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Test Booklet Series

TEST BOOKLET

C

GENERAL STUDIES (P) 2020 – Test–2970

Time Allowed: Two Hours

Maximum Marks: 200

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET DOES **NOT** HAVE ANY UNPRINTED OR TURN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE CLEARLY THE TEST BOOKLET SERIES **A, B, C** OR **D** AS THE CASE MAY BE IN THE APPROPRIATE PLACE IN THE ANSWER SHEET.
3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. **Do NOT** write anything else on the Test Booklet.
4. This Test Booklet contains **100** items (Questions). Each item is printed in English. Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response with you consider the best. In any case, choose **ONLY ONE** response for each item.
5. You have to mark all your responses **ONLY** on the separate Answer Sheet provided. See direction in the answers sheet.
6. All items carry equal marks. Attempt all items. Your total marks will depend only on the number of **correct responses** marked by you in the answer sheet. For **every incorrect** response **1/3rd of the allotted marks** will be deducted.
7. Before you proceed to mark in the Answer sheet the response to various items in the Test booklet, you have to fill in some particulars in the answer sheets as per instruction sent to you with your Admission Certificate.
8. After you have completed filling in all responses on the answer sheet and the examination has concluded, you should hand over to Invigilator only the answer sheet. You are permitted to take away with you the Test Booklet.
9. Sheet for rough work are appended in the Test Booklet at the end.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE ASKED TO DO SO

1. With reference to animal and plant biodiversity on earth, consider the following statements:

1. Animals constitute more than two-thirds of the total species on earth.
2. There are more types of fishes than types of insects.
3. India is one of the megadiverse countries in the world with 20 percent of the total global species diversity.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) 2 and 3 only
- (d) 1 and 3 only

2. An intermediate stage found in ecological succession in an ecosystem depicting the diversity of species of organisms, an increase in the number of species and organism as well as an increase in total biomass in a given area is termed as

- (a) Sere
- (b) Hydrarch Succession
- (c) Xerarch Succession
- (d) Ecological niche

3. Photoperiod is the duration of light received daily and seasonally by living organisms. It impacts:

1. Coordination of opening of buds and flowers in a plant
2. Migration cycles of birds
3. The breeding time of mammals

Select the correct answer using the code below.

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) 1, 2 and 3

4. In the polar regions, small-sized animals are rare. What is the reason behind this?

- (a) Small animals have less fur than large-sized animals.
- (b) The lack of vegetation in the polar regions is a challenge as small animals are primarily herbivorous.
- (c) Small sized animals easily fall prey to their larger counterparts and thus their population cannot flourish.
- (d) Small-sized animals have a larger surface area relative to their volume and thus they tend to lose heat very fast.

5. With reference to National Board for Wildlife, consider the following statements:

1. It has been constituted under the Wildlife Protection Act, 1972.
2. It is headed by Minister of Environment, Forest and Climate Change.
3. Its recommendations are binding on the union government.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 only
- (d) 1, 2 and 3

6. With reference to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), consider the following statements:

1. It aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival.
2. It was adopted under the aegis of United Nations Framework Convention on Climate Change.
3. It is legally binding on the Parties.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2 only
- (d) 1, 2 and 3

7. Which of the following species are extinct?

1. Dodo
2. Quagga
3. Passenger Pigeon
4. Steller's Sea Cow

Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 1, 2 and 3 only
- (c) 3 and 4 only
- (d) 1, 2, 3 and 4

8. Which of the following is/are examples of ex-situ conservation methods?

1. National parks
2. Botanical gardens
3. Zoological parks

Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

9. Consider the following pairs:

- | <i>Microbes</i> | <i>Used in
production
of acid</i> |
|-----------------------------|---|
| 1. Aspergillus niger | : Acetic acid |
| 2. Clostridium butylicum | : Lactic acid |
| 3. Saccharomyces cerevisiae | : Ethanol |

Which of the pairs is/are correctly matched?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 3 only

10. Consider the following statements regarding corals:

1. They are mainly found in tropical oceans and seas.
2. Most fishes lay eggs in coral colonies.
3. Coral reefs have greater biodiversity than tropical rainforests.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2 only
- (d) 1, 2 and 3

11. Consider the following statements regarding Biosphere Reserves:

1. They are areas of terrestrial and coastal ecosystems promoting balance between their conservation and sustainable use.
2. The "Man and the Biosphere (MAB) Programme" for establishing a coordinated World Network of biosphere reserves is an initiative of Convention on Biological Diversity (CBD).

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

12. With reference to Zoological Survey of India (ZSI), consider the following statements:

1. It is a statutory body under Ministry of Environment, Forest and Climate Change.
2. It undertakes Environmental Impact Assessments with regard to fauna.
3. It prepares the Red Data Book, Fauna of India and Fauna of States.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

13. Emissions from which of the following sources can cause acid rain?
1. Volcanoes
 2. Swamps
 3. Plankton in the ocean
 4. Power generation from fossil fuels
- Select the correct answer using the code given below.
- (a) 1, 2 and 3 only
 - (b) 2, 3 and 4 only
 - (c) 1 and 4 only
 - (d) 1, 2, 3 and 4
14. With reference to the agricultural practices, consider the following statements:
1. Inter-cropping method involves growing different crops simultaneously within the same plot.
 2. Mulching is the practice of cultivation of leguminous crops between the cropping seasons.
- Which of the statements given above is/are correct?
- (a) 1 only
 - (b) 2 only
 - (c) Both 1 and 2
 - (d) Neither 1 nor 2
15. Which among the following is the main assumption of the Limits to Growth theory?
- (a) Environment cannot support rising resource utilization beyond its carrying capacity.
 - (b) Certain animal species cannot grow beyond their population threshold.
 - (c) Landforms do not degrade beyond the base level.
 - (d) Environmental degradation limits the growth of flora of Tropical rain Forests.

16. In the context of environment and ecology, *Surangam* and *Zing* are:
- (a) living root bridges made by the Khasi and Jaintia tribes of the mountainous terrain along the southern part of the Shillong Plateau.
 - (b) traditional water harvesting practices used in the Western Ghats and Ladakh respectively.
 - (c) shifting cultivation practices in Manipur and Nagaland.
 - (d) terrace farming practices in the hilly regions of Shiwaliks.
17. Consider the following statements:
1. The total amount of water received in the form of rainfall over an area is called rainwater harvesting potential.
 2. The amount of water that can be effectively harvested out of total water received is called rainwater endowment.
- Which of the statements given above is/are correct?
- (a) 1 only
 - (b) 2 only
 - (c) Both 1 and 2
 - (d) Neither 1 nor 2
18. With reference to homeostasis, consider the following statements:
1. It refers to the maintenance of the constancy of an organism's internal environment despite varying external environmental conditions.
 2. Only mammals are capable of maintaining homeostasis.
- Which of the statements given above is/are correct?
- (a) 1 only
 - (b) 2 only
 - (c) Both 1 and 2
 - (d) Neither 1 nor 2

19. Which of the following statements regarding the effects of gaseous air pollutants is **not** correct?

- (a) Sulphur Dioxide causes stiffness of flower buds which fall off from the plants
- (b) The red haze in traffic is due to existence of oxides of Nitrogen
- (c) Hydrocarbon pollutants are formed by incomplete combustion of fuel
- (d) Carbon dioxide binds with haemoglobin in blood to form carboxyhaemoglobin

20. Sacred Groves in India can be best defined as

- (a) The patches in Sunderban mangroves where man-eater tigers are worshipped out of fear.
- (b) The plantation of trees like coconut and banana that produce fruits which are used as offerings to deities.
- (c) Tracts of forest in which all the trees and wildlife within are venerated and given total protection
- (d) Forests where wild animals are sacrificed as a part of a ritual.

21. Which of the following microbes can be used as an insecticide?

- 1. Bacteria
- 2. Fungi
- 3. Virus

Select the correct answer using the code given below.

- (a) 1 only
- (b) 1 and 3 only
- (c) 1, 2 and 3
- (d) 3 only

22. Consider the following statements:

- 1. While eurythermal organisms are those organisms which can survive in a wide range of temperatures, stenothermal organisms are restricted to a narrow range of temperatures.
- 2. While all vertebrates are stenothermal, all invertebrates are eurythermal.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

23. Which of the following are non-point sources of pollution in rivers?

- 1. Surface drains carrying municipal sewage
- 2. Run-off from agricultural fields
- 3. Dumping of un-burnt/half-burnt dead bodies
- 4. Dhobi ghats
- 5. Effluents from industries

Select the correct answer using the code given below.

- (a) 1, 4 and 5 only
- (b) 2 and 3 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4 only

24. Rain-soaked Meghalaya forests, deep ocean trenches, torrential streams and boiling thermal springs are examples of:

- (a) Populations
- (b) Ecotones
- (c) Realms
- (d) Habitats

25. Communities rich in species diversity are considered as stable communities. Which of the following is/are features of stable communities?

1. High variation in productivity from year to year.
 2. Resistance to occasional anthropogenic disturbances.
 3. Resistance to invasion by alien species
- Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) 1, 2 and 3

26. Consider the following pairs :

<i>International initiative</i>	<i>Focus</i>
1. Kyoto Protocol	: Reduction of greenhouse gases
2. Stockholm Conference	: Reduce the movements of hazardous waste between nations
3. Sendai framework	: Disaster Management

Which of the pairs given above is/are correctly matched?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 3 only
- (d) 1 and 3 only

27. Which of the following form abiotic components of an ecosystem?

1. Temperature
2. Moisture
3. Soil

Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

28. With reference to inter-species interaction, consider the following pairs:

<i>Interaction type</i>	<i>Effect</i>
-------------------------	---------------

- | | |
|---------------|--|
| 1. Mutualism | : Both the species benefit |
| 2. Predation | : One species benefits and other is harmed |
| 3. Amensalism | : One species benefits and other is unaffected |

Which of the pairs given above is/are correctly matched?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

29. With reference to Grazing Food Chain (GFC) and Detritus Food Chain (DFC), consider the following statements:

1. GFC begins with producers while DFC begins with dead organic matter.
2. In a terrestrial ecosystem, a larger fraction of energy flows through the GFC than through the DFC.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

30. In the context of biodiversity, the 'rivet popper hypothesis' is used to explain the

- (a) movement of nutrients and energy for an ecosystem.
- (b) process of ecological succession.
- (c) impact of loss of species richness on biodiversity.
- (d) features adopted by organisms to adjust to the climate change.

- 31.** With reference to tropical and temperate forests, consider the following statements:
1. Tropical Forests consists of very high tree species as compared to temperate forests.
 2. Temperate forests have a thin canopy of trees whereas tropical forests have a thick canopy.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
- 32.** Which of the following are examples of the sedimentary biogeochemical cycle?
1. Nitrogen cycle
 2. Carbon cycle
 3. Sulphur cycle
 4. Phosphorous cycle
- Select the correct answer using the code given below.
- (a) 1 and 2 only
(b) 3 and 4 only
(c) 1, 2 and 3 only
(d) 1, 3 and 4 only
- 33.** Which of the following micro organisms are used as bio-fertilizers?
1. Nostoc
 2. Anabaena
 3. Cyanobacteria
 4. Oscillatoria
- Select the correct answer using the code given below.
- (a) 1 and 2 only
(b) 2, 3 and 4 only
(c) 1 and 3 only
(d) 1, 2, 3 and 4

- 34.** With reference to the photochemical smog, consider the following statements:
1. It occurs in a cool humid climate.
 2. It is formed by the action of sunlight on unsaturated hydrocarbons and nitrogen oxides.
 3. Ozone is an important component of Photochemical smog.
- Which of the statements given above are correct?
- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3
- 35.** Consider the following statements regarding the Basel Convention, 1989:
1. It regulates the import and export of hazardous waste among the parties to it.
 2. It establishes a legally binding agreement for waste management.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
- 36.** Consider the following statements regarding Photosynthetically Active Radiation (PAR):
1. It is part of the electromagnetic radiation in the range from 400 nm to 700 nm.
 2. Plants need to absorb at least 80-85% of PAR to sustain the entire living world.
 3. PAR changes seasonally and varies depending on the latitude and time of day.
- Which of the statements given above are correct?
- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

37. With reference to the biotic community, consider the following statements:
1. Phagotrophs are organisms that consume producers directly or indirectly.
 2. Saprotrophs are organisms that obtain nutrition from the dead organic matter.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
38. Consider the following statements regarding Humus:
1. It serves as a reservoir of nutrients.
 2. It is highly resistant to microbial action.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
39. Consider the following statements, with reference to Environment Protection Act, 1986:
1. The act empowers the Central government to coordinate actions of State Governments and lay down standards for the quality of the environment.
 2. National parks, Sanctuaries, Tiger reserves and Biosphere reserves are set up by the Government of India under this act.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

40. Consider the following statements:
1. An ecosystem is a functional unit of nature where living organisms interact among themselves and also with the surrounding physical environment.
 2. There is an exchange of materials and energy within the ecosystem as well as between adjoining ecosystems.
 3. The vast network of all the interconnected ecosystems constitutes a niche.
- Which of the statements given above are correct?
- (a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3
41. With reference to Compressed Natural Gas (CNG), consider the following statements:
1. It is a mixture of hydrocarbons consisting of approximately 80 to 90 percent methane in gaseous form.
 2. It is lead-free and lighter than air.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
42. Consider the following statements regarding biodiversity hotspots:
1. Biodiversity hotspots are biogeographic regions where mostly exotic species of plants are found.
 2. Globally, the total number of biodiversity hotspots has witnessed a decline over the years.
 3. The Himalayas and the Western Ghats are the only two biodiversity hotspots in India.
- Which of the statements given above is/are **not** correct?
- (a) 1 and 3 only
(b) 2 only
(c) 3 only
(d) 1, 2 and 3

- 43.** World Conservation Strategy, adopted in 1980 aimed at :
1. Maintenance of essential ecological processes.
 2. Protection of genetic diversity.
 3. Sustainable use of species and ecosystem.
- Select the correct answer using the code given below.
- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1,2 and 3

- 44.** With reference to the primary productivity of an ecosystem, consider the following statements:
1. Gross primary productivity is the rate of formation of biomass or organic matter during photosynthesis.
 2. Net primary productivity is the rate of formation of new organic matter by consumers.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

- 45.** With reference to hibernation, consider the following statements:
1. It refers to temporary movements of organisms from the stressful habitat to a more hospitable area.
 2. The temperature of the animal body increases during hibernation.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

- 46.** Consider the following statements regarding bioremediation:
1. It is a process which uses micro-organisms to detoxify the pollutants in soil.
 2. It is a technique used to clear oil spills.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2

- 47.** Which of the following statements best describes the term ecology?
- (a) It is the study of human beings and their immediate surroundings.
- (b) It is the scientific study of plants and animals in relation to each other and to their environment.
- (c) It refers to the scientific study of plants, their classification and economic importance.
- (d) It is the study of wild animals and birds in their natural habitats only.

- 48.** Eutrophication in a pond ecosystem can lead to:
1. burgeoning of plant and animal lives
 2. reduction in the lake's temperature
 3. increase in the depth of the lake
- Select the correct answer using the code given below.
- (a) 1 only
(b) 1 and 2 only
(c) 3 only
(d) 2 and 3 only

49. With reference to the Neritic zone of the marine ecosystem, consider the following statements:

1. It extends between the highest high tide and lowest low tide levels.
2. This area is rich in density and diversity of organisms due to the presence of light and nutrients.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

50. Consider the following statements regarding 'Agenda 21':

1. It was adopted in the Earth Summit at Rio de Janeiro in the year 1992.
2. It is a plan to encourage sustainable development in the 21st century.
3. It emphasises on the role of 'women' and 'indigenous people' to achieve development-related goals.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

51. With reference to primary and secondary succession, consider the following statements:

1. Primary succession takes place in areas which have lost all the living organisms that existed there whereas secondary takes place in areas where no living organisms ever existed.
2. Rate of secondary succession is much slower compared to primary succession.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

52. In the context of biodiversity, 'The Evil Quartet' refers to the set of four:

- (a) events of mass extinction in the Geological Timescale.
- (b) major countries which have witnessed maximum biodiversity loss in the last ten years.
- (c) types of industries which emit the maximum greenhouse gas emissions.
- (d) major causes of biodiversity loss.

53. Which of the following is/are constituents of fly ash?

1. Black soot
2. Lead
3. Cadmium
4. Nickel

Select the correct answer using the codes given below.

- (a) 1 only
- (b) 2, 3 and 4 only
- (c) 1, 2 and 3 only
- (d) 1, 2, 3 and 4

54. Consider the following pairs:

<i>Temperate grasslands</i>	<i>Location</i>
-----------------------------	-----------------

- | | |
|-----------|----------------|
| 1. Veldts | : Hungary |
| 2. Pustaz | : South Africa |
| 3. Pampas | : Argentina |

Which of the pairs given above is/are correctly matched?

- (a) 3 only
- (b) 2 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

55. Which of the following statements best describes the term 'Antibiosis'?
- (a) It is a type of interaction in which one organism is unaffected but the other is damaged or killed by a chemical secretion.
 - (b) It is a type of interaction in which one organism kills to feed on the other.
 - (c) It is a type of interaction which is beneficial for both species where they totally rely on one another.
 - (d) It is a type of association which is beneficial for both species but is not essential for their survival.

56. Consider the following statements:
1. Coal gas is a mixture of methane, carbon monoxide and hydrogen.
 2. Coke is a coal-derived product which burns without smoke.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

57. Which of the following was/were provided by 'Wildlife Protection Act 1972'?
1. Captive breeding programmes for critically endangered species.
 2. A complete ban on trade and commerce of wildlife species.
 3. Strengthening management and protection of infrastructure of National parks and sanctuaries.

Select the correct answer using the code given below:

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 only
- (d) 1 and 3 only

58. Which of the following statements are correct regarding the ozone layer?
1. Ozone layer present in the upper troposphere acts as a protective layer against harmful ultraviolet rays.
 2. The polar stratospheric clouds prevent the spread of the ozone hole.
 3. The thickness of the ozone layer is measured in terms of Dobson units (DU).

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

59. With reference to the decomposition of detritus or dead matter, consider the following statements:

1. Low temperature (<10 degree Celsius) with a high soil moisture content favours high rate of decomposition.
2. The presence of nitrogen in detritus increases the decomposition rate.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

60. 'Access and Benefit Sharing Agreement' is a core part of which of the following treaties or conventions?

- (a) International Treaty on Plant Genetic Resources for Food and Agriculture
- (b) International Plant Protection Convention
- (c) Convention on Biological Diversity
- (d) Convention on International Trade in Endangered Species of Wild Fauna and Flora

61. Consider the following statements regarding 'Central Pollution Control Board':
1. It has been established as an autonomous body under the Environment Protection Act, 1986.
 2. It coordinates the activities of state pollution control boards and resolves disputes among them.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 only
(c) Both 1 and 2
(d) Neither 1 nor 2
62. Which of the following are adaptive features in plants to minimize the loss of water?
1. Presence of thick cuticle on the leaf surface
 2. Absence of leaves in some plants
 3. Arrangement of stomata in deep pits
- Select the correct answer using the code given below.
- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3
63. With reference to estuaries, consider the following statements:
1. These are transitional zones between the sea and rivers.
 2. They are nutrient-rich regions.
 3. The fauna in the estuary regions has the ability to maintain salt and water balance.
- Which of the statements given above is/are correct?
- (a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

64. Consider the following sources:
1. Cosmic rays
 2. Nuclear Fuels in atomic reactors
 3. X-ray waste
- Which of the sources given above cause Radioactive pollution?
- (a) 1 and 2 only
(b) 1 and 3 only
(c) 2 and 3 only
(d) 1, 2 and 3
65. In the context of environment and ecology, what is common between *ladybird beetle*, *syrphid fly*, and *soldier beetle*?
- (a) They are categorised under the list of extinct species of the International Union for Conservation of Nature (IUCN) Red list.
- (b) They are species endemic to the Western Ghats.
- (c) These are used as effective predators to control agricultural pests.
- (d) They are species found helpful in segregating wastes.
66. Which of the following statements regarding the Ozone layer is **not** correct?
- (a) Ozone layer is the product of UV radiations acting on dioxygen molecules
- (b) Ozone layer is thermodynamically unstable and decomposes into molecular oxygen
- (c) The main reason for Ozone layer depletion is the release of Freons
- (d) Depletion of ozone layer (i.e. Ozone hole) was first reported in North Pole

67. Which of the following type of living organisms are *not* invertebrates?
- Crustaceans
 - Molluscs
 - Insects
 - Reptiles
68. Oceans contain vast quantities of materials that presently serve as major resources for humans. Which of the following resources is/ are found in the oceans?
- food resources
 - fuel minerals
 - building or construction materials
 - non-conventional energy resources
- Select the correct answer using the code given below.
- 3 and 4 only
 - 1 and 2 only
 - 3 only
 - All the given resources are found in the oceans
69. Which of the following can be classified as natural disasters?
- Building fires
 - Volcanic eruption
 - Avalanche
 - Drought
- Select the correct answer using the code given below.
- 2 and 4 only
 - 2, 3 and 4 only
 - 1, 3 and 4 only
 - 1, 2 and 3 only

70. Which of the following is/are regarded as particulate pollutants?
- Bacteria
 - Fungi
 - Algae
 - Dust
- Select the correct answer using the code given below.
- 1, 2 and 3 only
 - 2 and 4 only
 - 4 only
 - 1, 2, 3 and 4
71. Consider the following statements regarding captive breeding:
- It is the process of breeding animals outside their natural environment in restricted areas like zoos and aquariums.
 - The sole aim of captive breeding programs is to exhibit interesting species.
 - The Nandankanan Zoological Park is the only zoological park to have captive-bred white tigers in India.
- Which of the statements given above is/are correct?
- 1 only
 - 2 and 3 only
 - 3 only
 - 1 and 3 only
72. Consider the following pollutants:
- Carbon Monoxide (CO)
 - Oxides of nitrogen (NOX)
 - Suspended Particulate Matter (SPM)
 - Unburnt hydrocarbons
- Which of the pollutants given above are released from vehicular emissions?
- 1, 2 and 3 only
 - 2 and 3 only
 - 1 and 4 only
 - 1, 2, 3 and 4

73. Consider the following statements regarding Environmental Impact Assessment (EIA):
1. The rules for EIA have been notified under the provisions of the Environment(Protection) Act, 1986.
 2. National Biodiversity Authority is the nodal authority to review the EIA application for all new projects.
 3. It is mandatory to involve the public while making the environment impact assessment.
- Which of the statements given above is/are correct?
- (a) 1 only
 - (b) 1 and 3 only
 - (c) 2 and 3 only
 - (d) 1, 2 and 3
74. Consider the following statements regarding Sanitary Landfills:
1. Depletion of organic matters takes place under anaerobic condition.
 2. Carbon dioxide and Hydrogen sulphide are generated in the depletion process.
- Which of the statements given above is/are correct?
- (a) 1 only
 - (b) 2 only
 - (c) Both 1 and 2
 - (d) Neither 1 nor 2
75. Which of the following certification marks issues quality mark for food products?
1. Agricultural Marketing (Agmark)
 2. ISI mark by Bureau of Indian Standards (BIS)
 3. Fruit Product Order Mark
- Select the correct answer using the code given below.
- (a) 1 and 3 only
 - (b) 1 and 2 only
 - (c) 2 and 3 only
 - (d) 1, 2 and 3

76. Consider the following pairs:
- | <i>Mechanism to control air pollution</i> | <i>Targeted Pollutant</i> |
|--|----------------------------------|
| 1. Electrostatic precipitator | : particulate matter |
| 2. Scrubber | : Sulphur Dioxide |
| 3. Catalytic converters | : unburnt hydrocarbon |
- Which of the pairs given above is/are correctly matched?
- (a) 1 only
 - (b) 1 and 2 only
 - (c) 3 only
 - (d) 1, 2 and 3
77. "This is one of the zones of the pond ecosystem. This zone is found in the deep-water part of the pond. This zone is cold and dense. Little light reaches this zone. The fauna in this zone eat dead organisms and use oxygen for cellular respiration."
- Which of the following is described in the paragraph above?
- (a) Littoral Zone
 - (b) Limnetic Zone
 - (c) Profundal Zone
 - (d) None of the above
78. Which of the following projects uses "Run of the river systems" for the purpose of generating electricity?
1. Tidal energy project
 2. Small-scale hydro power project
 3. Large reservoir based hydro power project
- Select the correct answer using code given below.
- (a) 1 and 2 only
 - (b) 1 and 3 only
 - (c) 2 only
 - (d) 1, 2 and 3

- 79.** Which of the following statements best describes the term catabolism?
- (a) It refers to the degradation of detritus into simpler inorganic substances.
 - (b) It is the transformation of larvae into full-grown insects.
 - (c) It is the act of consumption of another individual of the same species.
 - (d) It is the process of fat accumulation in living organisms.

- 80.** Consider the following statements with respect to Ecological Pyramid:
1. The pyramid of biomass in a sea is generally inverted.
 2. The pyramid of energy in any ecosystem can never be inverted.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

- 81.** Which of the following part of electromagnetic spectrum of sunlight is/are responsible for heating of solar cooker and solar water heater?

1. Infrared waves
2. UV-A waves
3. UV-B waves
4. UV-C waves

Select the correct answer using the codes given below

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 2, 3 and 4 only

- 82.** With reference to the photovoltaics, consider the following statements:

1. This method uses the principle of photosynthesis to generate electricity.
2. Traditional solar cookers employ this technology for heating food.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

- 83.** Which of the following statements is correct regarding the 'Environmental Pollution (Prevention and Control) Authority?

- (a) It was established under Water (Prevention and Control of Pollution) Act, 1974 to oversee pollution by industries.
- (b) It is a Supreme court mandated body to control air pollution in National capital region.
- (c) It has been established as an interm body for management of Compensatory Afforestation Fund.
- (d) It was established by Central government in 1994 in aftermath of Rio Earth Summit.

- 84.** 'Joint Forest Management ' initiated by the Government of India, aims at

- (a) collaborating with neighboring countries to protect and manage forests.
- (b) collaborating with private sector in forest conservation projects.
- (c) joint implementation of forest conservation programs by Central and state governments.
- (d) working closely with the local communities for protecting and managing forests.

85. In the context of biodiversity in India, which of the following species is **not** an invasive alien species?
- (a) Water hyacinth
 - (b) Carrot grass
 - (c) African catfish
 - (d) Red hibiscus

86. Which of the following are the possible impacts of Climate Change?
1. Improved agricultural yield in higher latitudes
 2. Reduction in biodiversity in the alpine regions
 3. Reduction in corals in the tropical oceans

Select the correct answer using the code given below.

- (a) 1 and 3 only
- (b) 2 and 3 only
- (c) 1 only
- (d) 1, 2 and 3

87. In the context of environment and ecology, '*standing crop*' refers to:
- (a) the mass of living material at a particular time at any trophic level.
 - (b) a community of herbs and shrubs.
 - (c) a growing crop ready for harvest.
 - (d) the mass of inorganic nutrients found in an ecosystem

88. With reference to Gene Therapy, consider the following statements:
1. It involves the delivery of a normal gene into the individual to compensate for the non-functional gene.
 2. It allows correction of a gene defect that has been diagnosed in an embryo.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

89. Which of the following are examples of a lentic water ecosystem?

1. Ponds
2. Marshes
3. Rivers
4. Springs

Select the correct answer using the code given below.

- (a) 1 and 2 only
- (b) 1 and 3 only
- (c) 2, 3 and 4 only
- (d) 1, 2, 3 and 4

90. Consider the following statements regarding the harmful effects of water pollutants:

1. Fluoride causes erosion of bones and teeth.
2. Lead is associated with liver and kidney damage.
3. Blue-baby syndrome is associated with potassium contamination.

Which of the statements given above are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

91. Which of the following is the correct sequence of food chain in an Agroecosystem?

- (a) Mustard crop-aphid-beetle-bird
- (b) Mustard crop-beetle-aphid-bird
- (c) Mustard crop- aphid-bird-beetle
- (d) Mustard crop-beetle-bird-aphid

92. Consider the following statements regarding Thermal Pollution:

1. Thermal power plants release recycled hot water into rivers leading to thermal pollution.
2. The dissolved oxygen level decreases with the increase in water temperature.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

93. Consider the following pairs:

<i>Food</i>	<i>Adulterant</i>
1. Black Pepper	: Papaya seeds
2. Turmeric	: Metanil yellow
3. Milk	: Urea

Which of the pairs given above is/are correctly matched?

- (a) 1 and 3 only
- (b) 2 only
- (c) 1 and 2 only
- (d) 1, 2 and 3

94. What is/are the significance(s) of wetlands in an ecosystem?

1. They are breeding and nesting areas for birds and animals.
2. They protect coastlines from erosion and reduce damage from storms and cyclones.
3. They help in purifying water.

Select the correct answer using the code given below.

- (a) 1, 2 and 3
- (b) 1 and 2 only
- (c) 1 only
- (d) 2 and 3 only

95. Consider the following statements regarding Biochemical Oxygen Demand (BOD):

1. The polluted water has less BOD than cleaner water.
2. It is a measure of chemical and organic pollutants.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

96. Consider the following statements:

1. Food adulteration means the addition of any substance to a food item to improve its flavour, colour and shelf life.
2. Currently there is no act to regulate food adulterants in India.

Which of the statements given above is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

97. Which of the following was the first conference/convention on the depletion of the Ozone layer?

- (a) United Nations Framework Convention on Climate Change (UNFCCC)
- (b) Saving the Ozone Layer conference
- (c) Convention on Biological Diversity
- (d) Vienna Conference

98. The correct sequence of the following Greenhouse Gases in order of increasing global warming potential (in a time horizon of 20 years) is:

1. Methane
2. Carbon dioxide
3. Nitrous Oxide
4. Sulphur hexafluoride

Select the correct answer using the code given below.

- (a) 1-2-3-4
- (b) 2-1-3-4
- (c) 4-3-2-1
- (d) 3-1-2-4

99. Macronutrients are important components required by living organisms. In this context, consider the following pairs:

Macronutrient	Function
1. Potassium	: Major solute in animal cells
2. Magnesium	: The structural component of Chlorophyll
3. Calcium	: Regulator of cell permeability

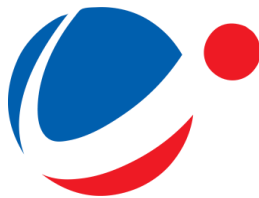
Which of the pairs given above is/are correctly matched?

- (a) 1 only
- (b) 1 and 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

100. It is a potent greenhouse gas. The transpiration and evaporation increase its concentration in the atmosphere. Its concentration greatly varies from season to season and region to region. It is one of the highest contributors to the warming of the earth due to its capacity to absorb both incoming and terrestrial radiation.

The greenhouse gas being described here is:

- (a) Chlorofluorocarbons(CFCs)
- (b) Nitrogen oxide
- (c) Water vapour
- (d) Carbon dioxide



ANSWERS & EXPLANATIONS

GENERAL STUDIES (P) TEST – 2970 (2020)

Q 1.A

- According to IUCN (2004), the total number of plant and animal species described so far is slightly more than 1.5 million. Estimates vary widely and many of them are only educated guesses.
- **Statement 1 is correct and statement 2 is not correct:** More than 70 per cent of all the species recorded are animals, while plants (including algae, fungi, bryophytes, gymnosperms, and angiosperms) comprise no more than 22 per cent of the total. **Among animals, insects are the most species-rich taxonomic group, making up more than 70 per cent of the total.** That means, out of every 10 animals on this planet, 7 are insects. The number of fungi species in the world is more than the combined total of the species of fishes, amphibians, reptiles, and mammals.
- **Statement 3 is not correct:** Although India has only 2.4 per cent of the world's land area, **its share of the global species diversity is an impressive 8.1 per cent.** That is what makes our country one of the 12 mega diversity countries of the world. Nearly 45,000 species of plants and twice as many of animals have been recorded from India.

Q 2.A

- An important characteristic of all communities is that **composition and structure constantly change in response to the changing environmental conditions.** This change is orderly and sequential, parallel with the changes in the physical environment. These **changes lead finally to a community** that is in near equilibrium with the environment and that is called a **climax community**. The gradual and fairly predictable change in the species composition of a given area is called **ecological succession**. During succession some species colonise an area and their populations become more numerous, whereas populations of other species decline and even disappear.
- The entire sequence of communities that successively change in a given area are called **sere(s)**. The **individual transitional communities** are termed **seral stages or seral communities**. In the successive seral stages there is a **change in the diversity of species of organisms, increase in the number of species and organisms** as well as an **increase in the total biomass**. Hence option (a) is the correct answer.
- **Based on the nature of the habitat** – whether it is water (or very **wet** areas) or it is on very **dry** areas – **succession of plants is called hydrarch or xerarch**, respectively. **Hydrarch succession** takes place in wetter areas and the successional series progress from hydric to the mesic conditions. As against this, **xerarch succession** takes place in dry areas and the series progress from xeric to mesic conditions.
- An **ecological niche** is a role and position a species has in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces. A species' niche includes all of its interactions with the biotic and abiotic factors of its environment. Biotic factors are living things, while abiotic factors are nonliving things.

Q 3.D

- Living organisms receive light by light receptors (e.g. eye, photoreceptors, stigma, ocellus, etc.) Thus, light is used as a stimulus for activity cycles. **The duration of light received daily and seasonally is called photoperiod.** For example, when the duration of daylight reduces, animals go into hibernation.
- Photoperiodism is the functional or behavioural response of an organism to changes of duration in daily, seasonal, or yearly cycles of light and darkness. Photoperiodic reactions can be reasonably predicted, but temperature, nutrition, and other environmental factors also modify an organism's response.

- It causes programming of life cycles, **coordination of opening of buds and flowers in plants** and migration in animals. Breeding time in most organisms is determined by photoperiod in such a way that the offspring have the greatest chance of survival. **Hence statement 1 is correct.**
- In animals, **the regular activities of migration, reproduction, and the changing of coats or plumage** can be induced out of season by artificially altering daylight. Birds, for example, have migrated north in the winter after having been exposed to reversed seasonal lighting in laboratories. The manipulation of a specific stimulating period of darkness, which is required by each species for every phase of the migratory process, is an important factor in photoperiodism. **Hence statement 2 is correct.**
- When stimulated by light, an animal's pituitary gland will release hormones that affect reproduction. Thus, the mating season of a species can be made to occur at an unusual time by manipulating daylight. Long periods of light followed by short periods will induce mating behavior in species that normally breed in autumn (e.g., goats and sheep), while spring breeders (e.g., mink) will start the reproductive process when daylight is increased. Application of photoperiodism is common in the poultry industry, as daylight affects egg-laying, mating, and the bodyweight of the fowl. **Hence statement 3 is correct.**

Q 4.D

- An overwhelming majority of animals and nearly all plants cannot maintain a constant internal environment. Their body temperature changes with the ambient temperature. In aquatic animals, the osmotic concentration of the body fluids changes with that of the ambient water osmotic concentration.
- These animals and plants are simply conformers. Thermoregulation is energetically expensive for many organisms. This is particularly true for small animals like shrews and hummingbirds. Heat loss or heat gain is a function of surface area. **Since small animals have a larger surface area relative to their volume, they tend to lose body heat very fast when it is cold outside; then they have to expend much energy to generate body heat through metabolism. This is the main reason why very small animals are rarely found in polar regions. Hence option (d) is the correct answer.**
- **Allen's rule, an ecogeographical rule**, states that significant differences exist in the size of limbs and other external organs of animals, even within the same species, depending on the geographical region in which they live. Animals living in colder regions of the world, for instance, have shorter limbs than those living in warmer regions as an adaptation to control the dissipation of heat. A smaller body surface area helps animals in colder regions stay warm by slowing down the loss of body heat.
- During the course of evolution, the costs and benefits of maintaining a constant internal environment are taken into consideration. Some species have evolved the ability to regulate, but only over a limited range of environmental conditions, beyond which they simply conform.

Q 5.C

- **Statement 1 is correct:** National Board for Wild Life is a "Statutory Organization" constituted under the Wildlife Protection Act, 1972.
- **Statement 3 is not correct:** The board is advisory in nature and advises the Central Government on framing policies and measures for conservation of wildlife in the country. However, it is a very important body because it serves as apex body to review all wildlife-related matters and approve projects in and around national parks and sanctuaries.
- **Statement 2 is not correct:** The NBWL is chaired by the Prime Minister. It has 47 members including the Prime Minister. Among these, 19 members are ex-officio members. Other members include three Members of Parliament (two from Lok Sabha and one from Rajya Sabha), five NGOs and 10 eminent ecologists, conservationists and environmentalists.
- The Indian Board for wildlife in its **15th meeting held in the year 1983 decided to prepare National wildlife Action Plan.** Accordingly, the **First National wildlife Action Plan was adopted in the year 1983 and was implemented upto 2001.** Subsequently second National wildlife action plan was in operation from 2002 to 2016. Presently third wildlife action plan is in operation for period 2017 to 2031.

Q 6.B

- **Statement 1 is correct:** CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

- **Statement 2 is not correct:** CITES was drafted as a result of a resolution adopted in **1963 at a meeting of members of IUCN** (The World Conservation Union). The text of the Convention was finally agreed at a meeting of representatives of 80 countries in Washington, D.C., the United States of America, on 3 March 1973, and **on 1 July 1975 CITES entered in force.**
- **Statement 3 is correct:** CITES is an international agreement to which States and regional economic integration organizations adhere voluntarily. States that have agreed to be bound by the Convention ('joined' CITES) are known as Parties. **Although CITES is legally binding on the Parties – in other words they have to implement the Convention – it does not take the place of national laws.** Rather it provides a framework to be respected by each Party, which has to adopt its own domestic legislation to ensure that CITES is implemented at the national level.

Q 7.D

- The human activities have emerged as a major cause for the loss of biological. The colonisation of the tropical Pacific Islands by humans is said to have led to the extinction of more than 2,000 species of native birds.
- The International Union for Conservation of Nature (IUCN) Red List of Threatened Species is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of quantitative criteria to evaluate the extinction risk of thousands of species. These criteria are relevant to most species and all regions of the world.
- Of the world's 5,490 mammals, 79 are Extinct or Extinct in the Wild, with 188 Critically Endangered, 449 Endangered and 505 Vulnerable. There are 1,677 reptiles on the IUCN Red List, with 293 added recently. In total, 469 are threatened with extinction and 22 are already Extinct or Extinct in the Wild.
- Some examples of recent extinctions include the **dodo (Mauritius)**, **quagga (Africa)**, thylacine (Australia), and three subspecies (Bali, Javan, Caspian) of tiger. The last twenty years alone have witnessed the disappearance of 27 species.
- In addition, many species extinctions in the last 500 years like **Steller's sea cow**, **passenger pigeon** etc. have been due to overexploitation by humans.
- **Hence option (d) is the correct answer.**

Q 8.C

- When we conserve and protect the whole ecosystem, its biodiversity at all levels is protected - we save the entire forest to save the tiger. This approach is called in situ (on-site) conservation. However, when there are situations where an animal or plant is endangered or threatened (organisms facing a very high risk of extinction in the wild in the near future) and needs urgent measures to save it from extinction, ex-situ (off-site) conservation is the desirable approach.
- **Examples of in-situ conservation methods are biosphere reserves, national parks, sanctuaries, and sacred groves.**
- **Examples of ex-situ conservation methods are Zoological parks, botanical gardens, and wildlife safari parks.**

Q 9.D

- Microbes are used for commercial and industrial production of certain chemicals like organic acids, alcohols and enzymes. Examples of acid producers are:
 - **Aspergillus niger (a fungus) of citric acid** (it is a natural preservative and is also used to add an acidic (sour) taste to foods and soft drinks);
 - *Acetobacter aceti* (a bacterium) of acetic acid (used in vinegar, used as an antiseptic against *pseudomonas*, *staphylococci*, etc., is also used in cervical cancer screening) ;
 - **Clostridium butylicum (a bacterium) of butyric acid** (aid in the prevention, management, and/or treatment of a variety of health conditions, including gastrointestinal problems, colon cancer, diabetes/metabolic disorders, and neurological disorders).
 - *Lactobacillus* (a bacterium) of lactic acid;
 - **Yeast (*Saccharomyces cerevisiae*) is used for commercial production of ethanol;**

- Streptokinase produced by the bacterium *Streptococcus* and modified by genetic engineering is used as a 'clot buster' for removing clots from the blood vessels of patients who have undergone myocardial infarction leading to heart attack.
- Bioactive molecule, cyclosporin A, that is used as an immunosuppressive agent in organ-transplant patients, is produced by the fungus *Trichoderma polysporum*.
- Statins produced by the yeast *Monascus purpureus* have been commercialised as blood-cholesterol lowering agents. It acts by competitively inhibiting the enzyme responsible for synthesis of cholesterol.
- **Hence only pair 3 is correctly matched.**

Q 10.D

- The coral is a polyp, an organism that lives in the shallow sea. Its skeleton is composed of limestone and dolomite. The layers of deposition of the skeletons of these polyps form a shallow rock known as Coral Reef.
- **They thrive in tropical oceans** confined between 25 degrees North and 25 degree south latitudes. Corals are found mainly in the tropical oceans and seas because they require a high mean annual temperature above 20 degree celsius. **Hence statement 1 is correct.**
- **Most fishes lay eggs in coral colonies. Hence statement 2 is correct.**
- Since coral polyps cannot survive above water level, coral reefs are found either up to sea level or below it.
- The coral reefs are more diverse than tropical rainforests because coral reefs have more than 1,000,000 species. **Hence statement 3 is correct.**

Q 11.A

- **Statement 1 is correct:** Biosphere reserves are areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. They are internationally recognized, nominated by national governments and remain under sovereign jurisdiction of the states where they are located.
- **Statement 2 is not correct:** Launched in 1971, UNESCO's Man and the Biosphere Programme (MAB) is an Intergovernmental Scientific Programme that aims to establish a scientific basis for the improvement of relationships between people and their environments. MAB combines the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable. Its World Network of Biosphere Reserves currently counts 701 sites in 124 countries all over the world, including 21 transboundary sites.
- There are 18 Biosphere Reserves in the country. Under the MAB Programme of the UNESCO, India has 11 internationally recognised biosphere reserves.

Q 12.C

- The Zoological Survey of India (ZSI), a subordinate organization of the Ministry of Environment, Forest and Climate Change was established in 1916 as a national centre for faunistic survey and exploration of the resources leading to the advancement of knowledge on the exceptionally rich faunal diversity of the country. ZSI has its headquarters at Kolkata.
- It has not been established under any act. Hence, it is not a statutory body.
- Its activities include:
 - Study of the fauna of states
 - Fauna of conservation areas
 - Fauna of important ecosystems
 - Status survey of endangered species
 - Fauna of India and
 - Ecological Studies & Environmental impact assessments.

- **One of its primary objectives is: Preparation of Red Data Book, Fauna of India and Fauna of States.**
- **ZSI undertakes Environmental Impact Assessment (EIA)** with special reference to ecology and wildlife, and provides necessary services to assess possible impact and also on mitigating measures. ZSI assists development agencies in advising alternatives to minimize ecological damage both In short and long time frame perspectives.

Q 13.D

- **Acid rain means the presence of excessive acids in rainwater.**
- The causes of acid rain are Sulfur and Nitrogen particles which get mixed with the wet components of rain. Sulfur and Nitrogen particles which get mixed with water are found in two ways either man-made i.e as the emissions are given out from industries or by natural causes. **Natural causes of acid rain are oxides of sulphur and nitrogen from volcanoes, swamps and plankton in the oceans.** However, most of the acids are produced by human activities like **power generation from fossil fuels** which produces around 70% of the SO₂ produced in the atmosphere. **However, this is not a natural source but is an anthropogenic source. Hence all the options are correct.**

Q 14.A

- **Statement 1 is correct:** Intercropping involves growing different crops simultaneously within the same plot of land. This increases the yield and maximizes utilization of abiotic inputs, like efficient use of sunlight, water etc.
- **Statement 2 is incorrect:** Mulches are generally waste plant materials. In mulching, these plant materials are spread around the base of the crops. It protects the soil from erosion, reduces compaction from the impact of heavy rains ,conserves moisture, reducing the need for frequent waterings, maintains a more even soil temperature and prevents weed growth.

Q 15.A

- The limits to growth theory, is a 1972 book about the computer simulation of exponential economic and population growth with finite resource supplies. It was funded by the Volkswagen Foundation and commissioned by the Club of Rome. It suggests that the environment cannot support rising resource utilisation beyond its carrying capacity. **Hence option (a) is the correct answer.**

Q 16.B

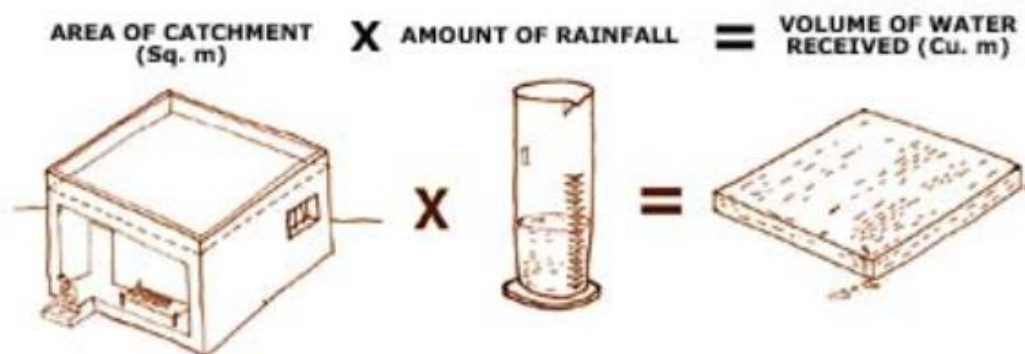
- The Indian government has started looking at means to revive the traditional systems of water harvesting in the country. Given that these methods are simple and eco-friendly for the most part, they are not just highly effective for the people who rely on them but they are also good for the environment.

<i>Region</i>	<i>Traditional water harvesting system</i>
Rajasthan	Kunds
Gujarat	Tankas
Maharashtra	Phad
Karnataka	Kere
Ladakh	Zings
Western Ghats	Surangam
Odisha	Katas

- **Hence option (b) is the correct answer.**

Q 17.D

The Potential



- Rainwater harvesting potential is the amount of water that can be effectively harvested out of total water received in an area. While the rainwater endowment is the total amount of water received in the form of rainfall over an area.
- **Hence both the statements are not correct.**

Q 18.A

- **Statement 1 is correct:** The maintaining of the constancy of an organism's internal environment despite varying external environmental conditions is called homeostasis.
- Some organisms are able to maintain homeostasis by physiological (sometimes behavioural also) means which ensures constant body temperature, constant osmotic concentration, etc. All birds and mammals, and a very few lower vertebrate and invertebrate species are indeed capable of such regulation (thermoregulation and osmoregulation).
- **Statement 2 is not correct:** An overwhelming majority (99 per cent) of animals and nearly all plants cannot maintain a constant internal environment. Their body temperature changes with the ambient temperature. In aquatic animals, the osmotic concentration of the body fluids change with that of the ambient water osmotic concentration. These animals and plants are called conformers.
- Thermoregulation is energetically expensive for many organisms. This is particularly true for small animals like shrews and humming birds. Heat loss or heat gain is a function of surface area. Since small animals have a larger surface area relative to their volume, they tend to lose body heat very fast when it is cold outside; then they have to expend much energy to generate body heat through metabolism.

Q 19.D

- **Statement (a) is correct:** Oxides of sulphur are produced when sulphur containing fossil fuel is burnt. The most common species, sulphur dioxide, is a gas that is poisonous to both animals and plants. It has been reported that even a low concentration of sulphur dioxide causes respiratory diseases e.g., asthma, bronchitis, emphysema in human beings. Sulphur dioxide causes irritation to the eyes, resulting in tears and redness. **High concentration of SO₂ leads to stiffness of flower buds which eventually fall off from plants.**
- **Statement (b) is correct:** Dinitrogen and dioxygen are the main constituents of air. These gases do not react with each other at a normal temperature. At high altitudes when lightning strikes, they combine to form oxides of nitrogen. NO₂ is oxidised to nitrate ion, NO₃⁻ which is washed into soil, where it serves as a fertilizer. In an automobile engine, (at high temperature) when fossil fuel is burnt, dinitrogen and dioxygen combine to yield significant quantities of nitric oxide (NO) and nitrogen dioxide (NO₂). **The irritant red haze in the traffic and congested places is due to oxides of nitrogen.** Higher concentrations of NO₂ damage the leaves of plants and retard the rate of photosynthesis. Nitrogen dioxide is a lung irritant that can lead to an acute respiratory disease in children. It is toxic to living tissues also. Nitrogen dioxide is also harmful to various textile fibres and metals.
- **Statement (c) is correct:** Hydrocarbons are composed of hydrogen and carbon only and are **formed by incomplete combustion of fuel used in automobiles.** Hydrocarbons are carcinogenic, i.e., they cause cancer. They harm plants by causing ageing, breakdown of tissues and shedding of leaves, flowers and twigs.

- **Statement (d) is not correct:** Carbon monoxide (CO) is one of the most serious air pollutants. It is a colourless and odourless gas, highly poisonous to living beings because of its ability to block the delivery of oxygen to the organs and tissues. It is produced as a result of incomplete combustion of carbon. Carbon monoxide is mainly released into the air by automobile exhaust. **It binds to haemoglobin to form carboxyhaemoglobin, which is about 300 times more stable than the oxygen-haemoglobin complex.** In blood, when the concentration of carboxyhaemoglobin reaches about 3–4 per cent, the oxygen carrying capacity of blood is greatly reduced. This oxygen deficiency, results into headache, weak eyesight, nervousness and cardiovascular disorder.

Q 20.C

- India has also a history of religious and cultural traditions that emphasised the protection of nature. In many cultures, tracts of forest were set aside, and all the trees and wildlife within were venerated and given total protection. Such sacred groves are found in Khasi and Jaintia Hills in Meghalaya, Aravalli Hills of Rajasthan, Western Ghat regions of Karnataka and Maharashtra and the Sarguja, Chanda and Bastar areas of Madhya Pradesh. In Meghalaya, the sacred groves are the last refuges for a large number of rare and threatened plants. **Hence option (c) is the correct answer.**

Q 21.C

- All the microbes mentioned can be used as pesticides. **Single cell organisms, such as bacteria, fungi and protozoa, and viruses,** have been mass produced and formulated for use in a manner similar to insecticides. Eg - Bacillus Thuringiensis. **Hence all the options are correct.**
- Several fungi have been studied as potential microbial insecticides. Beauveria bassiana can affect a wide variety of arthropods.
- Virus can also be used as insecticide. Baculoviruses are a family of naturally-occurring viruses known to infect only insects and some related arthropods. Most are so specific in their action that they infect and kill only one or a few species of Lepidoptera larvae (caterpillars), making them good candidates for management of crop pests with minimal off-target effects.

Q 22.A

- Living organisms are scattered all over the world. However, their distribution is not even. Their ability to survive and reproduce is mostly dependent on abiotic factors such as temperature, pH, salinity, moisture, humidity, oxygen levels, etc. Organisms that are best adapted to the environmental conditions of that particular area are dominant while other organisms are dominant in other areas.
- **Statement 1 is correct:** Based on temperature tolerance, different groups of organisms are defined. Among them, eurythermal and stenothermal animals are two categories. **Eurythermal animals are able to tolerate a wide range of temperature levels. Stenothermal animals are those which can tolerate a narrow range of temperature levels.**
- **Statement 2 is not correct:** Eurythermal animals include cat, dog, man, goat, tiger, etc which are vertebrates (as they have a backbone and a spinal column). **Thus vertebrates can be eurythermal. Although stenothermal animals include a penguin, python, crocodile,** some aquatic insects survive in a narrow range of temperature, usually cool water (cold stenotherms). **Insects are not vertebrates (as they lack a backbone and a spinal column). Thus all stenothermal organisms are not necessarily vertebrates.**
- A few organisms can tolerate and thrive in a wide range of temperatures - eurythermal, but, a vast majority of them are restricted to a narrow range of temperatures - stenothermal.

Q 23.C

- **Point sources:** These are organized sources of pollution where the pollution load can be measured, e.g. **surface drains carrying municipal sewage** or industrial effluents, sewage pumping stations and sewerage systems, **trade effluents from industries,** etc. Pollution loads due to untreated sewage is one of the main reasons threatening the ecological health of rivers. Most of the urban lakes in the country are also facing similar challenges.

- **Non-point sources:** These are non-measurable sources of pollution such as **run-off from agricultural fields** carrying chemicals and fertilizers, run-off from solid waste dumps and areas used for open defecation, **dumping of un-burnt/half-burnt dead bodies** and animal carcasses, **dhobi ghats**, cattle wallowing, etc.
- Out of the total measurable pollution in the rivers from various point sources, around 75% is contributed by municipal sewage from towns located along the banks of rivers and remaining 25% by industrial effluents.

Q 24.D

- A biome is an area of the planet that can be classified according to the plants and animals that live in it. Temperature, soil, and the amount of light and water help determine what life exists in a biome.
- Not all scientists classify biomes in the same way. Some use broad classifications and count as few as six biomes. These are forest, grassland, freshwater, marine, desert, and tundra.
- Other scientists use more precise classifications and list dozens of different biomes. For example, they consider different kinds of forests to be different biomes. Tropical rain forests that are warm and wet year-round are one biome. Temperate deciduous forests—those that have cold winters, warm summers, and are dominated by trees that lose their leaves—are a different biome. Taiga forests, which are in cold regions and are dominated by cone-bearing firs and spruces, are yet another biome.
- **Regional and local variations within each biome lead to the formation of a wide variety of habitats.** Life exists not just in a few favourable habitats but even in extreme and harsh habitats - scorching Rajasthan desert, **rain-soaked Meghalaya forests**, **deep ocean trenches**, **torrential streams**, permafrost polar regions, high mountain tops, **boiling thermal springs**, and stinking compost pits. Even our intestine is a unique habitat for hundreds of species of microbes. **Hence, option (d) is the correct answer.**
- **Biogeographic realms**
 - These are large spatial regions within which ecosystems share a broadly similar biological evolutionary history. Eight terrestrial biogeographic realms are typically recognized, corresponding roughly to continents - Australasian, Afrotropical, Nearctic, Oceanic, Antarctic, Indo-Malayan, Neotropical, Palearctic.
- **Population** refers to the organisms of the same species that are in proximity to one another. For e.g. a group of rabbits.
- **Ecotones-** Ecotone, a transitional area of vegetation between two different plant communities, such as forest and grassland. It has some of the characteristics of each bordering biological community and often contains species not found in the overlapping communities. An ecotone may exist along a broad belt or in a small pocket, such as a forest clearing, where two local communities blend together. **The influence of the two bordering communities on each other is known as the edge effect.**

Q 25.B

- George David Tilman is an American ecologist. **It is said that a stable community should not show too much variation in productivity from year to year; it must be either resistant or resilient to occasional disturbances (natural or man-made), and it must also be resistant to invasions by alien species. Hence statements 2 and 3 are correct and 1 is not correct.**
- David Tilman's long term ecosystem experiments using outdoor plots show how these attributes are linked to species richness in a community. Tilman found that plots with more species showed less year-to-year variation in total biomass. He also showed that in his experiments, increased diversity contributed to higher productivity.

Q 26.D

- **The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding Green House Gases emission reduction targets. Hence pair 1 is correctly matched.** The targets for the first commitment period of the Kyoto Protocol cover emissions of the **six main greenhouse gases**, namely:

- Carbon dioxide (CO₂);
- Methane (CH₄);
- Nitrous oxide (N₂O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Sulphur hexafluoride (SF₆)
- **The Stockholm Conference, 1972:** In 1972, the United Nations Conference on the Human Environment (UNCHE) was convened to address issues concerning the environment and sustainable development. UNCHE, also known as the Stockholm Conference, linked environmental protection with sustainable development. The Stockholm Conference also produced concrete ideas on how governments could work together to preserve the environment. **Hence pair 2 is not correctly matched.**
- **The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework)** is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action. It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on **Disaster Risk Reduction (WCDRR)**. **Hence pair 3 is correctly matched.**

Q 27.D

- Biotic and abiotic are the two important factors of the ecosystem which have important characters in shaping the ecosystem. Therefore, both the biotic and abiotic factors affect survival and reproduction process.
- Both components are related to each other. If one of the components or a factor is removed or changed, it affects the entire ecosystem.
- **Biotic Factors**
 - Biotic factors or components are mainly referred to all the living things in the ecosystem. Their presence or their materials affect the composition of an ecosystem. These materials include all living organisms, like animals, humans, plants, fungi, and bacteria. All the interactions will make the difference in survival and reproduction of each species.
 - All living components of an ecosystem, including the producers, consumers, and decomposers or detritivores are considered as the biotic examples.
- **Abiotic Factors**
 - Abiotic factors or components are mainly referred to all the non-living things with chemical and physical factors. These can be acquired from the atmosphere, hydrosphere, and lithosphere. **Sunlight (Temperature), air, moisture, minerals, and soil** are some examples of abiotic factors. **Hence, option (d) is the correct answer.**
 - These factors have a significant impact on the survival and reproduction of species in an ecosystem.
 - For instance, without the worthy amount of sunlight, all autotrophic organisms are not able to survive and eventually dies, then there will be less food for plant-eating animals, which directly affects the other flesh-eating animals. Overall, this leads to the disbalance of the ecosystem.

Q 28.B

- Interspecific interactions arise from the interaction of populations of two different species. They could be beneficial, detrimental or neutral (neither harm nor benefit) to one of the species or both.
- Both the species benefit in **mutualism** and both lose in competition in their interactions with each other. **Hence pair 1 is correctly matched.** Lichens result from the symbiotic union between fungi and algae or fungi and cyanobacteria. The fungus receives nutrients obtained from the photosynthetic algae or bacteria, while the algae or bacteria receive food, protection, and stability from the fungus. Clownfish and sea anemones have a mutualistic relationship in which each party provides valuable services for the other. Clownfish live within the protective tentacles of the sea anemone. In return, the sea anemone receives cleaning and protection.
- In both **parasitism and predation**, only one species benefits (parasite and predator, respectively) and the interaction is detrimental to the other species (host and prey, respectively). **Hence pair 2 is correctly matched.** The best-known examples of predation involve carnivorous interactions, in which one animal consumes another, such as tiger eating deer. Carnivorous plants, such as the Venus fly trap and the pitcher plant, consume insects are also examples of Predation.

- The interaction where one species is benefitted and the other is neither benefitted nor harmed is called **commensalism**. In **amensalism**, on the other hand, one species is harmed whereas the other is unaffected. **Hence pair 3 is not correctly matched.** One of the best-known examples of commensalism is the remora (family Echeneidae) that rides attached to sharks and other fishes.
- Predation, parasitism, and commensalism share a common characteristic– the interacting species live closely together.

Q 29.A

- The Grazing Food Chain (GFC) begins with producers (green plants) while the detritus food chain (DFC) begins with dead organic matter. **Hence statement 1 is correct.**
- In GFC the producers are consumed, directly or indirectly, by consumers. If they feed on the producers, the plants, they are called primary consumers, and if the animals eat other animals which in turn eat the plants (or their produce) they are called secondary consumers. Likewise, you could have tertiary consumers too. The consumers that feed on these herbivores are carnivores, or more correctly primary carnivores (though secondary consumers). Those animals that depend on the primary carnivores for food are labelled secondary carnivores.
- The DFC is made up of decomposers which are heterotrophic organisms, mainly fungi, and bacteria. They meet their energy and nutrient requirements by degrading dead organic matter or detritus. These are also known as saprotrophs (sapro: to decompose). Decomposers secrete digestive enzymes that breakdown dead and waste materials into simple, inorganic materials, which are subsequently absorbed by them.
- In an aquatic ecosystem, GFC is the major conduit for energy flow. As against this, in a terrestrial ecosystem, a much larger fraction of energy flows through the DFC than through the GFC. **Hence statement 2 is not correct.**

Q 30.C

- The impact of species richness on the well-being of an ecosystem is a continuing area of research. In this context, a proper perspective has been developed by Stanford ecologist Paul Ehrlich through an analogy - the 'rivet popper hypothesis',
- In an airplane (ecosystem) all parts are joined together using thousands of rivets (species). If every passenger traveling in it starts popping a rivet to take home (causing a species to become extinct), it may not affect flight safety (proper functioning of the ecosystem) initially, but as more and more rivets are removed, the plane becomes dangerously weak over a period of time.
- Furthermore, which rivet is removed may also be critical. Loss of rivets on the wings (key species that drive major ecosystem functions) is obviously a more serious threat to flight safety than the loss of a few rivets on the seats or windows inside the plane.
- **Thus the 'rivet popper hypothesis' helps us in understanding the impact of the loss of species richness on biodiversity. Hence the option (c) is the correct answer.**

Q 31.C

- **Statement 1 is correct:** Flora in temperate forests are characterized by 3-4 tree species per square kilometre while for tropical forests it may be as high as 100 different tree species.
- **Statement 2 is correct:** Temperate forests have a thin canopy of trees which allows more light and heat to penetrate and permit the survival of smaller and cold-blooded animals like garter snakes, turtles, and a few amphibians. Tropical forests have a thick canopy of trees which restricts light to penetrate.
- Trees of temperate forests are distinguished by broad leaves which shed their leaves annually during the dry season. They include such species as oak, hickory, beech, hemlock, maple, basswood, cottonwood, elm, willow, and spring-flowering herbs. In case of boreal or taiga forests, the trees are cold-tolerant evergreen conifers with needle-like leaves like pine, fir, and spruce. While in tropical forests, trees are 25-30 m tall, with shallow roots, mostly evergreen, with large dark green leaves. Some examples are orchids, bromeliads, vines (lianas), ferns, mosses, and palms.

Q 32.B

- Organisms need a constant supply of nutrients to grow, reproduce and regulate various body functions. The amount of nutrients, such as carbon, nitrogen, phosphorus, calcium, etc., present in the soil at any given time, is referred to as the standing state. It varies in different kinds of ecosystems and also on a seasonal basis.

- Nutrients are never lost from the ecosystems, rather they are recycled time and again indefinitely. The movement of nutrient elements through the various components of an ecosystem is called nutrient cycling. Another name of nutrient cycling is biogeochemical cycles (bio: living organism, geo: rocks, air, water).
- Nutrient cycles are of two types:
 - gaseous- **the reservoir for the gaseous type of nutrient cycle (e.g., nitrogen, carbon cycle) exists in the atmosphere** and
 - sedimentary- **for the sedimentary cycle (e.g., sulphur and phosphorus cycle), the reservoir is located in Earth's crust.**
- Environmental factors, e.g., soil, moisture, pH, temperature, etc., regulate the rate of release of nutrients into the atmosphere. The function of the reservoir is to meet with the deficit which occurs due to imbalance in the rate of influx and efflux.

Q 33.D

- Bio-fertilizers are specific types of living organisms like symbiotic bacteria, **Cyanobacteria** are autotrophic microbes widely distributed in aquatic and terrestrial environments many of which can fix atmospheric nitrogen, e.g. **Anabaena, Nostoc, Oscillatoria**, etc. In paddy fields, cyanobacteria serve as an important biofertiliser.
- *Anabaena azollae*, *Anabaena cycadae*, *Azolla pinnata* and *Nostoc* are different plants that enhance the productivity of soil when added to it. Bacteria like *Rhizobium* fix nitrogen for plants and *Nostoc* and *Azolla* that are great nitrogen fixers, are used as biofertilizers in crop fields, most frequently. Hence all the given microorganisms are used as biofertilizers. Bio-fertilizers are useful in the Conservation and Management of soil in the following ways:
 - These are helpful in the replenishment and enhancement of soil fertility
 - These fertilizers improve water holding capacity, aeration, porosity and drainage of the soil.
 - These fertilizers are helpful in the reclamation of unproductive soils.
 - These fertilizers are helpful in preventing soil erosion.
- **Hence all the options are correct.**

Q 34.B

- Smog is a combination of smoke and fog. Smog occurs due to factors like geography, sunlight, industrial activity, vehicular emissions etc.
- There are two types of smog:
 - **Classical smog** occurs in a cool humid climate. It is a mixture of smoke, fog and sulphur dioxide. Chemically it is a reducing mixture and so it is also called as reducing smog.
 - **Photochemical smog** occurs in a warm, dry and sunny climate. **Hence, Statement 1 is not correct.**
- **The main components of the photochemical smog result from the action of sunlight on unsaturated hydrocarbons and nitrogen oxides produced by automobiles and factories. Hence, Statement 2 is correct.**
- Photochemical smog has a high concentration of oxidizing agents and is, therefore, called oxidizing smog.
- **Effects of photochemical smog:** The common components of photochemical smog are **ozone**, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN). Photochemical smog causes serious health problems. Both **ozone** and PAN act as powerful eye irritants. **Ozone** and nitric oxide irritate the nose and throat and their high concentration causes headache, chest pain, dryness of the throat, cough and difficulty in breathing. Photochemical smog leads to cracking of rubber and extensive damage to plant life. It also causes corrosion of metals, stones, building materials, rubber and painted surfaces. **Hence, Statement 3 is correct.**

Q 35.A

- **The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted on 22 March 1989** by the Conference of Plenipotentiaries in Basel, Switzerland, in response to a public outcry following the discovery, in the 1980s, in Africa and other parts of the developing world of deposits of toxic wastes imported from abroad. **Hence statement 1 is correct.**

- Awakening environmental awareness and corresponding tightening of environmental regulations in the industrialized world in the 1970s and 1980s had led to increasing public resistance to the disposal of hazardous wastes – in accordance with what became known as the NIMBY (Not In My Back Yard) syndrome – and to an escalation of disposal costs.
- It was against this background that the Basel Convention was negotiated in the late 1980s, and its thrust at the time of its adoption was to combat the “toxic trade”, as it was termed. The Convention entered into force in 1992.
- Although **not legally-binding**, technical guidelines provide for the foundation upon which countries can operate at a standard that is not less environmentally sound than that required by the Basel Convention. These guidelines are aimed at assisting developing countries, in particular, in ensuring the environmentally sound management of hazardous and other wastes. **Hence statement 2 is not correct.**
- The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” - household waste and incinerator ash. Aims and provisions:
- The provisions of the Convention centre around the following principal aims:
- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes,
- wherever the place of disposal; the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and
- a regulatory system applying to cases where transboundary movements are permissible

Q 36.C

- Photosynthetically active radiation (PAR) is the part of the electromagnetic radiation that can be used as the source of energy for photosynthesis by green plants. Technically, it is defined as radiation in the **spectral range from 400 to 700 nm**, which is the range of visible light. **Hence statement 1 is correct.**
- **PAR changes seasonally and varies depending on the latitude and time of day.**
- Photosynthetically Active Radiation is needed for photosynthesis and plant growth. **Plants capture only 2-10 per cent of the PAR and this small amount of energy sustains the entire living world. Hence only statement 2 is not correct.**

Q 37.C

- Each biotic community comprises of Producers, Consumers, and Decomposers.
- **Producers:** The green autotrophic plants are regarded as producers. They are able to synthesize carbohydrates, proteins, fats, amino acids, etc. (complex organic compounds) from certain inorganic constituents (Carbon Dioxide, Water, mineral salts, etc.) obtained from the surrounding environment with the help of chlorophyll in the presence of sunlight. The process of producing food using sunlight is known as photosynthesis.
- **Consumers or Phagotrophs:** The living organisms that cannot produce their own food and procure their food or nutrition by consuming producers directly or indirectly are called Consumers. **Hence statement 1 is correct.**
- They are of three types:
 - **Primary Consumers:** They are commonly known as herbivorous.
 - **Secondary Consumers:** They are commonly called carnivores or flesh-eating animals.
 - **Tertiary consumers:** These are the top carnivores which prey upon carnivores, omnivores, and herbivores. Lions, tigers, shark, eagle, etc. are considered as tertiary consumers.
- **Omnivores:** They are animals that are both herbivores and carnivores i.e. they consume plants as well as animals.
- **Decomposers or Saprotrophs:** They are micro-organisms mostly bacteria, fungi, protozoa, etc. Instead of ingesting food as done by the heterotrophs, they release enzymes into the dead organic matter, convert the complex organic substances into simpler compounds and then absorb some of the degraded products. **Hence statement 2 is correct.**

Q 38.C

- Humification and mineralization occur during decomposition in the soil. **Humification** leads to accumulation of a dark-colored amorphous substance called humus that is **highly resistant to microbial action** and undergoes decomposition at an extremely slow rate. Being colloidal in nature it **serves as a reservoir of nutrients**. Stable (or passive) humus consisting of humic acids, or humins are so highly insoluble (or tightly bound to clay particles that they cannot be penetrated by microbes) that they are greatly resistant to decomposition.
- **Hence both statements are correct.**
- The humus is further degraded by some microbes and release of inorganic nutrients occur by the process known as **mineralization**.
- **Benefits of Humus**
 - The mineralization process that converts raw organic matter to the relatively stable substance that is humus feeds the soil population of micro-organisms and other creatures, thus maintaining high and healthy levels of soil life.
 - Effective and stable humus are further sources of nutrients to microbes, the former providing a readily available supply while the latter acts as a more long-term storage reservoir.
 - Humification of dead plant material causes complex organic compounds to break down into simpler forms which are then made available to growing plants for uptake through their root systems.
 - Humus is a colloidal as substance, and increases the soil's cation exchange capacity, hence its ability to store nutrients by chilation as can clay particles; thus while these nutrient cations are accessible to plants, they are held in the soil safe from leaching away by rain or irrigation.
 - Humus can hold the equivalent of 80-90% of its weight in moisture, and therefore increases the soil's capacity to withstand drought conditions.
 - The biochemical structure of humus enables it to moderate – or buffer – excessive acid or alkaline soil conditions.
 - During the Humification process, microbes secrete sticky gums; these contribute to the crumb structure of the soil by holding particles together, allowing greater aeration of the soil. Toxic substances such as heavy metals, as well as excess nutrients, can be chelated (that is, bound to the complex organic molecules of humus) and prevented from entering the wider ecosystem.
 - The dark colour of humus (usually black or dark brown) helps to warm up cold soils in the spring.

Q 39.A

- **Statement 1 is correct:** The **Environment Protection Act (1986)** empowers the **Central government** to **coordinate actions of State Governments**, plan and execute a nationwide programme for the prevention, control and abatement of environmental pollution, lay down standards for the quality of environment in its various aspects and for emission or discharge of environmental pollutants from different sources.
- **Statement 2 is not correct:** To **protect wildlife**, Government of India has set up National parks, Sanctuaries, Tiger reserves and Biosphere reserves **under the Wildlife Protection Act, 1972**.

Provisions of the Act

- The Act is an “**umbrella**” for legislations designed to provide a **framework for Central Government**, coordination of the activities of various central and state authorities established under previous Acts, such as the Water Act and the Air Act.
- In this Act, main emphasis is given to “**Environment**”, defined to **include water, air and land** and the inter-relationships which exist among water, air and land and human beings and other living creatures, plants, micro-organisms and property.
- “**Environmental pollution**” is the presence of pollutant, defined as any solid, liquid or gaseous substance present in such a concentration as may be or may tend to be injurious to the environment.
- “**Hazardous substances**” include any substance or preparation, which may cause harm to human beings, other living creatures, plants, microorganisms, property or the environment.
- The **Act empowers the Centre** to “take all such measures as it deems necessary”.

- By virtue of this Act, **Central Government has armed itself with considerable powers** which include:
 - coordination of action by state
 - planning and execution of nationwide programmes, laying down environmental quality standards, especially those governing emission or discharge of environmental pollutants
 - placing restriction on the location of industries and so on.
 - authority to issue direct orders, included orders to close, prohibit or regulate any industry.
 - power of entry for examination, testing of equipment and other purposes and power to analyze the sample of air, water, soil or any other substance from any place.
- The **Act explicitly prohibits discharges of environmental pollutants** in excess of prescribed regulatory standards.
- There is also a **specific prohibition against handling hazardous substances** except those in compliance with regulatory procedures and standards.
- The **Act provides provision for penalties**. For each failure or contravention the punishment included a **prison term up to five years or fine up to Rs. 1 lakh, or both**.
- The Act imposed an **additional fine of up to Rs. 5,000 for every day of continuing violation**.

Q 40.A

- **Statement 1 is correct:** An Ecosystem is a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment. It includes all of the living things in a given area, interacting with each other, and also with their non-living environments.
- **Statement 2 is correct:** The energy for the functioning of the ecosystem is derived from the Sun. The ecosystem is not a watertight compartment and there is an exchange of materials (in the form of nutrients) and energy within the ecosystem as well as between adjoining ecosystems.
- **Statement 3 is not correct:** The vast network of all interconnected ecosystems constitutes the biosphere. The biosphere, also known as the ecosphere is the global sum of all ecosystems. It can also be termed the zone of life on Earth, a closed system and largely self-regulating. The biosphere is the global ecological system integrating all living beings and their relationships, including their interaction with the elements of the lithosphere, geosphere, hydrosphere, and atmosphere.
- An ecological niche is a role and position a species has in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces. A species' niche includes all of its interactions with the biotic and abiotic factors of its environment. It describes how an organism or population responds to the distribution of resources and competitors and how it, in turn, alters those same factors.

Q 41.C

- CNG is an acronym for Compressed Natural Gas. **It is a mixture of hydrocarbons consisting of approximately 80 to 90 per cent methane in gaseous form.**
- **CNG is lead free** and reduces harmful emissions. Another advantage of CNG is the extension of life of lubricating oils as the fuel does not contaminate and dilute the crankcase oil.
- Compared to petrol or diesel CNG vehicles emit 40% less of nitrous oxide, 80% less of Carbon monoxide and 25% less of Carbon dioxide.
- **It is a safe-fuel and lighter than air.**
- **Hence both the statements are correct.**

Q 42.D

- A biodiversity hotspot is a biogeographic region that is both a significant reservoir of biodiversity and is threatened with destruction. These regions have very high level of species richness (not species evenness) and a high degree of endemism (that is, species confined to that region and not found anywhere else). These hotspots are also regions of accelerated habitat loss. **Hence statement 1 is not correct.**
- Initially 25 biodiversity hotspots were identified but subsequently, nine more have been added to the list, bringing the total number of biodiversity hotspots in the world to 34. As of today, their number is 35. The biodiversity hotspots hold especially high numbers of endemic species, yet their combined area of remaining habitat covers only 2.3% of the Earth's land surface. Each hotspot faces extreme threats and has already lost at least 70% of its original natural vegetation. Over 50% of the world's plant species and 42% of all terrestrial vertebrate species are endemic in nature. **Hence statement 2 is not correct.**

- Biodiversity Hotspots in India
 - **Himalaya**
 - Includes the entire Indian Himalayan region (and that falling in Pakistan, Tibet, Nepal, Bhutan, China and Myanmar)
 - **Indo-Burma**
 - Includes entire North-eastern India, except Assam and Andaman group of Islands (and Myanmar, Thailand, Vietnam, Laos, Cambodia and southern China)
 - Sundalands
 - Includes Nicobar group of Islands (and Indonesia, Malaysia, Singapore, Brunei, Philippines)
 - The Western Ghats and Sri Lanka
 - Includes entire Western Ghats (and Sri Lanka)
- **Hence statement 3 is not correct.**

Q 43.D

- One of the most important developments after The **1972 Stockholm Conference is the adoption of the World Conservation Strategy. It was published by the International Union for Conservation of Nature(IUCN) together with the United Nations Environment Programme(UNEP) and World Wildlife Fund (WWF, now “World Wide Fund for Nature”)**.
- **World Conservation Strategy of 1980 is the first international document on living resource conservation produced with inputs from governments, non-governmental organizations, and other experts.** The report argues that for development to be **sustainable**, it should support conservation rather than hinder it. The world conservation strategy has set out three fundamental principles namely :
 - **All essential ecological processes and life support systems must be maintained. Hence statement 1 is correct.**
 - **Protection must be provided to genetic diversity. Hence statement 2 is correct.**
 - **Any use of species and ecosystem must be sustainable. Hence statement 3 is correct.**

Q 44.A

- A constant input of solar energy is the basic requirement for any ecosystem to function and sustain. Primary production is defined as the amount of biomass or organic matter produced per unit area over a time period by plants (producers) during photosynthesis. It is expressed in terms of weight (gm^{-2}) or energy (kcal m^{-2}). The rate of biomass production is called productivity. It is expressed in terms of $\text{gm}^{-2} \text{yr}^{-1}$ or $(\text{kcal m}^{-2}) \text{yr}^{-1}$ to compare the productivity of different ecosystems. It can be divided into gross primary productivity (GPP) and net primary productivity (NPP).
- Gross primary productivity of an ecosystem is the rate of production of organic matter during photosynthesis. A considerable amount of GPP is utilized by plants in respiration. **Hence statement 1 is correct.**
- Gross primary productivity minus respiration losses, is the net primary productivity (NPP). Net primary productivity is the available biomass for the consumption to heterotrophs (herbivores and decomposers). Secondary productivity is defined as the rate of formation of new organic matter by consumers. **Hence statement 2 is not correct.**

Q 45.D

- Hibernation, aestivation and diapause are the forms of Suspend response of organisms to the abiotic components of the environment.
- **Statement 1 is not correct:** Hibernation and Aestivation are not related to movement of organisms from one place to another; rather they are escape in time. Bears go into hibernation during winter while some snails and fish go into aestivation to avoid summer related problems like heat. These are not forms of migration of the organisms.
- **Statement 2 is not correct:** During true hibernation animal's body temperature drops but remains above the outside atmosphere and rate of breathing and heartbeat becomes slow.

Q 46.C

- **Statements 1 and 2 are correct:** The application of **biotic agents like microorganisms** in the correction and recovery of environmental damage is called as bioremediation, in other words, **Bioremediation** is a process used to **treat contaminated media**, including water, soil and subsurface material, by **altering environmental conditions to stimulate growth of microorganisms and degrade the target pollutants**. The **removal of oil spilled on sea water** by the help of **bacteria** is one example of bioremediation.

Q 47.B

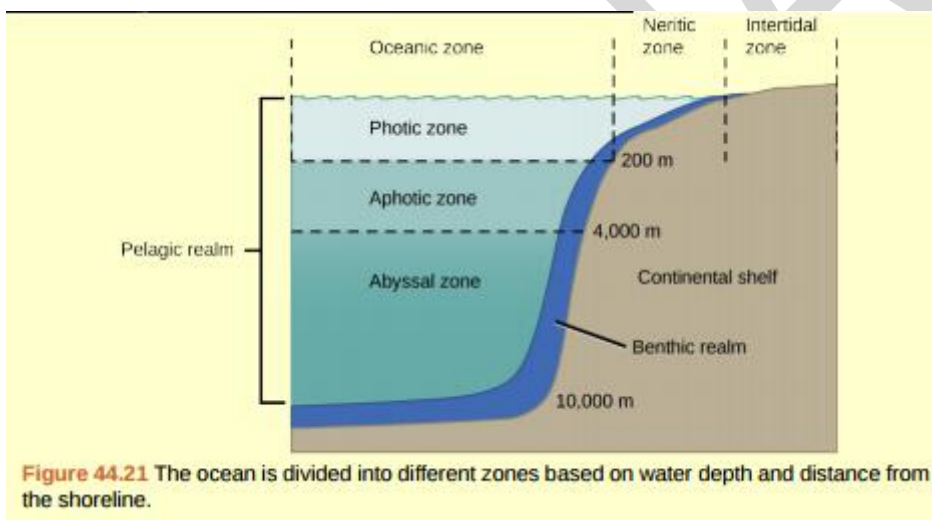
- **Ecology**
 - It refers to the scientific study of plants and animals in relation to each other and to their environment. It was introduced by a German biologist, Hanns Reiter by combining two words Greek words - Oikos (house) and logos (study of).
 - **Hence option (b) is the correct answer.**
- **Environment**
 - It refers to the sum total of all the forces, materials and influences around a living organism at a given point of time and place.
- **Environmental Science**
 - It is the application of knowledge from many disciplines to the study and management of the environment.
 - It merges ecology, geology, mineralogy, biology, zoology, soil science, and other sciences into the scientific study of the environment. It is the analysis of the interaction between chemical, biological, and physical elements present in the environment, and their impact on the ecosystem and the organisms living in it.
 - Ecology is a section of Environmental Science. However, there are certain differences between both of them :
 - First, ecology is the scientific study of the interaction of organisms with each other, along with their relationship with other organisms and their ecosystem. Meanwhile, environmental science is the extensive scientific analysis of the environment. It focuses on the interaction between physical, chemical and biological components within the environment.
 - Ecology and environmental science also have different aims. Ecology seeks to understand life process, adaptation, and biodiversity. It analyzes factors that influence the prevalence and distribution of organisms and the relationship that exist between them. Environmental science, on the other hand, is broader in scope as it aims to identify the internal and external factors that affect the environment and the organisms living in it. Additionally, this interdisciplinary field seeks probable solutions for environmental problems.
- **Ecosystem**
 - It is a self-regulating and self-sustaining structural and functional unit of the biosphere. It 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.

Q 48.A

- Eutrophication is the natural ageing of a lake by nutrient enrichment of its water. In a young lake the water is cold and clear, supporting little life. With time, streams draining into the lake introduce nutrients such as nitrogen and phosphorus, **which encourage the growth of aquatic organisms. Hence, statement 1 is correct.**
- As the lake's fertility increases, plant and animal life burgeons, and organic remains begin to be deposited on the lake bottom. Over the centuries, as silt and organic debris pile up, **the lake grows shallower and warmer**, with warm-water organisms supplanting those that thrive in a cold environment. Marsh plants take root in the shallows and begin to fill in the original lake basin. Eventually, the lake gives way to large masses of floating plants (bog), finally converting into land. **Hence, statements 2 and 3 are not correct.**

Q 49.B

- The marine ecosystems are divided into oceans and coastal ecosystems. The average depth of the marine environment is about 3800 meters. Living organisms are found at all depths but with a decreasing density.
- The major zones in the marine ecosystem are:
 - **Littoral:** This is the seashore area extending between the highest high tide and lowest low tide levels. Waves and tides have maximum effect on the zone. This zone is sometimes exposed to air. Different types of species like algae, starfish, crustaceans, etc are found in this zone. It supports the growth of algae and other sea animals. Common animals found here include snails, clams, barnacles, crustaceans, sea cucumbers, sea urchins, etc. **Hence statement 1 is not correct.**
 - **Neritic:** This region is shallow enough to support plants rooted in the seafloor. This region constitutes the edge of the continental shelf. This area is rich in the density and diversity of organisms owing to the penetration of light to this depth of the sea and owing to the presence of nutrients washed down from the land. Phytoplankton and zooplankton are abundant in this region. Extensive community of giant kelps, different types of fishes, snails, whales, sea-otters, sea-snakes, and large squids, etc, are found in this zone. **Hence statement 2 is correct.**
 - **Pelagic:** This is the open area below the neritic region. On the surface of this zone, various types of plankton are found. In addition, there is zooplankton along with shrimp and jellyfish, etc.
 - **Benthic:** This forms the floor of the ocean. Production, in this region, is limited by low nutrient supply. Most of the organisms found here are luminescent. Rooted organisms are sea lilies, sea fan, sponges, etc. Snails and clams are embedded in the mud whereas starfish and sea urchins move on the surface.



Q 50.D

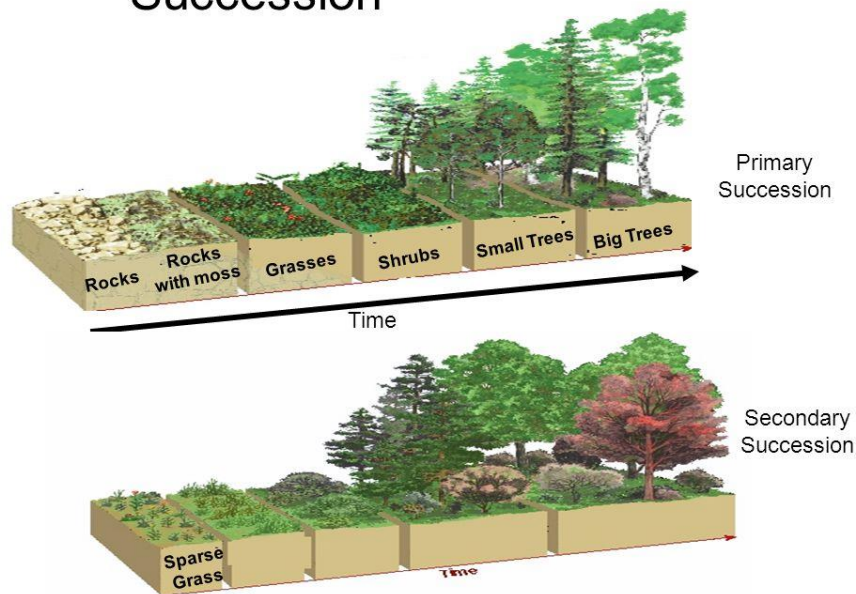
- **Agenda 21** is the outcome of the **Earth Summit at Rio de Janeiro in the year 1992**. It is the “Voluntary” action plan of the United Nations (UN) related to **sustainable development**. This 40 point document was a comprehensive blueprint of action to be taken globally, nationally and locally by organizations of the UN, governments, and major groups in every area in which humans directly affect the environment. **Hence statement 1 is correct.**
- **Agenda 21 is the action plan to encourage sustainable development through harmonisation of social, economic and environmental uses, and its journey in the 21st century.** **Hence statement 2 is correct.**
- **Agenda 21 also includes two groups to play major roles in sustainable development. These groups are 'women' and 'indigenous people and their community'.** Agenda 21 calls on governments to adopt national strategies for sustainable development. **Hence statement 3 is correct.**

Q 51.D

- An important characteristic of all communities is that their composition and structure constantly change in response to the changing environmental conditions. This change is orderly and sequential, parallel with the changes in the physical environment. These changes lead finally to a community that is in near equilibrium with the environment and that is called a climax community. The gradual and fairly predictable change in the species composition of a given area is called ecological succession. During succession, some species colonize an area and their population becomes more numerous whereas populations of other species decline and even disappear.

- The entire sequence of communities that successively change in a given area is called sere(s). The individual transitional communities are termed seral stages or seral communities.
- The species that invade a bare area are called pioneer species.
- Succession is hence a process that starts in an area where no living organisms are there – these could be areas where no living organisms ever existed, say bare rock; or in areas that somehow, lost all the living organisms that existed there. The former is called primary succession, while the latter is termed secondary succession. **Hence statement 1 is not correct.**
- In the case of secondary succession, since the soil is already there, the rate of succession is much faster and hence, the climax is also reached more quickly compared to primary succession. **Hence statement 2 is not correct.**

Succession



Q 52.D

- **The major causes that are responsible for the loss of Biodiversity are described or called as ‘The Evil Quartet’.** The following are the four factors impacting the environment that leads to the loss of Biodiversity:
 - **Habit Loss and Fragmentation**
 - This is the most important cause of driving animals and plants to extinction. The most dramatic examples of habitat loss come from tropical rain forests. Once covering more than 14 per cent of the earth’s land surface, these rain forests now cover no more than 6 per cent.
 - **Over- Exploitation**
 - Humans have always depended on nature for food and shelter, but when ‘need’ turns to ‘greed’, it leads to overexploitation of natural resources. Many species extinctions in the last 500 years (Steller’s sea cow, passenger pigeon) were due to overexploitation by humans. Presently many marine fish populations around the world are over-harvested, endangering the continued existence of some commercially important species.
 - **Co-extinctions**
 - When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate.
 - **Invasion of Alien species**
 - When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive and cause decline or extinction of indigenous species. The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.

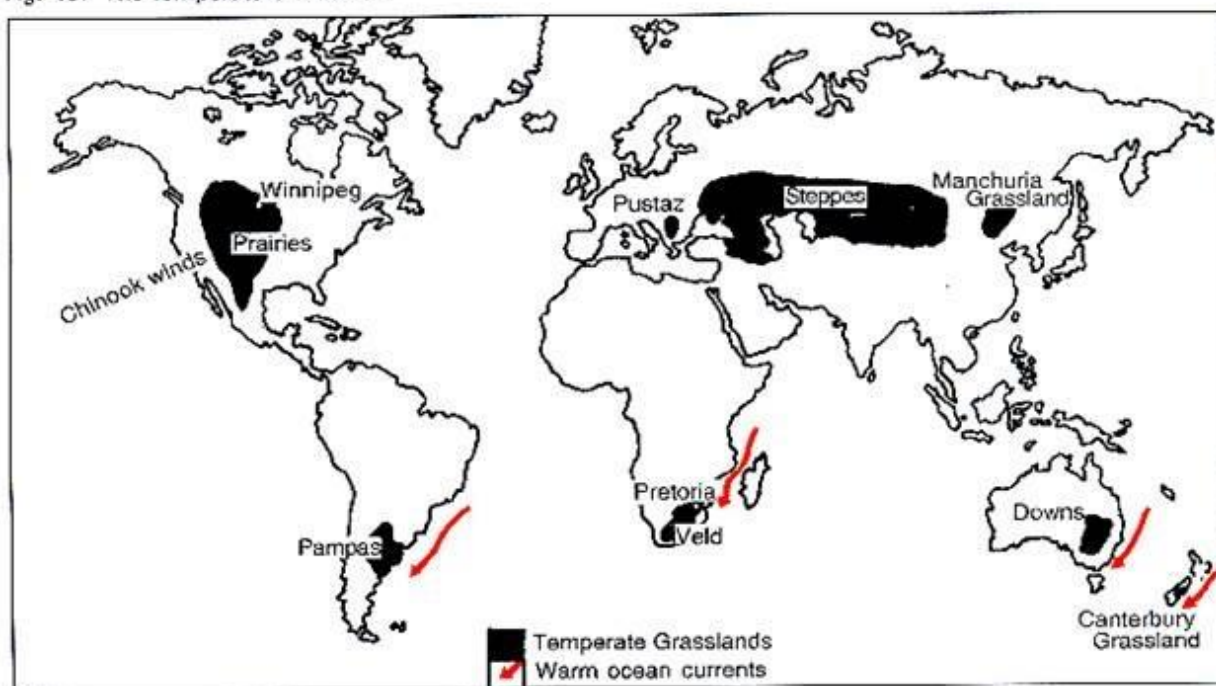
Q 53.D

- Fly ash: also known as Pulverised fuel ash is the light weight substance which tends to fly around in hot flue gases.
- It includes **black soot** occurring due to combustion of coal, vapourised particles of **lead, cadmium, nickel** etc.
- Fly ash is actively being used in concrete to enhance its strength. However, it negatively impacts the environment by depositing over snow, thus reducing the albedo and initiating melting. Himalayan ecology in particular is negatively impacted by fly ash.

Q 54.A

- Temperate grasslands are located away from the equator compared to tropical grasslands. They have hot summers and harsh winters. Rainfall is moderate. Precipitation usually occurs in the late spring and early summer. The temperature range is very large over the course of the year.
- The major temperate grasslands are **Veldts of South Africa, the Puszta of Hungary, the Pampas of Argentina and Uruguay, the Steppes of the former Soviet Union, and the plains and Prairies of Central North America. Hence only pair 3 is correctly matched.**

Fig. 137 The Temperate Grasslands



Q 55.A

- Antibiosis is an association between two microorganisms that is detrimental to at least one of them and that is caused by the release of metabolites or cell components. **Hence option (a) is the correct answer.**
- Predation refers to an interaction between two organisms in which one organism (predator) kills to feed on the other (prey). Besides acting as 'conduits' for energy transfer across trophic levels, predators play important roles. They keep prey populations under control. But for predators, prey species could achieve very high population densities and cause ecosystem instability.
- Protocooperation is where two species interact with each other beneficially; they have no need to interact with each other - they interact purely for the gain that they receive from doing this. It is not at all necessary for protocooperation to occur; growth and survival is possible in the absence of the interaction.

Q 56.C

- **Coal** is the most important and abundant fossil fuel in India. It accounts for **55% of the country's energy needs**. The country's industrial heritage was built upon indigenous coal.
- The most significant uses of coal are in **electricity generation, steel production, cement manufacturing and as a liquid fuel**. Steam coal - also known as thermal coal - is mainly used in power generation.

- **Statement 1 is correct:** Coal is also used for **producing products** like **coal gas** (a **mixture of methane, hydrogen and carbon monoxide**), **ammonical liquor, coal tar** and **coke**. Coal gas is formed by the destructive distillation of coal. Before natural gas was popular, coal gas was the primary source as a gaseous fuel in the United States and the United Kingdom.
- The following are the uses of coal gas:
 - Used in lighting.
 - Used for heating.
 - Used for cooking.
- **Statement 2 is correct:** Coke is essentially the solid residue which remains after certain types of bituminous coals are heated to a high temperature in the absence of air- a destructive distillation process (by which coal gas is produced). It is a grey, hard, and porous fuel with high carbon content and few impurities with minor amounts of hydrogen, nitrogen, sulfur, and oxygen. It burns without giving any smoke and has high calorific value (defined as heat produced per gram of coal). It is used as major fuel in many industries.

Q 57.D

- **Wildlife protection act came into effect in 1972.** The primary purpose of enacting this was to **maintain ecological processes and life-supporting systems to preserve biodiversity and to ensure continuous use of species** i.e., protection and conservation of wildlife. The major provisions of this act are :
- Strengthening management and protection of infrastructure of National parks and sanctuaries. Hence statement 3 is correct.
- Protection of wildlife from threats of poaching and illegal trade in wildlife products: It prohibits hunting of the endangered species. It bans the trade or commerce in scheduled animals. **There is provision for trade and commerce in some wildlife species with a license for sale, possession, transfer etc. Hence statement 2 is not correct.**
- **Special care and captive breeding programmes for highly endangered species** (e.g. Gharial, Estuarine Crocodile) of wildlife. Protection to some endangered plants like Beddome Cycad, Blue Vanda, Ladies Slipper Orchid, Pitcher Plant, etc. is also provided under the Act. It provides for legal powers to officers and punishment to offenders. **Hence statement 1 is correct.**
- Research and Development: The Act defines the wildlife-related terminology and provides a comprehensive list of endangered wildlife species.
- Development of selected Ex-situ conservation areas, like Zoological and Botanical Gardens.

Q 58.C

- **Statement 1 is correct: Ozone layer is present in the upper stratosphere as a protective layer against harmful Ultraviolet rays.** It is also present in the troposphere as a pollutant. **In the stratosphere, it is a product of UV radiations acting on dioxygen (O₂) molecules.** The UV radiations split apart molecular oxygen into free oxygen (O) atoms. These oxygen atoms combine with the molecular oxygen to form ozone.
- The main reason of ozone layer depletion is believed to be the release of chlorofluorocarbon compounds (CFCs), also known as freons. These compounds are used in refrigerators, air conditioners. Once CFCs are released in the atmosphere, they mix with the normal atmospheric gases and eventually reach the stratosphere. In the stratosphere, they get broken down by powerful UV radiations, releasing chlorine free radical. The chlorine radicals then reacts with stratospheric ozone to form chlorine monoxide radicals and molecular oxygen. Reaction of chlorine monoxide radical with atomic oxygen produces more chlorine radicals. The chlorine radicals are continuously regenerated and cause the breakdown of ozone. Thus, CFCs are transporting agents for continuously generating chlorine radicals into the stratosphere and damaging the ozone layer.
- **Statement 2 is not correct: In winter, a special type of clouds called polar stratospheric clouds are formed over Antarctica.** They contain water, nitric acid and/or sulfuric acid. They are formed mainly during the event of the polar vortex in winter; more intense at the south pole. The Chlorine-catalyzed ozone depletion is dramatically enhanced in the presence of polar stratospheric clouds (PSCs). These polar stratospheric clouds provide a surface on which chlorine nitrate formed gets hydrolyzed to form hypochlorous acid. It also reacts with hydrogen chloride produced to give molecular chlorine. **Hence, PSCs don't prevent the spread of the ozone hole, rather they promote ozone depletion.**
- **Statement 3 is correct:** The thickness of the ozone in a column of air from the ground to the top of the atmosphere is measured in terms of Dobson units (DU). One Dobson unit being equivalent to a layer of pure ozone 0.01 mm thick at standard temperature and pressure.

Q 59.B

- The rate of decomposition of detritus is regulated by the climatic factors like temperature and soil moisture as well as the chemical quality of detritus (dead matter). These factors limit the rate of decomposition through their regulatory effect on the activities of soil microbes.
 - **Temperature and soil moisture:** Organic waste matter decomposes rapidly at high temperatures (>25 degree Celsius) and moist conditions of humid tropical regions. However, low temperature (<10 degree Celsius) sharply reduces the decomposition rate even if the moisture content of the soil is high. **Hence statement 1 is not correct.**
 - **Chemical quality of Detritus:** The chemical quality of detritus is determined by the relative proportions of water-soluble substances like sugars, polyphenols, lignin, and nitrogen. Within the same climatic conditions, the decomposition rate is high when detritus is rich in nitrogen and has low amounts of lignin. High quantities of lignin and chitin lower the rate of decomposition. **Hence statement 2 is correct.**

Q 60.C

- **Access and Benefit Sharing Agreement (ABSA)**
 - It is an agreement that defines the fair and equitable sharing of benefits arising from the use of genetic resources. It requires a foreign partner to get prior consent from the host country to use a biological resource. Such an agreement must result in a share of the benefits between the biodiversity-rich country and the prospecting firm.
- The concept of ABSA stems from the **Convention on Biological Diversity** which, among other objectives, seeks to ensure the fair and equitable sharing of benefits arising from genetic resources. **Hence, option (c) is the correct answer.**
- The **Nagoya Protocol, a supplementary agreement to the Convention on Biological Diversity**, provides a legal framework for implementing that objective. Article 5 of the Nagoya Protocol requires that benefits arising from the utilization of genetic resources, as well as from subsequent applications and commercialization, to be shared in a fair and equitable way with the party providing such resources. Article 5 states that such sharing shall be upon mutually agreed terms.
- **CBD Convention on Biological Diversity - 1994**
 - The objectives of the CBD are the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising from commercial and other utilization of genetic resources. The agreement covers all ecosystems, species, and genetic resources.
- **International Plant Protection Convention - 1952**
 - The IPPC aims to protect world plant resources, including cultivated and wild plants by preventing the introduction and spread of plant pests and promoting the appropriate measures for their control. The convention provides the mechanisms to develop the International Standards for Phyto-sanitary Measures (ISPMs), and to help countries to implement the ISPMs and the other obligations under the IPPC, by facilitating the national capacity development, national reporting and dispute settlement. The Secretariat of the IPPC is hosted by the Food and Agriculture Organization of the United Nations (FAO).
- **International Treaty on Plant Genetic Resources for Food and Agriculture - 2004**
 - The objectives of the Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.
 - The Treaty covers all plant genetic resources for food and agriculture, while its Multilateral System of Access and Benefit-sharing covers a specific list of 64 crops and forages. The Treaty also includes provisions on Farmers' Rights.
- **Convention on International Trade in Endangered Species of Wild Fauna and Flora - 1975**
 - It aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Through its three appendices, the Convention accords varying degrees of protection to more than 30,000 plant and animal species.

Q 61.B

- The Central Pollution Control Board of India (CPCB) is a statutory organisation under the Ministry of Environment, Forest and Climate Change. It was established in 1974 under the Water Act, 1974. The CPCB is also entrusted with the powers and functions under the Air Act, 1981. Hence statement 1 is not correct.
- The CPCB has wide-ranging powers and responsibilities like :
 - To advise the central government on any matter related to prevention and control of water and air pollution
 - Improvement of air quality
 - Plan nationwide programs for the prevention
 - Control and abatement of water and air pollution
 - **Coordinate the activities of SPCBs and resolve disputes among them. Hence statement 2 is correct.**

Q 62.D

- Adaptation is an attribute of the organism (morphological, physiological, behavioural) that enables the organism to survive and reproduce in its habitat. Many adaptations have evolved over a long evolutionary time and are genetically fixed. In the absence of an external source of water, the kangaroo rat in North American deserts is capable of meeting all its water requirements through its internal fat oxidation (in which water is a by product). It also has the ability to concentrate its urine so that minimal volume of water is used to remove excretory products.
- Many desert plants have a **thick cuticle on their leaf surfaces and have their stomata arranged in deep pits** to minimise water loss through transpiration. They also have a special photosynthetic pathway (CAM) that enables their stomata to remain closed during day time. Some desert plants like Opuntia, have no leaves - they are reduced to spines - and the photosynthetic function is taken over by the flattened stems.
- Mammals from colder climates generally have **shorter ears and limbs** to minimise heat loss. In the polar seas aquatic mammals like seals have a **thick layer of fat (blubber) below their skin** that acts as an insulator and reduces loss of body heat.
- **Hence option (d) is the correct answer.**

Q 63.D

- Estuaries are transitional zones between the sea and rivers where freshwater streams or rivers merge with the ocean. The temperature and water currents keep on changing considerably on a seasonal, daily and even hourly basis. **Hence statement 1 is correct.**
- In the estuaries, the water composition keeps on changing due to tidal action and water runoff from the land. Due to the accumulation of organic materials and agricultural chemicals from adjacent land into the water, the level of nutrients is also high. **Hence statement 2 is correct.**
- **Flora:** The flora includes seaweeds, marsh grasses, mangrove trees. The primary producers are phytoplankton, which is consumed directly by some fish. However, most of this phytoplankton form the primary food for small crustaceans and the zooplankton, which in turn are food for fish.
- **Fauna:** Estuaries constitute a variety of fauna including worms, oysters, crabs, and waterfowls. The estuarine animals show a number of adaptations to the unstable conditions of the environment. They have a special ability to maintain salt and water balance in the presence of a changing environment. They also have special adaptations to tidal and ocean action. **Hence statement 3 is correct.**

Q 64.D

- **Option (d) is correct:** Radioactive Pollution is defined as the increase in natural background radiation, emerging from the activities of a man using naturally occurring or artificially produced radioactive materials. Environmental radiation is divided into two types – natural and man-made radiation.
- Radiations from nature are – **cosmic radiations** from the outer space reaching the earth's surface and terrestrial radiation from natural radio-isotopes from the earth's crust.

- The cosmic rays containing highly energetic particles reach the surface of the earth causing pollution. The intensity of cosmic rays depends on latitudes and altitude of the place. The intensity is maximum at the poles and minimum at the equator. Also, naturally the minerals containing Uranium- 235 (U235), Uranium-238 (U238), Thorium-232 (Th232), Plutonium- 239 (Pu239) etc. are capable of emitting energetic radiations causing pollution.
- Man-made radiations originate from the use of radioactive materials. These materials are used in the production of nuclear weapons, nuclear fuel and electric power.
- **Nuclear fuels in atomic reactors produce pollution.** The heat given out during fission is converted into electricity. During this process, two types of wastes are formed: the fission products remaining in both the primary and secondary fuels and extraneous activation products in the coolant. The disposal of radioactive wastes causes pollution. The high-level products of nuclear wastes remain in the environment for several hundred years. Leakage in nuclear reactors causes environmental pollution.
- The use of **X-rays** is common for detecting skeletal disorders. Cancer patients undergo radium and other isotope radiations. The x-rays pass through genetic cells and affect chromosomes, resulting in mutations.

Q 65.C

- **Ladybird beetle, syrphid fly and soldier beetle are predator species used against agricultural pests.** These species are effective predators if aphids are abundant (high pest density). Ladybird beetle need to eat many aphids per day so that they can lay eggs.
- **Hence option (c) is the correct answer.**

Q 66.D

- **Option (a) is correct:** The upper stratosphere consists of considerable amount of ozone (O₃), which protects us from the harmful ultraviolet (UV) radiations coming from the sun. These radiations cause skin cancer (melanoma) in humans. Therefore, it is important to maintain the ozone shield. Ozone in the stratosphere is a product of UV radiations acting on dioxygen (O₂) molecules. The UV radiations split apart molecular oxygen into free oxygen (O) atoms. These oxygen atoms combine with the molecular oxygen to form ozone.
- **Option (b) is correct:** Ozone is thermodynamically unstable and decomposes to molecular oxygen. Thus, a dynamic equilibrium exists between the production and decomposition of ozone molecules. In recent years, there have been reports of the depletion of this protective ozone layer because of the presence of certain chemicals in the stratosphere.
- **Option (c) is correct:** The main reason of ozone layer depletion is believed to be the release of chlorofluorocarbon compounds (CFCs), also known as Freons. These compounds are non-reactive, non-flammable, non-toxic organic molecules and therefore used in refrigerators, air conditioners, in the production of plastic foam and by the electronic industry for cleaning computer parts etc. Once CFCs are released in the atmosphere, they mix with the normal atmospheric gases and eventually reach the stratosphere.
- **Option (d) is not correct:** In 1980s, for the first time, atmospheric scientists working in Antarctica reported about depletion of ozone layer commonly known as ozone hole over the South Pole. It was found that a unique set of conditions was responsible for the ozone hole.

Q 67.D

- On the basis of possession of a backbone or a spinal column, animals can be classified into two main groups: vertebrates and invertebrates.
- Vertebrates are animals that have a backbone inside their body. The major groups include fish, amphibians, **reptiles**, birds, and mammals.
- Invertebrates do not have a backbone. The major groups include **Crustaceans, Molluscs, Insects, flatworms** etc.
- **Hence option (d) is the correct answer.**

Q 68.D

- Resources presently extracted from the sea or areas that were formerly in the sea range from common construction materials to high-tech metals to water itself and presently serve as major resources for humans.
- Principal **mineral resources** - Salt, or sodium chloride; Pottasium, Magnesium, Placer Gold, Tin, Titanium, and Diamonds. etc
- **Sand and gravel, limestone and gypsum** - beaches and near-shore sediments are locally extracted for use in **construction and building industries**.
- Solar, mechanical (wave and tidal), thermal, and wind energy can all be generated at sea, to supplement conventional sources of **non-renewables** such as oil and gas.
- **Fossil fuels** derived from the decay and compression of land vegetation in areas that have since sunken below sea level – **natural gas and petroleum** are being exploited in shallow and deep water.
- **Hence all the options are correct.**

Q 69.B

- A disaster is a natural or man-made event which causes large scale loss of life and property.
- **Natural disaster:** they are of natural origin. They are geological or weather-related occurrences like volcanic eruptions, earthquakes, avalanches, drought, floods etc.
- **Man-made disasters:** They are exclusively of human origin they include war, forest fires, building fires, air crashes, train accidents, the collapse of the bridge, nuclear attack etc.
- **Forest Fires:** They are usually caused by agriculture or forestry activities for the clearing of uncultivated land, renewal of pastures, burning of stubble etc. It is a man-made disaster. Fires may also be caused by negligence due to recreational and tourist activities.
- **Earthquake:** It is a sudden trembling of the earth crust. It is a geological phenomenon and is hence a natural disaster.
- **Volcanic eruption:** It is an eruption of molten lava due to seismic activities which is a geological phenomenon.
- **Avalanche:** Rapid downslope movement of snow and ice in steep mountain areas. It is usually triggered by earthquakes, heavy rainfall etc.
- **Drought:** Acute shortage of water that occurs when rainfall drops below a certain level.

Q 70.D

- **Particulates pollutants** are the **minute solid particles or liquid droplets in air**. These are present in vehicle emissions, smoke particles from fires, dust particles and ash from industries. Particulates in the atmosphere may be **viable or non-viable**.
- The **viable particulates** e.g., **bacteria, fungi, moulds, algae** etc., are minute living organisms that are dispersed in the atmosphere. Human beings are allergic to some of the fungi found in air. They can also cause plant diseases.
- **Non-viable particulates** may be classified according to their nature and size as follows: **Smoke particulates** consist of **solid or mixture of solid and liquid particles** formed during combustion of organic matter. Examples are:
 - cigarette smoke, smoke from burning of fossil fuel, garbage and dry leaves, oil smoke etc.
 - **Dust is composed of fine solid particles** (over $1\mu\text{m}$ in diameter), produced during crushing, grinding and attribution of solid materials. Sand from sand blasting, saw dust from wood works, pulverized coal, cement and fly ash from factories, dust storms etc., are some typical examples of this type of particulate emission.
 - **Mists** are **produced by particles of spray liquids** and by condensation of vapours in air. Examples are sulphuric acid mist and herbicides and insecticides that miss their targets and travel through air and form mists.
 - **Fumes** are generally **obtained by the condensation of vapours** during sublimation, distillation, boiling and several other chemical reactions. Generally, organic solvents, metals and metallic oxides form fume particles.
- **Hence option (d) is the correct answer.**

Q 71.A

- **Statement 1 is correct and 2 is not correct:** Captive breeding is the process of breeding animals outside their natural environment in restricted areas like zoos and aquariums. The choice of individual animals that are to be part of a captive breeding population, and the mating partners within that population, are controlled by humans. Captive breeding is generally carried out for one of these main purposes:
 - To produce animals for zoos, aquaria, research institutions, and other public facilities.
 - **To provide for education and exhibition of interesting species.**
 - **To increase captive population numbers of threatened or endangered species.** In some cases, these individuals are part of a management program aimed at eventually reintroducing captive-bred animals into wild habitats and populations.
 - To produce animals for commercial purposes (pets, food, fibre, medicine, and other human uses).
- **Statement 3 is not correct:** Nandankanan Zoological Park is a zoological as well as a botanical garden in Odisha. It captive-breeds a number of species. It is the pioneer in conservation breeding of Gharials. There is also a Pangolin Conservation Breeding Center for the endangered Indian pangolin. White tiger, which is a recessive mutant of the Bengal tiger, was reported in the wild from time to time in Assam, Bengal, Bihar and especially from the former State of Rewa (now in Madhya Pradesh). Currently, many Indian zoos captively breed white tiger. **New Delhi has loaned out white tigers to many other zoos in India. Alipore Zoo in Kolkata has white tigers. Nandankanan zoo is believed to have the highest number of white tigers in captive breeding.**

Q 72.D

- **Option (d) is correct:** Vehicles are mainly responsible for more than 80 per cent of total air pollution. The major pollutants released from automobiles, locomotives, aircraft, etc., include Carbon Monoxide (CO), Unburnt hydrocarbons and nitrogen monoxide, nitrogen dioxide, suspended particulate matter emissions.
- In metropolitan cities, vehicular exhausts account for most of the CO, hydrocarbons, oxides, and suspended particulate matter emissions.

Q 73.B

- **Environmental Impact Assessment is defined as an activity that has been designed to identify, predict and interpret the impact of an action on human health, including the well being of the ecosystem on which the survival of human beings depends.**
- Environment Impact Assessment in India is statutorily backed by the **Environment Protection Act in 1986**, which contains various provisions on EIA methodology and process. **Hence, statement 1 is correct.**
- EIA covers the following projects :
 - Development projects such as (a) mining (b) thermal power plants (c) river valley (d) communication projects (e) ports and harbours (f) road, highways, bridges etc and (g) airports.
 - Those which are sensitive and located in environmentally degraded areas.
 - Those which require the approval of the Public Investment Board / Planning Commission / Central Electricity Authority.
 - Other sectors such as irrigation, power, transport, tourism, communications etc.
- **It is necessary to involve the public while making the Environment Impact Assessment.** The planning reports and the projected environmental impacts are **presented to the public**. This is done by interacting with the community representatives or with a small group of people at the local level. **Hence statement 3 is correct.**
- The environmental clearance process for new projects consists of four stages, some of which may not be required for all projects. These four stages in sequential order are:
 - **Screening stage:** At the screening stage, the **State level Expert Appraisal Committee (SEAC)** reviews the application to determine whether the project requires further environmental studies for the preparation of an EIA report.
 - **Scoping stage:** At the scoping stage, detailed and comprehensive Terms of Reference (TOR) addressing all relevant environmental concerns for the preparation of an EIA report are determined. This is carried out by the **Expert Appraisal Committee (EAC)** for Category A projects and by the

State-level Expert Appraisal Committee (SEAC) for Category B1 projects. Scoping is not required for B2 projects.

- **Public Consultation stage:** This stage involves consultation with project-affected persons on the effects of the project. Public consultation is required for all Category A and Category B1 projects, with some exceptions including projects involving the expansion of Roads and Highways which do not involve any further acquisition of land. The concerns heard during the public consultation process must be addressed in the EIA report and in the Environmental Management Plan.
- **Appraisal stage:** This stage sees the overall and detailed scrutiny of the final EIA report, which will have been presented to EAC or SEAC. The EAC or SEAC considers the environmental aspects of the project and makes a recommendation to the Regulatory Authority on whether prior EC should be granted or not. **Hence, statement 2 is not correct.**

Q 74.C

- In sanitary landfill the waste is packed and dumped at the site and is covered with earth daily to prevent insects and rodents from entering into the landfill. The waste then is subjected to the bacterial decomposition. Firstly, aerobic bacteria deplete the available oxygen and as the result the temperature inside the landfill increases.
- After the depletion of oxygen, anaerobic condition establishes and Hydrogen and Carbon dioxide are evolved. After this Methane gas generates and organic matter starts depleting. Thus, physical, chemical and biological reaction that takes place inside the sanitary landfill generated different gases like Carbon dioxide, methane, Ammonia and hydrogen sulphide.
- **Hence both statements 1 and 2 are correct.**

Q 75.D

- **Agricultural Marketing (AGMARK) is a certification mark employed on agricultural products in India, assuring that they conform to a set of standards.**
 - It is **issued by Directorate of Marketing and Inspection** of the Government of India of agricultural products for domestic trade and export.
 - It is **legally enforced in India by the Agricultural Produce (Grading and Marking) Act of 1937 (and amended in 1986)**. The present AGMARK standards cover quality guidelines for **225 different commodities**.
 - While framing the standards, the existing standards in The Food Safety and Standards Act, 2006, Codex Alimentarius Commission, International Organisation for Standardization, etc. are considered. Trade Associations, Research Institutions, etc. are also consulted.
 - **For Blended Edible Vegetable Oils and Fat Spread certification under AGMARK is mandatory as per provisions in The Food Safety and Standards Act and regulations, 2006.**
 - The commodities certified under Agmark for domestic trade are spices, ghee, butter, mustard oil, wheat atta, Besan, honey, etc.
- **ISI Mark is issued by Bureau of Indian Standards (BIS) for industrial products and certain food and related products like condensed milk, partly skimmed and skimmed condensed milk, packaged natural mineral water, milk-cereal based weaning foods, etc. It is effective since 1955.**
 - The **erstwhile Indian Standards Institution (now Bureau of Indian Standards) was established in the year 1947** with the objective of harmonious development of standardization activity in India.
 - **BIS was established under the BIS Act, 1986** for the harmonious development of the activities of standardization, marking and quality certification of goods and for matters connected therewith or incidental thereto.
 - A **new Bureau of Indian Standards Act, 2016** which was notified on 22nd March 2016, has been brought into force with effect from 12 October 2017 that reinforces the activities of BIS in respect to standardization and certification of goods, articles, processes, systems and services.
 - Indian Standards are **formulated through specialist technical committees** (functioning under the Division Councils) **namely, Sectional Committees**

- All established standards are **reviewed periodically, at least once in five years**, to determine the need for revision or withdrawal. Standards which in the opinion of the Sectional Committee need no revision or amendment are reaffirmed by the Sectional Committee.
- **Decisions in BIS technical committees are reached through consensus.**
- As a policy, the standards formulation activity of BIS has been harmonized as far as possible with the relevant standards as laid down by the International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC). BIS, being a signatory to the 'Code of Good Practice for the preparation, adoption and application of standards (Article 4 of WTO-TBT Agreement, Annex 3)' has also accordingly aligned its standards formulation procedure.
- The mark certifies that a product conforms to the Indian Standards, mentioned as **IS: XXXX** on the top of the mark.
- **Fruit Product Order/FPO Mark is issued by Ministry of Food Processing for processed fruit products. It is effective since 1955.**
 - This mark is a certification mark **mandatory for all the "processed fruit products" in India.**
 - This mark is **applicable** on food such as packaged fruit beverages, fruit-jams crushes and squashes, pickles, dehydrated fruits, products and fruits extracts, following the food safety and standard act of 2006.
 - This mark **proves that this product has been manufactured in a clean 'food safe' environment and is not harmful for people's health.**

Q 76.D

- **Electrostatic precipitator: electrostatic precipitator can remove over 99 per cent particulate matter** present in the exhaust from a thermal power plant. It has electrode wires that are maintained at several thousand volts, which produce a corona that releases electrons. These electrons attach to dust particles giving them a net negative charge. The collecting plates are grounded and attract the charged dust particles. The velocity of air between the plates must be low enough to allow the dust to fall.
- **Scrubber: It can remove gases like sulphur dioxide.** In a scrubber, the exhaust is passed through a spray of water or lime.
- **Catalytic converters:** They are fitted into automobiles for reducing the emission of poisonous gases. As the exhaust passes through the catalytic converter, **unburnt hydrocarbons are converted into carbon dioxide and water**, and carbon monoxide and nitric oxide are changed to carbon dioxide and nitrogen gas, respectively. Motor vehicles equipped with catalytic converter should use unleaded petrol because lead in the petrol inactivates the catalyst

Q 77.C

- The standing water or lentic or pond ecosystem is divided into three different zones which are usually determined by depth and distance from the shoreline.
 - **Littoral zone:** The topmost zone near the shore of a lake or pond is the littoral zone. This zone is the warmest since it is shallow and can absorb more of the Sun's heat. It sustains a fairly diverse community, which can include several species of algae, rooted and floating aquatic plants, grazing snails, clams, insects, crustaceans, fishes and amphibians. The vegetation and animals living in the littoral zone are food for other creatures such as turtles, snakes, and ducks.
 - **Limnetic zone:** The near-surface open water surrounded by the littoral zone is the limnetic zone. It is well-lighted and is dominated by plankton, both phytoplankton, and zooplankton. A variety of freshwater fish also occupies this zone.
 - **Profundal zone:** The deep-water part of the lake or pond is called the profundal zone. This zone is much colder and denser than the other two. Little light penetrates all the way through the limnetic zone into the profundal zone. The fauna is heterotrophs, meaning that they eat dead organisms and use oxygen for cellular respiration. **Hence option (c) is correct.**

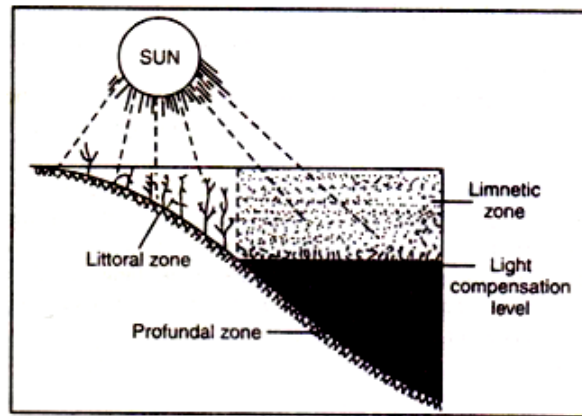


Fig. 4.9. Three major zones of a freshwater lake.

Q 78.C

- **Option 1 is not correct:** Tidal energy uses the periodic rise and fall of waters of the ocean for generation of electricity and not run of the river system.
- **Option 2 is correct:** Small-scale hydro project: The flow of river water is harnessed by channelising it through a narrow canal without any creation of artificial reservoir, this type of system is called as 'run of the river systems'. It produces small amount of electricity which can be utilized on a small scale.
- **Option 3 is not correct:** Large reservoir based hydro project: It involves creation of artificial reservoir of water to produce a huge amount of electricity. Run-of-river systems do not rely on large storage reservoirs, but rather on the diverted river water to drive turbines, and then discharge the water back into the river system.

Q 79.A

- The process of breaking down of complex organic matter into inorganic substances like carbon dioxide, water, and nutrients by decomposers is referred to as decomposition. The important steps in the process of decomposition are fragmentation, leaching, catabolism, humification, and mineralization.
- Detritivores (e.g., earthworm) break down detritus into smaller particles. This process is called fragmentation. By the process of leaching, water-soluble inorganic nutrients go down into the soil horizon and get precipitated as unavailable salts.
- **Bacterial and fungal enzymes degrade detritus into simpler inorganic substances. This process is called catabolism. Hence option (a) is the correct answer.**
- Humification leads to accumulation of a dark-colored amorphous substance called humus that is highly resistant to microbial action and undergoes decomposition at an extremely slow rate. Being colloidal in nature it serves as a reservoir of nutrients. The humus is further degraded by some microbes and release of inorganic nutrients occur by the process known as mineralization. Decomposition is largely an oxygen-requiring process.

Q 80.C

- In most ecosystems, all the pyramids, of number, of energy and biomass are upright, i.e., producers are more in number and biomass than the herbivores, and herbivores are more in number and biomass than the carnivores. Also energy at a lower trophic level is always more than at a higher level.
- However, there are exceptions to this generalisation: The pyramid of biomass in sea is generally inverted because the biomass of fishes far exceeds that of phytoplankton. **Hence statement 1 is correct.**
- **Pyramid of energy is always upright**, can never be inverted, because when energy flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step. Each bar in the energy pyramid indicates the amount of energy present at each trophic level in a given time or annually per unit area. **Hence statement 2 is correct.**

Q 81.A

- **Option 1 is correct:** The Infra red part of electromagnetic spectrum of sunlight is responsible for heating up the solar cooker as well as in solar water heater. A solar cooker lets the UV light rays in and then converts them to longer infrared light rays that cannot escape, that infrared radiation has the right energy to make the water, fat and protein molecules in food vibrate vigorously and heat up.

- **Option 4 is not correct:** UV-C is the part of sun rays which is the deadliest and is absorbed by the ozone layer.
- **Options 2 and 3 are not correct:** UV-B and UV-A are mild in comparison to UV-C but they are not absorbed by ozone layer.

Q 82.D

- Solar energy can be converted into other forms of energy by methods like Photovoltaic method, Thermal method, etc.
- **Photovoltaic Method:** In this method, **the sun's energy is directly converted into electricity using a photovoltaic cell or solar cell.** The electricity produced through this method is used for street lighting, radio and television sets, lighting houses, water pumps, sprayers, etc. Whereas, photosynthesis is the process by which green plants and certain other organisms transform light energy into chemical energy. During photosynthesis in green plants, light energy is captured and used to convert water, carbon dioxide, and minerals into oxygen and energy-rich organic compounds.
- **Thermal Method:** In this method, **solar radiation in the form of heat is converted into mechanical, electrical or chemical energy by using solar thermal devices like cookers, heaters, dryers, etc.** The thermal system makes use of solar collectors which are capable of converting incident radiation from the sun into heat. In these systems, solar reflectors concentrate sunlight onto a receiver, which contains liquid. The heated liquid drives turbine, producing electricity with an overall efficiency of about 20 per cent.
- **Hence statements 1 and 2 are not correct.**

Q 83.B

- **Environmental Pollution (Prevention and Control) Authority (EPCA) is a Supreme Court mandated body tasked with taking various measures to tackle air pollution in the National Capital Region.**
- **It was notified in 1998 by Environment Ministry under Environment Protection Act, 1986. Its mandate is to protect and improve the quality of the environment and prevent and control environmental pollution in the National Capital Region.**
- It is also mandated to **enforce the Graded Response Action Plan (GRAP) in NCR as per the pollution levels.** In November 2017, EPCA had enforced several measures, including a ban on brick kilns, closure of Badarpur thermal power plant, hot mix plants and stone crushers, and construction activities in NCR.

Q 84.D

- **Joint Forest Management (JFM) is one of the most significant efforts in India to involve local communities in managing degraded forest lands under government control.**
- Under joint forest management (JFM), **village communities are entrusted with the protection and management of nearby forests.** The areas concerned are usually degraded or even deforested areas. The communities are required to organize forest protection committees, village forest committees, village forest conservation and development societies, etc. Each of these bodies has an executive committee that manages its day-to-day affairs.
- **In return for their services to the forest, the communities get the benefit of various forest products (e.g., fruits, gum, rubber, medicine, etc.), and thus the forest can be conserved in a sustainable manner.**
- Ministry of Environment Forests and Climate Change consolidated the intervention on participatory forest management through the **National Forest Policy, 1988**, and then through **enabling guidelines in 1990 on Joint Forest Management (JFM).**
- States followed their own guidelines on the JFM programme.
- The JFM programme got further impetus when the JFM Cell and National Afforestation and Eco-Development Board (NAEB) evolved the concept of **Forest Development Agencies (FDAs)** as an autonomous federation of JFMCs registered under the Societies Act 1860, for empowerment of the local communities for the regeneration of the forests and for livelihood creation activities.
- This provided financial support to JFM programme by the Government of India and facilitated fund flow to the implementing agency (-FDA) to their bank account directly from NAEB.

- In addition, financial support to JFM activities came from other sources in different states such as World Food Programme (WFP), Hariyali Yojana, District Rural Development Agency (DRDA), Tribal Development Schemes, externally aided projects, etc.
- In some states like Arunachal Pradesh, Mizoram, Meghalaya and Nagaland, JFM activities are confined to forest plantation areas which are fully funded under FDA.

Q 85.D

- An alien species is a species introduced outside its normal distribution. When alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive and cause decline or extinction of indigenous species.
- The Nile perch introduced into Lake Victoria in east Africa led eventually to the extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.
- Similarly, in the case of India invasive alien species weed species like **carrot grass (Parthenium)**, **Lantana** and **water hyacinth (Eichhornia)** have led to huge environmental damage. Illegal introduction of the African catfish *Clarias gariepinus* for aquaculture purposes is posing a threat to the indigenous catfishes in Indian rivers.
- **Native Species**
 - A native species is one that is found in a certain ecosystem due to natural processes, such as natural distribution and evolution. No human intervention brought a native species to the area or influenced its spread to that area. Native species are also called indigenous species.
- **Endemic species**
 - Endemic Species are species of those plants and animals which are found in just one particular region and nowhere else in the world. In other words, it can be said that endemic species are those which are only found in a given region or location and nowhere else.
 - Hibiscus is a genus of flowering plants in the mallow family, Malvaceae. The genus is quite large, comprising several hundred species that are native to warm-temperate, subtropical and tropical regions throughout the world. **The red hibiscus** is a flower that frequently appears in depictions of art in Bengal, India, often with the goddess and the flower merging in form. The red hibiscus is used as an offering to deities. **It is not an invasive species.**

Q 86.D

- Climate Change will affect agriculture yield because of the change in temperature and rainfall.
- **Climate and agricultural zones are likely to shift towards the poles.** Because average temperatures are expected to rise more near the north and south poles than near the equator, the shift in climate zones will be more pronounced at higher latitudes. In the mid-latitude regions (45° to 60°), present temperature zones could shift by 150–550 km. Since each of today's latitudinal climate belts is optimal for particular crops, such shifts could strongly affect agricultural and livestock production. Efforts to shift crops poleward in response could be limited by the inability of soil types in the new climate zones to support intensive agriculture as practiced today in the main producer countries.
- Because carbon dioxide is a natural fertilizer, the plants will grow larger and faster with increasing carbon dioxide in the atmosphere. Increased temperature will **impact agriculture production. Higher temperatures reduce the total duration of the crop cycle by inducing early flowering.** The shorter the crop cycle, the lower the yield per unit area. Agriculture will also benefit with the rise in temperature as the winter season will be shorter and the growing seasons longer. **Hence, option 1 is correct.**
- **Pest infection:** As the temperature rises conditions will become more favourable for pests such as grasshoppers to complete a number of reproduction cycles, thereby increasing their population in the high latitudes.
- **Effect on ecosystem and biodiversity:** Species that live in higher alpine zones would be forced to move higher up to find suitable habitat, thus reducing the area in which they can live. This could lead to the extinction of some mountain plants and animals. **Hence, option 2 is correct.**
- **Impact on marine life:** Corals will reduce because they are very sensitive to the higher temperatures which causes bleaching. **Hence, option 3 is correct.** Further, Zooplanktons that float on the sea surface

will decline in numbers. The number of fish and sea birds that feed on these organisms will also decline. Rising temperature in the Arctic endangers polar bears, seals and fish.

Q 87.A

- **Each trophic level has a certain mass of living material at a particular time called the standing crop.** The standing crop is measured as the mass of living organisms (biomass) or the number in a unit area. **Hence option (a) is the correct answer.**
- **The standing state** is the number of **inorganic nutrients** found in an ecosystem.

Q 88.C

- **Gene therapy is a collection of methods that allows correction of a gene defect that has been diagnosed in a child/embryo.** Here genes are inserted into a person's cells and tissues to treat a disease.
- **Correction of a genetic defect involves delivery of a normal gene into the individual or embryo to take over the function of and compensate for the non-functional gene.**
- The first clinical gene therapy was given in 1990 to a 4-year old girl with adenosine deaminase (ADA) deficiency. This enzyme is crucial for the immune system to function. The disorder is caused due to the deletion of the gene for adenosine deaminase. In some children ADA deficiency can be cured by bone marrow transplantation; in others it can be treated by enzyme replacement therapy, in which functional ADA is given to the patient by injection. But the problem with both of these approaches that they are not completely curative. As a first step towards gene therapy, lymphocytes from the blood of the patient are grown in a culture outside the body. A functional ADA cDNA (using a retroviral vector) is then introduced into these lymphocytes, which are subsequently returned to the patient. However, as these cells are not immortal, the patient requires periodic infusion of such genetically engineered lymphocytes. However, if the gene isolate from marrow cells producing ADA is introduced into cells at early embryonic stages, it could be a permanent cure.
- **Hence, both the statements are correct.**

Q 89.A

- Freshwater is defined as having a low salt concentration- usually less than 1%. Plants and animals in freshwater regions are adjusted to salt content and cannot survive in areas of high salt concentration (i.e. oceans).
- Freshwater ecosystems can be divided into two categories:
 - **A lentic ecosystem entails a body of standing water, ranging from ditches, seeps, ponds, seasonal pools, basin marshes, swamp and lakes.** Deeper waters, such as lakes, may have layers of ecosystems, influenced by light. Ponds, due to their having more light penetration, are able to support a diverse range of water plants. There are also known as Pond ecosystem.
 - **A lotic ecosystem can be any kind of moving water, such as a run, creek, brook, river, spring, channel or stream.** The water in a lotic ecosystem, from source to mouth, must have atmospheric gases, turbidity, longitudinal temperature gradation and material dissolved in it.

Q 90.A

- **Statement 1 is correct:** For drinking purposes, water should be tested for fluoride ion concentration. Its deficiency in drinking water is harmful to man and causes diseases such as tooth decay etc. However, F⁻ ion concentration above 2 ppm causes brown mottling of teeth. At the same time, excess fluoride (over 10 ppm) causes harmful effect to bones and teeth, as reported from some parts of Rajasthan.
- **Statement 2 is correct:** Drinking water gets contaminated with lead when lead pipes are used for transportation of water. The prescribed upper limit concentration of lead in drinking water is about 50 ppb. Lead can damage kidney, liver, reproductive system etc.
- **Statement 3 is not correct:** The maximum limit of nitrate in drinking water is 50 ppm. Excess nitrate in drinking water can cause disease such as methemoglobinemia ('blue baby' syndrome).

Q 91.A

- **The correct sequence of food chain in the given agroecosystem is: Mustard crop-aphid-beetle-bird.**
- Aphids, also known as plant lice (small sap-sucking insects) are dependent on Mustard crop. Aphids are eaten by beetle and beetle is eaten by small birds.

Q 92.C

- **Both the statements are correct:** The thermal power plants located near the rivers use water for cooling purposes. They release the recycled hot water into the rivers leading to thermal pollution. The hot water makes the temperature of the aquatic environment rise which endangers the aquatic ecosystem.
- Warm water does not have the same oxygen holding capacity as cold water. Therefore, some fishes which require a certain oxygen concentration, either emigrate from the polluted area or die.
- When the temperature in the water bodies increases, the dissolved oxygen level decreases. Thus, anaerobic conditions set in resulting in the release of foul gases. But, the Blue-green algae grow better in warm water, they produce a significant amount of toxins.

Q 93.D

<i>Name of the food article</i>	<i>Adulterant</i>	<i>Method for detection of common adulterants</i>
Oils and Fats (including mustard oil)	Argemone oil	Oil is taken in a test tube and equal quantity of concentrated Nitric acid is added to it. A red to reddish brown colour in lower (acid) layer would indicate the presence of Argemone oil.
Milk	Starch	A few drops of tincture of Iodine or Iodine solution are added to the milk. Formation of blue colour indicates the presence of starch.
Milk	Urea	Soybean or arhar powder is added to milk, taken in a test tube. The contents are mixed thoroughly by shaking the test tube and after 5 minutes, a red litmus paper is dipped in it. A change in colour from red to blue indicates the presence of urea in the milk.
Chillies powder	Brick powder, salt powder or talc powder	Any grittiness that may be felt on rubbing the sediment at the bottom of glass confirms the presence of brick powder/sand, soapy and smooth touch of the white residue at the bottom indicates the presence of soap stone. To a little powder of chilli, small amount of conc. HCl is added and it is mixed to the consistency of paste, the rear end of the match stick is dipped into the paste and held over the flame, a brick red flame colour is observed due to the presence of calcium salts in brick powder.
Turmeric	Metanil yellow colour	Appearance of magenta colour on the addition of concentrated Hydrochloric acid.
Black pepper	Papaya seeds	Papaya seeds can be separated out from pepper as they are shrunken, oval in shape and greenish brown or brownish black in colour.
Green chilli and green vegetables	Malachite green	A cotton piece soaked in liquid paraffin is taken and the outer green surface of a small part of green vegetable is rubbed. If the cotton turns, green, we can say that the vegetable is adulterated with malachite green.

Q 94.A

- A wetland is a place where the land is covered by water. Marshes, ponds, the edge of a lake/ocean, the delta at the mouth of a river, low-lying areas that frequently flood — all of these are wetlands.

- As per the **Ramsar Convention definition** most of the natural water bodies (such as rivers, lakes, coastal lagoons, mangroves, peatland, coral reefs) and man made wetlands (such as ponds, farm ponds, irrigated fields, sacred groves, salt pans, reservoirs, gravel pits, sewage farms and canals) in India constitute the wetland ecosystem.
- Wetlands are indispensable for the countless benefits or “ecosystem services” that they provide humanity, ranging from freshwater supply, **breeding and nesting areas for birds and animals**, food and building materials, to **control flood by protecting the coastlines from erosion** as well as reducing the damage from cyclones, groundwater recharge, **purifying water** and climate change mitigation etc.
- **Hence all the statements are correct.**

Q 95.D

- **Statement 1 is not correct:** The amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water is called Biochemical Oxygen Demand (BOD). The amount of BOD in the water is a measure of the amount of organic material in the water, in terms of how much oxygen will be required to break it down biologically. **Clean water would have a BOD value of less than 5 ppm whereas highly polluted water could have a BOD value of 17 ppm or more.**
- **Statement 2 is not correct:** Many inorganic chemical pollutants that include heavy metals such as cadmium, mercury, nickel etc are water-soluble and constitute an important class of pollutants. The Biochemical Oxygen Demand (BoD) is the measure of the oxygen needed to break down the organic matter and not the chemical/inorganic matter. **Therefore, Chemical pollutants are not included in Biochemical Oxygen Demand (BoD).**

Q 96.D

- **Statement 1 is not correct:** Mixing of **undesirable cheap and often harmful substances in edible materials** is called as **Food Adulteration**. Whereas, substances that are added to food to maintain or improve the safety, freshness, taste, texture, or appearance of food are known as **food additives**.
- **Statement 2 is not correct:** **Food Adulteration is a punishable crime** under **Prevention of Food Adulteration (PFA) Act 1954** (amended in 1964, 1976 and 1986). It has been enacted to **ensure the availability of pure and standard food to consumers and to protect them from deceptive trade practices**. The prevention of food Adulteration Act prohibits manufacture; sale and distribution of adulterated foods and foods contaminated with toxicants and misbranded foods.
- **Additives are needed to ensure processed food remains safe and in good condition** throughout its journey from factories or industrial kitchens, during transportation to warehouses and shops, and finally to consumers. Some food additives have been in **common use for preservation** – such as salt (in meats such as bacon or dried fish), sugar (in marmalade), or sulfur dioxide (in wine).
- According to World Health Organization, (WHO) the use of food additives is only justified when their use has a technological need, does not mislead consumers, and serves a well-defined technological function, such as to preserve the nutritional quality of the food or enhance the stability of the food.
- WHO, together with Food and Agriculture Organization of the United Nations (FAO), groups **food additives into 3 broad categories** based on their function.
 - **Flavouring agents** – which are added to food to improve aroma or taste – make up the greatest number of additives used in foods. Natural flavouring agents include nut, fruit and spice blends, as well as those derived from vegetables and wine. In addition, there are flavourings that imitate natural flavours.
 - **Enzyme preparations** are a type of additive that may or may not end up in the final food product. Enzymes are naturally-occurring proteins that boost biochemical reactions by breaking down larger molecules into their smaller building blocks. They can be obtained by extraction from plants or animal products or from micro-organisms such as bacteria and are used as alternatives to chemical-based technology. They are mainly used in baking (to improve the dough), for manufacturing fruit juices (to increase yields), in wine making and brewing (to improve fermentation), as well as in cheese manufacturing (to improve curd formation).
 - **Other additives** are used for a variety of reasons, such as preservation (maintain quality of food, help control contamination that can cause foodborne illness, including life-threatening botulism, etc.), colouring (added to food to replace colours lost during preparation, or to make food look more attractive), and sweetening (e.g. non-sugar sweeteners especially because they contribute fewer or no calories when added to food).

- **WHO, in cooperation with the FAO, is responsible for assessing the risks to human health from food additives.** Risk assessment of food additives are conducted by an independent, international expert scientific group – the **Joint FAO/WHO Expert Committee on Food Additives (JECFA)**. **Only food additives that have undergone a JECFA safety assessment, and are found not to present an appreciable health risk to consumers, can be used.** This applies whether food additives come from a natural source or they are synthetic. National authorities, either based on the JECFA assessment or a national assessment, can then authorize the use of food additives at specified levels for specific foods.
- The safety assessments completed by JECFA are used by the **joint intergovernmental food standard-setting body of FAO and WHO, the Codex Alimentarius Commission**, to establish levels for maximum use of additives in food and drinks. **Codex standards(also known as Food Code) are the reference for national standards for consumer protection, and for the international trade in food**, so that consumers everywhere can be confident that the food they eat meets the agreed standards for safety and quality, no matter where it was produced. The Codex Alimentarius Commission also establishes standards and guidelines on food labelling.
- **"Codex India"** is the the National Codex Contact Point (NCCP) which is located at Food Safety and Standards Authority of India (Ministry of Health and Family Welfare. It coordinates and promotes Codex activities in India in association with the National Codex Committee and facilitates India's input to the work of Codex through an established consultation process.

Q 97.D

- The **Vienna conference was the first global conference on the depletion of the ozone layer, held in Vienna, Austria in 1985.** It was held after a hole as large as the size of the US was discovered in the ozone layer. At this conference, Vienna convention for the protection of the Ozone layer was agreed. **Hence option (d) is the correct answer.**
- The **Saving the Ozone Layer Conference** was an international meet, which was organised **jointly by UNEP and the British Government in 1989**, to draw attention to the global problem created by the developed world, which was trying to dictate its terms to the developing countries for CFCs pollution. It stressed upon the final withdrawal of all Ozone depleting CFCs and other chemicals.
- The **United Nations Framework Convention on Climate Change (UNFCCC)** entered into force on 21 March 1994. Today, it has near-universal membership. The 197 countries that have ratified the Convention are called Parties to the Convention. The UNFCCC is a “Rio Convention”, one of three adopted at the “Rio Earth Summit” in 1992. Its sister Rio Conventions are the UN Convention on Biological Diversity and the Convention to Combat Desertification. The ultimate objective of the Convention is to "stabilise (and not eliminate) greenhouse gas concentrations in the atmosphere at a level that will prevent dangerous human interference with the climate system."
- At the **1992 Earth Summit in Rio de Janeiro**, world leaders agreed on a comprehensive strategy for “sustainable development” — meeting our needs while ensuring that we leave a healthy and viable world for future generations. One of the key agreements adopted at Rio was the **Convention on Biological Diversity**. The Convention on Biological Diversity is the international legal instrument for “the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources” that has been ratified by 196 nations.

Q 98.B

- **Greenhouse Gases (GHGs):** Atmospheric gases like carbon dioxide, methane, nitrous oxide (N₂O), water vapour, etc are capable of trapping the out-going infrared radiation from the earth’s surface thereby causing the greenhouse effect. Hence these gases are known as greenhouse gases and the heating effect is known as the greenhouse effect. Global warming potential.
- Global warming potential (GWP) is a measure of how much heat a greenhouse gas traps in the atmosphere up to a specific time horizon, relative to carbon dioxide.
 - Carbon dioxide(CO₂)-1
 - Methane(CH₄)-56
 - Nitrous Oxide(N₂O)-280
 - Sulphur hexafluoride(SF₆)-16300

Q 99.D

- Elements that are needed by living organisms in large amount are called macronutrients. Some of the macronutrients and their major functions are:
 - Carbon, Hydrogen- The basis constituents of life that drive all processes
 - Nitrogen- Structural component of proteins and nucleic acids
 - Phosphorous- a structural component of nucleic acids, phospholipids, and bone
 - Sulphur- structural component of many proteins
 - **Potassium- Major solute in animal cells**
 - **Calcium- Structural component of bone; regulator of cell permeability**
 - **Magnesium- Structural component of Chlorophyll**; involved in the function of many enzymes
 - **Iron- Structural component of haemoglobin** and many enzymes
 - Sodium- Major solute in extracellular fluids in animals

Q 100.C

- **The most dominant greenhouse gas overall is water vapour**, but it has a very short atmospheric lifetime (about 10 days). Water vapour is also a variable gas in the atmosphere, which decreases with altitude. Water vapour also decreases from the equator towards the poles. In the warm and wet tropics, it may account for four per cent of the air by volume, while in the dry and cold areas of desert and polar regions, it may be less than one per cent of the air. One unique feature about this greenhouse gas is that it absorbs both incoming and outgoing solar radiation.