PAPER-III
ENVIRONMENTAL SCIENCES

Signature and Name of Invigilator

1. (Signature) _____
   (Name) _____

2. (Signature) _____
   (Name) _____

S 8 9 1 3

Time : **2 ¹/₂ hours]**

OMR Sheet No. :	

(To be filled by the Candidate)

Roll No. [ ][ ][ ][ ][ ][ ][ ][ ]

(In figures as per admission card)

Roll No._____

(In words)

[**Maximum Marks : 150**

Number of Pages in this Booklet : **12**	Number of Questions in this Booklet : **75**

Instructions for the Candidates

1. Write your roll number in the space provided on the top of this page.
2. This paper consists of seventy five multiple-choice type of questions.
3. At the commencement of examination, the question booklet will be given to you. In the first 5 minutes, you are requested to open the booklet and compulsorily examine it as below :
   (i) To have access to the Question Booklet, tear off the paper seal / polythene bag on the booklet. Do not accept a booklet without sticker-seal / without polythene bag and do not accept an open booklet.
   (ii) **Tally the number of pages and number of questions in the booklet with the information printed on the cover page. Faulty booklets due to pages/questions missing or duplicate or not in serial order or any other discrepancy should be got replaced immediately by a correct booklet from the invigilator within the period of 5 minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time will be given.**
   (iii) After this verification is over, the OMR Sheet Number should be entered on this Test Booklet.
4. Each item has four alternative responses marked (A), (B), (C) and (D). You have to darken the circle as indicated below on the correct response against each item.
   Example : Ⓐ Ⓑ ● Ⓓ
   where (C) is the correct response.
5. Your responses to the items are to be indicated in the **OMR Sheet given inside the Booklet only.** If you mark at any place other than in the circle in the OMR Sheet, it will not be evaluated.
6. Read instructions given inside carefully.
7. Rough Work is to be done in the end of this booklet.
8. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except for the space allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
9. You have to return the original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. You are however, allowed to carry duplicate copy of OMR Sheet on conclusion of examination.
10. **Use only Blue/Black Ball point pen.**
11. **Use of any calculator or log table etc., is prohibited.**
12. **There is no negative marks for incorrect answers.**

परीक्षार्थियों के लिए निर्देश

1. पहले पृष्ठ के ऊपर नियत स्थान पर अपना रोल नम्बर लिखिए ।
2. इस प्रश्न-पत्र में पचहत्तर बहुविकल्पीय प्रश्न हैं ।
3. परीक्षा प्रारम्भ होने पर, प्रश्न-पुस्तिका आपको दे दी जायेगी । पहले पाँच मिनट आपको प्रश्न-पुस्तिका खोलने तथा उसकी निम्नलिखित जाँच के लिए दिये जायेंगे, जिसकी जाँच आपको अवश्य करनी है :
   (i) प्रश्न-पुस्तिका खोलने के लिए पुस्तिका पर लगी कागज की सील / पोलिथीन बैग को फाड़ लें । खुली हुई या बिना स्टीकर-सील / बिना पोलिथीन बैग की पुस्तिका स्वीकार न करें ।
   (ii) **कवर पृष्ठ पर छपे निर्देशानुसार प्रश्न-पुस्तिका के पृष्ठ तथा प्रश्नों की संख्या को अच्छी तरह चैक कर लें कि ये पूरे हैं । दोषपूर्ण पुस्तिका जिनमें पृष्ठ/प्रश्न कम हों या दुबारा आ गये हों या सीरियल में न हों अर्थात् किसी भी प्रकार की त्रुटिपूर्ण पुस्तिका स्वीकार न करें तथा उसी समय उसे लौटाकर उसके स्थान पर दूसरी सही प्रश्न-पुस्तिका ले लें । इसके लिए आपको पाँच मिनट दिये जायेंगे । उसके बाद न तो आपकी प्रश्न-पुस्तिका वापस ली जायेगी और न ही आपको अतिरिक्त समय दिया जायेगा ।**
   (iii) इस जाँच के बाद OMR पत्रक की क्रम संख्या इस प्रश्न-पुस्तिका पर अंकित कर दें ।
4. प्रत्येक प्रश्न के लिए चार उत्तर विकल्प (A), (B), (C) तथा (D) दिये गये हैं । आपको सही उत्तर के वृत्त को पेन से भरकर काला करना है जैसा कि नीचे दिखाया गया है ।
   उदाहरण : Ⓐ Ⓑ ● Ⓓ जबकि (C) सही उत्तर है ।
5. प्रश्नों के उत्तर **केवल प्रश्न पुस्तिका के अन्दर दिये गये OMR पत्रक पर ही** अंकित करने हैं । यदि आप OMR पत्रक पर दिये गये वृत्त के अलावा किसी अन्य स्थान पर उत्तर चिह्नांकित करते हैं, तो उसका मूल्यांकन नहीं होगा ।
6. अन्दर दिये गये निर्देशों को ध्यानपूर्वक पढ़ें ।
7. कच्चा काम (Rough Work) इस पुस्तिका के अन्तिम पृष्ठ पर करें ।
8. यदि आप OMR पत्रक पर नियत स्थान के अलावा अपना नाम, रोल नम्बर, फोन नम्बर या कोई भी ऐसा चिह्न जिससे आपकी पहचान हो सके, अंकित करते हैं अथवा अभद्र भाषा का प्रयोग करते हैं, या कोई अन्य अनुचित साधन का प्रयोग करते हैं, तो परीक्षा के लिये अयोग्य घोषित किये जा सकते हैं ।
9. आपको परीक्षा समाप्त होने पर मूल OMR पत्रक निरीक्षक महोदय को लौटाना आवश्यक है और परीक्षा समाप्ति के बाद उसे अपने साथ परीक्षा भवन से बाहर न लेकर जायें । हालांकि आप परीक्षा समाप्ति पर OMR पत्रक की डुप्लीकेट प्रति अपने साथ ले जा सकते हैं ।
10. केवल नीले/काले बाल प्वाईंट पेन का ही इस्तेमाल करें ।
11. किसी भी प्रकार का संगणक (कैलकुलेटर) या लाग टेबल आदि का प्रयोग वर्जित है ।
12. गलत उत्तरों के लिए कोई अंक काटे नहीं जाएँगे ।

ENVIRONMENTAL SCIENCES
Paper – III

Note : This paper contains **seventy five (75)** objective type questions of **two (2)** marks each. **All** questions are compulsory.

1. In which part of the atmosphere the momentum, heat flux and moisture content are conserved ?

   (A) Surface Boundary Layer

   (B) Mesosphere

   (C) Troposphere

   (D) Stratosphere

2. The soil type which is good for agriculture is

   (A) Podozols

   (B) Latosols

   (C) Serpent soil

   (D) Solonachak

3. A local laboratory analyzed a water sample and determined that it contained a total solid (TS) content of 132 mg/L and a conductivity of 112 μS/cm. The total suspended solid (TSS) content (mg/L) of water will be

   (A) ~ 57   (B) ~ 75

   (C) ~ 32   (D) ~ 120

4. The settling of discreet, non-flocculating particle in a dilute suspension is known as

   (A) Class-I sedimentation

   (B) Class-II sedimentation

   (C) Class-III sedimentation

   (D) Compression

5. The theoretical oxygen demand for a solution containing 500 mg/L of phenol will be

   (A) 298 mg/L

   (B) 596 mg/L

   (C) 1191 mg/L

   (D) 2382 mg/L

6. The compound p-dichlorobenze has been found to have $K_{OM} = 625$. For a soil containing 1.6% organic matter, the distribution coefficient (K_d) will be

   (A) 2

   (B) 5

   (C) 10

   (D) 20

7. Which one of the following is the single most important reactive intermediate species in atmospheric chemical processes ?

   (A) $OH^{\bullet}$

   (B) $O_2^{\bullet -}$

   (C) $ROO^{\bullet}$

   (D) OH^{-}

8. As per Indian Standards (BIS) for drinking water desirable limit for total hardness as $CaCO_3$ is

(A) 100 mg/l

(B) 200 mg/l

(C) 300 mg/l

(D) 400 mg/l

9. Flue gas laden with fine particles from a thermal power plant with a volume flow rate of 100 m^3/second passes through an electrostatic precipitator (ESP) having 5000 m^2 of collector plate area. If the particle collection efficiency of the ESP is 98%, the drift velocity of the flue gas must be

(A) ~ 0.052 m/s

(B) ~ 0.078 m/s

(C) ~ 0.15 m/s

(D) ~ 1.5 m/s

10. Molar extinction coefficient of malondialdehyde is 0.155 mM^{-1} Cm^{-1}. The concentration of malondialdehyde in a solution having an absorbance of 0.31 is

(A) 2 mM

(B) 0.31 mM

(C) 0.155 mM

(D) 1.55 mM

11. Removal of top fertile soil by water is called

(A) Leaching

(B) Siltation

(C) Weathering of soil

(D) Soil erosion

12. The rate of settling of air-borne particles in the atmosphere varies with their aerodynamic diameter (d) as

(A) α d

(B) α d^2

(C) α d^3

(D) α $d^{½}$

13. The smokestack plumes exhibit 'coning' behaviour when

(A) stable atmospheric conditions exist

(B) atmosphere is unstable

(C) the height of the stack is below the inversion layer

(D) inversion exists right from the ground surface above

14. Among total dissolved matter in marine water, chlorine accounts for

(A) 30%

(B) 55%

(C) 12%

(D) 6%

15. Photodissociation of NO_2 occurs in the presence of photons of wavelength,

(A) < 0.39 μm

(B) 0.5 – 0.6 μm

(C) 0.6 – 0.65 μm

(D) 0.65 – 0.7 μm

16. Peroxyacetyl Nitrate (PAN) is formed by oxidation of

(i) Hydrocarbons

(ii) Isoprene

(iii) Terpene

(iv) Arsenic

Choose the correct answer from the codes :

Codes :

(A) (i) and (iv)

(B) (ii) and (iv)

(C) (iii) and (iv)

(D) (i), (ii) and (iii)

17. The evolution of genetic resistance to antibiotics among disease-carrying bacteria is an example of

(A) Directional natural selection

(B) Stabilizing natural selection

(C) Diversifying natural selection

(D) Convergent natural selection

18. Pulmonary oedema is caused by

(A) Carbon monoxide

(B) Sulphur dioxide

(C) Nitrous oxide

(D) Methane

19. What is the half life of 131_I ?

(A) 60 days

(B) 8 days

(C) 12 years

(D) 30 days

20. Which one of the following makes blood toxic, after combining with haemoglobin ?

(A) CO_2

(B) CO

(C) SO_2

(D) CH_4

21. Respiratory electron transport chain can be inhibited by

(A) ADP

(B) Phosphate

(C) H_2S

(D) CO_2

22. **Assertion (A) :** Oil slick in the ocean causes mass scale death of fish.

Reason (R) : The gills of fish get clogged.

Point out the correct one of the following :

(A) Both (A) and (R) are true with (R) being the correct explanation.

(B) Both (A) and (R) are true but (R) is not the correct explanation.

(C) (A) is true, but (R) is wrong.

(D) Both (A) and (R) are wrong.

23. Chaparral, Maquis, Encinous, Melleseab are important areas of

(A) Tropical evergreen woodland

(B) Temperate evergreen woodland

(C) Tropical deciduous woodland

(D) Temperate deciduous woodland

24. The Keystone predator species maintain diversity in a community by

(A) preying on community's dominant species

(B) allowing immigration of other predators

(C) competitively excluding other predators

(D) coevolving with their prey

25. Which of the following is not an external factor controlling an ecosystem ?

(A) Climate

(B) Topography

(C) Parent material forming soil

(D) Microbes

26. Which of the following food chain is correct ?

(A) Phytoplankton → Zooplankton → Turtle → Crabs

(B) Phytoplankton → Zooplankton → Crab → Turtle

(C) Turtle → Crab → Zooplankton → Phytoplankton

(D) Zooplankton → Turtle → Crab → Phytoplankton

27. Which of the following is <u>not</u> categorized as an internal factor of an ecosystem ?

(A) Decomposition

(B) Succession

(C) Root competition

(D) Bedrock

28. Two species cannot remain in same place according to

(A) Allen's law

(B) Gause hypothesis

(C) Doll's rule

(D) Weismann's theory

29. Identify the correct pair :

(A) Ecotope – Transition between two ecosystems .

(B) Edaphic – Saline soil

(C) Heliophytes – Photophilic plants

(D) Ecotone – Particular type of soil

30. Based on the number arrange the following group of endemic vertebrate species of India in descending order :

(i) Mammals

(ii) Birds

(iii) Reptiles

(iv) Amphibians

Choose the correct answer from the following :

(A) Amphibians, Reptiles, Birds and Mammals.

(B) Reptiles, Amphibians, Birds and Mammals.

(C) Mammals, Birds, Amphibians and Reptiles.

(D) Birds, Mammals, Reptiles and Amphibians

31. Freshwater ecosystems are nutritionally limited by

(A) Phosphorous and Iron

(B) Phosphorous and Carbon

(C) Iron and Nitrogen

(D) Nitrogen and Calcium

32. 'Threshold of Security' refers to the population level at which

(A) Parasites damage the host body but do not cause immediate mortality.

(B) Predators no longer find it profitable to hunt for the prey species.

(C) Functional response of the predator is very high.

(D) The balance between parasite and host is disturbed as the host produces antibodies.

33. "Bermuda grass allergy" is a type of

(A) Airborne allergy

(B) Contact allergy

(C) Hydroborne allergy

(D) Soilborne allergy

34. Parasites which initiate production of antibodies within hosts are termed as

(A) Endoparasites

(B) Pathogenic parasites

(C) Zooparasites

(D) Homoparasites

35. Which of the following material is not easily broken down ?

(A) Cellulose

(B) Hemicellulose

(C) Chitin

(D) Amino acids

36. Melting of polar ice is expected to cover a sea level rise of approximately

(A) 10 metre

(B) 20 metre

(C) 60 metre

(D) 100 metre

37. Pleistocene represents period of

(A) Cold climate

(B) Warm climate

(C) Alteration of cold and warm climate with high proportion of cold period

(D) Alteration of cold and warm climate with very high proportion of warm period

38. GIS is applied to study

(A) View shed analysis

(B) Environmental Impact Assessment

(C) Wildlife habitat analysis and migration routes planning

(D) All of the above

39. Tectonic control in landscape evolution is manifested by

(A) Tilted river terraces

(B) Alluvial forms

(C) Increased boulder proportions in the river belt

(D) River meandering

40. Difference between mineral resource and reserve is

(A) Reserve implies high degree of economic viability

(B) Resource implies high degree of geological knowledge

(C) Reserve implies high degree of economic viability and high degree of geological knowledge

(D) Resource implies high degree of economic viability and high degree of geological knowledge

41. Characteristic difference between two polar Ice Caps is

(A) Arctic Ice Cap is on land

(B) Antarctic Ice Cap is on land

(C) Both are on land but Antarctic Ice Cap is thicker

(D) Both are on sea but Arctic Ice Cap is thicker

42. Laterite represents

(A) Regolith soil

(B) Glacial soil

(C) Black cotton soil

(D) Red soil

43. In a whole-rock chemical analysis the dividing criterion between major and trace element on weight percent basis is

(A) 1 %

(B) 0.1 %

(C) 0.01 %

(D) 0.001 %

44. The mineral, most resistant to chemical weathering is

(A) Olivine

(B) Quartz

(C) K-feldspar

(D) Biotite

45. **Assertion (A) :** Phosphorus cycle is not an exogenic elemental cycle.

Reason (R) : Phosphorus cycle does not have a gaseous component.

Choose correct answer :

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are true, but (R) is not correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

46. The El Nino disappears in March and re-appears in

(A) May

(B) August

(C) October

(D) December

47. The elemental composition of earth's crust in the descending order of weight percent is

(A) Silicon > Aluminium > Iron > Calcium

(B) Aluminium > Iron > Calcium > Silicon

(C) Iron > Calcium > Silicon > Aluminium

(D) Calcium > Silicon > Aluminium > Iron

48. Bio-oil can be obtained from lignocellulose by

(A) Combustion

(B) Fast pyrolysis

(C) Gasification

(D) Transesterification

49. For an ideal Magneto-hydrodynamic power generator, the power output (P) varies with the hot fuel velocity u as

(A) $P \propto u$

(B) $P \propto u^2$

(C) $p \propto u^{3/2}$

(D) $p \propto u^3$

50. Assuming that due to large scale change in land use pattern of the world, the earth's albedo changes from 0.32 to 0.3. If the climate sensitivity factor is 0.5 °C w^{-1} m^2, the change in surface temperature of earth will be (take solar constant S = 1400 w/m^2)

(A) 3.5 °C

(B) 0.25 °C

(C) 7.0 °C

(D) 1.5 °C

51. Global Warming Potential (GWP) of a greenhouse gas (GHG) is a factor comparing the global warming impacts of

(A) 1 m^3 of GHG with 1 m^3 of CO_2

(B) 1 kg of GHG with 1 kg of CO_2

(C) 1 gram mole of GHG with 1 gram mole of CO_2

(D) 1 kg of GHG with 1 mole of CO_2

52. The energy released during combustion of methane is ~ 900 kJ/mol. The carbon intensity of methane is

(A) ~ 0.05 gram C/kJ

(B) ~ 0.013 gram C/kJ

(C) ~ 0.018 gram C/kJ

(D) ~ 1.08 gram C/kJ

53. The term B10 implies

(A) Blending of 10 percent biodiesel with 90 percent conventional diesel.

(B) Blending of 90 percent biodiesel with 10 percent conventional diesel.

(C) Blending of 50 percent biodiesel with 50 percent conventional diesel.

(D) Blending of 1 percent biodiesel with 10 percent conventional diesel.

54. The validity period of Environmental Clerance after Environmental Impact Assessment is least for

(A) Mining projects

(B) River valley projects

(C) Harbour projects

(D) Area development projects

55. In Environmental assessment study, interpretation and evaluation should consider

(A) Uncertainty of possible impacts

(B) Significance of measured impacts

(C) Comparison of alternatives

(D) All of the above

56. Who are responsible for the public consultation process of EIA ?

(A) State Pollution Control Board

(B) State Pollution Control Board and District Collector

(C) State Pollution Control Board and CPCB Chairman

(D) State Pollution Control Board and Civil Society

57. Arrange the following components of an environmental management system in a sequential order. Choose the correct answer from the codes given below :

I. Planning

II. Environmental policy

III. Implementation

IV. Monitoring

V. Review

Codes :

(A) I, II, III, V, IV

(B) II, I, III, IV, V

(C) I, III, II, IV, V

(D) I, V, III, II, IV

58. Match List – I with List – II and choose the correct answer from the codes given below :

	List – I		List – II
a.	Life Cycle Assessment	1.	14010 series
b.	Environmental Auditing	2.	14030 series
c.	Environmental Performance Evaluation	3.	14040 series
d.	Environmental Labelling	4.	14020 series

Codes :

	a	b	c	d
(A)	1	4	3	2
(B)	3	1	2	4
(C)	2	3	4	1
(D)	4	2	1	3

59. Which statement is not correct for hazardous wastes ?

(A) They contain one or more of 39 toxic compounds

(B) They catch fire easily

(C) They are nonreactive and stable

(D) They are capable of corroding metal containers

60. Right to clean environment is guaranteed in Indian Constitution by

(A) Article 14

(B) Article 19

(C) Article 21

(D) Article 25

61. National Ambient Air Quality Standards for major pollutants were notified by CPCB in

(A) 1994

(B) 1984

(C) 2004

(D) 1974

62. Public Liability Insurance Act came into existence in the year

(A) 1986

(B) 1989

(C) 1991

(D) 1995

63. The eigen value of the matrix $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ is

(A) 0

(B) 1

(C) 2

(D) 3

64. The standard deviation of weights of certain 1 kg packets of milk is 10 grams. A random sample of 20 packets showed a standard deviation of 15 grams. The value of χ^2 statistic for the sample is

(A) 30

(B) 45

(C) 1.5

(D) 0.66

65. **Assertion (A) :** According to Gaussian Plume Model, the downward concentration of pollutant appears to be inversely proportional to average wind speed at effective stack height.

Reason (R) : Plume rise does not depend on wind speed. It only depends on buoyancy flux parameter.

Identify the correct answer :

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are correct and (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

66. The population of an urban area increased from 5 million to 15 million over a period of 50 years. If the growth of population has been exponential at a constant rate over this period, the growth rate is

(A) ~ 0.693 %

(B) ~ 1.2 %

(C) ~ 1.38 %

(D) ~ 2.2 %

67. A random sample of size 26 has a mean of 20. The sum of squares of the deviations taken from the mean is 200. If the population mean is 18, what is the value of t-statistic ?

(A) ~ 0.9

(B) ~ 2.1

(C) ~ 3.6

(D) ~ 5.2

68. In Y-shaped energy flow model, one arm represents herbivore and the other

(A) Carnivore

(B) Decomposer

(C) Omnivore

(D) Secondary consumer

69. The population of a certain fish species in a pond follows logistic equation $\frac{dN}{dt} = \alpha N - \beta N^2$. When $\alpha = 0.5$ and $\beta = 0.01$, the maximum sustainable yield is

(A) 25

(B) 50

(C) 20

(D) 5

70. A change in a population's gene pool over time is called

(A) Microevolution

(B) Macroevolution

(C) Chemical evolution

(D) Inorganic evolution

71. The scale length of variation of pressure in vertical direction in atmosphere is

(A) ~ 2.5 km

(B) ~ 5 km

(C) ~ 7 km

(D) ~ 8.5 km

72. Assertion (A) : Planetary, synoptic and mesoscale motions in earth's atmosphere are essentially quasi-horizontal.

Reason (R) : The vertical component of wind velocity is more than an order of magnitude smaller than its horizontal component for all motions in atmosphere.

Identify the correct answer :

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are true and (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

73. GLOBE stands for

(A) Global Leading Occupations to Benefit the Environment

(B) General Learning and Observations to Benefit the Environment

(C) Global Learning and Observations to Benefit the Environment

(D) Global Leaders and their Observations to Benefit the Environment

74. Which one of the following is <u>not</u> the goal of sustainable agriculture in India ?

(A) Maintaining productive topsoil

(B) Reduce the use of chemical fertilizer and pesticides

(C) Mechanised farming

(D) Keep farms economically viable

75. The term of Kyoto Protocol has been extended beyond December 2012 by

(A) 5 years   (B) 7 years

(C) 8 years   (D) 3 years

Space For Rough Work