M.Sc. Environmental Science

Set No. 1

Question Booklet No.

16P/290/7

(To be filled up by the candidate by blue/black ball-point pen)

Roll No. 

Serial No. of OMR Answer Sheet 

Day and Date 

INSTRUCTIONS TO CANDIDATES

(Use only blue/black ball-point pen in the space above and on both sides of the Answer Sheet)

1. Within 30 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.

2. Do not bring any loose paper, written or blank, inside the Examination Hall except the Admit Card without its envelope.

3. A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.

4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.

5. On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.

6. No overwriting is allowed in the entries of Roll No., Question Booklet no., and Set no. (if any) on OMR sheet and Roll No. and OMR sheet no. on the Question Booklet.

7. Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.

8. Each question in this Booklet is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.

9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.

10. Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).

11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.

12. Deposit only OMR Answer Sheet at the end of the Test.

13. You are not permitted to leave the Examination Hall until the end of the Test.

14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

Total No. of Printed Pages: 48

[अर्थपूर्ण निर्देश हिंदी में अंतिम आदर्श यूँ पर दिये गए हैं]
ROUGH WORK
राफ कार्य
16P/290/7

No. of Questions : 180

Time : 2 Hours

Full Marks : 360

Note : (1) Attempt as many questions as you can. Each question carries 3 (Three) marks. One mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question.

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

(3) This Question Booklet comprises two Sections viz., Section-A and Section-B:

Section-A : This is compulsory. This contains two sub-sections having question of two disciplines viz.

(i) Basic Environmental Science

(ii) Chemistry

A candidate is required to attempt above both all sub-sections are compulsory.

Section-B : This contains three Sub-sections having questions of three disciplines viz.,

(i) Life Science

(ii) Physics

(iii) Geology

A candidate is required to attempt only one from above three Sub-sections.

3

P.T.O.
SECTION - A
(i) BASIC ENVIRONMENTAL SCIENCES
(Compulsory for all)

01. Which region of the sea oceans are the most polluted?
   (1) Estuarine       (2) Sea depths
   (3) Sea surface    (4) Coastal

02. Demography is the statistical study of:
   (1) Bird population (2) Human population
   (3) Human Society   (4) Human Life

03. Largest salt water lake in India is:
   (1) Chilka         (2) Lonar
   (3) Wullar         (4) Sambhar

04. Which elemental cycle has no atmospheric reservoir?
   (1) Oxygen         (2) Carbon
   (3) Phosphorus     (4) Nitrogen

05. Concept of ecological pyramid was given by:
   (1) A.G. Tansley    (2) E.P. Odum
   (3) R. Mishra      (4) C. Elton
06. How many mega-bio diverse countries have been identified in the world?

(1) 12  (2) 17  (3) 24  (4) 35

07. Ecological of physiological races are also known as:

(1) Ecads  (2) Ecotypes
(3) Ecophens  (4) Ectogens

08. Maximum amount of radiation per unit area is received in the:

(1) Tropical region  (2) Temperate region
(3) Higher latitude  (4) Mid latitude

09. Ecosystems regulation in nature is called:

(1) Homeostasis  (2) Succession
(3) Cybernetics  (4) Ecosystem function

10. The wavelength of the atmospheric windows is:

(1) 4.0 - 6.0 μ  (2) 2.0 - 5.0 μ
(3) 8.0 - 13.0 μ  (4) 7.0 - 10.0 μ
11. Government of India has enacted various Acts for protection & conservation of environment. However, more inclusive Act is:

(1) Water (Prevention & Control of Pollution) Act 1974
(2) Air (Prevention & Control of Pollution) Act 1981
(3) The Biological Diversity Act 2002
(4) Environment (Protection) Act 1986

12. Richael Carsson in her book *Silent Spring* has raised concerned on:

(1) Economical & social impacts
(2) Impacts of agro-chemicals on ecological functions
(3) Deforestation
(4) Climate change

13. Redox titration is used in determination of:

(1) Dissolved oxygen  (2) Total hardness
(3) Chemical oxygen demand  (4) Biochemical oxygen demand

14. Convention on International Trade in Endangered species was held in:

(1) 1980  (2) 1973
(3) 1962  (4) 1986
15. Species - Area Curve is record of:
   (1) Frequency and Area   (2) Density and Area
   (3) Number of species and Area   (4) Abundance and Area

16. Mauna Loa, in Hawaii is famous for:
   (1) Botanical Gardens
   (2) Monitoring sea level rise since 1950
   (3) Biggest collection of mammal's fossils
   (4) Continuous monitoring atmospheric CO₂ since 1957

17. Largest source fresh water on earth is:
    (1) Rivers'   (2) Lakes
    (3) Glaciers   (4) Polar Ice

18. "Itai Itai" disease is caused by:
    (1) Mercury   (2) Cadmium
    (3) Lead   (4) Arsenic

19. Acetyl choline esterase enzyme is inhibited by:
    (1) Organophosphates   (2) Triazine
    (3) Phenylurea   (4) Organomercurals

7
20. The Headquarter of UNEP is located at:
   (1) Paris   (2) Rio de Janeiro
   (3) Nairobi   (4) Geneva

21. Permafrost soil is characteristic of:
   (1) Tundra biome   (2) Taiga biome
   (3) Tropical rain forest   (4) Savannah

22. The biggest hindrance in using biomass as an energy source is:
   (1) Lack of proven technology for commercialization
   (2) Energy yield is low
   (3) Large land area is required to grow energy crops
   (4) Air pollution due to combustion

23. Which of the following category of plants get benefited more due to
elevation of CO₂ level?
   (1) C₃ plants   (2) C₄ plants
   (3) CAM plants   (4) All of the above

24. The value of solar constant(S) is:
   (1) 20 W/m²   (2) 1372 W/m²
   (3) 1732 W/m²   (4) 1330 W/m²
25. The second most important source after fossil fuels contributing to India's energy needs is:

(1) Solar energy  (2) Nuclear energy
(3) Wind energy  (4) Hydropower

26. Which one of the following is an Ex-Situ method of biodiversity conservation?

(1) Seed storage  (2) Tissue culture
(3) Gene bank    (4) All of the above

27. Ramsar convention on Wetland International Importance is effective since:

(1) 1992  (2) 1971
(3) 1972  (4) 1974

28. Natural source of polycyclic aromatic hydrocarbons (PAHs) is:

(1) Grass fire  (2) Root exudates
(3) Aerobic bacteria  (4) Anaerobic bacteria

29. Cinabar is an ore of:

(1) Iron  (2) Mercury
(3) Gold  (4) Lead
30. Most Productive zone in a freshwater Lake/Pond is:

(1) Profundal zone
(2) Limnetic zone
(3) Benthic zone
(4) Littoral zone
(ii) CHEMISTRY

(Compulsory for all)

31. The molecular structure of ozone is similar to that of:
   (1) Chlorine dioxide  (2) Carbon dioxide
   (3) Sulphur trioxide  (4) Borane

32. How many germs of oxygen will be obtained if one mole of water is fully electrolysed?
   (1) 0.5 g   (2) 1 g   (3) 16 g   (4) 32 g

33. The bond angles in boron trifluoride molecule are:
   (1) $90^\circ$   (2) $104^\circ$   (3) $109^\circ$   (4) $120^\circ$

34. The bond dissociation energy of fluorine is:
   (1) Similar to that of chlorine   (2) Similar to that of bromine
   (3) Similar to that of iodine   (4) Highest among the halogens

35. If 10 ml of 0.1 M hydrochloride acid is added to 5ml of 0.1 M sulphuric acid and the mixture titrated against 0.2 M sodium hydroxide, what will be the titre value?
   (1) 7.5 ml   (2) 10 ml   (3) 15 ml   (4) 30 ml
36. A list of which includes only gases that dissolve in water to give an acidic solution is:

(1) CO₂, SO₂, SO₃, HI  
(2) CO₂, SO₂, F₂, N₂  
(3) NO₂, SO₂, HI, F₂  
(4) CO₂, SO₂, SO₃, HBr

37. What is the best way to describe the geometry of XeF₄?

(1) Spherical  
(2) Octahedral  
(3) Tetrahedral  
(4) Planar

38. The anion and cation are iso-electronic in:

(1) LiF  
(2) NaF  
(3) RbI  
(4) CsCl

39. Which of the following is not a polymeric compound?

(1) Starch  
(2) Cellulose  
(3) Melanin  
(4) Tryptophan

40. How many unpaired electrons are there in an atom of C?

(1) None  
(2) 1  
(3) 2  
(4) 3

41. Which of the following is not a paramagnetic compound?

(1) O₂  
(2) NO₂  
(3) CuCl₂  
(4) C₆H₆⁻ (anion)
42. What is the oxidation number of Fe in \((NH_4)_2[Fe(CN)_6]\)

(1) +2  (2) -2  (3) +3  (4) +4

43. What is the C-H bond-order in benzene:

(1) 0  (2) 1  (3) 1.5  (4) 2

44. Identify the pair in which both molecules have \(sp^2\) hybridised atoms:

(1) \(C_2H_4\) and \(CO_2\)  (2) \(C_6H_6\) and \(CHCl_3\)
(3) \(C_2H_4\) and \(C_3H_4\)  (4) \(HCN\) and \(C_2H_2\)

45. What is the total number of orbital associated with the principal quantum number, \(n=4\) ?

(1) 3  (2) 4  (3) 16  (4) 24

46. The name of de Broglie is associated with:

(1) The uncertainty principle  (2) Matter waves
(3) Atomic orbitals  (4) Electron spin

47. An element crystallizes in FCC lattice. How many atoms are there per unit cell?

(1) 1  (2) 2  (3) 3  (4) 4

13

P.T.O.
48. A sample of water contains 200 ppm of Ca\(^{2+}\) in it. What is the molality of the solution with respect to Ca (at. wt. 40) ?

(1) 0.2 m  (2) 2 m  (3) 5 \times 10^{-3} \text{ m}  (4) 0.05 \text{ m}

49. Coke is often used in extractive metallurgy. Its major role is:

(1) As an oxidizing agent  (2) As a reducing agent
(3) As a fuel  (4) To form slag

50. Which of the following is not a crystalline substance?

(1) Glass  (2) Quartz
(3) Chalk  (4) Diamond

51. How many neutrons are there in the nucleus of a \(^{17}\text{O}\) atom?

(1) 6  (2) 8  (3) 9  (4) 11

52. Which element exists in the +2 oxidation state in all its common compounds?

(1) Mn  (2) Mg  (3) Mo  (4) Eu

53. From each pair given below identify the ion which is smaller in size.

\([\text{Fe}^{2+}, \text{Fe}^{3+}]  [\text{K}^+, \text{Ca}^{2+}]  [\text{Na}^+, \text{F}^-]  [\text{Se}^{2-}, \text{S}^2-] :\)

(1) \text{Fe}^{2+}, \text{K}^+, \text{F}^-, \text{S}^2-
(2) \text{Fe}^{3+}, \text{Ca}^{2+}, \text{Na}^+, \text{S}^2-
(3) \text{Fe}^{2+}, \text{Ca}^{2+}, \text{F}^-, \text{Se}^{2-}
(4) \text{Fe}^{3+}, \text{K}^+, \text{Na}^+, \text{Se}^{2-}
54. Which one of the following set contains one element each from s-block, p-block and d-block?
   (1) Rb, K, Ru  (2) Li, W, Bi
   (3) C, Cl, Sr  (4) Sc, Pd, Te

55. Which of the following is not a Lewis acid?
   (1) S²⁻  (2) Zn²⁺  (3) BF₃  (4) Co³⁺

56. Potassium permanganate solution may be standardised by titration against:
   (1) Sodium carbonate  (2) Chromic acid
   (3) Phthalic acid  (4) Sodium oxalate

57. Which of the following compounds does not contain a C=O group?
   (1) Acetic acid  (2) Formaldehyde
   (3) Cyclobutanone  (4) Furan

58. Which group is present in a secondary amine?
   (1) -NR₂  (2) -NHR  (3) -NH₂  (4) =NH
59. For which one among the following reactions does $\Delta H^0$ of the reaction represent an enthalphy of formation?

(1) $2H_2(g) + C(s) \rightarrow CH_4(g)$
(2) $2NO_2(g) \rightarrow N_2O_4(g)$
(3) $2N_2(g) + 3O_2(g) \rightarrow 2NO_2(g) + 2NO(g)$
(4) $CO_2(g) + H_2(g) \rightarrow H_2O(g) + CO(g)$

60. Consider the following three reactions:

\[ \text{NH}_4\text{NO}_3(s) = N_2O(g) + 2\text{H}_2\text{O}(g) \quad (1) \]
\[ 2\text{H}_2(g) + O_2(g) = 2\text{H}_2\text{O}(g) \quad (2) \]
\[ 2\text{H}_2(g) + O_2(g) = 2\text{H}_2\text{O}(l) \quad (3) \]

which statement regarding the entropy changes ($\Delta S$) in the above reactions is correct?

(1) $\Delta S_1 > \Delta S_2 > \Delta S_3$
(2) $\Delta S_1 > \Delta S_2 = \Delta S_3$
(3) $\Delta S_1 < \Delta S_2 < \Delta S_3$
(4) $\Delta S_1 > \Delta S_2 < \Delta S_3$

61. Which one of the following compounds does not decolourise potassium permaganate solution?

(1) Styrene
(2) Benzene
(3) Propionaldehyde
(4) Oxalic acid
62. Which one of the following compound is optically active?

(1) Ethyl benzoate  (2) Succinic acid
(3) Salicylaldehyde  (4) Sucrose

63. Which of the following compounds is acidic?

(1) Allyl alcohol  (2) Aniline
(3) Acetophenone  (4) Phenol

64. How many isomers are there for dichlorobenzene?

(1) 1 (no isomer)  (2) 2
(3) 3  (4) 4

65. Which one of the following statement is false?

(1) Cis and trans isomers of a compound will, in general, have
different melting points

(2) Enantiomers will have same dipole moments

(3) Diastereomers will always have same solubilities

(4) Asymmetric centre is not essential for chirality

66. The number of degree of freedom at the triple point of water is:

(1) 0  (2) 1  (3) 2  (4) 3

17 P.T.O.
67. Which one of the following statements is false?

(1) $p$-nitrophenol has a higher melting point than $o$-nitrophenol
(2) Aniline is less basic than benzyl amine
(3) $t$-butanol forms a more stable carbonium ion than isopropanol
(4) Pyridine is more basic than ammonia

68. Markonikof's rule applies to:

(1) Electrophilic substitution of aromatic compounds
(2) Electrophilic addition of alkenes
(3) Steric strain
(4) Relative stabilities of carbanions

69. What is the major product when $t$-butylbenzene is nitrated?

(1) $p$-nitro-$t$-butylbenzene
(2) 2,6-nitro-$t$-butylbenzene
(3) $o$-nitro-$t$-butylbenzene
(4) $m$-nitro-$t$-butylbenzene

70. What product will be obtained if acetaldehyde is oxidized?

(1) Ethanol
(2) Menthanol
(3) Acetic acid
(4) Acetamide
71. What is the main compound of cooking gas?
   (1) Propane  (2) Ethanol
   (3) Butane   (4) Methane

72. The boat and chair from of cyclohexane are:
   (1) Isomers  (2) Enantiomers
   (3) Diasteromers (4) Conformers

73. $S_n1$ reaction involves a.............as an Intermediate:
   (1) Carbanion  (2) Carbonium ion
   (3) Pentavalent carbon species (4) Free radical

74. Which one of the crystal unit cells does not have all axes orthogonal to one another?
   (1) Tetragonal cell  (2) Rhombohedral cell
   (3) Orthorhombic cell (4) Cubic cell

75. If the half life of a radioactive particle is 12 minutes what percentage of the total number of particles will remain after 10 minutes?
   (1) 56   (2) 54   (3) 17   (4) 60
76. The RMS speed of nitrogen molecules at 300 K is 516 m/s. What will be the RMS speed of helium atoms?

(1) 3612 m/s  (2) 1365 m/s  (3) 965 m/s  (4) 1806 m/s

77. The cryoscopic constant of water is 2 °C/m. What will be the freezing point of 1 kg of water in which 1.1 kg of ethylene glycol (C$_2$H$_6$O$_2$) is dissolved?

(1) -36 °C  (2) -12 °C  (3) -24 °C  (4) 23 °C

78. What solid products is obtained when calcium carbide reacts with water?

(1) CaCO$_3$  (2) Ca(OH)$_2$  (3) Ca  (4) CaCl$_2$

79. Which of the following are exothermic processes?

(a) A match burns;
(b) molten candle wax solidifies;
(c) kerosene evaporates

(1) All three  (2) (a) and (b)  (3) (a) and (c)  (4) (b) and (c)
80. What will be the main product in the following reaction?

\[(H_3C)_3C-Cl \quad + \quad C_2H_5O \quad \rightarrow\]

(1) \(C_2H_5O-C(CH_3)_3\)   \(\quad\) (2) \((H_3C)(C_2H_5)C=CH_2\)
(3) \((H_3C)_3C-OH\)   \(\quad\) (4) \((H_3C)_2C=CH_2\)

81. Other things being equal, how will the rate of the forward reaction in the following system change if the volume of the reaction vessel is halved?

\[CO(g) \quad + \quad Cl_2(g) \quad = \quad COCl_2(g)\]

(1) The rate will be halved
(2) The rate will be decrease to \(1/4\) of the original value
(3) The rate will be double
(4) The rate will be increase four times

82. What product is obtained when \(CH_3CONH_2\) is treated with bromine and sodium hydroxide?

(1) \(CH_3COOH\)   \(\quad\) (2) \(CH_3NH_2\)
(3) \(C_2H_5NH_2\)   \(\quad\) (4) \(CH_3CH_2Br\)
83. How many stereoisomers are possible for butane-2,3-dicarboxylic acid?

(1) 1  (2) 2  (3) 3  (4) 4

84. What changes will increase the equilibrium concentration of product C in the system, A(g) + B(g) = C(g), if the ΔH° of the reaction is negative? Choose from the following conditions:

(a) The adding of a catalyst,
(b) The addition of an extra amount of substance A,
(c) Raising of the temperature,
(d) Lowering the temperature

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

85. What is the pH of a 0.001 M solution of sodium hydroxide?

(1) -3  (2) 3  (3) 11  (4) 7

86. The reaction of copper sulphate with potassium iodide in aqueous medium is an example of:

(1) Redox reaction
(2) Disproportionation reaction
(3) Double decomposition reaction
(4) Halogenation reaction
87. CsF adopts the NaCl crystal structure. If the unit cell edge is length 4.02 Å, what is the shortest distance between the Cs⁺ and F⁻ ions in the crystal?

(1) 2.01 Å  (2) 2.84 Å  (3) 3.48 Å  (4) 4.02 Å

88. Steady state approximation for the reaction \( A \rightarrow B \rightarrow C \) makes the assumption,

(1) \( \frac{d[C]}{dt} = -\frac{d[A]}{dt} \)  (2) \([A] + [C]\) is a constant
(3) \( \frac{d[B]}{dt} = 0 \)  (4) \([A] - [C] = 0\)

89. Which of the following hydrocarbons has the most acidic H atom?

(1) Ethane  (2) Ethylene
(3) Acetylene  (4) Benzene

90. Select the reagent(s) suitable for converting benzoic acid to benzoyl chloride?

\( \text{SOCl}_2, \text{Cl}_2, \text{PCl}_5, \text{HCl} \)

(1) \( \text{SOCl}_2 \) and \( \text{PCl}_5 \)  (2) \( \text{SOCl}_2 \) and \( \text{Cl}_2 \)
(3) \( \text{PCl}_5 \)  (4) \( \text{Cl}_2 \) and \( \text{HCl} \)
SECTION - B

(i) LIFE SCIENCE

(Optional)

91. The oldest organisms are considered to be:

(1) PPLO  
(2) Archaea

(3) Animals  
(4) Bacteria

92. Gram staining was introduced by:

(1) Robert Gram  
(2) Christian Gram

(3) Robert Koch  
(4) Louis Pasteur

93. When a virus enters a cell but does not replicate immediately, the situation is called:

(1) Synergism  
(2) Symbiosis

(3) Mutualism  
(4) Lysogeny

94. The organism which obtain their energy from chemicals are designated as:

(1) Chemotrophs  
(2) Autotrophs

(3) Organotrophs  
(4) Prototrophs
95. An organism that expends energy to grow in a habitat with a low water activity in order to maintain internal solute concentrations to retain water is:

(1) Alkalophile          (2) Aerotolerant
(3) Acidophile           (4) Osmotolerant

96. The plasmids can be eliminated from a cell by the process known as:

(1) Fixing                (2) Curing
(3) Expulsion            (4) Breaking

97. Protein content in dry weight of SCP is:

(1) 80-90%               (2) 40-50%  (3) 60-80% (4) 20-30%

98. T-phages are a specific class of bacteriophages with:

(1) Double stranded DNA  (2) Single stranded DNA
(3) Double stranded RNA  (4) Single stranded RNA

99. Sulfonamide is synthetic.............compound:

(1) Antiviral            (2) Antibacterial
(3) Antifungal          (4) None of the above
100. Alcohol that is derived from fermentation of germinated barley grains, is known as:

1. Beer
2. Wine
3. Vodka
4. Rum

101. The tuberculosis is caused by:

1. Mucobacterium
2. Mycobacterium
3. Campylobacter
4. Salmonella

102. Germ theory of disease was first demonstrated by:

1. Robert Koch
2. L. Pasteur
3. P.A. Micheli
4. Benedict Prevost

103. Causal agents of severe rusts of all cereal grains and cultivated gasses are:

1. Puccinia spp
2. Salmonella spp
3. Pseudomonas spp
4. Fusarium spp

104. When a disease present more or less constantly in a particular location in moderate or severe form is called as:

1. Pandemic disease
2. Epidemic disease
3. Endemic disease
4. Sporadic disease
105. Which of the following reflects the correct order of events that take place during the multiplication of a virus?

(1) Attachment, release, biosynthesis, maturation, penetration
(2) Attachment, penetration, maturation, biosynthesis, release
(3) Penetration, attachment, biosynthesis, maturation, release
(4) Attachment, penetration, biosynthesis, maturation, release

106. Which of the following groups of animals does not come under deuterostomes:

(1) Chordata  (2) Arthropoda
(3) Protochordata  (4) Echinodermata

107. Water vascular system is found in which of the following group of animals?

(1) Echinodermata  (2) Ctenophora
(3) Mollusca  (4) Platyhelminthes

108. The lateral line system of bony fishes and sharks functions in:

(1) Osmoregulation
(2) Gas exchange
(3) Hydrodynamics
(4) Sensory reception
109. The first set of genes to be activated for axis specification of *Drosophila*
    is during early embryonic development is:
    (1) Gap genes  (2) Pair rule gene
    (3) Homeotic genes  (4) Segment polarity genes

110. During *gastrulation* the movement of ectodermal cells to cover the
    entire embryo is known as:
    (1) Epiboly  (2) Delamination
    (3) Ingression  (4) Invagination

111. Slow block to polyspermy resulting in removal of sperms from vitelline
    membrane is accomplished by:
    (1) Changes in membrane potential
    (2) Cortical rotation
    (3) Cortical reaction
    (4) Acrosomal reaction

112. If you need to prepare 5M NaCl (MW 58.4), you will dissolve:
    (1) 1 gm of NaCl in a total volume of 100 ml of water
    (2) 1 gm of NaCl in a total volume of 1000 ml of water
    (3) 58.4 gm of NaCl in a total volume of 200 ml of water
    (4) 5.84 gm of NaCl in a total volume of 100 ml of water

28
113. Which of the following is the major source of blood glucose during an overnight fasting?

(1) Hepatic glycogenolysis
(2) Gluconeogenesis
(3) Dietary glucose from intestine
(4) Muscles glycogenolysis

114. Pearl is formed in oysters:

(1) In the shell following the entry of an irritant
(2) By the mantle
(3) Between the mantle and inner body
(4) By calcium carbonate deposition at any site

115. Immunoprecipitation is done to study:

(1) DNA-protein interaction  (2) Protein-Protein interaction
(3) Protein-RNA interaction  (4) DNA-RNA interaction

116. Circadian rhythm in our body is regulated by:

(1) TSH  (2) Melatonin
(3) Prostaglandins  (4) ADH
117. In ovarian cycle:
   (1) Preovulatory phase occurs mainly due to section of LH
   (2) LH surge causes ovulation
   (3) Regulation of water balance in the blood
   (4) Filtration of blood

118. Drinking alcoholic beverages on hot days is not safe because alcohol inhibits release of the following hormone which normally help to conserve water during dehydration?
   (1) Oxytocin
   (2) Antidiuretic hormone
   (3) Thyroxine
   (4) Tri-iodothyronine

119. The bulk of CO₂ is transported in arterial blood as:
   (1) Dissolved CO₂
   (2) Bicarbonate
   (3) Carbamino haemoglobin
   (4) Carboxyhaemoglobin

120. The volume of air breathed in and out during quiet respiration is known as:
   (1) Respiratory minute volume
   (2) Inspiratory capacity
   (3) Residual volume
   (4) Tidal wave
(ii) PHYSICS

(Optional)

121. When some work is done then there will be some wastage of heat energy, this is in accordance with:

(1) Zeroth law of thermodynamics
(2) First law of thermodynamics
(3) Second law of thermodynamics
(4) Third law of thermodynamics

122. A sample of 100 gm of water is slowly heated from 27 °C to 87 °C. If the specific heat capacity of water is 4200 J/kg K then the change in the entropy of the water is:

(1) 7.6 J/K  (2) 36 J/K  (3) 42 J/K  (4) 65 J/K

123. Newton's law of cooling is a special case of:

(1) Stefan's law  (2) Kirchhoff's law
(3) Rayleigh Jean's law  (4) Joule's law

124. The temperature below which a gas must be cooled to be liquefied by pressure alone is called:

(1) Boyle temperature  (2) Critical temperature
(3) Curie temperature  (4) Inversion temperature
125. If a particle is projected at an angle $30^\circ$ to the horizontal with kinetic energy $E$ then the kinetic energy at the highest point of its trajectory will be:

(1) $E/4$  (2) $E/2$  (3) $3E/4$  (4) $\frac{E}{\sqrt{2}}$

126. A bird alights on a telephone wire stretched between two poles. The additional tension produced in the wire will be:

(1) Equal to the weight of the bird
(2) less than the weight of the bird
(3) Greater than the weight of the bird
(4) Zero

127. The length of a metal wire is $l_1$ when the tension in it is $T_1$ and is $l_2$ when the tension is $T_2$. The natural length of the wire is:

(1) $\frac{l_1 T_2 - l_2 T_1}{T_2 - T_1}$  (2) $\frac{l_1 T_2 + l_2 T_1}{T_1 + T_2}$
(3) $\frac{l_1 T_2 - l_2 T_1}{T_1 + T_2}$  (4) $\frac{l_1 T_2 + l_2 T_1}{T_1 - T_2}$

128. A shell fired from a canon with a velocity $v$ m/sec at an angle $\theta$ with the horizontal. It explodes into two pieces of equal masses at highest point of its path. One of the pieces retraces its path to the canon. The speed of the other piece immediately after the explosion is:

(1) $3v \cos \theta$ m/sec  (2) $4v \cos \theta$ m/sec
(3) $2v \cos \theta$ m/sec  (4) $v \cos \theta$ m/sec
129. Two uniform circular discs A and B of equal masses and thickness are made of materials of densities $d_A$ and $d_B$ respectively. If their moments of inertia about an axis passing through the center and normal to the circular surface are $I_A$ and $I_B$ respectively then:

$$
\begin{align*}
(1) \quad & \frac{I_A}{I_B} = \frac{d_A}{d_B} \\
(2) \quad & \frac{I_A}{I_B} = \frac{d_{A'}}{d_{B'}} \\
(3) \quad & \frac{I_A}{I_B} = \frac{d_B}{d_A} \\
(4) \quad & \frac{I_A}{I_B} = \frac{d_{B'}}{d_{A'}}
\end{align*}
$$

130. In the half life time of radon ($^{222}$Rn) is 3.8 days then how long does it take for 60% of sample of radon to decay?

(1) 4 days (2) 4.5 days
(3) 5 days (4) 6.5 days

131. A particle is executing simple harmonic motion with time period $T = \frac{2\pi}{3}$ and amplitude $A = 2$ meters. What is its maximum acceleration during its motion:

(1) 6 m/sec$^2$ (2) 18 m/sec$^2$
(3) 9 m/sec$^2$ (4) 36 m/sec$^2$

132. A pure Ge crystal has intrinsic carrier concentration $N_i = 10^{13}$ /cm$^3$ at room temperature when it is doped with antimony the hole density is found to be $10^{11}$ /cm$^3$ at room temperature the doping density, assuming that all impurity atoms are ionized, is:

(1) $10^{11}$ /cm$^3$ (2) $10^{13}$ /cm$^3$
(3) $10^{15}$ /cm$^3$ (4) $10^{12}$ /cm$^3$
133. For a transistor the current gain $\alpha = 0.98$. If the transistor is used as an amplifier in common emitter configuration and the base current changes by 0.1 mA on applying the input signal then the collector current will changes by:

1. $5\ mA$
2. $4.8\ mA$
3. $9.8\ mA$
4. $4.9\ mA$

134. Which of the following statement is wrong:

1. Voltmeter should have very high resistance
2. Ammeter should have very high resistance
3. Voltmeter should be connected parallel to the device across which voltage is to be measured
4. Ammeter should be connected in series with the electric circuit

135. If two electric heaters rated $P_1$ and $P_2$ watts of voltage are connected in parallel across a power supply of $V$ volts then the total power drawn would be:

1. $\frac{P_1P_2}{P_1+P_2}$
2. $\frac{P_1+P_2}{P_1P_2}$
3. $P_1 + P_2$
4. $\sqrt{P_1P_2}$

136. If the frame around which wire is wound in a moving cell galvanometer is metallic then its:

1. damping is increased
2. damping is decreased
3. hysteresis loss is decreased
4. sensitivity is increased
137. For a polentiometer to be very sensitive the:

(1) Wire must be long
(2) Wire must be small
(3) Potential drop per unit length must be small
(4) Potential drop per unit length must be large

138. Two linearly polarized light waves with their polarization planes at right angles to each other give rise to:

(1) Circular polarization  (2) Elliptical polarization
(3) Linear polarization  (4) Unpolarized light

139. The decomposition of a ray of light into two different rays when it passes through calcite crystal is known as:

(1) Diffraction  (2) Refraction
(3) Interference  (4) Bifringence

140. A thin needle of steel can be made to float in a bowl filled with pure water without any external support because its weight is balanced by:

(1) The surface tension of water  (2) The viscosity of water
(3) The buoyancy of water  (4) The stream energy of water
141. Stern-Gerlach experiment shows:

(1) Discrete values for the physical quantities
(2) Continuous values for the physical quantities
(3) Uncertainty in simultaneous measurement of position and momentum of electron
(4) Wave nature of electron

142. Which of the following combinations of three identical capacitors will store maximum energy for the same voltage:

(1) Two in series and one in parallel across them
(2) Two in parallel and one in series
(3) All three in series
(4) All three in parallel

143. For a medium the response of conduction electrons to an electromagnetic field is determined by the relation \( \vec{j} = \sigma \vec{E} \) where symbols have their usual meaning. If \( \sigma \) increases with temperature the medium is:

(1) A conductor
(2) A semiconductor
(3) An insulator
(4) A dielectric

36
144. In a full-wave rectifier circuit being operated from 50Hz A.C. mains frequency the second harmonic frequency in the ripple would be:

(1) 25 Hz  
(2) 50 Hz  
(3) 100 Hz  
(4) 200 Hz

145. The width of the depletion layer of a P-N junction diode:

(1) Is increased under reverse bias
(2) Is increased under forward bias
(3) Is independent of applied bias
(4) Is increased with high doping

146. The moderator in a nuclear reactor is used for:

(1) Absorbing neutrons  
(2) Absorbing thermal energy  
(3) **Slowing** down neutrons  
(4) Accelerating neutrons

147. A measurement establishes the position of a proton with an accuracy of $\pm 1.0 \times 10^{-11}$ m. The uncertainty in the proton's position 1.00 sec later will be (Assume velocity of proton to be very-very less than velocity of light and $h = 1.054 \times 10^{-34}$ J.sec)

(1) $2.35 \times 10^{-12}$ m  
(2) $1.15 \times 10^{-13}$ m  
(3) $3.15 \times 10^{-19}$ m  
(4) $3.25 \times 10^{-16}$ m
148. Ultraviolet light of wave length 350 nm and intensity 1.00 w/m² is directed at a potassium surface. If the work function for potassium surface is 2.2 eV then the maximum K.E of the photoelectrons emitted from the surface will be:

(1) 1.2 eV  (2) 1.3 eV  (3) 1.4 eV  (4) 1.5 eV

149. An electron collides with a hydrogen atom in its ground state and excites it to a state of n=3. How much energy was given to the hydrogen atom in this collision (Given that ionization energy of hydrogen atom is 13.6 eV)

(1) 10.4 eV  (2) 9.5 eV  (3) 12.1 eV  (4) 6.1 eV

150. Which of the following statement is not correct about LASER light beams:

(1) The light is very nearly monochromatic
(2) All the waves in the light are exactly in phase with each other
(3) A LASER beam courages hardly at all
(4) The beam is extremely intense
(iii) GEOLOGY  
(Optional)

151. As per the principle of cirs-cross cutting:

(1) Intruded rock is older than intruding rock
(2) Intruded rock is younger than intruding rock
(3) Both are of same age
(4) There is no time relationship between them

152. Which of the following physical divisions of India is represented by a triangular plateau?

(1) Extra peninsular  (2) Peninsular
(3) Indo-gangetic Plains  (4) None of these

153. "Structural highs" in Indo-gangetic plains are:

(1) Thrust faults  (2) Flysch zone
(3) Buried hills  (4) Synclinorium

154. Siwalik rocks are present in:

(1) Outer Himalaya zone
(2) Lasser Himalaya zone
(3) Central crystalline axis
(4) Tethyan Himalaya zone
155. Indus suture zone has characteristic rock type known as :

(1) Ophiolite
(2) Gondite
(3) Charnockite
(4) Khondalite

156. Select a lithostratigraphic unit from the following :

(1) System
(2) Lithodeme
(3) Formation
(4) Biozone

157. Which of the following eras has three periods ?

(1) Hadean
(2) Mesozoic
(3) Palaeozoic
(4) Cenozoic

158. Mesozoic Era is also known as :

(1) Age of Mammals
(2) Age of reptiles
(3) Age of birds
(4) Age of fishes

159. When the most primitive fishes did first appeared ?

(1) Devonian
(2) Permian
(3) Ordovician
(4) Cambrian

160. In which type of preservation, the hard parts of the organism becomes heavier and denser ?

(1) Replacement
(2) Petrification
(3) Recrystallisation
(4) Carbonisation
161. Which of the following is a pseudofossil?
   (1) Dendrites  (2) Chondrites
   (3) Graptolite  (4) Trilobite

162. The impression produced in the sediments due to behavioural activities of ancient organisms is known as:
   (1) Body fossils  (2) Leaked fossil
   (3) Pseudofossil  (4) Trace fossil

163. What is meaning of extinction in fossil record?
   (1) It has suddenly disappeared and never recur
   (2) It has suddenly disappeared but recurs again
   (3) Its number has suddenly increased and then decreased
   (4) Its number has suddenly decreased and then increased

164. Which is the greatest period of coal formation?
   (1) Permian  (2) Carboniferous
   (3) Eocene  (4) Miocene

165. Which of the following horizons of Lower Gondwana is devoid of coal seams?
   (1) Barakar Formation
   (2) Raniganj Formation
   (3) Karharbari Formation
   (4) Barren Measure Formation
166. The lignite coalfield of Tamil Nadu is known as:

(1) Panadbro Lignite  (2) Neyveli Lignite
(3) Palna Lignite  (4) None of these

167. Which of the following oilfields is situated in Assam?

(1) Digboi  (2) Nawagam
(3) Ankleshwar  (4) Nagapatinam

168. In Bombay High, the age of hydrocarbon bearing liomestone is:

(1) Oligocene  (2) Eocene
(3) Miocene  (4) Palaeocene

169. Which of the following areas is famous for iron ore deposits?

(1) Malanjkhand  (2) Kudremukh
(3) Zawar  (4) Sukinda

170. Find a copper-ore mineral from the following:

(1) Chamosite  (2) Chalcopyrite
(3) Pyrite  (4) Galena

171. Maganite is a mineral of:

(1) Carbon  (2) Magnesium
(3) Iron  (4) Manganese
172. Blue dust is variety of:

1. Iron ore
2. Copper ore
3. Manganese ore
4. Chromite ore

173. Which of the following is not mechanically disintegrated sedimentary rock?

1. Sandstone
2. Conglomerate
3. Shale
4. Limestone

174. In the clastic sediments, the size of cobbles of range in between:

1. 4-64 mm
2. 64-256 mm
3. 2-4 mm
4. 2-1/16 mm

175. The sandstones with more feldspar than quartz are called:

1. Arkose
2. Greywacke
3. Quartz arenite
4. None of these

176. Which of the following is a primary sedimentary structure?

1. Convolute bedding
2. Concretions
3. Solution structure
4. Stratification
177. The epizone of metamorphism is characterized by:

1. Low grade metamorphism
2. Medium grade metamorphism
3. High grade metamorphism
4. High grade metamorphism

178. Which of the following metamorphic rocks is equivalent of shales and mudstone?

1. Schist
2. Geneiss
3. Quartzite
4. Slate

179. Select from the following an acidic igneous rock:

1. Basalt
2. Granite
3. Syenite
4. Diorite

180. Which of the following is considered as quartz-free igneous rock?

1. Nepheline Syenite
2. Lamprophyre
3. Dolerite
4. Rhyolite
ROUGH WORK
राफ कार्य
ROUGH WORK
रफ कार्य
अध्यायों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण पृष्ठ पर तथा उत्तर-पत्र के होने पृष्ठों पर
केवल नीली-काली बाल-व्याख्या लेख से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 30 मिनट के अंदर ही देखें लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटना नहीं है। पुस्तिका दोहराने पर जाने पर इसकी सूचना तकाली कस्क निरीक्षण को देखकर समूह प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में लिखने रहित प्रश्न-पत्र के अतिरिक्त, लिखा या सादा कोई भी खुला कागज साथ में न लायें।

3. उत्तर-पत्र अलग से दिया गया है। इसे न तो सोचें और न ही विकृत करें। द्वितीय उत्तर-पत्र नहीं दिया जायेगा।

4. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर लेन से निर्धारित स्थान पर लिखें।

5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिसे वृत्तों को गाढ़ा कर दें। जहां-जहां आवश्यक हो वहां प्रश्न-पुस्तिका का क्रमांक तथा सेट का संख्या उचित स्थानों पर लिखें।

6. ओ. प्र. आर. पत्र पर अनुक्रमांक संख्या, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक और ओ. प्र. आर. पत्र संख्या की प्रविष्टियों में अनलैन की अनुमति नहीं है।

7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रभावित होना चाहिये अनुमति यह एक अनुमित साफ़त का प्रयोग माना जायेगा।

8. प्रश्न-पुस्तिका में प्रश्नक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रश्नक प्रश्न के वैकल्पिक उत्तर के लिए आपको उत्तर-पत्र को सम्बंधित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।

9. प्रश्नक प्रश्न के उत्तर के लिए केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अं०००० पर पेन से जल्दी ही उत्तर गलत माना जायेगा।

10. ध्यान दें कि एक बार स्थापीय द्वारा अंकित उत्तर बदलना नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देंगे तो, तो संबंधित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर पूर्ण अंक दिये जायें।

11. रफ्तार कार्य के लिए प्रश्न-पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा उत्तर-पुस्तिका के अंतिम पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरात्र केवल ओ. प्र. आर. उत्तर-पत्र परीक्षा भवन में होगा करें।

13. परीक्षा समाप्त होने से पहले परीक्षा भवन से वापस जाने की अनुमति नहीं होगी।

14. यदि कोई अभावों परीक्षा में अनुमित साधनों का प्रयोग करता है, तो वह विद्यमान प्रत्येक निर्देश से पालन करें।