

- The rapid urbanization in India has led to the development of urban ecology as a prominent field. Research has focused on the effects of urban sprawl, pollution, and resource consumption on the surrounding ecosystems.
- Studies on urban biodiversity, green spaces, and ecological restoration of cities are becoming increasingly important to ensure sustainable cities.

4. Ecological Restoration:

- A major research focus has been the restoration of degraded ecosystems, especially forest restoration and the rehabilitation of areas affected by mining, deforestation, and agricultural expansion.
- Efforts have been made to restore degraded grasslands, wetlands, and coastal ecosystems.

5. Conservation of Marine Ecosystems:

- With a long coastline, India has been focusing on the study of marine biodiversity and ecosystems. Research on the Indian Ocean, mangroves, coral reefs, and coastal habitats has been crucial for sustainable fisheries and protecting marine biodiversity.

Opportunities for Ecologists in India

As India faces significant environmental challenges and strives towards sustainable development, there is an increasing demand for qualified ecologists to address these issues. Here are some key areas where ecologists have opportunities in India:

1. Government Agencies:

- Ecologists can work with various government bodies such as the **Ministry of Environment, Forest and Climate Change (MoEFCC)**, **National Biodiversity Authority (NBA)**, and **National Environmental Engineering Research Institute (NEERI)**, contributing to policy formulation, environmental monitoring, and conservation planning.
- Forest departments at the state and national levels also hire ecologists for conducting biodiversity surveys, habitat restoration, and forest management.

2. Non-Governmental Organizations (NGOs):

- Numerous NGOs in India are working on biodiversity conservation, ecological

restoration, wildlife protection, and climate change mitigation. Ecologists can contribute to grassroots-level projects, research, advocacy, and education.

3. Academia and Research:

- Universities and research institutions offer career opportunities for ecologists as faculty members, researchers, or postdoctoral fellows. Institutes such as **Indian Institute of Remote Sensing (IIRS)**, **Indian Institute of Science (IISc)**, **Wildlife Institute of India (WII)**, and **National Centre for Biological Sciences (NCBS)** provide avenues for high-quality research in ecology.
- Many ecologists work as consultants or research fellows in collaboration with international organizations and universities.

4. Environmental Consulting Firms:

- With the growing need for **Environmental Impact Assessments (EIA)** and environmental audits, ecologists are in demand by consulting firms that specialize in environmental consultancy, sustainability practices, and natural resource management.

5. Ecotourism:

- Ecologists can play a significant role in developing ecotourism by assessing the environmental impact of tourism on local ecosystems and contributing to sustainable tourism practices. Many ecotourism ventures in India aim to conserve biodiversity while benefiting local communities.

6. Private Sector:

- Many companies, especially in the renewable energy, mining, and agriculture sectors, are increasingly hiring ecologists to ensure that their operations are environmentally sustainable and meet regulatory requirements for environmental protection.

Ecology and Environmental Institutions in India

- Indian Institute of Tropical Meteorology (IITM) – Pune, Maharashtra
- Indian Agricultural Research Institute (IARI) – New Delhi
- National Environmental Engineering Research Institute (NEERI) – Nagpur, Maharashtra
- Salim Ali Centre for Ornithology and Natural History (SACON) – Coimbatore, Tamil Nadu
- Wildlife Institute of India (WII) – Dehradun, Uttarakhand
- Forest Research Institute (FRI) – Dehradun, Uttarakhand
- G.B. Pant National Institute of Himalayan Environment – Almora, Uttarakhand
- Indian Institute of Forest Management (IIFM) – Bhopal, Madhya Pradesh
- Central Pollution Control Board (CPCB) – New Delhi
- National Centre for Sustainable Coastal Management (NCSCM) – Chennai, Tamil Nadu

- Centre for Environmental Planning and Technology (CEPT University) – Ahmedabad, Gujarat
- Indian Institute of Science (IISc) – Bangalore, Karnataka
- Jawaharlal Nehru University (JNU) – New Delhi
- Tata Institute of Social Sciences (TISS) – Mumbai, Maharashtra
- Banaras Hindu University (BHU) – Varanasi, Uttar Pradesh

Journals and Publications in Ecology

Several journals focus on ecological research, environmental science, and conservation, providing platforms for ecologists in India to publish their work and stay updated on global trends. Some prominent journals include:

1. **Current Science:** This journal publishes articles on a broad range of scientific topics, including ecology, biodiversity, and environmental science.
2. **Ecology and Environment:** This journal covers studies related to ecology, environmental issues, and conservation in India and globally.
3. **Journal of Environmental Biology:** A leading journal focused on research related to environmental biology, including ecology, environmental science, and conservation.
4. **Indian Journal of Ecology:** This journal focuses specifically on ecological studies, including conservation biology, ecosystem services, and biodiversity.

5. **Environmental Monitoring and Assessment:** An international journal that publishes research on environmental monitoring, biodiversity, and ecology.
6. **Conservation Biology:** Although an international journal, it frequently publishes research on conservation

strategies, species protection, and ecological restoration in India.

7. **Environmental Management:** This journal focuses on the relationship between management practices and environmental sustainability.

EXERCISE

1. **The study of geographic distribution of plant species is called:**

- (a) Geobotany (b) Phytogeography
(c) Biogeography (d) Ecophysiology

Ans. (b) Phytogeography focuses on plant distribution patterns. Biogeography includes animals.

2. **Who coined the term "ecology" and is regarded as its father?**

- (a) Charles Darwin
(b) Ernst Haeckel
(c) Alexander von Humboldt
(d) Arthur Tansley

Ans. (b) Haeckel introduced "ecology" in 1866 to study organism-environment interactions.

3. **The term "ecosystem" was first proposed by:**

- (a) Eugene Odum
(b) A.G. Tansley
(c) Ramdeo Misra
(d) Robert Whittaker

Ans. (b) Tansley (1935) conceptualized ecosystems as functional units of nature.

4. **Who is considered the father of Indian ecology?**

- (a) M.S. Swaminathan
(b) Ramdeo Misra
(c) Salim Ali
(d) Madhav Gadgil

Ans. (b) Misra pioneered ecological studies in India and established the School of Ecology at Banaras Hindu University.

5. **The Indian Institute of Ecology and Environment was established on:**

- (a) 15 August 1947
(b) 5 June 1980
(c) 22 April 1970
(d) 2 October 1950

Ans. (b) Founded on World Environment Day to promote ecological education.

6. **The National Centre for Sustainable Coastal Management (NCSCM) is headquartered at:**

- (a) Anna University, Chennai
(b) JNU, New Delhi
(c) IISc, Bengaluru
(d) NIO, Goa

Ans. (a) NCSCM conducts research on coastal conservation under the Ministry of Environment.

7. Which Indian institution is renowned for wildlife research?

- (a) Wildlife Institute of India (WII), Dehradun
- (b) Indian Agricultural Research Institute (IARI)
- (c) CSIR-National Environmental Engineering Research Institute (NEERI)
- (d) Botanical Survey of India (BSI)

Ans. (a) WII trains wildlife professionals and conducts conservation research.

8. The Man and Biosphere (MAB) Programme is initiated by:

- (a) UNEP
- (b) IUCN
- (c) UNESCO
- (d) WWF

Ans. (c) MAB (1971) establishes biosphere reserves to balance conservation and development.

9. Anuradha Sawhney is renowned for her contributions to:

- (a) Climate change policy
- (b) Animal rights activism
- (c) Forest conservation
- (d) Marine biology

Ans. (b) Former head of PETA India and advocate for ethical treatment of animals.

10. Who led the "Chipko Movement" in India?

- (a) Medha Patkar
- (b) Sunderlal Bahuguna
- (c) Vandana Shiva
- (d) Sunita Narain

Ans. (b) Bahuguna organized villagers to hug trees, preventing deforestation in Uttarakhand.

11. The "Green Rating Project" for industries was initiated by:

- (a) Centre for Science and Environment (CSE)
- (b) TERI
- (c) WWF-India
- (d) MoEFCC

Ans. (a) CSE's project evaluates industries' environmental performance.

12. Which journal is most associated with ecological research?

- (a) Nature Ecology & Evolution
- (b) Current Science
- (c) Journal of Biosciences
- (d) All of the above

Ans. (d) All publish ecological studies; Nature Ecology & Evolution is globally leading.

13. The Indian Journal of Ecology is published by:

- (a) Ecological Society of India
- (b) Indian Council of Agricultural Research (ICAR)
- (c) CSIR
- (d) BSI

Ans. (a) Focuses on ecological studies from the Indian subcontinent.

14. The "Intergovernmental Panel on Climate Change (IPCC)" was established by:

- (a) UNEP and WMO
- (b) UNESCO and IUCN
- (c) WHO and FAO
- (d) UNDP and World Bank

Ans. (a) IPCC (1988) assesses climate science for policymakers.

15. The Convention on Biological Diversity (CBD) was adopted at:

- (a) Rio Earth Summit (1992)
- (b) Stockholm Conference (1972)
- (c) Kyoto Protocol (1997)
- (d) Paris Agreement (2015)

Ans. (a) CBD aims to conserve biodiversity sustainably.

16. The "Great Green Wall" initiative targets:

- (a) Desertification in Africa
- (b) Urban greening in Europe
- (c) Rainforest restoration in Amazon
- (d) Coral reef protection in Australia

Ans. (a) Aims to restore 100 million hectares of degraded land by 2030.

17. "Project Tiger" was launched in India in:

- (a) 1973 (b) 1985
- (c) 1991 (d) 2000

Ans. (a) Initiated to protect Bengal tigers and their habitats.

18. The "Red Data Book" is maintained by:

- (a) IUCN (b) UNEP
- (c) CITES (d) WWF

Ans. (a) Documents threatened species globally.

19. India's first "Marine Spatial Planning" framework was developed for:

- (a) Gulf of Kutch (b) Sundarbans
- (c) Lakshadweep (d) Gulf of Mannar

Ans. (c) Aims to balance conservation and sustainable use of marine resources.

20. The "Eco-Sensitive Zone (ESZ)" concept was introduced under:

- (a) Wildlife Protection Act (1972)
- (b) Environment Protection Act (1986)

- (c) Forest Conservation Act (1980)
- (d) Biological Diversity Act (2002)

Ans. (b) ESZs buffer protected areas from developmental pressures.

Ans. Which of the following is not a biotic component of an ecosystem?

- (a) Bacteria (b) Plants
- (c) Fungi (d) Soil

Ans. (d) Soil is an abiotic (non-living) component. The others are all living (biotic).

21. Who is known as the "Father of Ecology" in India?

- (a) Salim Ali
- (b) M.S. Swaminathan
- (c) Ramdeo Misra (d) Madhav Gadgil

Ans. (c) Prof. Ramdeo Misra pioneered ecological studies in India)

22. Which gas is primarily responsible for global warming?

- (a) Oxygen (b) Carbon dioxide
- (c) Hydrogen (d) Nitrogen

Ans. (b) CO₂ traps heat in the atmosphere, leading to the greenhouse effect.

23. An organism that feeds on both plants and animals is called:

- (a) Herbivore (b) Carnivore
- (c) Omnivore (d) Detritivore

Ans. (c) Omnivores consume both plant and animal matter (e.g., humans, bears).

24. The term "biodiversity" refers to:

- (a) Number of trees in a forest
- (b) Variety of life forms in an ecosystem
- (c) Variation in abiotic components
- (d) Genetic engineering

Ans. (b) Biodiversity includes species, genetic, and ecosystem diversity.

25. Which of the following is an example of a non-renewable resource?

- (a) Wind energy (b) Solar energy
(c) Coal (d) Biomass

Ans. (c) Coal is a fossil fuel and cannot be replenished on a human timescale.

26. Ecology is the study of:

- (a) Soil formation
(b) Earth's core
(c) Interactions between organisms and their environment
(d) Human society

Ans. (c) Ecology studies the relationships among living organisms and their surroundings.

27. The ozone layer is found in which part of the atmosphere?

- (a) Troposphere (b) Stratosphere
(c) Mesosphere (d) Thermosphere

Ans. (b) The ozone layer absorbs harmful UV radiation in the stratosphere.

28. Which of the following is a secondary consumer in a food chain?

- (a) Grass (b) Rabbit
(c) Snake (d) Mushroom

Ans. (c) Snake eats primary consumers like mice or frogs, making it a secondary consumer.

29. Which of the following practices is best for sustainable agriculture?

- (a) Deforestation (b) Slash-and-burn
(c) Crop rotation (d) Monoculture

Ans. (c) Crop rotation maintains soil fertility and reduces pest infestations.

30. Which organism is a decomposer?

- (a) Earthworm (b) Fox
(c) Grass (d) Tiger

Ans. (a) Earthworms break down organic matter, enriching the soil.

31. Which of the following is a greenhouse gas?

- (a) Helium (b) Methane
(c) Neon (d) Argon

Ans. (b) Methane is a potent greenhouse gas emitted from livestock and wetlands.

32. Which ecosystem has the highest biodiversity?

- (a) Desert
(b) Grassland
(c) Tropical rainforest
(d) Tundra

Ans. (c) Tropical rainforests have dense vegetation and a wide variety of species.

33. Which of the following is not a method of conservation of biodiversity?

- (a) National parks
(b) Botanical gardens
(c) Deforestation
(d) Wildlife sanctuaries

Ans. (c) Deforestation destroys biodiversity rather than conserving it.

34. Which one of the following is a point source of pollution?

- (a) Agricultural runoff
(b) Factory discharge pipe
(c) Acid rain
(d) Vehicle emissions

Ans. (b) Point source pollution originates from a single, identifiable source.

35. Eutrophication is caused by excess of:

- (a) Oxygen
(b) Carbon
(c) Nutrients (Nitrogen and Phosphorus)
(d) Salt

Ans. (c) Nutrient overload in water bodies causes algal blooms and oxygen depletion.

36. Which of the following is an abiotic factor in an ecosystem?

- (a) Algae (b) Bacteria
(c) Humidity (d) Fungi

Ans. (c) Humidity is a non-living environmental condition.

37. Which Indian law deals with the protection of wildlife?

- (a) Forest Act, 1927
(b) Water Act, 1974
(c) Wildlife Protection Act, 1972
(d) Environment Protection Act, 1986

Ans. (c) This act provides legal protection to wildlife in India

38. Carrying capacity refers to:

- (a) Number of species in an ecosystem
(b) Maximum population an environment can support sustainably
(c) Migration capacity of birds
(d) Lifespan of an organism

Ans. (b) Beyond carrying capacity, resources get depleted, causing population stress.

39. Which of these best represents a food chain?

- (a) Soil Plant Bacteria
(b) Grass Grasshopper Frog Snake Hawk
(c) Oxygen Tree Cow
(d) Water Fish Bear

Ans. (b) This is a proper sequence of energy flow in a food chain.

40. The ultimate source of energy for all living organisms is:

- (a) Earth (b) Water
(c) Sun (d) Moon

Ans. (c) The sun provides energy directly (via photosynthesis) or indirectly for all food chains.

41. Which level of the food chain has the least available energy?

- (a) Producers
(b) Primary consumers
(c) Secondary consumers
(d) Tertiary consumers

Ans. (d) Energy decreases as it moves up the trophic levels (10% law).

42. What is the role of nitrogen-fixing bacteria?

- (a) Convert nitrogen into oxygen
(b) Fix atmospheric nitrogen into usable forms for plants
(c) Release nitrogen gas
(d) Absorb carbon dioxide

Ans. (b) These bacteria convert inert N₂ gas into ammonia and nitrates.

43. Which of the following biomes has the lowest precipitation?

- (a) Tropical rainforest
(b) Desert
(c) Grassland (d) Tundra

Ans. (b) Deserts receive less than 250 mm of rainfall annually.

44. An organism's role in its environment is called its:

- (a) Habitat (b) Trophic level
(c) Niche (d) Succession

Ans. (c) A niche includes the organism's behavior, food source, and interactions.

45. Which is an in-situ method of biodiversity conservation?

- (a) Zoological park (b) Botanical garden
(c) Seed bank (d) National park

Ans. (d) In-situ conservation protects species in their natural habitats.

46. The term “biome” refers to:

- (a) A species
- (b) A region with similar climate and organisms
- (c) A population
- (d) A gene pool

Ans. (b) Biomes include deserts, tundras, rainforests, etc.

47. The process of gradual replacement of one community by another is called:

- (a) Evolution
- (b) Natural selection
- (c) Succession
- (d) Adaptation

Ans. (c) Ecological succession is the natural progression of ecosystems.

48. Which zone of a lake is most productive?

- (a) Profundal zone
- (b) Littoral zone
- (c) Benthic zone
- (d) Abyssal zone

Ans. (b) The littoral zone receives ample sunlight, promoting high photosynthetic activity.

49. What is the full form of IUCN?

- (a) International Union for Conservation of Nature
- (b) Indian Union for Conservation of Nature
- (c) Institute for Urban and Climate Network
- (d) International Union for Climate and Nature

Ans. (a) IUCN is known for its Red List of Threatened Species.

50. Which gas is primarily responsible for acid rain?

- (a) Nitrogen
- (b) Sulphur dioxide
- (c) Carbon dioxide
- (d) Methane

Ans. (b) SO_2 and NO_x react with water to form acidic precipitation.

51. Which of the following ecosystems is carbon-rich and acts as a carbon sink?

- (a) Deserts
- (b) Coral reefs
- (c) Mangroves
- (d) Alpine tundra

Ans. (c) Mangroves sequester large amounts of carbon in their biomass and soils.

52. Which of the following is not a greenhouse gas?

- (a) Water vapor
- (b) Nitrous oxide
- (c) Oxygen
- (d) Carbon dioxide

Ans. (c) O_2 is essential for respiration but not a greenhouse gas.

53. Biomagnification refers to:

- (a) Increase in number of organisms
- (b) Increase in population size
- (c) Accumulation of toxins in higher trophic levels
- (d) Increase in food web complexity

Ans. (c) Toxins like mercury or DDT increase in concentration up the food chain.

54. The main cause of coral bleaching is:

- (a) Overfishing
- (b) Water pollution
- (c) Ocean acidification and rising sea temperatures
- (d) Oil spills

Ans. (c) These stresses cause coral to expel symbiotic algae, turning white.

55. Which of the following is an example of ex-situ conservation?

- (a) Wildlife sanctuary
- (b) Sacred grove
- (c) Seed bank
- (d) Biosphere reserve

Ans. (c) Ex-situ means conservation outside the natural habitat.

56. Which of the following affects both biotic and abiotic factors in an ecosystem?

- (a) Decomposers (b) Producers
(c) Climate change (d) Herbivores

Ans. (c) Climate change alters temperature, rainfall (abiotic), and species behavior (biotic).

57. Which one is a primary consumer?

- (a) Snake (b) Hawk
(c) Rabbit (d) Lion

Ans. (c) Rabbits feed directly on producers (plants), making them primary consumers.

58. Which Indian initiative aims to increase forest and tree cover?

- (a) AMRUT
(b) Project Tiger
(c) Green India Mission
(d) Swachh Bharat Abhiyan

Ans. (c) This is part of India's climate action plan under the National Action Plan on Climate Change (NAPCC).

59. Which of the following is most sensitive to air pollution and used as a bioindicator?

- (a) Fern (b) Lichen
(c) Grass (d) Rose

Ans. (b) Lichens are highly sensitive to air pollutants, especially SO₂, and are good bioindicators.

60. Which of the following cycles involves the conversion of atmospheric nitrogen into usable forms by living organisms?

- (a) Carbon cycle (b) Nitrogen cycle
(c) Water cycle (d) Oxygen cycle

Ans. (b) The nitrogen cycle includes nitrogen fixation, nitrification, assimilation, and denitrification.

61. A species found only in a particular region and nowhere else is called:

- (a) Indigenous (b) Exotic
(c) Endangered (d) Endemic

Ans. (d) Endemic species are restricted to a specific geographic location.

62. Which of these is a non-conventional source of energy?

- (a) Coal (b) Petroleum
(c) Solar (d) Natural gas

Ans. (c) Solar energy is renewable and non-conventional.

63. The correct sequence of ecological hierarchy is:

- (a) Organism Population
Community Ecosystem Biosphere
(b) Population Organism Ecosystem
Community Biosphere
(c) Community Ecosystem
Organism Population Biosphere
(d) Organism Ecosystem Population
Community Biosphere

Ans. (a) This represents increasing levels of ecological organization.

64. The interbreeding population of a species living in a specific area is called:

- (a) Community (b) Population
(c) Ecosystem (d) Biome

Ans. (b) A population is a group of individuals of the same species in one area.

65. Which of the following is a keystone species in Indian forests?

- (a) Langur (b) Peafowl
(c) Tiger (d) Deer

Ans. (c) Tigers regulate herbivore populations and maintain ecosystem balance.

66. Which of the following is not a cause of deforestation?

- (a) Urbanization
- (b) Forest fires
- (c) Reforestation
- (d) Agricultural expansion

Ans. (c) Reforestation increases forest cover; others reduce it.

67. A food web is:

- (a) A linear food chain
- (b) An isolated feeding interaction
- (c) A network of interconnected food chains
- (d) A chain involving only herbivores

Ans. (c) Food webs show multiple feeding relationships among organisms.

68. Which protocol aims to reduce emissions of greenhouse gases?

- (a) Kyoto Protocol
- (b) Montreal Protocol
- (c) Basel Convention
- (d) Cartagena Protocol

Ans. (a) The Kyoto Protocol sets binding emission reduction targets for developed nations.

69. Which of the following is the major cause of ozone layer depletion?

- (a) CO₂
- (b) SO₂
- (c) CFCs
- (d) CH₄

Ans. (c) CFCs break down ozone molecules in the stratosphere.

70. The process of breaking down organic substances by microorganisms is known as:

- (a) Photosynthesis
- (b) Nitrogen fixation
- (c) Decomposition
- (d) Succession

Ans. (c) Decomposers convert organic matter into simpler compounds.

71. The largest reservoir of fresh water on Earth is:

- (a) Rivers
- (b) Lakes
- (c) Glaciers and polar ice
- (d) Groundwater

Ans. (c) About 69% of Earth's fresh water is stored in ice and glaciers.

72. Which of the following is the best indicator of environmental health?

- (a) Presence of humans
- (b) Variety of species (biodiversity)
- (c) Air temperature
- (d) Noise levels

Ans. (b) Higher biodiversity indicates a more stable and resilient ecosystem.

73. Which is the largest terrestrial biome on Earth?

- (a) Tropical rainforest
- (b) Desert
- (c) Tundra
- (d) Taiga (Boreal forest)

Ans. (d) The Taiga is the world's largest land biome, stretching across Canada and Russia.

74. Which of the following techniques is used to treat wastewater?

- (a) Carbonation
- (b) Desalination
- (c) Eutrophication
- (d) Activated sludge process

Ans. (d) It is a biological wastewater treatment method using aerated microbial communities.

75. Which of the following human activities is a major cause of soil erosion?

- (a) Reforestation
- (b) Deforestation
- (c) Crop rotation
- (d) Organic farming

Ans. (b) Removing trees leaves soil exposed to erosion by wind and water.

76. Ecotone refers to:

- (a) The zone where two ecosystems overlap
- (b) The climax community
- (c) An urban ecosystem
- (d) A desert region

Ans. (a) Ecotones are transition zones rich in biodiversity.

77. Which layer of the atmosphere contains weather phenomena?

- (a) Stratosphere (b) Mesosphere
- (c) Troposphere (d) Thermosphere

Ans. (c) The troposphere contains most of the Earth's weather systems and clouds.

78. The pH of acid rain is typically:

- (a) Below 5.6 (b) Above 7
- (c) Exactly 7 (d) Between 6 and 7

Ans. (a) Acid rain forms when rainwater becomes acidic due to atmospheric pollutants like SO₂ and NO_x.

79. The Red Data Book provides information about:

- (a) Endangered and threatened species
- (b) Weather data
- (c) Protected monuments
- (d) Forest cover

Ans. (a) Published by the IUCN, it categorizes species based on extinction risk.