Total No. of Printed Pages: **08**   No. of Questions : **50**

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PET 2024 (9012) Doctor of Philosophy (Environmental Science)

(To be filled by the Candidate)

Candidate Seat Number
(As per Admit card)

OMR Sheet Number

Invigilator's signature with Date

Candidate's Seat No. in Words   :_____

Name of the Center   :_____

Paper Code & Name of Examination   : **9012 - Doctor of Philosophy (Environmental Science)**

Date: **03/10/2024**   **PET 2024 - EXAMINATION**

Time: **One Hours**   Total Marks: **100**

Important Instructions for the candidate	**विद्यार्थ्यासाठी महत्त्वाच्या सूचना**
1. Write your seat number and OMR Sheet number on the question paper in the earmarked space	1. परीक्षार्थींनी आपला आसन क्रमांक या पृष्ठावरील वरच्या कोप-यात तसेच आपणास दिलेल्या उत्तर पत्रिकेचा क्रमांक त्याखाली लिहावा.
2. This question paper carries Fifty (50) Multiple-choice type questions and each question carries 2 Marks	2. या प्रश्नपत्रिकेतील सर्व प्रश्न सोडवणे अनिवार्य आहे.
3. At the commencement of examination, the question paper will be given to the student.	3. परीक्षा सुरू झाल्यावर विद्यार्थ्याला प्रश्नपत्रिका दिली जाईल.
4. Each question 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 question Example: where (C) is correct answer	4. प्रत्येक प्रश्नासाठी (A) (B) (C) (D) अशी चार विकल्प उत्तरे दिली आहेत, त्यातील योग्य उत्तराचा रकाना खाली दर्शविल्याप्रमाणे ठळकपणे काळा निळा करावा. उदा: जर (C) हे उत्तर योग्य असेल तर

(A)   (B)   ●   (D)

(A)   (B)   ●   (D)

5. Your responses to the answer are to be indicated in the OMR Sheet. If you mark at any place other than in the circle in the OMR Sheet it will not be evaluated.	5. या प्रश्नपत्रिकेतील प्रश्नांची उत्तरे ओएमआर उत्तर पत्रिकेतच दर्शवावीत इतर ठिकाणी लिहिलेली उत्तरे तपासली जाणार नाहीत.
6. Rough work is to be done at the end of this question paper.	6. प्रश्नपत्रिकाच्या शेवटी कोण्या जागेवरच कच्चे काम करावे
7. You have to return OMR answer sheet and question paper to the invigilator at the end of examination compulsorily and must not carry with you outside the examination hall.	7. परीक्षा संपल्यानंतर विद्यार्थ्यांनी मूळ ओ. एम. आर उत्तरपत्रिका पर्यवेक्षकाकडे परत करणे आवश्यक आहे तथापि प्रश्नपत्रिका व ओ. एम. आर. उत्तरपत्रिका आपल्याबरोबर नेण्यास विद्यार्थ्याला परवानगी नाही.
8. Use only Black / Blue ball point pen	8. फक्त काळ्या किंवा निळ्या बॉलपेनचाच वापर करावा
9. Use of any type of calculator or log table etc. is prohibited.	9. कॅल्क्युलेटर किंवा लॉग टेबल वापरण्यास परवानगी नाही
10. There is no negative marking for incorrect answers	10. चुकीच्या उत्तरासाठी गुण कपात केली जाणार नाही

Q. No.   **Question**

1. Which Windows-based software tool is best suited for conducting spatial analysis and modeling in environmental science?
    (A) Microsoft Excel   (B) ArcGIS for Desktop
    (C) Adobe Illustrator   (D) MATLAB

2. Which Windows application would be most appropriate for a researcher to use when developing a dynamic model to simulate climate change effects on local ecosystems?
    (A) Microsoft Access   (B) MATLAB
    (C) Microsoft PowerPoint   (D) Microsoft Word

3. Which Windows-based application would be most effective for environmental scientists to use when conducting a statistical analysis of environmental data collected from field experiments?
    (A) Microsoft Publisher   (B) SPSS Statistics
    (C) Microsoft Paint   (D) Internet Explorer

4. For a study aiming to analyze long-term trends in water quality across multiple rivers, which data collection method would best ensure consistent and reliable results?
    (A) Random sampling of water samples in different seasons
    (B) Installation of automated water quality sensors
    (C) Surveys of local fishing practices
    (D) Review of historical water quality reports

5. When investigating the impact of urban development on local air quality, which data collection method would provide the most actionable insights?
    (A) Conducting interviews with urban planners
    (B) Monitoring air quality using fixed and mobile sensors
    (C) Reviewing historical air quality data from government reports
    (D) Observing traffic patterns and estimating emissions

6. In a study aimed at understanding the distribution of a rare plant species across a large, heterogeneous landscape, which sampling technique would be most effective for capturing spatial variability?
    (A) Simple random sampling   (B) Systematic sampling
    (C) Stratified random sampling   (D) Convenience sampling

7. To assess the effectiveness of a new land management practice across different forest types, which sampling method would provide a comprehensive view of its impacts?
    (A) Random sampling within each forest type
    (B) Systematic sampling along forest boundaries
    (C) Stratified random sampling by forest type and management practice
    (D) Opportunistic sampling of easily accessible areas

8. For a study aiming to measure soil contamination at varying depths across a large agricultural field, which sampling technique would be most appropriate to ensure representative coverage?
    (A) Simple random sampling at random depths
    (B) Systematic sampling at fixed intervals along transects
    (C) Composite sampling from selected areas
    (D) Stratified sampling by soil depth and field zones

9. When studying the impact of urbanization on local biodiversity, which method would provide the most comprehensive data on species presence and abundance across various urban and rural areas?
    (A) Automated camera traps placed in selected areas
    (B) Citizen science reporting of wildlife sightings
    (C) Surveys of local environmentalists' observations
    (D) Review of existing biodiversity databases

10. For evaluating the effectiveness of a marine protected area (MPA) in conserving fish populations, which data collection approach would provide the most robust evidence of changes in fish abundance and diversity?
    (A) Underwater visual surveys using SCUBA diving
    (B) Fisherman surveys and catch records
    (C) Satellite tracking of migratory fish patterns
    (D) Review of historical MPA management reports

11. Which statement best describes the primary distinction between a hypothesis and a theory in environmental science?
    (A) A hypothesis is a general explanation based on a large body of evidence, while a theory is a testable prediction based on limited observations.
    (B) A hypothesis is a testable prediction about specific observations, while a theory is a broad explanation supported by a substantial body of evidence.
    (C) A hypothesis is a proposed explanation with no empirical testing, while a theory is a speculative idea about environmental processes.
    (D) A hypothesis is an initial idea without empirical support, while a theory is a detailed mathematical model used for prediction.

12. Which characteristic differentiates a scientific theory from a hypothesis in environmental research?
    (A) Theories are specific and narrow in scope, while hypotheses are broad and general.
    (B) Theories are untested ideas, while hypotheses are well-supported by empirical data.
    (C) Theories provide a comprehensive framework for understanding phenomena, whereas hypotheses are testable predictions.
    (D) Theories are simple explanations based on limited observations, while hypotheses are complex and broad in nature.

13. How does the concept of falsifiability differentiate a hypothesis from a scientific theory in environmental science?
    (A) Hypotheses are not falsifiable, while theories must be falsifiable.
    (B) Hypotheses are falsifiable predictions, while theories are broad explanations that must also be falsifiable.
    (C) Both hypotheses and theories are falsifiable, but only hypotheses are required to be falsifible.
    (D) Falsifiability is irrelevant for both hypotheses and theories.

14. For investigating the effectiveness of a new pollution control technology in reducing emissions from industrial processes, which research design would provide the most robust evidence of its impact?
    (A) Case study of a single industrial site using the technology
    (B) Cross-sectional survey of multiple industrial sites with and without the technology
    (C) Controlled field experiment with random assignment of sites to technology and control groups
    (D) Review of existing literature on similar technologies

15. In an investigation of the effects of invasive species on native plant communities, which research method would be best for assessing both ecological impacts and potential management strategies?
    (A) Observational study of invasive species and native plants in their natural habitats
    (B) Laboratory experiment simulating invasive species introduction to native plant communities
    (C) Field experiment with manipulation of invasive species density and monitoring of native plant responses
    (D) Review of historical records of invasive species and their management

16. Which of the following is a significant challenge faced by environmental researchers in India when conducting field studies in remote or protected areas?
    (A) Lack of access to advanced data analysis software
    (B) Difficulties in obtaining necessary permits and permissions from regulatory authorities
    (C) High cost of publishing research findings in international journals
    (D) Limited availability of research funding from international sources

17. In India, which issue frequently affects the reliability of environmental data collected from various regions?
    (A) Excessive data redundancy due to multiple research teams
    (B) Variability in data collection methods and standards across different studies
    (C) Overemphasis on theoretical research over practical applications
    (D) Insufficient number of research publications in the local languages

18. What is a common issue faced by researchers when trying to engage local communities in environmental science projects in India?
    (A) Excessive interest from local communities leading to too many collaborators
    (B) Language barriers and lack of culturally appropriate communication strategies
    (C) High levels of awareness and knowledge about environmental issues among local communities
    (D) Limited access to traditional ecological knowledge held by local communities

19. In the context of a study evaluating the impact of land reclamation on local wetlands, how would the distinction between research methods and research methodology be most accurately described?
    (A) Research methods would involve the use of remote sensing data and field surveys, while research methodology would involve the justification of why these methods are suitable for assessing land reclamation impacts.
    (B) Research methods would refer to the statistical tools used to analyze wetland data, while research methodology would involve choosing which wetland to study.
    (C) Research methods would include the design of the experimental plots, while research methodology would be about the background research on land reclamation effects.
    (D) Research methods and research methodology are interchangeable terms, referring to the same aspects of research.

20. In designing a study on the effects of urban green spaces on air quality, how would research methods and research methodology interact?
    (A) Research methods would be used to collect data on air quality and green space characteristics, while research methodology would involve the design of the study and the theoretical basis for why green spaces affect air quality.
    (B) Research methods would determine the statistical analysis of data, while research methodology would focus on the policy implications of the findings.
    (C) Research methods include the survey of residents' perceptions, while research methodology focuses on the historical analysis of green space developments.
    (D) Research methods and research methodology are the same and used interchangeably in this context.

21. When designing a study to assess the impact of deforestation on local wildlife populations, which research design concept is critical for ensuring that observed effects are directly attributable to deforestation rather than other variables?
    (A) Random sampling
    (B) Control groups and random assignment
    (C) Longitudinal data collection
    (D) Case study analysis

22. For research examining the effects of urban green spaces on local temperature regulation, which design approach would best allow researchers to account for confounding variables such as building density and vegetation type?
    (A) Cross-sectional survey of temperature data
    (B) Experimental design with manipulation of green space variables
    (C) Observational study with statistical controls for confounding factors
    (D) Review of historical temperature records and urban planning documents

23. In the context of a randomized controlled trial (RCT) assessing the effectiveness of a new conservation strategy, what is a primary consideration to ensure that the results are valid and applicable to broader environmental contexts?
    (A) The study should be conducted in a single, highly controlled environment.
    (B) The sample size should be large enough to allow for statistical significance and generalizability.
    (C) The conservation strategy should be tested only in regions with similar environmental conditions.
    (D) The trial should focus exclusively on short-term outcomes rather than long-term effects.

24. In the context of environmental research, which criterion is most crucial for assessing the validity of a study's conclusions?
    (A) The study's alignment with popular media trends.
    (B) The use of high-end technology regardless of its relevance.
    (C) C. The soundness of the study's methodology and data analysis.
    (D) D. The number of citations the study receives.

25. What role does stakeholder engagement play in the context of evaluating environmental research?
    (A) It primarily ensures that the research meets academic publishing standards.
    (B) It helps in tailoring research findings to the needs and concerns of the communities affected by environmental issues.
    (C) It increases the amount of data collected without focusing on its relevance.
    (D) It guarantees that the research will be free from any form of bias.

26. According to the Central Pollution Control Board, particles that are responsible for causing great harm to human health are of diameter.
    (A) 2.50 micrometers
    (B) 5.00 micrometers
    (C) 10.00 micrometers
    (D) 7.5 micrometers

27. Choose the incorrect statement
    (A) The Montreal protocol is associated with the control of emission of ozone depleting substances
    (B) Methane and carbon dioxide are green house gases
    (C) Dobson units are used to measure oxygen content.
    (D) Use of incinerators is crucial to disposal of hospital wastes.

28. Catalytic converters are fitted into automobiles to reduce emission of harmful gases. Catalytic converters change un burnt hydrocarbons into:
    (A) Carbon dioxide and water
    (B) Carbon mono oxide
    (C) Methane
    (D) Carbon dioxide and methane

29. Algal blooms impart a distinct color to water due to:
    (A) Their pigments
    (B) Excretion of colored substances
    (C) Formation of colored chemicals in water facilitated by physiological degradation of algae
    (D) Absorption of light by algal cell wall.

30. Transgenic organism are
    (A) Produced by gene transfer technology
    (B) Extinct organisms
    (C) Naturally occurring and endemic
    (D) Produced by traditional plant breeding technique

31. A bioreactor known for mass culturing of cells/microbes must have
    (A) Agitation for mixing of cells and medium
    (B) Sterile conditions
    (C) Regulation of temperature, aeration, etc
    (D) All of these

32. "The species that are not found after searches of known or likely areas where they may occur" are known as:
    (A) Normal species   (B) Vulnerable species
    (C) Extinct species   (D) Rare species

33. The programs which are as permanent as hardware and stored in ROM is known as
    (A) Hardware   (B) Software
    (C) Firmware   (D) ROMware

34. Which of the following is invalid type of memory
    (A) RAM (Random Access Memory)
    (B) ROM (Read Only Memory)
    (C) PRAM (Programmable Read Access Only Memory)
    (D) EPROM (Erasable Programmable Read Only)

35. What is the harm from the depletion of Earth's ozone layer?
    (A) The average temperature of earth's surface will increase gradually
    (B) The oxygen content of the atmosphere will decrease
    (C) Increased amount of Ultra violet radiation will reach earth's surface
    (D) Sea levels will rise as the polar ice caps will gradually melt

36. The "Vienna Convention" related with environment is basicaaly related with
    (A) International trade in endangered species
    (B) Protection of ozone layer
    (C) Biodiversity conservation
    (D) Preservation of cultural environment

37. Eutrophication of water bodies resulting to killing of fishes is mainly due to
    (A) Non-availability of food
    (B) Non-availability of light
    (C) Non-availability of oxygen
    (D) Non-availability of essential minerals

38. The fundamental difference between materials and energy is that
    (A) Energy is cycled through ecosystems; materials are not.
    (B) Materials can be converted into energy; energy cannot be converted into materials
    (C) Energy can be converted into materials; materials cannot be converted into energy
    (D) Materials are cycled through ecosystems; energy is not

39. The concept that energy cannot cycle through an ecosystem is best explained by
    (A) The law of conservation of energy
    (B) The principle of biomagnifications
    (C) 15 eterotrophy 15ions of thermodynamics
    (D) The competitive exclusion principles

40. The methodology used to predict impacts depends on:
    (A) The type and size of the EIA team
    (B) Nature of the potential impact
    (C) The experience of the authorities
    (D) Time to do the EIA and EMP

41. Which substances are regulated by the Kyoto Protocol ?
    I.   Argon
    II.   Carbon dioxide
    III.   Nitrogen
    IV.   Nitrous oxide
    V.   Sulfur hexafluoride
    (A) I, II and III only   (B) I and III only
    (C) II and V only   (D) II, IV and V only

42. A Disease caused by eating fish contaminated by industrial waste, containing mercury compounds, is called
    (A) Osteosclerosis   (B) Hashimoto's oxidase
    (C) Bright's disease   (D) Minimata disease

43. The toxic effect of carbon monoxide is due to its greater affinity ofr hemoglobin as compared to oxygen approximately by
    (A) 200 times   (B) 1000 times
    (C) 2 times   (D) 20 times

44. The true statement about "Green –house effect" is that it is
    (A) Caused by combination of may gases
    (B) Caused only by CO_2
    (C) Caused by CO_2, CFC,CH_4 and NO_2 gases
    (D) None of these

45. In a terrestrial ecosystem such as forest, maximum energy is in which trophic level ?
    (A) T3   (B) T4
    (C) T1   (D) T2

46. What is the best pH of the soil for cultivation of plants?
   (A) 3.4-5.4   **(B)** 6.5-7.5
   (C) 4.5-8.5   **(D)** 5.5-6.5

47. Deforestation is occurring in many countries and it is therefore difficulty to detect the ongoing damage. Which of the following types of remote sensing would be best suited for locating deforestation?
   (A) Thermal infrared   **(B)** Microwave
   (C) Radar   **(D)** Colour Infrared

48. Multispectral remote sensing allows researchers to obtain data about Earth in areas of the electromagnetic spectrum beyond what the eye can see. If you were studying the effects of drought on vegetation, which portion of the electromagnetic spectrum would provide the most pertinent data?
   (A) Thermal infrared   **(B)** Middle infrared
   (C) Near infrared   **(D)** Blue spectrum

49. Better access to certain markets, differentiation of products, arid the sale of pollution-control technology are ways in which better environmental performance can:
   (A) Increase revenue   **(B)** Increase cost
   (C) Decrease revenue   **(D)** Decrease cost

50. What is the most commonly cited definition for , and accepted thinking about sustainable development ?
   (A) Brundtland World on Committee Environment and Sustainable Development
   (B) Brundtland World Committee on Environment and Development
   (C) Brundtland World Commission on Environment and Sustainable Development
   (D) Brundtland Word Commission on Environment and Development

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