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Test Booklet Series

C

TEST BOOKLET

GENERAL STUDIES (P) 2020 – Test–2974

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. Consider the following statements regarding Pietra Dura:

1. It is a style of ornamentation that came into existence during the regnal years of Shah Jahan.
2. This style carves floral designs made of semi-precious stones on to the walls of monuments.
3. This style of ornamentation was extensively used on to the walls of Taj Mahal.

Which of the statements given above is/are correct?

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

2. What is common to the sites - Eran, Gilund and Kayatha?

(a) Sites associated with the chalcolithic phase in India.
(b) Major political centres of the mahajanapada period.
(c) Urban cities of the Gupta period.
(d) Port settlements in ancient India.

3. Consider the following statements regarding the Rig Vedic society:

1. Women attended assemblies and performed rituals of sacrifice.
2. Widow remarriage was strictly prohibited.
3. Child marriage was widely prevalent during the Rigvedic period.

Which of the statements given above is/are correct?

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

4. Consider the following statements with respect to SARAL index:

1. Its objective is to rank the states based on the quality of higher education.
2. It was launched by NITI Aayog.

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

5. Which of the following is the objective of the campaign Angikaar?

(a) To create awareness among people regarding organ donation
(b) To mobilize youth to actively participate in the election process
(c) To promote social behavioural change by encouraging adoption of a series of wholesome lifestyle choices
(d) To create awareness about the benefits of breastfeeding

6. Consider the following differences between the *Chauth* and *Sardeshmukhi:*

1. While *Chauth* was collected for the neighbouring territories of the Deccan sultanates, *Sardeshmukhi* was collected for the territories within the Maratha Kingdom.
2. The *Chauth* and *Sardeshmukhi* amounted to *four percent and ten percent* of the land revenue assessment respectively.

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

7. With reference to the Telugu literature in medieval India, consider the following statements

1. Telugu literature forms a part of the Sangam texts.
2. It reached its peak during Chola empire.
3. Amukta Malyada is a rich collection of Telugu poetry written by Krishadevaraya.

Which of the statements given above is/are correct?

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

8. With reference to the scripts used in pre-historic and ancient India, consider the following statements:

1. The Harappan script is a pictographic script which is yet to be deciphered.
2. Brahmi script is written from right to left while Kharoshti script is written from left to right.
3. Greek and Aramaic scripts were used in writing Ashokan inscriptions in Afghanistan.

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

9. *It was a short-lived style of watercolour painting produced in the 19th century in Eastern India. It usually depicted popular Hindu deities, but scenes of contemporary life are also found.Though its themes were urban, the artists were rural migrants living in the surrounding villages. A typical theme in the painting shows Yashoda with baby Krishna. Famous artist Matisse and Picasso were influenced by its simplicity and boldness.*

The above passage best describes which of the following School of Indian folk painting?

(a) Patua
(b) Kalighat
(c) Paitkar
(d) Manjusha

10. With reference to the trade and commerce during the Mughal rule, consider the following statements:

1. Water transportation was widely used for the movement of bulk goods.
2. Food and textile products were the most important component of inter-regional trade.

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

11. In the context of cultural history of India, the terms *ghatikas* and *matha* refers to:

(a) traditional pottery works
(b) educational institutions
(c) poetic literary compositions
(d) commercial centers of trade and commerce

12. Consider the following statements regarding Dhrupad:

1. It is a form of Hindustani classical music.
2. Its lyrics are usually in the dialects of Hindi called Awadhi and Brij Bhasha.
3. Tansen was one of the most famous dhrupad singers.

Which of the statements given above is/are correct?

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

13. Consider the following statements about saint Basavanna:

1. He belonged to the Vaishnavaite sect.
2. He was a contemporary of the Vaishnavite saint Ramanujan.
3. The famous 'vachhanas' of Basavanna talked about welfare state.

Which of the statements given above are correct?

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

14. Consider the following cities and the corresponding dynasties under which they were founded:

	City		***Founded by***
1.	Jaunpur	:	Khalji Dynasty
2.	Agra	:	Lodhi Dynasty
3.	Hisar	:	Tughlaq Dynasty

Which of the pairs given above are correctly matched?

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

15. Consider the following statements regarding Hoysala temple architecture:

1. Hoysala temples were constructed in Vesara style.
2. The temples are laid out in a star-like pattern.
3. They have plain walls with no carvings.

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

16. Consider the following statements regarding Rig Vedic age:

1. During the Rig Vedic age, king was elected by tribal assembly called samiti.
2. A standing army under the military commander was maintained by king during the period.

Which of the statements given above are correct?

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

17. Which of the following was/were introduced by Akbar in India?

1. Assessment of revenue on the basis of measurement of land
2. A strong navy
3. Policy of matrimonial alliances

Select the correct answer using the code given below.

(a) 1 and 2 only
(b) 3 only
(c) 1, 2 and 3
(d) None

18. *This school of philosophy forms a part of vedic philosophy. It talks about systematic release of purusha from prakriti and admits the existence of God as a teacher and guide. It includes the element of yama, niyam, asana, dharna, pratyahara and Samadhi.*

Which of the following Schools of Indian philosophy is most accurately described by the above statements?

(a) Nyaya
(b) Vaisheshikha
(c) Yoga
(d) Vedanta

19. Which among the following statements regarding the Satavahana is/are ***not*** correct?

1. Satavahana rulers started the practice of rewarding and paying officers with land grants.
2. Coins bearing the names and images of rulers were issued for the first time by the Satavahana rulers.

Select the correct answer using the code given below.

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

20. Indian Council of Cultural Relations (ICCR) has been actively engaged in promoting India's soft power. Consider the following statements with reference to ICCR.

1. It is an attached body under the Ministry of Culture.
2. It is mandated to facilitate the celebration of International Yoga day since 2015

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

21. Which of the following statements is ***not*** correct regarding the Digambara sect of Jainism?

(a) Digambara monks do not wear clothes as they believe it increases the dependency and desire for material things.
(b) They believed that both men and women can attain salvation/moksha.
(c) They believe that Mahavira remained unmarried.
(d) Suttapahuda text contains the earliest record of the beliefs of Digambaras.

22. *This Indian painter is best known for uniting Hindu mythological subject matter with European realist historicist painting style. He/She was one of the first Indian artists to use oil paints and master the art of lithographic reproduction of his/her work. The depictions of Hindu deities and episodes from the epics and Puranas was a major theme of his/her work. Some of the famous works by the artist include Harischandra in Distress, Jatayu Vadha, Shakuntala.*

Which of the following Indian artists is being described in the above passage?

(a) Amrita Shergil
(b) Jaimini Roy
(c) Raja Ravi Varma
(d) Abanindranath Tagore

23. In the context of medieval history, *Moidam* refers to a*:*

(a) vaulted chamber for storing grains during the time of disasters in South India.
(b) handmade drawing on bamboo handicrafts in North-East India
(c) sport played during the harvest festival in North-West India.
(d) vaulted chamber entombing the deceased royal in North-East India.

24. Consider the following statements with respect to Regulatory Sandbox approach:

1. It refers to the testing of new products in a controlled regulatory environment with relaxations.
2. Recently Reserve Bank of India (RBI) released the enabling framework for the regulatory sandbox for financial products.

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

25. Which of the following crafts/techniques were introduced/popularised by Turks in India?

1. Iron stirrup
2. Use of Lime mortar for building
3. Printing Press
4. Cultivation of Tobacco and Pineapple

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

26. With reference to the development of science and technology in ancient India, consider the following statements:

1. The earliest expression of principles regarding the Pythagora's theorem were contained in Aryabhatiyam.
2. By the 2nd-century AD treatment for Kala-azar was known.
3. The concept of right and the acute angle was known by the 2nd century B.C.

Which of the statements given above is/are correct?

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

27. Which among the following Buddhist Stupas belong to the Saka-Satavahana Period?

1. Ramabhar Stupa
2. Nagarjunakonda
3. Sanchi Stupa

Select the correct answer using the code given below.

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

28. What is the correct chronological order in which the following ancient Indian texts were composed?

1. Sangam texts
2. Tipitaka
3. Tirukkural

Select the correct answer using the codes given:

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

29. Recently Royal Astronomical Society has defined a new class of celestial objects called 'ploonets', which are

(a) millions of dust particles orbiting the Sun between the Mars and the Jupiter.
(b) very small planets in distant galaxies which lose mass and get consumed by stars.
(c) stars which revolve around bigger stars.
(d) celestial bodies which are initially moons, but eventually move out and become independent planets.

30. Consider the following statements with respect to Central Wakf Council:

1. It is an executive body under the administrative control of the Ministry of Minority Affairs.
2. Secretary to the ministry of Minority Affairs is the ex-officio chairperson of the Central Waqf Council.
3. It can issue directions to the state governments to furnish information to the Council on the performance of the Wakf boards.

Which of the statements given above is/are correct?

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

31. With reference to the recently launched Project SU.RE, consider the following statements:

1. The project aims at making India the leading cotton apparel exporter.
2. It has been jointly launched by the Ministry of Textile and the Ministry of Commerce and Industry.

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. In the context of Sufism, *Malfuzat*, *Maktubat*, and *Tazkiras* are the

(a) ornamentation style used in shrines of sufi saints.
(b) sources used to reconstruct the history of sufi traditions.
(c) titles conferred upon sufi saints.
(d) sub-sects of sufi traditions.

33. *'Kutagarashala'* in the context of ancient India refers to:

(a) a haulting place where generally philosophical discussions among followers of various sects were held.
(b) fort where the convicts for the offence of religious blasphemy were kept.
(c) group tasked with planning and expansion of the state sponsored religious activities.
(d) factory for the refinement of various types of spices to be exported.

34. Which of the following statements about the social conditions during the Gupta period is/are correct?

1. Kshatriya occupied the top position in the society as the supremacy of Brahmans began to decline.
2. Shudras were allowed to listen to religious texts.
3. Position of upper-caste women improved as they were allowed to inherit landed property.

Select the correct answer using the code given below.

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

35. Dragonfly Mission, often seen in the news, is related to:

(a) protecting dragonflies due to their beneficial role in farming.
(b) developing an advanced combat helicopter.
(c) robotic mission to Saturn's largest moon, Titan for exploring life.
(d) developing next generation computing processor.

36. Which of the following factors led to the decline of the Mughal Empire under Aurangzeb?

1. Expansionist policy towards Deccan
2. Gradual failure of the mansabdari system
3. Religious discrimination

Select the correct answer using the code given below.

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

37. Which of the following events happened earliest?

(a) Shifting of capital of Magadha from Rajgriha to Patliputra.

(b) Vardhman Mahavira attained omniscience (kaivalya).

(c) Alexander invaded north-western India.

(d) Ashoka held the third Buddhist council.

38. *He emerged as one of the leading proponents of Vaishnavism in Assam in the late fifteenth century. His teachings, based on the Bhagavad Gita, focused on absolute surrender to the supreme deity. He encouraged the establishment of satras or monasteries for the transmission of spiritual knowledge. His major compositions include the Kirtana-ghosha.*

Who among the following is being described in the above passage?

(a) Namdeva

(b) Shankaracharya

(c) Shankaradeva

(d) Ramananda

39. Who among the following contributed to the field of medicine in ancient India?

1. Varahamihira
2. Charaka
3. Susruta
4. Vagbhata

Select the correct answer using the code given below.

(a) 1, 2 and 3 only

(b) 2, 3 and 4 only

(c) 1, 2 and 4 only

(d) 1, 3 and 4 only

40. Which of the following took place during Babur's reign?

1. Better defense against foreign invasions.
2. Strengthening of India's foreign trade.
3. Establishment of an all-India empire.
4. Large scale destruction of temples.

Select the correct answer using the code given below.

(a) 1 and 3 only

(b) 2, 3 and 4 only

(c) 1 and 2 only

(d) 1, 2, 3 and 4

41. Which of the following is/are correct regarding Sufi traditions?

1. Sufis sought an interpretation of the Qur'an on the basis of their personal experience
2. Sufis maintained austerity while maintaining absolute isolation from political power and the state.
3. A teaching master enrolled disciples and also established rules for spiritual conduct among the Sufis.

Select the correct answer using the code given below.

(a) 1 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

42. With reference to Scheme for Protection and Preservation of Endangered Languages (SPPEL), consider the following statements:

1. Its objective is to document and archive the country's languages that have become endangered or likely to be endangered in the near future.
2. This scheme was instituted by the Ministry of Culture.

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

43. Which of the following is ***not*** correct with reference to Aihole Inscription?

1. The inscription is located on the banks of Malprapha river in the fertile Raichur doab.
2. It is composed by poet named Ravikirti.
3. It belongs to Rashtrakuta dynasty.

Select the correct answer using the code given below.

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

44. Consider the following statements about Mauryan King Ashoka:

1. Ashoka Dhamma's primary objective was to attract and convert people to the Buddhist religion.
2. King Ashoka appointed the special officials for the peaceful functioning of the principles of Dhamma.

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. Consider the following pairs:

	Work		***Author***
1.	Ashtadhyayi	:	Panini
2.	Natyashastra	:	Bharata
3.	Dhatupatha	:	Aryabhata

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

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

46. Consider the following statements with respect to the Singapore Convention on Mediation:

1. It establishes a harmonized legal framework for the right to invoke settlement agreements and effective methods of resolving trade disputes.
2. India has recently signed the convention.

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 dynasties find a mention in the Ashokan inscriptions?

1. Cholas
2. Pandyas
3. Keralaputras

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

48. Which of the following is ***not*** one of the criteria by Sahitya Akademi for classical language status in India?

(a) High antiquity of early texts/recorded history of over 1500 to 2000 years
(b) Body of ancient literature/texts that is considered a valuable heritage by generations of speakers
(c) original literary tradition, not borrowed from another speech community
(d) No discontinuity between the classical language and its later forms or offshoots

49. In the context of Indian medieval history, *amara, bhandaravada and manya* refers to different types of*:*

(a) water harvesting methods
(b) cropping patterns
(c) land tenure systems
(d) grain storage methods

50. Consider the following statements regarding the reign of Saka ruler Rudradaman:

1. During his reign, Sudarshan lake was built.
2. Early specimen of Kavya style in ancient India is found in Junagarh inscription of Rudradaman.

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

51. Consider the following statements with reference to the Ganas (or Sanghas) of ancient India:

1. They were mostly located in and around the fertile alluvial tracts of the middle Ganga plains.
2. The Brahmanical texts provided an elaborate account of the organisation and the working of these Sanghas.
3. The ancient Ganas (or Sanghas) were organised and functioned as democracies.

Which of the statements given above is/are correct?

(a) 2 only
(b) 3 only
(c) 1 and 2 only
(d) None

52. Consider the following pairs:

	Puppet form		***State***
1.	Kathputli	:	Maharashtra
2.	Kundhei	:	Orissa
3.	Pavakoothu	:	Tamil Nadu

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

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

53. With reference to the recently released report 'State of Food Security and Nutrition in the World, 2019', consider the following statements:

1. The report was prepared by the International Food Policy Research Institute (IFPRI).
2. According to the report, the number of people who suffer from hunger has increased globally over the past three years.
3. It reported Asia as the continent with the highest prevalence of undernourishment.

Which of the statements given above is/are correct?

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

54. Consider the following:

1. Recognition of existence of God
2. Prohibition on practice of agriculture
3. Complete disagreement with varna system

Which of the above is/are the feature/s of Jainism ?

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

55. Consider the following statements regarding Amir Khusrau:

1. He was a disciple of the Sufi saint Hazrat Nizamuddin Auliya.
2. He evolved a new style of music referred to as Qawwalis.
3. He created a new form of poetry known as Sabaq-i-Hind or the Indian style.

Which of the statements given above is/are correct?

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

56. Which of the following reasons account for the shift of capital from Gulbarga to Bidar for the Bahmani Kingdom?

1. Bidar was more closely located to the Vijayanagara empire and hence provided an advantage to the Bahmani Kingdom during the conflict.
2. Bidar was located on the banks of Krishna River and hence provided for rich fertile grounds.
3. Bidar formed the point of convergence for the three linguistic areas namely - Marathi, Kannada, and Telugu.

Select the correct answer using the code given below.

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

57. Consider the following statements with reference to the Total Fertility Rate (TFR) in India:

1. Bihar has the highest TFR among the states in India.
2. TFR in India has steadily declined in the last ten years.
3. Only the Indian states south of the tropic of cancer have a TFR below the replacement level.

Which of the statements given above is/are correct?

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

58. A research team at IIT Madras has developed a script called Bharati Script. It is

(a) a new script for English language which does not use Latin alphabets.
(b) an AI algorithm that attempts to decipher the Harappan script.
(c) a unified script for nine Indian languages.
(d) a set of symbols that can be used to link codes written in different programming languages.

59. Consider the following statements regarding the Rashtrakuta dynasty:

1. They established close trade relations with the Arabs.
2. The rock-cut Kailashnatha temple at Ellora was built by King Dantidurga of the Rashtrakuta dynasty.
3. It was involved in a tripartite struggle with the Gurjara-Pratihara and Pala dynasties over the control of Kannauj.

Which of the statements given above is/are correct?

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

60. In the context of the later Vedic period, the term 'goghna' referred to

(a) a guest who was fed by sacrificing a cattle.
(b) a place where men and women gathered for festive celebrations.
(c) a ritual involving rhythmic chanting of Vedic mantras.
(d) a person who was responsible for veterinary service to cows in the area.

61. Which of the following statements are correct regarding *Tantrism?*

1. Tantric worship is predominantly associated with the female goddess.
2. It had influences over both Hinduism as well as Buddhism
3. Tantric practices frequently ignored the authority of the Vedas.

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

62. Consider the following pairs with reference to the terms prevalent during Maratha age:

	Term		***Meaning***
1.	Majumdar	:	Accountant
2.	Dabir	:	Master of ceremonies
3.	Sari-i-naubat	:	Responsible for intelligence post and household affairs
4.	Waqenavis	:	Senapati

Which of the pairs given above are correctly matched?

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

63. Which of the following are related to Dravida style of Architecture?

1. Absence of boundary walls
2. Presence of gopuram
3. Presence of water tank

Select the correct answer using the code given below.

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

64. Consider the following statements regarding Bharatnatyam and Odissi dances:

1. While Bharatnatyam is completely based on Hindustani music, Odissi dance is based completely on carnatic music.
2. Tribhanga posture and hand mudras are found in Bharatnatyam and not in Odissi.
3. While Bharatnatyam originated in the temples of Tamil Nadu, Odissi dance had roots in village folk traditions.

Which of the statements given above is/are correct?

(a) 1 only
(b) 1 and 3 only
(c) 1, 2 and 3
(d) None

65. Consider the following statements about the Mathura school of art:

1. It flourished under the patronage of Kushana rulers.
2. It had foreign influence.
3. It contained only Buddha images.

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

66. Consider the following statements with reference to the Neolithic period (or the New Stone Age) in India:

1. Neolithic settlements of south India are generally older than the ones in northern India.
2. People were largely dependent on hunting, fishing and gathering as cultivation had not yet begun.
3. Neolithic people used foot wheels to make pots.

Which of the statements given above is/are correct?

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

67. Consider the following statements:

1. Both Koodiyattam and Mudiyettu are traditional folk theatre forms of Kerela.
2. While Koodiyattam depicts the story of Bhadrakali, Mudiyettu is based on Sanskrit theatre tradition.
3. While Mudiyettu is recognised under UNESCO's list of intangible cultural heritage, Koodiyaattam is not.

Which of the statements given above is/are ***not*** correct?

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

68. Consider the following statements about the sites associated with the Indus Valley Civilization:

1. Chanhudaro was an important centre of craft activity and hosted a bead factory.
2. Lothal was famous for its dockyard which lies on the eastern edge of the site.
3. The city of Dholavira had a unique water harvesting and management system.

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

69. *'This Hindu temple belongs to the Karkota period of Kashmir built during the eighth and ninth centuries. This temple is built in the middle of a tank. A row of elephants at the base and a decorated doorway are the only embellishments on the shrine.'*

Which of the following temple is being described in the above passage?

(a) Kamakhya temple
(b) Siddheshvara Mahadeva temple
(c) Pavapuri temple
(d) Pandrethan temple

70. With reference to the religious history of India, consider the following statements:

1. Madhyamika and Yogacara are schools of Hinanyana Buddhism.
2. Yogacara believes that the world is built by consciousness and had no reality than the dream.

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

71. Land grants became frequent from the fifth century A.D. What was/were the impact of land grants on the socio-economic conditions of Indian society?

1. It led to the expansion of land under agricultural practices.
2. It led to the proliferation of caste in Indian society.
3. It led to the spread of Tantrism in tribal societies.

Select the correct answer using the code given below.

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

72. Which of the following statements are correct regarding Guru Nanak?

1. He wished to establish a new religion distinct from both Hinduism and Islam.
2. He created the *Guru-Mukhi* script to better communicate with his disciples.
3. He established the first Sikh commune at Kartarpur.
4. He started the concept of a free community kitchen(langar) to uphold the principle of equality.

Select the correct answer using the code given below.

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

73. Arrange the following administrative units during the time of Delhi Sultanate from the smallest to the largest unit of administration:

1. Iqtas
2. Shiqs
3. Pargana

Select the correct answer using the code given below.

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

74. With reference to Rajput miniature paintings, which of the following statements is/are correct?

1. The life of Krishna was a famous theme across various schools of Rajput paintings
2. Bani Thani is a famous work under the Bundi school of Rajput painting .
3. Nihal Chand was a famous painter associated with the Kishangarh school of Rajput paintings

Select the correct answer using the code given below.

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

75. Which of the following is correct regarding *Tauhid-i-ilahi, a* new faith promulgated by Akbar?

(a) It believed in the supremacy of religious scriptures.
(b) Only those approved by Akbar were allowed to join as a member.
(c) It was used as a tool to assert political authority of ruler over the subjects.
(d) The members were paid one time monetary incentive to join the order.

76. Consider the following pairs :

	Literary work		***Author***
1.	Devichandraguptam	:	Visakhadatta
2.	Kavyadarsa	:	Dandin
3.	Kritarjuniya	:	Bharavi

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

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

77. Recently the Union Ministry of Health and Family Welfare has put a ban on Colistin, an antibiotic. It was used in which of the following cases?

1. In the treatment of infections caused by Gram-negative bacilli bacteria
2. For treating Ebola.
3. As a growth promoter in poultry.

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) 3 only

78. *'A contemporary of Babur, he established his empire with its capital in Sasaram in modern-day Bihar. He is known for the reintroduction of the branding system (dagh) of the horses and descriptive rolls (chehra). The notable hindi work, Padmavat was compiled during his reign'.*

Who among the following is being described in the above passage?

(a) Bahlul Lodhi
(b) Sher Shah Suri
(c) Islam Shah
(d) Krishna Deva Raya

79. Helium hydride ion (HeH+), recently in news, is

(a) a major by-product of nuclear fusion reactions.

(b) a new rocket propellant fuel.

(c) the first molecule believed to have formed after the Big Bang.

(d) an efficient fuel which can replace Li-ion cells.

80. Consider the following pairs of Geographical Indications and states:

Geographical Indication		***State***
1. Tawlhlohpuan	**:**	Nagaland
2. Kandangi Saree	**:**	Tamil Nadu
3. Palani Panchamirtham	**:**	Kerala

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

(a) 2 only

(b) 2 and 3 only

(c) 1 only

(d) 1 and 2 only

81. Consider the following statements regarding seals of Harappan Civilization:

1. Copper was the most common element used to make the seal.
2. Seals were used for the identification of persons.
3. Religious symbols were not found in Harappan sites.

Which of the statements given above is/are correct?

(a) 2 only

(b) 1, 2 and 3

(c) 1 and 2 only

(d) 1 and 3 only

82. With reference to the megalithic culture of south India, Dolmen, Cairn and Menhir are types of

(a) weapons used for hunting

(b) burial practices

(c) pottery

(d) agricultural tools

83. Consider the following statements regarding the Hoyasala empire:

1. It was founded by Vishnuvardhana Raya.
2. They supported both the Shaivite and Vaishnavite sects of Hinduism.

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

84. Tardigrades, recently seen in the news, are:

(a) a type of thorny flower plants endemic to the West Asia.

(b) near-microscopic animals which can survive in extreme pressure-temperature conditions.

(c) craters of large diameters found on the surface of the moon.

(d) rocks found in Antarctica which lie beneath thick ice masses.

85. *'Anda'*, *'Harmika'* and *'Chhatra'* were associated with which of the following?

(a) Rock edicts

(b) Chaitya

(c) Vihara

(d) Stupa

86. With respect to the mahajanapadas, consider the following pairs:

	Mahajanapada		*Current Location*
1.	Anga	:	Bhagalpur
2.	Magadha	:	Patna
3.	Kurus	:	Meerut

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

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

87. With reference to the Buddhist Sanghas, consider the following statements:

1. Only men were allowed into Sangha.
2. Sangha was based on democratic principles where consensus was arrived at through discussions and voting.
3. The disciples had to attend fortnightly meetings of the Buddhist monastic assembly, at the times of the full moon and the new moon, to reaffirm the rules of discipline.

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

88. Which of the following characteristics is/ are associated with Sattriya dance?

1. It is a devotional dance narrating the mythological stories of Krishna.
2. The dance is performed in monasteries.
3. Khol and flute are major accompanying instruments of this dance form.

Select the correct answer using the code given below.

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

89. Consider the following statements with respect to the principle of non-refoulement:

1. It is a principle that forbids a country receiving asylum seekers from returning them to a country in which they would be in likely danger of persecution.
2. India is obligated to follow the non-refoulement principle as it is a signatory to the Refugee Convention of 1951.

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

90. With reference to socio-economic life during Mughal Rule, consider the following statements:

1. Material possessions were the primary factor in determining the position of people in rural society.
2. It witnessed higher urbanization than British India.
3. Residential areas in cities were generally segregated based upon caste and profession.

Which of the statements given above is/are correct?

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

91. The issue of reservation of Limboo and Tamang communities in the legislative assembly of a particular state is being considered by the Union Government. These communities are native to which of the following areas?

(a) Purvanchal hills
(b) Sikkim Himalayas
(c) North West Himalayas
(d) Arunachal Himalayas

92. Which of the following port cities of ancient India was/were situated on the Malabar Coast?

1. Arikamedu
2. Muziris
3. Kaveripattanam

Select the correct answer using the code given below.

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

93. Consider the following art forms:

1. Kalbelia dance of Rajasthan
2. Manjusha Painting of Bihar
3. Chundan vallam of Kerala

Which of the above Indian art/culture are centered around the theme of snakes?

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

94. Which of the following initiatives was/were taken by Muhammad Bin Tughluq to promote agriculture?

1. Abolition or reduction of agrarian cesses.
2. Introduced the practice of giving agricultural loans named *Sondhar*.
3. Creation of new department of agriculture to extend the area under cultivation.

Select the correct answer using the code given below.

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

95. With reference to Alauddin Khalji's Deccan campaigns, which of the following statements is/are correct?

1. The aim of these invasions was to annex the Southern Kingdoms so as to increase the territorial reach of the Delhi Sultanate.
2. The Deccan policy led to huge financial drains for the Delhi Sultanate owing to the need for maintenance of huge army.

Select the correct answer using the code given below.

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

96. Consider the following pairs:

	Region		***Country***
1.	Goma	:	Democratic Republic of Congo
2.	Okinoshima	:	South Korea
3.	Ghazni	:	Afghanistan
4.	Khartoum	:	Syria

Which of the pairs given above are correctly matched?

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

97. The Archaeological Survey of India is restoring the Markandeshwar group of temples in the Gadchiroli district of Maharashtra. With reference to these temples, consider the following statements:

1. They belong to the Nagara group of temples.
2. The temples belong to Saiva faith only.

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

98. Consider the following statements regarding the social system during the period of the Delhi Sultanate:

1. The practice of Sati was negligible or completely absent during this period.
2. The different ethnic and racial groups within the Muslim society mixed freely and practiced intermarriages among them.
3. The practice of Slavery flourished with the establishment of slave markets for both men and women.

Which of the statements given above is/are correct?

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

99. With reference to Acute Encephalitis Syndrome (AES), consider the following statements:

1. Japanese encephalitis (JE) virus is the most common cause of AES in India
2. It affects the central nervous system that hampers neurological functions.

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

100. With reference to the religious practices of the Indus Valley civilization, consider the following statements:

1. One of the major features was the worship of the female goddess associated with fertility.
2. Several big temple constructions have been excavated from the ruins of Harappa and Mahenjo-daro.
3. Animal worship was generally not practised at the time and emerged later in the Vedic period.

Which of the statements given above is/are correct?

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

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 hydrach 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 infraction 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 Volkswagon 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.**

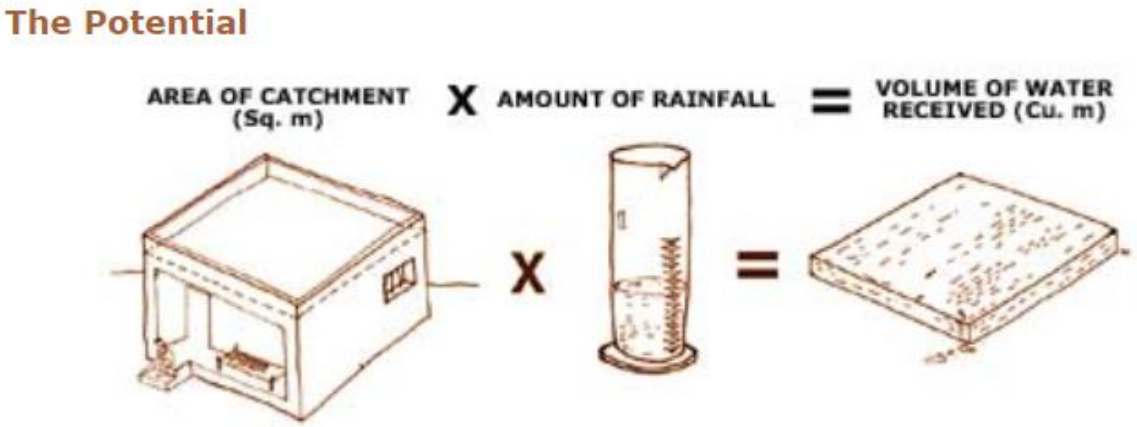
Q 16.B

- 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.

Region	***Traditional water harvesting system***
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



- 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 (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Hydrofluorocarbons (HFCs);
- Perfluorocarbons (PFCs); and
- Sulphur hexafluoride (SF_6)

- **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 Echineidae) 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 gm–2 yr–1 or (kcal m–2) 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 s 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.

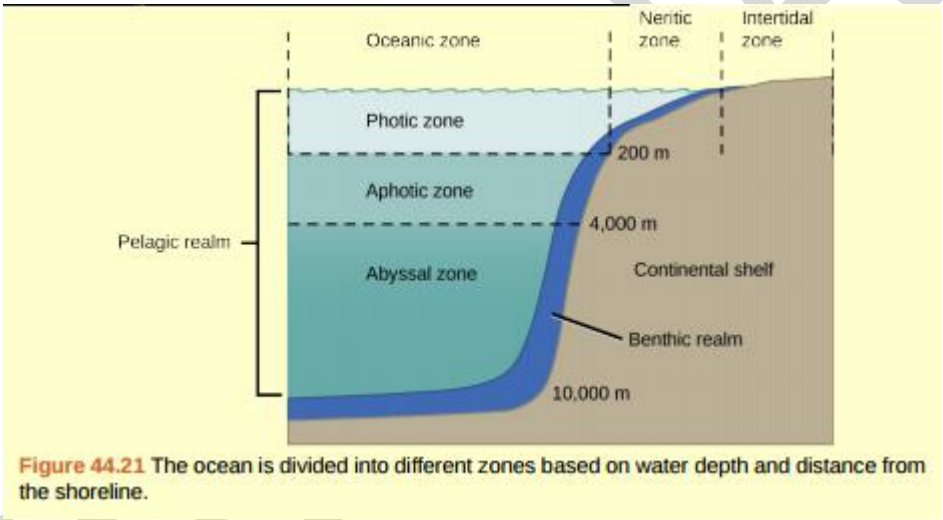


Figure 44.21 The ocean is divided into different zones based on water depth and distance from the shoreline.

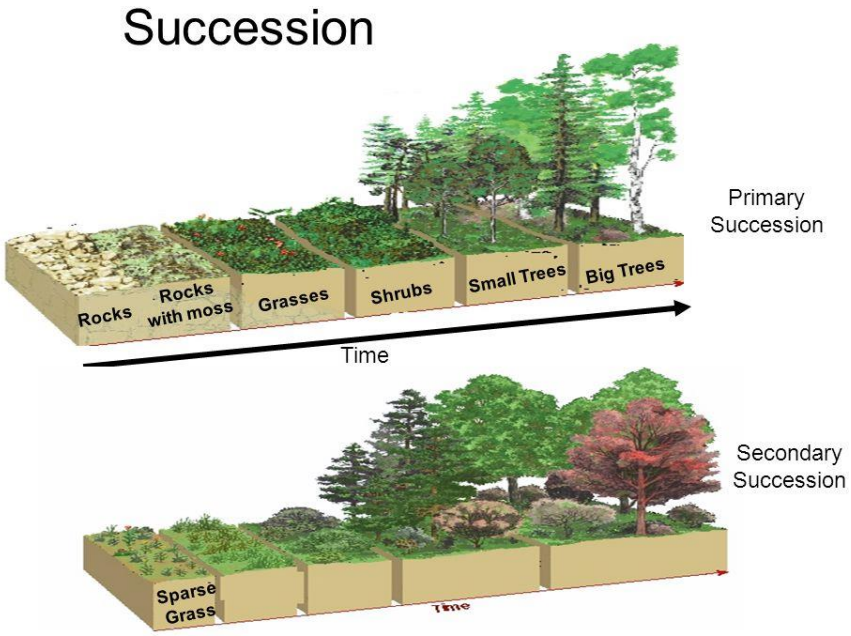
Q 50.D

- **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 rules 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.**



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.

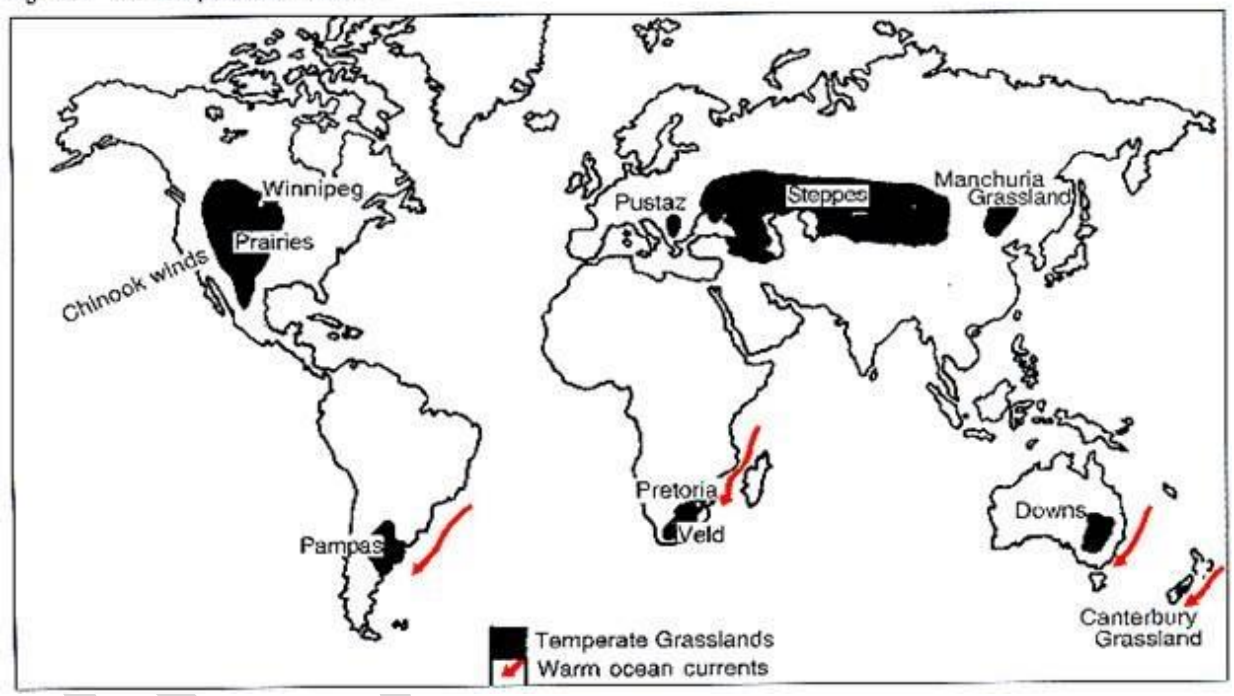
Q 53.D

- Fly ash: also know as Pulverised fuel ash is the light weight substance which tend 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 vertex 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 propositions 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 o**f 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 1μm 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 ofthis 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 c**ondensed 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 confirms 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.**

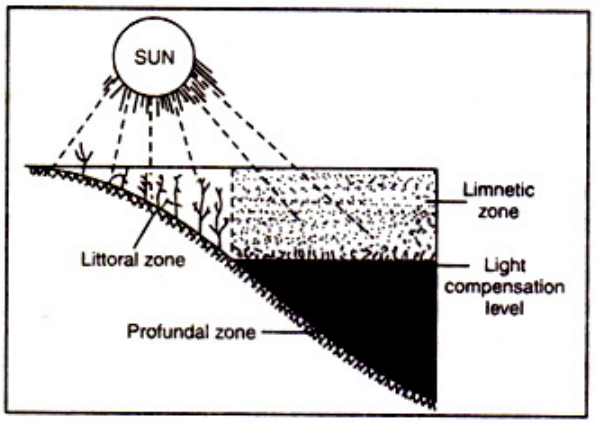


Fig. 4.9. Three major zones of a freshwater lake.

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

- **Option1 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 (45o to 60o), 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 sametime, 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

Name of the food article	***Adulterant***	***Method for detection of common adulterants***
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 slats 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 t**hroughout 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 j**oint 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 organise**d 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.