M.Sc. in Environmental Science.

10P/290/8

Question Booklet No.....

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

Roll No. | | | | | | | | |

Roll No.
(Write the digits in words) .....

Serial No. of OMR Answer Sheet .....

Day and Date ....
(Signature of Invigilator)

INSTRUCTIONS TO CANDIDATES

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

1. Within 10 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 also 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 ball-point 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 mark).
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 *both the Question Booklet and the 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.

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण-पृष्ठ पर दिये गए हैं]

[No. of Printed Pages : 32+2

10P/290/8

Time/समय : 2 Hours/घण्टे **Full Marks/पूर्णांक :** 360

Note/नोट : (1) Attempt as many questions as you can. Each question carries **3** 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.
Section—B : This contains three sub-sections having questions of three disciplines viz.,
Life Sciences (sub-section B-1)
Physics (sub-section B-2)
Geology (sub-section B-3).
A candidate is required to attempt only one from these three sub-sections.

Section—A

BASIC ENVIRONMENTAL SCIENCES

(Compulsory for all)

1. A material which does not occur in nature, but is introduced by human activity is called as

(1) pollutant (2) contaminant (3) smog (4) waste

2. The earth absorbs radiation mainly

(1) visible region (2) UV region

(3) infrared region (4) radio waves

3. Lithosphere can be defined as

(1) outer mantle of earth (2) study of soil

(3) inner core (4) study of rocks

4. Which radiation is primarily responsible for the production of ions in the ionosphere?

(1) UV radiation (2) Visible radiation

(3) IR radiation (4) Gamma radiation

5. Which gas has the maximum 'Global Warming Potential' ?

(1) CFC (2) Methane (3) Carbon dioxide (4) Nitrogen oxide

6. Topographic and edaphic factors are

(1) direct factors (2) indirect factors

(3) determining factors (4) physiographic factors

7. Conservation of natural resources means

(1) complete utilization of natural resources

(2) less utilization of natural resources

(3) less and effective utilization of natural resources

(4) rational utilization of natural resources

8. MOHO is the discontinuity between

(1) lithosphere and asthenosphere (2) asthenosphere and mesosphere

(3) crust and mantle (4) homosphere and asthenosphere

9. The dust-cloud hypothesis explains

(1) the origin of earth (2) the origin of the solar system

(3) the origin of the planets (4) None of the above

10. The seismicity in the earth is concentrated in

(1) outer core (2) inner core

(3) mantle (4) the crust and the upper mantle

11. The composition of chromite is

(1) $FeCrO_4$ (2) $Fe_2Cr_2O_4$ (3) $FeCr_2O_4$ (4) Cr_2O_3

12. Peat has its greatest development in

(1) tropical regions (2) subtropical regions

(3) temperate and cold regions (4) the regions of great rainfall

13. In an isochemical metamorphic rock there is

(1) no addition and subtraction of material from outside

(2) an addition and subtraction of material from outside

(3) a great change in the bulk chemical composition of rock

(4) no change in the bulk chemical composition of rock

14. The kind of soil water most useful to plant is

(1) free water (2) hygroscopic water

(3) crystalline water (4) capillary water

15. Laterization of soil is

(1) formation of soil (2) degradation of soil

(3) sterilization of soil (4) soil erosion

16. Ratio of nitrogen to oxygen in atmosphere is

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

17. The composition of the planet is largely a function of its

(1) size (2) date of formation

(3) distance from the sun (4) interactions with comets and asteroids

18. Each ecological factor to which an organism responds has maximum and minimum limits, this is commonly known as

(1) law of tolerance (2) law of minimum

(3) law of maximum (4) law of conservation

19. Compass is used to read direction of wind. The compass has how many points?

(1) 8 (2) 16 (3) 4 (4) 2

20. Arawali means

(1) desert (2) rain (3) wall of stones (4) None of the above

21. Minimum thermometer contain

(1) alcohol (2) mercury (3) water (4) bromine water

22. Wind vane tells about

(1) wind speed (2) wind direction

(3) wind temperature (4) All of the above

23. Air pressure can be determined by

(1) anemometer (2) barometer (3) hygrometer (4) psychrometer

24. Which type of forecast helps to plan in advance regarding disaster mitigation?

(1) Short-range forecast (2) Long-range forecast

(3) Medium-range forecast (4) All of the above

25. When compared with river water, seawater contains oxygen

(1) 10% more (2) 10% less (3) 20% more (4) 20% less

26. A rainfall will be called as acidic if pH is less than

(1) 5·0 (2) 5·6 (3) 6·5 (4) 7·0

27. Of the following atmospheric gases, the one having the shortest estimated residence time is

(1) Argon (2) Oxygen (3) Carbon dioxide (4) Helium

28. Which one of the following statements about carbon monoxide is false?

(1) CO is tasteless, odorless and colorless gas

(2) The single, largest anthropogenic source of CO in the atmosphere is the automobile

(3) There is less CO in the atmosphere than carbon dioxide

(4) CO is toxic to animals because it interferes with nerve impulse conduction

29. The characteristics of photochemical smog is

(1) oxidizing (2) reducing (3) inert (4) None of the above

30. The main source of SO_x in atmosphere is

(1) transportation (2) fuel combustion

(3) industrial process (4) landfills

CHEMISTRY

(Compulsory for all)

31. Law of conservation of mass states that when chemical reaction takes place, then matter is

(1) created
(2) destroyed
(3) neither created nor destroyed
(4) created and destroyed

32. pH is

(1) $pH = +\log (a_e)$ (2) $pH = -\log (e)$ (3) $pH = -\log (a_{H^+})$ (4) $pH = +\log (a_{H^+})$

33. Molar concentration of pure water is

(1) 556·6 mol/L (2) 55·56 mol/L (3) 565·6 mol/L (4) 56·56 mol/L

34. Residue of Gobar gas plant is a type of

(1) farmyard manure
(2) compost
(3) green manure
(4) humus

35. Bauxite is

(1) aluminium oxide
(2) hydrous aluminium oxide
(3) a complex aluminium salt
(4) hydrous aluminium chloride

36. 1 joule is equivalent to

(1) 4·185 ergs (2) 4185 ergs (3) 10^7 ergs (4) $4 \cdot 185 \times 10^7$ ergs

37. Which of the following solutions has highest freezing point?

(1) 0·1 M NaCl (2) 0·1 M $BaCl_2$

(3) 0·1 M $Al_2(SO_4)_3$ (4) 0·1 M urea

38. The mass of $(COOH)_2 \cdot 2H_2O$ needed to prepare 500 ml of 0·1 molar solution is

(1) 12·6 gm (2) 6·3 gm (3) 4·5 gm (4) 9·0 gm

39. The relationship between ΔG and ΔS is

(1) $\Delta G = \Delta S + T\Delta H$ (2) $\Delta S = \Delta G - T\Delta H$

(3) $\Delta H = \Delta S - \frac{\Delta G}{T}$ (4) $\Delta S = \Delta H - \frac{\Delta G}{T}$

40. Ethers are isomeric with

(1) carboxylic acids (2) aldehydes

(3) alcohols (4) ketones

41. NO_x is a mixture of

(1) NO_2 and N_2O_3 (2) NO and NP

(3) NO and NO_2 (4) HCl

42. DDT accumulates in which tissue of humans?

(1) Muscles (2) Blood (3) Bones (4) Fat

43. In unpolluted regions the pH of rainwater is

(1) 7·0 (2) 6·5 (3) 5·6 (4) 6·7

44. At present the second largest contributor to greenhouse effect on earth is

(1) CH_4 (2) CO_2 (3) N_2O (4) CFCs

45. Hb, chlorophyll and cytochrome share

(1) Fe (2) porphyrin (3) Mg (4) phytol

46. The halogen exhibits oxidation number from

(1) -2 to $+6$ (2) -1 to $+7$ (3) -3 to $+4$ (4) -2 to $+4$

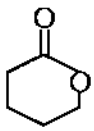
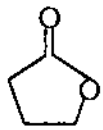
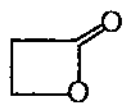
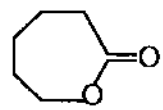
47. Optimum fluoride concentration in drinking water is

(1) 0·1 p.p.m. (2) 1·0 p.p.m. (3) 0·5 p.p.m. (4) 1·5 p.p.m.

48. One kilocalorie is equal to

(1) 418·4 joules (2) 4·184 joules (3) 396·8 BTU (4) 3·968 BTU

49. Which of the following absorbs higher frequency ?

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

50. Which polymer is used in making rayon?

(1) Polyester (2) Nylon (3) Cellulose (4) Starch

51. Vitamin E is also called

(1) tocopherol (2) cynocobalam (3) lactoflavin (4) ascorbic acid

52. Which one is not a chlorionated pesticide?

(1) Aldrin (2) Lindane (3) DDT (4) Malathion

53. Which one is not an organophosphate pesticide?

(1) DDT (2) Malathion (3) Baygon (4) Carbamates

54. Fluorine is an example of an element which has to be produced by electrolytic oxidation because

(1) it can be cheaply produced by electrolytic method

(2) it can be easily produced by electrolytic method

(3) chemical methods of oxidising the fluoride ion are not feasible due to its high electronegativity

(4) containers will be attacked by fluorine

55. Primitive atmosphere of earth contains H_2, NH_3 and

(1) CH_4 (2) CO_2 (3) N_2 (4) O_2

56. Which one of the following gases can deplete ozone layer in upper atmosphere?

(1) CH_4 (2) CO (3) NH_3 (4) SO_2

57. What produces more carbon dioxide than any other sources?

(1) Industrial exhaust (2) Burning of the rainforest

(3) Dry ice factories (4) Burning of cow dung

58. How much has carbon dioxide increased in the air since 1850?

(1) None (2) About 5% (3) 25% (4) 15%

59. Alum is used for the water purification as it helps in

(1) filtration (2) disinfection (3) irradiation (4) sedimentation

60. Protons

(1) are negatively charged (2) are similar in mass to neutrons

(3) have no electric charge (4) circle the atomic nucleus

61. Atoms of same element that differ in their atomic mass numbers are called

(1) ions (2) anions (3) isomers (4) isotopes

62. Covalent bonding occurs when

(1) ions of opposite charge attract each other

(2) atoms share electrons

(3) nuclei of different atoms fuse together

(4) atoms share neutron

63. For corrosion prevention iron pipes carrying drinking water are covered with zinc. The process in known as

(1) soldering (2) alloy formation (3) electroplating (4) galvanishing

64. Colloidal solutions are formed due to

(1) increase in the surface area of dispersed phase

(2) increase in the volume of dispersion medium

(3) decrease in the surface tension of dispersed surface

(4) increase in surface area and surface tension of dispersed phase

65. The average pH of seawater lies between

(1) 3-5 (2) 5-8 (3) 8-8·2 (4) 12-14

66. The gas found dissolved in the sea in an amount greater than its amount in the atmosphere is

(1) nitrogen (2) oxygen (3) carbon dioxide (4) argon

67. The characteristic minerals in the zone of oxidation are

(1) sulphides (2) oxides (3) native metals (4) sulphates

68. A sample of U^{238} (half life = $4 \cdot 5 \times 10^9$ years) ore is found to contain 23·8 g of U^{238} and 20·6 g of Pb^{206}. Calculations for the age of the ore may show the figure for age as

(1) $4 \cdot 5 \times 10^9$ years (2) $2 \cdot 2 \times 10^9$ years

(3) $1 \cdot 1 \times 10^9$ years (4) 9×10^9 years

69. There is a change and deepening of colour in going from fluorine to iodine. Fluorine is pale yellow but iodine is violet because of

(1) change in electronegativity

(2) change in size of the molecule

(3) change in density of the molecule

(4) change in polarisability of the molecule

70. One of the difficult problems about oxygen binding by haemoglobin concerns the Fe—O_2 grouping. The experimental evidence appears to be in favour of

(1) a linear arrangement, Fe—O—O

(2) a side-on arrangement, 

(3) a bent arrangement, 

(4) None of these

71. One litre of a buffer solution containing 0·01 M NH_4Cl and 0·1 M NH_4OH having pK = 5, would have the pH of

(1) 9 (2) 10 (3) 4 (4) 6

72. $^{12}C_6$ differs from $^{13}C_6$ in

(1) the number of protons only

(2) the number of neutrons only

(3) the number of protons and neutrons

(4) the number of protons, neutrons and electrons

73. The half life of a radioactive substance is 100 days. If you start with 1 gm of the substance, then at the end of 500 days, the amount of substance remaining is

(1) $\frac{1}{5}$ gm (2) $\frac{4}{5}$ gm (3) $\frac{1}{32}$ gm (4) $\frac{31}{32}$ gm

74. The bond angle C—O—C in ether is about

(1) 118° (2) 104° (3) 110° (4) 102°

75. When some work is done, then there will be some waste heat, this is in accordance with

(1) 1st law of thermodynamics (2) 2nd law of thermodynamics

(3) 3rd law of thermodynamics (4) entropy

76. Which of the following acids is called as Cero's acid?

(1) H_2SO_4 (2) H_2SO_3 (3) H_2SO_5 (4) H_2SO_2

77. Stochiometric calculations are based on

(1) atomic number (2) atomic mass

(3) decrease in mass (4) number of moles

78. What is the Boyle temperature for H_2 gas?

(1) 117 °K (2) 24 °K (3) 332 °K (4) 860 °K

79. Pure water is separated by a semi-permeable membrane from dilute aqueous salt solution. To prevent migration of water across the semi-permeable membrane

(1) one must apply pressure on the solution side and with rise in temperature the pressure to be applied shows a nearly linear increase

(2) one must apply pressure on the solvent side and with rise in temperature the pressure to be applied shows a nearly linear increase

(3) one must apply pressure on the solvent side and with rise in temperature, the pressure to be applied shows a nearly linear decrease

(4) one must apply pressure on the solution side and with rise in temperature, the pressure to be applied shows a nearly linear decrease

80. The pH of a solution is twice as alkaline (i.e. which contains twice as many hydroxide ions per litre) as pure water. The pH of this solution is

(1) 7·30 (2) 3·5 (3) 14 (4) 6·7

81. If the pK_a of carbonic acid is 6·40 and the pH of blood serum is 7·40, the ratio of the concentration of bicarbonate to carbonic acid in serum is

(1) 0·01 (2) 0·1 (3) 1·0 (4) 10·0

82. The pH of a 10^{-8} m aqueous solution of HCl is

(1) 8 (2) slightly above 7

(3) slightly below 7 (4) 4

83. The intensity of light emerging from after absorption by a copper sulphate solution is I, that emerging through pure water is I_0 (path length in both cases is 1 cm)

(1) $\frac{I}{I_0}$ increases by a factor of 2 if copper sulphate concentration is doubled

(2) $\frac{I}{I_0}$ decreases by a factor of 2 if copper sulphate concentration is doubled

(3) $\ln\left(\frac{I}{I_0}\right)$ increases by a factor of 2 if copper sulphate concentration is doubled

(4) $\ln\left(\frac{I}{I_0}\right)$ decreases by a factor of 2 if copper sulphate concentration is doubled

84. Higher calorific value of fuel assumes that it

(1) contains H_2O in liquid form

(2) contains H_2O in vapour form

(3) contains H_2O in liquid and partly in vapour form

(4) contains H_2O in partly vapour form

85. The major oxidant found in polluted atmosphere is

(1) peroxyacetyl nitrate (2) nitrogen dioxide

(3) nitrogen oxide (4) ozone

86. A reaction is not feasible, if

(1) ΔH is negative ΔS is negative (2) ΔH is positive and ΔS is positive

(3) ΔH is positive and ΔS is negative (4) ΔH is negative and ΔS is positive

87. In order to study internal atomic structure of crystals we use

(1) X-rays (2) UV-rays (3) IR-rays (4) yellow light

88. The mean kinetic energy per gram molecule for diatomic gas is

(1) $\frac{3}{2}RT$ (2) $\frac{4}{2}RT$ (3) $\frac{5}{2}RT$ (4) $\frac{6}{2}RT$

89. An ideal gas undergoes an adiabatic change in volume with pressure. Then

(1) $P^{\gamma}V = \text{constant}$ (2) $PV^{\gamma} = \text{constant}$

(3) $(PV)^{\gamma} = \text{constant}$ (4) $PV = \text{constant}$

90. The first law of thermodynamics is a special case of

(1) Newton's law (2) law of conservation of energy

(3) Charles' law (4) law of heat exchange

Section—B

LIFE SCIENCES (sub-section B-1)

(Optional)

91. Nitrifying bacteria are

(1) organotrophic (2) osmotrophic (3) heterotrophic (4) autotrophic

92. Which of the following is most acidic?

(1) H_2O (2) CH_3OH (3) C_2H_5OH (4) $CH_3CH_2CH_2OH$

93. For recycling the most suitable matter(s) is/are

(1) papers (2) plastics

(3) iron and copper (4) glass and aluminium

94. The salinity of seawater depends upon

(1) evaporation (2) precipitation

(3) evaporation and precipitation (4) atmospheric pressure

95. In succession on bare rock surfaces the first colonizers are

(1) Mosses (2) Foliose lichens

(3) Crustose lichens (4) Brown algae

96. COD is always

(1) equal to BOD (2) equal to higher than BOD

(3) lower than BOD (4) 1·8 times of BOD

97. Plants that complete their life cycle within 4 to 6 weeks are called

(1) ephemerals (2) biennials (3) perennials (4) climbers

98. Indian coal has an average ash content of

(1) 50% (2) 70% (3) 40% (4) 30%

99. DDT can reduce bird population by

(1) affecting their breeding time (2) increasing fragility of eggs

(3) disturbing their thermal insulation (4) reducing their sperm count

100. The main cause of eutrophication of a water body is

(1) increase in DO (2) increase in BOD

(3) increase in nutrients (4) change in pH

101. Frankia is associated with

(1) nitrification (2) denitrification

(3) nitrogen fixation (4) ammonification

102. Potential of air pollution increase when the ventilation coefficient is

(1) $>11000\ m^2/s$ (2) $>7600\ m^2/s$ (3) $<3600\ m^2/s$ (4) $<6000\ m^2/s$

103. Which plant is total stem parasite?

(1) *Cuscutta* (2) Mango (3) Mushroom (4) *Rafflesia*

104. Which plant bears clinging roots?

(1) Screw Pine (2) *Podostemon* (3) Orchid (4) *Trapa*

105. In 1995, the Central Ganga Authority was renamed as

(1) Ganga Yamuna Authority (2) National River Conservation Authority

(3) Ganga Action Plan Authority (4) Ganga Project Directorate

106. Lethal genes were discovered by

(1) Johanssen (2) Hammerling

(3) Castle and Little (4) Cuenot

107. *Ulothrix* and *Spirogyra* are filamentous and

(1) branched (2) colonial (3) unbranched (4) solitary

108. Antibiotics has been extracted from

(1) *Chlorella* (2) *Spirogyra* (3) *Oscillatoria* (4) *Nostoc*

109. Pyramid of energy in grassland or pond ecosystem is always

(1) inverted (2) first inverted then upright

(3) upright only (4) first upright then inverted

110. What is the rate of transpiration when temperature increases?

(1) Low (2) Low in herbs and high in trees

(3) Nil (4) High

111. The greenhouse effect at present increase the earth's temperature

(1) 16 °C (2) 33 °C (3) 23 °C (4) 8 °C

112. Which is an auxin?

(1) ATP (2) Pyruvic acid

(3) Phosphoglyceric acid (4) Indole acetic acid

113. In 1985 the largest use of CFCs was as

(1) refrigerants (2) rigid foam insulation

(3) solvents (4) aerosol propellants

114. Food chains can be divided into how many basic types?

(1) Two (2) Six (3) Three (4) Four

115. Red Data Book is published by

(1) WWF (2) IUCN (3) Green peace (4) BNHS

116. The example of a biochemical rocks is

(1) sandstone (2) diatomite (3) calcite (4) gypsum

117. Hormone responsible for puberty in man is

(1) thyroxine (2) testosterone (3) cortisol (4) pituitrin

118. Example of carnivorous plant is

(1) Utricularia (2) Lemna (3) Usnea (4) Lantana

119. Biodegradable plastics contain

(1) polyhydroxybutyrate
(2) crosslinked glycols
(3) strieght glycols
(4) biodegradable cellulose

120. A marine compound discovered off the coast of Key Largo in Florida inhibits cancer cell growth in lab tests and is likely to promot the development of effective new drugs. The drug is derived from

(1) Virus (2) Cyanobacteria (3) Bacteria (4) Protozoa

PHYSICS (sub-section B-2)

(Optional)

121. A person standing on the floor of an elevator drops a coin. The coin reaches the floor of the elevator in a time t_1 if the elevator is stationary and in time t_2 if it is moving uniformly, then

(1) $t_1 = t_2$

(2) $t_1 > t_2$

(3) $t_1 < t_2$

(4) $t_1 < t_2$ or $t_1 > t_2$ depending on whether the elevator is going up or going down

122. A body of mass 2 kg placed on a long frictionless horizontal table is pulled horizontally by a constant force F. If it is found to move 10 m in first 2 sec, then the magnitude of F is

(1) 5 N (2) 10 N (3) 15 N (4) 20 N

123. Suppose a tunnel could be dug through the earth from one side to the other along a diameter and a particle of mass m is dropped into the tunnel. if we neglect the frictional forces and assume that the earth has uniform density ρ, then the particle will execute SHM with

(1) $T = \sqrt{\frac{6\pi}{G\rho}}$ (2) $T = 2\pi\sqrt{\frac{6}{G\rho}}$ (3) $T = 2\pi\sqrt{\frac{3}{G\rho}}$ (4) $T = \sqrt{\frac{3\pi}{G\rho}}$

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

125. Air is pushed into a soap bubble of radius r to double its radius. If the surface tension of the soap solution is S the work done in this process is

(1) $8\pi r^2 S$ (2) $12\pi r^2 S$ (3) $16\pi r^2 S$ (4) $24\pi r^2 S$

126. Bernoulli's theorem is based on the conservation of

(1) mass (2) momentum

(3) energy (4) angular momentum

127. A system can be taken from the initial state P_1V_1 to the final state P_2V_2 by two different methods. Let ΔQ and ΔW represent the heat given to the system and the work done by the system. Which of the following must be same in ball methods?

(1) ΔQ (2) ΔW (3) $\Delta Q + \Delta W$ (4) $\Delta Q - \Delta W$

128. 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 approximately

(1) 7·6 J/°K (2) 36 J/K (3) 42 J/K (4) 65 J/°K

129. Newton's law of cooling is a special case of

(1) Stefan's law (2) Kirchhoff's law

(3) Wien's displacement law (4) Planck's law

130. Indicate the false statement about the Brownian motion

(1) It is decreased in liquids

(2) It increases with decrease in temperature

(3) It increases with decrease in viscosity

(4) It increases with decrease in density of liquid

131. The Maxwell's equation $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ represents

(1) Ampere's law (2) Faraday's law (3) Biot-Savart law (4) Gauss's law

132. In electromagnetic spectrum the wavelength 200 nm lies in

(1) visible region (2) infrared region

(3) ultraviolet region (4) radio wave region

133. A thin lens of focal length 12 cm is immersed in water ($\mu = 1{\cdot}33$). What is its new focal length?

(1) 48 cm (2) 24 cm (3) 6 cm (4) 18 cm

134. At what distance from a convex mirror of focal length 2·5 m should a boy stand so that his image has a height equal to half the original height? The principal axis is perpendicular to the height

(1) 5 m (2) 7·5 m (3) 25 m (4) 10 m

135. The diameter of the objective lens of the telescope is chosen to be large

(1) to increase its magnifying power

(2) to increase its resolving power

(3) to decrease the light of the telescope

(4) to decrease the near point of the eye

136. The velocity of electromagnetic waves in free space is given by

(1) $\sqrt{\frac{\mu_0}{\varepsilon_0}}$ (2) $\sqrt{\frac{\varepsilon_0}{\mu_0}}$ (3) $\frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ (4) $\sqrt{\mu_0 \varepsilon_0}$

137. In Young's double slit experiment the separation between the slits is 0·10 nm, the wavelength of the light used is 600 nm and the interference pattern is observed on a screen 1·0 m away. The separation between the successive bright fringes will be

(1) 6·0 mm (2) 3 mm (3) 12 mm (4) 1·5 mm

138. Indicate the false statement about Lasers

(1) These are coherent sources of light

(2) These are not the monochromatic sources of light

(3) Two independent Laser sources can produce interference fringes

(4) The path difference between two Laser sources may be several metres long

139. A parallel beam of green light of wavelength 546 mm passes through a slit of width 0·40 mm. The transmitted light is collected on a screen 40 cm away. The distance the two first order minima is

(1) 0·55 mm (2) 2·2 mm (3) 0·275 mm (4) 1·1 mm

140. Which of the following properties show that the light is a transverse wave?

(1) Interference (2) Diffraction (3) Polarisation (4) Dispersion

141. If the light is incident on the plane surface of a material whose refractive index is μ at an angle of incidence given by $\tan i = \mu$, then

(1) the refracted light is completely polarised

(2) the reflected light completely polarised

(3) the reflected light is never completely polarised

(4) the polarised refracted light is used in preparing sunglasses

142. A 1000 μF capacitor is connected in series with a 10 kΩ resistance and a DC voltage source of 1000 volts through a switch. How much time after closing the switch the charge across the capacitor will be 0·5 coulomb?

(1) 7 sec approximately (2) 3 sec approximately

(3) 5 sec approximately (4) 10 sec approximately

143. A resistance of 10 Ω and an inductance of 100 mH are connected in series with an AC source $V = 100 \sin (100\, t)$. The phase difference between the current in the circuit and the applied potential source will be

(1) π (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{4}$ (4) zero

144. In the presaturation current range of diode the currents at plate voltages 400 V and 200 V are I_1 and I_2 respectively. The ratio $\frac{I_1}{I_2}$ will be

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

145. The impurity atoms with which pure silicon should be doped to make *p*-type semiconductor are those of

(1) arsenic (2) boron (3) phosphorous (4) sodium

146. If for a transistor the common base current gain α is 0·98, then for this transistor the common emitter current gain β will be

(1) 49 (2) 50 (3) 0·2 (4) 0·49

147. The X-rays beam coming from an X-ray tube will be

(1) monochromatic

(2) having all wavelengths smaller than a certain maximum wavelength

(3) having all wavelengths larger than a certain minimum wavelength

(4) having all wavelengths lying between a minimum and maximum wavelengths

148. The half life of a radio isotope is 5 years. The fraction of atoms decayed in this substance after 15 years will be

(1) $\frac{1}{8}$ (2) $\frac{3}{8}$ (3) $\frac{5}{8}$ (4) $\frac{7}{8}$

149. During a nuclear fusion reaction

(1) a heavy nucleus breaks into two fragments by itself

(2) a light nucleus bombarded by thermal neutrons breaks up

(3) two light nuclei combine to give a heavier nucleus and possibly alter products

(4) a heavy nucleus bombarded by thermal neutrons breaks up

150. In a nuclear reactor

(1) a moderator is used to slow down the neutrons

(2) a moderator is used to control the number of neutrons

(3) controller rods are used to slow down the speed of the neutrons

(4) coolant is used to slow down the speed of the neutrons

GEOLOGY (sub-section B-3)

(Optional)

151. Sial is also known as

(1) part of core
(2) lower continental crust
(3) mantle
(4) upper continental crust

152. The Richter's scale is used for measuring the

(1) relative humidity of atmosphere
(2) intensity of earth's tremor
(3) electric conductivity of water
(4) speed of wind

153. The environment between the high tide and low tide levels of the sea is known as

(1) neritic (2) littoral (3) bathyal (4) abyssal

154. An unconformity in which the overlying and underlying beds are not parallel is termed as

(1) non-conformity
(2) disconformity
(3) para-unconformity
(4) angular unconformity

155. Which one is an example of a structure having quaquaversal dip?

(1) Joint (2) Fault (3) Dome (4) Basin

156. When older rocks surrounded by the younger rocks, the structure is called

(1) Outlier (2) Overlap (3) Inlier (4) Offlap

157. Crystal face with Miller indices (111) is known as

(1) prismatic face (2) unit face (3) solid face (4) inclined face

158. Which one among the following is non-pleochroic mineral ?

(1) Biotite (2) Olivine (3) Garnet (4) Tourmaline

159. Hornblende is a

(1) feldspar (2) amphibole (3) pyroxene (4) zeolite

160. Mineral diamond crystallizes in

(1) orthorhombic system (2) tetragonal system

(3) cubic system (4) monoclinic system

161. Mineral bauxite is formed by

(1) magmatic process (2) sedimentary process

(3) pegmatitic process (4) post-magmatic process

162. Quartz exhibits ——— fracture

(1) conchoidal (2) hackly (3) uneven (4) even

163. Black shale facies is characterized by the presence of

(1) large volumes of stagnant water (2) running water

(3) salty water (4) frozen water

164. Which is the volcanic rock equivalent to gabbro?

(1) Andesite (2) Basalt (3) Rhyolite (4) Trachyte

165. The usual parent rock of marble is

(1) limestone (2) shale (3) granite (4) sandstone

166. Spherulitic texture is associated with

(1) plutonic rock (2) volcanic rock

(3) hypabyssal rock (4) metamorphic rock

167. Pegmatite rock contains one of the following in abundance

(1) Tourmaline (2) Spinel (3) Forsterite (4) Andesine

168. Plaster of Paris is obtained from

(1) bauxite (2) gypsum (3) kaolin (4) limestone

169. Hydrocarbons in huge quantity have been found in recent years in

(1) Vindhyan basin (2) K-G basin

(3) Kachchh basin (4) Narmada basin

170. Find odd one out

(1) schist (2) shale (3) sandstone (4) limestone

171. Find odd one out

(1) system (2) formation (3) stage (4) series

172. Which of the following periods has the largest duration?

(1) Permian (2) Ordovician (3) Cretaceous (4) Paleogene

173. Jurassic of Kachchh is best known for its

(1) Ammonoid fauna (2) Foraminifer fauna

(3) Microfauna (4) Bivalve fossils

174. The Precambrian/Cambrian boundary lies at

(1) 542 ma (2) 450 ma (3) 900 ma (4) 670 ma

175. The strike of Dharwar supergoup is

(1) NNW-SSE (2) NNE-SSW (3) NW-SW (4) SE-NW

176. Permian Gondwana sediments are of great economic significance because of presence of

(1) iron (2) petroleum (3) coal (4) plant fossils

177. Which Cephalopoda has simple suture?

(1) *Ceratites* (2) *Nautilus* (3) *Goniatites* (4) *Perisphinctes*

178. Which one of these trilobites is blind?

(1) *Asaphus* (2) *Olenellus* (3) *Agnostus* (4) *Olenus*

179. *Homo sapiens* belong to order

(1) Primates (2) Rodentia (3) Chiroptera (4) Mollusca

180. Dinosaurs got extinct at the close of

(1) Jurassic (2) Triassic (3) Cretaceous (4) Tertiary

★★★

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली या काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में *लिफाफा रहित प्रवेश-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 मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा, केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।***

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

5. **उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।**

6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक सं० और ओ० एम० आर० पत्र सं० की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।

7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।

8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। ***प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।***

9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।

10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का *उत्तर नहीं देना चाहते हैं,* तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।

11. रफ़ कार्य के लिये प्रश्न-पुस्तिका के मुखपृष्ठ के अन्दर वाले पृष्ठ तथा अंतिम पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरान्त *प्रश्न-पुस्तिका एवं उत्तर-पत्र* परीक्षा भवन में जमा कर दें।

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

14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।