Environmental Science Code No. 290

Set No. 1

18P/290/27

No. of Printed Pages : 40

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 .....

Centre Code No.

.....

Date 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 OMR 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.*
3. A separate OMR Answer Sheet is given. *It should not be folded or mutilated. A second OMR Answer Sheet shall not be provided. Only the OMR Answer Sheet will be evaluated.*
4. Write all the entries by blue/black ball pen in the space provided above.
5. **On the front page of the OMR Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, write the Question Booklet Number, Centre Code Number and the Set Number (wherever applicable) in appropriate places.**
6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR Answer Sheet and also Roll No. and OMR Answer Sheet Serial 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 OMR Answer Sheet by darkening the appropriate circle* in the corresponding row of the OMR Answer Sheet, by ball-point pen as mentioned in the guidelines given on the first page of the OMR Answer Sheet.
9. For each question, darken only one circle on the OMR 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. On completion of the Test, the Candidate must handover the OMR Answer Sheet to the Invigilator in the examination room/hall. However, candidates are allowed to take away Text Booklet and copy of OMR Answer Sheet with them.
13. Candidates 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.

परंतु निर्देश हिन्दी में अन्तिम आवरण-पृष्ठ पर दिये गए हैं।

SPACE FOR ROUGH WORK

रफ़ कार्य के लिए जगह

No. of Questions : 180

Time : 2 Hours **Full Marks** : 360

Note : (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. This contains two sub-sections having questions of **two** disciplines.

(i) **Basic Environmental Science**

(ii) **Chemistry**

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

Section—B : This contains three sub-sections having questions of **three** disciplines viz.,

(i) **Life Science (sub-section B-1)**

(ii) **Physics (sub-section B-2)**

(iii) **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. Largest source of freshwater resource on the Earth is

(1) glaciers and permanent snow (2) groundwater

(3) lakes and rivers (4) marshes and wetlands

2. Who put forward the view that plant community behaves like a super-organism which arises, grows, matures and dies?

(1) F. E. Clements (2) H. Gleason

(3) J. T. Curtis (4) R. F. Daubenmire

3. In both terrestrial and aquatic ecosystems energy pyramid is

(1) always inverted (2) sometime inverted

(3) always upright (4) sometime upright

4. Enrichment of water bodies like lakes and ponds by organic waste is called

(1) Oligotrophy (2) Eutrophy (3) Biotrophy (4) *Allogeny*

5. Y-shaped energy flow model in the ecosystem was proposed by

(1) Lindeman (2) Wiegert and Owen

(3) Odum (4) Golley

6. The rate of energy storage at consumer level in ecosystem is called

(1) primary productivity (2) secondary productivity

(3) ecosystem productivity (4) gross productivity

7. The current Earth's atmospheric CO_2 concentration is estimated to be about

(1) 408 ppmv (2) 300 ppmv (3) 280 ppmv (4) 350 ppmv

8. The highest concentration of atmospheric gases occur in

(1) Troposphere (2) Stratosphere (3) Mesosphere (4) Ionosphere

9. A river with high BOD values indicates

(1) heavy metal pollution (2) organic pollution

(3) highly clean state (4) oxygen rich condition

10. MAB program stands for

(1) Man and Biotechnology program

(2) Man and Biology program

(3) Man and Biodiversity program

(4) Man and Biosphere program

11. Hot spots are the regions which are rich in

(1) biodiversity (2) invasive species

(3) nomadic population (4) atmospheric pollutants

12. Which one of the following is responsible for ozone layer depletion?

(1) Oxygen (2) Carbon dioxide

(3) Sulphur dioxide (4) Chloro-fluoro carbons

13. Which among the following constitutes the largest ecosystem in the World?

(1) Forests (2) Rivers (3) Oceans (4) Deserts

14. Human beings are

(1) primary producers (2) carnivores

(3) omnivores (4) herbivores

15. Renewable source of energy is

(1) petroleum (2) coal (3) natural gas (4) wind energy

16. *CPCB* stands for

(1) Central Pollution Control Board

(2) Central Power Control Board

(3) Corporate Pollution Control Board

(4) Corporate Power Control Board

17. World Earth Day is celebrated on

(1) 6 March (2) 22 April (3) 10 May (4) 2 July

18. Which one of the following is a primary producer?

(1) Birds (2) Tiger (3) Gaur (4) Plants

19. The most abundant mineral in the surface of Earth is

(1) Quartz (2) Granite (3) Mica (4) Feldspar

20. Decibel is the unit of

(1) water pollution (2) noise pollution

(3) air pollution (4) soil pollution

21. Richter Scale is the unit of

(1) landslides (2) tsunamis (3) earthquakes (4) volcanoes

22. NPP stands for

(1) Net Primary Productivity (2) Net Primary Producers

(3) Natural Primary Producers (4) National Primary Productivity

23. Mangroves are found in

(1) coastal areas (2) ponds and lakes

(3) dry forests and arid areas (4) flood plains

24. Medha Patekar was associated with

(1) Narmada Movement (2) Gene Campaign

(3) Chipko Movement (4) WWG—India

25. Landslide Prone State of India is

(1) Uttar Pradesh (2) Uttarakhand

(3) Rajasthan (4) Bihar

26. The word 'ecology' was coined by

(1) Charles Darwin (2) Robert Whittaker

(3) Ernst Haeckel (4) Arthur Tansley

27. Ecological succession on a sandy area is called as

(1) Xerosere (2) Lithosere (3) Psammosere (4) Hydrosere

28. Which one of the following is an endangered migratory bird?

(1) Peacock (2) Eagle (3) Crow (4) Siberian crane

29. 'The Environment (Protection) Act' came into force in the year

(1) 1974 (2) 1980 (3) 1984 (4) 1986

30. Which one of the following is not related to sustainable development?

(1) The Rio Declaration (1992)

(2) The Earth Summit (1992)

(3) Agenda 21

(4) Pipeline Model of Economic Growth

CHEMISTRY

(Compulsory for all)

31. *Which one of the following ion is coloured?*

(1) Cu^{+} (2) Ti^{4+} (3) Ni^{2+} (4) Zn^{2+}

32. Predict the number of unpaired electron in $[Co(NH_3)_6]Cl_3$

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

33. The geometrical arrangement of bonds produced by dsp^2 hybrid orbital is

(1) tetrahedral (2) octahedral

(3) square planar (4) plane triangular

34. Which one of the following is a coordination compound?

(1) $KCl \cdot MgCl_2 \cdot 6H_2O$ (2) $[Fe(CN)_6]^{4-}$

(3) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ (4) $FeCl_3$

35. The complexes $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ exhibit

(1) hydrate isomerism (2) ionization isomerism

(3) coordination isomerism (4) geometrical isomerism

36. The ground state electronic configuration of Gd ($Z = 64$) is

(1) $4f^7 6s^2$ (2) $4f^9 6s^2$ (3) $4f^8 6s^2$ (4) $4f^7 5d^1 6s^2$

37. Which one of the following elements exhibits both (+3, +4) oxidation states?

(1) La (2) Ce (3) Nd (4) Lu

38. The size of (Zr, Hf) is almost identical because of the

(1) variable oxidation states of lanthanides

(2) metallic nature of lanthanides

(3) lanthanide contraction effect

(4) high sum of first three ionization energies of lanthanides

39. The reaction $NH_3 + H^+ \longrightarrow [NH_4^+]$ illustrates

(1) Lewis acid-base definition

(2) Lux-flood acid-base definition

(3) Bronsted Lowry acid-base definition

(4) Solvent system acid-base definition

40. The ability of a solvent to dissolve ionic solids strongly depends on its

(1) wide liquid range (2) high dielectric constant

(3) nature of autoionization (4) donor and acceptor properties

41. Which one of the following is an aprotic solvent?

(1) H_2O (2) NH_3 (3) H_2SO_4 (4) CCl_4

42. Shape of $XeOF_4$ is

(1) square pyramidal (2) octahedral

(3) pyramidal (4) square planar

43. Which one is an electron deficient compound?

(1) NaCl (2) B_2H_6 (3) $BeCl_2$ (4) $CaCl_2$

44. *Which one of the following* has a cradle shaped structure?

(1) SF_4 (2) $SeCl_2$ (3) S_4N_4 (4) S_2F_4

45. In NO^+ the bond order is

(1) 2·5 (2) 3 (3) 2 (4) 1·5

46. The greater probability of finding an electron close to nucleus is in the orbital

(1) $2p$ (2) $3p$ (3) $3d$ (4) $2s$

47. Which one of the following electronic configurations is in accordance with Hund's rule?

(1) $1s^2 2s^2 2p_x^2 2p_y^1 2p_z^0$ (2) $1s^2 2s^2 2p_x^2 2p_y^1 2p_z^1$

(3) $1s^2 2s^2 2p_x^2 2p_y^1 2p_z^3$ (4) $1s^2 2s^2 2p_x^2 2p_y^2 2p_z^0$

48. KO_2 is an example of

(1) suboxide (2) peroxide (3) superoxide (4) normal oxide

49. The HAH angle is smallest in the molecule AH_3 (A = N, P, As, Sb), where

(1) A is the largest

(2) A is the smallest

(3) A is more electronegative

(4) A has more electron affinity

50. van der Waals radii are

(1) much larger than covalent radii

(2) much shorter than covalent radii

(3) little larger than covalent radii

(4) equal to covalent radii

51. In cubic close packing of ionic solids, the pattern is

(1) AB AB AB ···

(2) ABC ABC ABC ···

(3) BCA CBA ACB ···

(4) BC AB BC ···

52. Which one of the following is a weakest bond?

(1) *Covalent* bond

(2) Ionic bond

(3) Hydrogen bond

(4) Metallic bond

53. Ionization energy of nitrogen is greater than oxygen because of the

(1) smaller electronegativity of nitrogen

(2) smaller atomic number of nitrogen

(3) half filled *p*-orbitals of nitrogen

(4) smaller electron affinity of the nitrogen

54. Which one of the following properties of a metal is responsible for photoelectric effect?

(1) High ionization energy (2) Low ionization energy

(3) High electron affinity (4) Low reduction potential

55. The first ionization energy of hydrogen is somewhat greater than the first ionization energy of chlorine, yet chlorine does not form simple Cl^+ ion because of the

(1) greater electronegativity of chlorine

(2) greater electron affinity of chlorine

(3) greater positive value of standard electrode potential for chlorine

(4) the low lattice and hydration energies of chlorine

56. In the following dehydration

$$CH_3—CONH_2 \xrightarrow{P_2O_5} CH_3CN$$

the hybridization state of carbon changes from

(1) sp to sp^3 (2) sp^2 to sp^3 (3) sp^2 to sp (4) sp^3 to sp^2

57. Optical isomerism is shown by

(1) 1-butanol (2) 2-butanol (3) 3-pentanol (4) 4-heptanol

58. Baeyer's reagent is

(1) alkaline permanganate solution

(2) acidified permanganate solution

(3) neutral permanganate solution

(4) aqueous bromine solution

59. Which one of the following will have least hindered rotation about carbon-carbon bond?

(1) Ethane (2) Ethylene

(3) Acetylene (4) Hexachloromethane

60. Kind of six carbon atoms of benzene are of

(1) one (2) two (3) three (4) four

61. Which xylene is most easily sulphonated?

(1) Ortho (2) Para

(3) Meta (4) All at the same rate

62. $(CH_3)_3CMgBr$ on reaction with D_2O produces

(1) $(CH_3)_3CD$ (2) $(CH_3)_3C\text{-}OD$ (3) $(CD_3)_3CD$ (4) $(CD_3)_3C\text{-}OD$

63. Cannizzaro reaction is not given by

(1) tri-methylacetaldehyde (2) acetaldehyde

(3) benzaldehyde (4) formaldehyde

64. *Benzyl* alcohol is obtained from benzaldehyde by

(1) Wurtz reaction
(2) Cannizzaro reaction
(3) Claisen reaction
(4) Perkin reaction

65. Which one of the following reagents cannot be used to distinguish between pentanol and pentanone?

(1) Tollens reagent
(2) Fehling solution
(3) I_2 in NaOH
(4) Br_2 in CCl_4

66. Acetanilide is treated separately with the following reagents. Which one of these would give methylamine?

(1) PCl_5
(2) $NaOH + Br_2$
(3) Soda lime
(4) Hot concentrated H_2SO_4

67. Which compound will liberate CO_2 from $NaHCO_3$?

(1) CH_3NH_2 (2) CH_3NHNH_2 (3) $(CH_3)_4N^+Cl^-$ (4) CH_3COOH

68. Amongst the following, the most basic compound is

(1) benzylamine
(2) aniline
(3) acetanilide
(4) *p*-nitroaniline

69. Benzenediazonium chloride on reaction with phenol in weakly basic medium gives

(1) diphenyl ether
(2) *p*-hydroxyazobenzene
(3) chlorobenzene
(4) benzene

70. Acetoxybenzoic acid is

(1) antiseptic (2) aspirin (3) antibiotic (4) mordant

71. Most reactive towards electrophilic nitration is

(1) benzene (2) chlorobenzene

(3) nitrobenzene (4) xylene

72. Which one of the following will form carbanion most easily?

(1) Formic acid (2) Acetophenone

(3) Picric acid (4) H_2O

73. Which one of the following reaction is reversible reaction?

(1) Bromination on benzene (2) Nitration on benzene

(3) Friedel-Crafts alkylation (4) Sulphonation on benzene

74. Which one of the following set of values is correct for the isothermal free expansion of an ideal gas into vacuum?

(1) $\Delta U = 0,\ q > 0,\ w < 0$ (2) $\Delta U > 0,\ q > 0,\ w = 0$

(3) $\Delta U = 0,\ q = 0,\ w = 0$ (4) $\Delta U < 0,\ q = 0,\ w < 0$

75. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is

(1) critical temperature (2) Boyle's temperature

(3) inversion temperature (4) reduced temperature

76. For the reaction $2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$

(1) $k_p = k_c \times RT$ (2) $k_p = k_c \times (RT)^2$

(3) $k_p = k_c/(RT)^2$ (4) $k_p = k_c/RT$

77. The rise of liquid in a capillary is due to

(1) viscosity (2) osmosis

(3) surface tension (4) diffusion

78. Which one of the following expresses the correct relationship between mean free path (λ) and molecular diameter (d)?

(1) $\lambda \propto \frac{1}{d}$ (2) $\lambda \propto d^2$ (3) $\lambda \propto \sqrt{d}$ (4) $\lambda \propto \frac{1}{d^2}$

79. The effect of temperature on heat of reaction is given by

(1) Clausius-Clapeyron equation (2) Joule-Thomson equation

(3) Kirchhoff's equation (4) Gibbs-Helmholtz equation

80. The value of van der Waals' constant a for gases NH_3, CH_4, O_2 and N_2 are 4·170, 2·253, 1·360 and 1·390 lit^2 atm mol^{-1} respectively. The gas which can easily be liquefied is

(1) NH_3 (2) CH_4 (3) O_2 (4) N_2

81. The extent to which a real gas departs from ideal behavior may be depicted in terms of a function called compressibility factor (z), which is defined as

(1) RT/M (2) pV/nRT (3) $2pV/RT$ (4) RV/PT

82. The maximum external work that can be obtained from a system is represented by

(1) $-\Delta U$ (2) $-\Delta G$ (3) $-\Delta S$ (4) $-\Delta H$

83. The ratio $\frac{\eta_{solution} - \eta_{solvent}}{\eta_{solvent}}$ defines

(1) intrinsic viscosity (2) reduced viscosity

(3) specific viscosity (4) relative viscosity

84. *Which* one of the following thermodynamic equation is wrong?

(1) $\left(\frac{\partial A}{\partial T}\right)_V = S$ (2) $\left(\frac{\partial G}{\partial T}\right)_P = -S$

(3) $\left(\frac{\partial G}{\partial P}\right)_T = V$ (4) $\left(\frac{\partial A}{\partial V}\right)_T = -P$

85. If the initial concentration of the reactant is reduced to half, the half life period of the reaction becomes half. The order of reaction would be

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

86. At 300 K one mole of an ideal gas expands reversibly and isothermally from 1 L to 10 L. What is the entropy change for the process?

(1) 9·2 calK^{-1} mol^{-1} (2) 6·9 calK^{-1} mol^{-1}

(3) 4·6 calK^{-1} mol^{-1} (4) 2·3 calK^{-1} mol^{-1}

87. The temperature dependence of rate constant for a reaction is given as $k = Ae^{-E_a/RT}$. The reaction will occur more rapidly, if there is decrease in

(1) A (2) E_a (3) T (4) All of the three

88. Catalyst is a material which

(1) increases the equilibrium concentration of the products

(2) changes the value of equilibrium constant

(3) helps in attaining equilibrium state quickly

(4) provides energy for the reaction

89. For solid $\rightleftharpoons$ liquid equilibra at transition temperature, which one of the following is correct?

(1) $\Delta G = 0$ (2) $\Delta H = 0$ (3) $\Delta S = 0$ (4) $\Delta Q = 0$

90. Which one of the following is not an intensive variable?

(1) Density (2) Specific heat

(3) Pressure (4) Temperature

Section—B

LIFE SCIENCE (sub-section B-1)

(Optional)

91. In population interaction of two species when both species are adversely affected, the interaction is termed as

(1) Commensalism (2) Competition

(3) Amensalism (4) Epiphytism

92. Which factor maintains the distinctive traits of a species?

(1) Specific niche (2) Reproductive isolation

(3) Cooperative interaction (4) Continuous intercommunication

93. The first plants to appear on a burnt forest area will be

(1) grasses (2) ferns (3) mosses (4) liverworts

94. In ecological succession from pioneer to climax community, the biomass shall

(1) decrease (2) increase and then decrease

(3) no relation (4) increase continuously

95. Total organic matter present in an ecosystem is called

(1) litter (2) biome (3) biomass (4) food

96. Which one of the following has the highest global warming potential?

(1) CFC-11 (2) CFC-12 (3) CH_4 (4) CO_2

97. Which range of wavelength is absorbed by the stratospheric O_3 ?

(1) 280-320 nm (2) < 280 nm (3) 321-390 nm (4) > 390 nm

98. Which State of India has maximum area of saline soils?

(1) *Uttar Pradesh* (2) Rajasthan

(3) West Bengal (4) Haryana

99. Transverse whitebands on fingernails is a toxicity symptom of

(1) lead (2) mercury (3) arsenic (4) cadmium

100. Grasslands with clumps of trees are known as

(1) Chaparral biomass (2) Desert biomes

(3) Tropical savanna (4) Tundra biomes

101. Which one of the following gives the best picture of food chain?

(1) Standing crop (2) Pyramid of energy

(3) Pyramid of biomass (4) Pyramid of number

102. Which one of the following is not an *in situ* approach of biodiversity conservation?

(1) Biosphere reserves (2) Sanctuaries

(3) Nature reserves (4) Botanical gardens

103. Which one of the following is a correct order in plant succession?

(1) Migration—Ecesis—Aggregation—Reaction

(2) Aggregation—Ecesis—Migration—Reaction

(3) Ecesis—Aggregation—Migration—Reaction

(4) Reaction—Ecesis—Migration—Aggregation

104. Acid rain is defined by pH

(1) between 3·5 and 6·5 (2) below 6·5

(3) below 5·6 (4) below 7·0

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

(1) hygroscopic water (2) capillary water

(3) crystalline water (4) free water

106. Number of Barr bodies in XXXX female is

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

107. Speciation requires

(1) reproductive isolation (2) molecular isolation

(3) phyletic gradualism (4) directional isolation

108. In Down's syndrome of a male child, the sex chromosomes complement will be

(1) XXY (2) XY (3) XX (4) XO

109. Both husband and wife have normal vision, though their fathers were colour blind. The probability of their daughter becoming colour blind is

(1) 50% (2) 0% (3) 75% (4) 25%

110. The lac harvested before swarming is called

(1) Ari lac (2) Stick lac (3) Seed lac (4) Button lac

111. Isinglass is a high grade collagen produced from the

(1) air bladder of fish (2) fish skin

(3) fish fin (4) fish scale

112. Albinism is a congenital disorder resulting from the lack of

(1) fructokinase (2) tyrosinase

(3) xanthine oxidase (4) catalase

113. The most striking example of point mutation is found in a disease called

(1) Down's syndrome (2) Thalassemia

(3) Night blindness (4) Sickle cell anaemia

114. Sternum is lacking in

(1) Reptilia (2) Aves (3) Pisces (4) Amphibia

115. Haemophilia is more common in males because

(1) recessive trait carried by X-chromosome

(2) recessive character carried by Y-chromosome

(3) dominant character carried by Y-chromosome

(4) dominant trait carried by X-chromosome

116. During submergence in aquatic turtles, the accessory respiratory organ is

(1) gills (2) air sacs

(3) cloacal bladder (4) skin

117. The volume of urine is controlled by

(1) adrenaline (2) insulin (3) ADH (4) thyroxine

118. Hormone controlling the contraction of uterine muscles at the time of child birth is

(1) oxytocin (2) vasotocin (3) vasopressin (4) isotocin

119. In *Hippocampus*, the brood pouch is found

(1) on the back of male (2) on the back of female

(3) on the belly of male (4) on the belly of female

120. In chromatin, nucleosome core consists of two molecules each of histones

(1) H2, H26, H1 and H1a (2) H2a, H2b, H3 and H4

(3) H1, H2, H3, H4 (4) H6, H4, H5, H2b

PHYSICS (sub-section B-2)

(Optional)

121. Polarisation of light indicates that light is

(1) a longitudinal wave

(2) a transverse wave

(3) a longitudinal and transverse wave simultaneously

(4) not a wave at all

122. When an unpolarised light is incident on a calcite crystal, it splits into refracted rays. This phenomenon is known as

(1) scattering (2) dispersion

(3) double refraction (4) diffraction

123. The phenomenon of rotating the plane of vibration of a polarised light is known as

(1) polarisation (2) optical activity

(3) double refraction (4) Kerr effect

124. The magnetic susceptibility of a paramagnetic substance varies with absolute temperature T is

(1) T^{-2} (2) T (3) T^{-1} (4) T^{2}

125. *Michelson's* interferrometer is based on the principle of

(1) division of amplitude
(2) division of wavefront
(3) addition of amplitudes
(4) addition of wavefronts

126. The substances in which the molecules have zero magnetic moment are

(1) paramagnetic
(2) diamagnetic
(3) ferromagnetic
(4) paramagnetic or ferromagnetic depends on temperature

127. The temperature at which the ferromagnetism disappears and the substance becomes paramagnetic is known as

(1) temperature of inversion
(2) Boyle temperature
(3) Curie temperature
(4) Kelvin temperature

128. The sweep voltage used in a CRO is of the shape of

(1) square wave
(2) rectangular wave
(3) saw-tooth wave
(4) sine wave

129. Mosley's law is concerned with

(1) continuous X-rays
(2) characteristic X-rays
(3) γ-rays
(4) β-rays

130. The element to be doped in a pure germanium crystal to make it a *p*-type semiconductor is

(1) As (2) Sb (3) P (4) Al

131. With the rise of temperature, the resistivity of a semiconductor

(1) remains unchanged

(2) increases

(3) decreases

(4) first increases and then decreases

132. The Poisson ratio of any material σ, satisfies the inequality

(1) $-1 < \sigma < \frac{1}{2}$ (2) $-\frac{1}{2} < \sigma < 1$ (3) $-1 < \sigma < 0$ (4) $1 > \sigma > 0$

133. The Fermi-level of an intrinsic semiconductor lies

(1) near the top of valence band in the band gap

(2) near the bottom of the conduction band in the band gap

(3) in the middle of the band gap

(4) close to the bottom but inside the conduction band

134. In which one of the following configuration of a transistor, the voltage gain is highest?

(1) Common base (2) Common emitter

(3) Common collector (4) Same in all the three

135. The wave which does not belong to the electromagnetic spectrum is

(1) heat (2) ultraviolet (3) X-rays (4) ultrasonic

136. When a beam of light is incident on a glass plate at polarising angle, then the angle between reflected and refracted beams is

(1) 0° (2) 45° (3) 60° (4) 90°

137. Wien's law of radiation is

(1) $\lambda_m T^{-1}$ – constant (2) $\lambda_m T$ = constant

(3) $\lambda_m^{-1} T^3$ = constant (4) $\lambda_m^{-1} T^2$ = constant

138. The first law of thermodynamics may be written in usual symbols as

(1) $dS = TdQ$ (2) $\delta Q = TdS$

(3) $\delta Q = dU + pdV$ (4) $dU = \delta Q + pdV + VdP$

139. The equation $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$ represents

(1) Faraday's law (2) Ampere's law

(3) Gauss's law (4) Ohm's law

140. The ripple factor of half-wave rectifier is

(1) 0·482 (2) 1·71 (3) 1·21 (4) 1·57

141. The depression of a cantilever is directly proportional to

(1) square of length
(2) length
(3) cube of the length
(4) square root of length

142. The de Broglie wavelength λ of a molecule of mass m having thermal energy kT is

(1) $\lambda = \frac{h}{2mkT}$
(2) $\lambda = \frac{h}{\sqrt{2mkT}}$
(3) $\lambda = \frac{h}{(2mkT)^{3/2}}$
(4) $\lambda = \frac{h}{(2mkT)^2}$

143. Two light waves are called coherent if their

(1) amplitudes are equal
(2) frequencies are same
(3) wavelengths are same
(4) phase difference is same

144. Newton's rings are fringes of

(1) equal inclination
(2) equal thickness
(3) *both* equal inclination and thickness
(4) equal radii

145. In Compton effect, the shift in wavelength $\Delta\lambda$ depends upon

(1) properties of scatterer
(2) wavelength of incident radiation
(3) scattering angle
(4) All of the above

146. The quality factor Q of an LCR electrical circuit is

(1) $Q = \frac{L\omega}{R}$ (2) $Q = \frac{LR}{\omega}$ (3) $Q = \frac{R\omega}{L}$ (4) $Q = \frac{R}{\omega L}$

where ω is angular frequency of oscillation.

147. The photoelectric effect can be understood on

(1) the electromagnetic theory of light

(2) the special theory of relativity

(3) the quantum theory of light

(4) wave theory of light

148. The most important characteristics of a LASER light is

(1) polarisation (2) coherence

(3) high intensity (4) directionality

149. A high entropy system should be in great

(1) order (2) disorder (3) amount (4) quality

150. The process in which no heat enters or leaves the system is called

(1) isothermal (2) isobaric (3) adiabatic (4) isochoric

GEOLOGY (sub-section B-3)

(Optional)

151. The Moho discontinuity is located in between

(1) Mantle and Core

(2) Crust and Mantle

(3) Lithosphere and Asthenosphere

(4) Lower Mantle and Upper Mantle

152. Match the hypotheses and their propounder of the origin of the Earth :

(a) Tidal Hypothesis	(i) Kant and Laplace
(b) Nebular Hypothesis	(ii) Moulton and Chamberlin
(c) Planetesimal Hypothesis	(iii) Jeans and Jeffreys
(d) The Meteorite Hypothesis	(iv) Schmidt, Weizsacker and Kuiper

(1) (a)–(iii), (b)–(i), (c)–(ii), (d)–(iv)

(2) (a)–(i), (b)–(ii), (c)–(iii), (d)–(iv)

(3) (a)–(ii), (b)–(iii), (c)–(i), (d)–(iv)

(4) (a)–(iii), (b)–(iv), (c)–(ii), (d)–(i)

153. What is the name of deepest oceanic trench?

(1) Mariana Trench

(2) The South Sandwich Trench

(3) The Tonga Trench

(4) The Diamantina Trench

154. Which one of the following geomorphic features belongs to the glacial topography?

(1) Hamada, Loess and Zeugens

(2) Rapids, Meanders and Point Bars

(3) Drumlins, Cirques and Roches Moutonnees

(4) Doline, Stalactites and Stalagmites

155. Which one is the correct form of crystal system?

(1) Triclinic : $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma = 90°$

(2) Monoclinic : $a \neq b \neq c$ and $\alpha \neq \beta \neq \gamma \neq 90°$

(3) Orthorhombic : $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90°$

(4) Tetragonal : $a = b = c$ and $\alpha \neq \beta \neq \gamma \neq 90°$

156. The Si : O ratio in Tectosilicate is

(1) 1 : 3 (2) 1 : 4 (3) 4 : 10 (4) 1 : 2

157. What is the correct ascending order of the hardness of the following sets o minerals?

(1) Quartz, Topaz, Calcite and Orthoclase

(2) Calcite, Orthoclase, Quartz and Topaz

(3) Quartz, Calcite, Topaz and Orthoclase

(4) Quartz, Orthoclase, Topaz and Calcite

158. Name the mineral which shows parallel extinction

(1) Muscovite (2) Anorthite (3) Augite (4) Hornblende

159. The Indo-Gangetic Alluvial Plains took shapes during

(1) Sirmurian Orogeny (2) Karakoram Orogeny

(3) Siwalik Orogeny (4) Kirthar Orogeny

160. Which types of microscope is used for the identification of polished sections of metallic ores?

(1) Polarizing Microscope (2) Reflected Microscope

(3) Binocular Microscope (4) Compound Microscope

161. The true dip of a bed is measured along N 50°E. What is the strike direction of the bed?

(1) N-S (2) E-W (3) N 55°W (4) N 40°W

162. Fold axis lies in the direction

(1) parallel to limb

(2) parallel to hinge lines

(3) normal to hinges

(4) inclined to hinges

163. Tear faults are a variety of

(1) strike faults

(2) dip faults

(3) strike-slip faults

(4) dip-slip faults

164. Closely spaced joints may be described as

(1) bedding fissility

(2) fracture cleavage

(3) crenulation cleavage

(4) slip cleavage

165. What are unconformities?

(1) These are two-dimensional, directional features

(2) These are three-dimensional, directional features

(3) These are three-dimensional, non-directional features

(4) these are two-dimensional, non-directional features

166. Petrifaction is a type of fossilization, where

(1) only original form and structures are preserved

(2) only hard parts are preserved

(3) entire organism is preserved

(4) only soft parts are preserved

167. The study of trace fossils is known as

(1) Paleoecology (2) Synecology (3) Ichnology (4) Ichthyology

168. The trilobite fauna are restricted to

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

169. Name the basic unit of geologic time

(1) Era (2) Epoch (3) Period (4) Eon

170. Select a lithostratigraphic unit from the following

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

171. What is the origin of disseminated or 'porphyre' copper deposits?

(1) Hypothermal origin (2) Epithermal origin

(3) Telethermal origin (4) Mesothermal origin

172. Which one of the following is not a lead mineral?

(1) Galena (2) Sphalerite (3) Cerrusite (4) Anglesite

173. The mineralogy of which one of the following contact metamorphic facies i similar to that of the high grade amphibolite facies?

(1) Hornblende-hornfels facies (2) Pyroxene hornfels

(3) Albite-epidote-hornfels facies (4) Sanidinite facies

174. Choose the correct sequence of increasing grade of metamorphism

(1) Shale—Phyllite—Schist—Slate—Gneiss

(2) Shale—Slate—Schist—Phyllite—Gneiss

(3) Shale—Slate—Phyllite—Schist—Gneiss

(4) Shale—Gneiss—Phyllite—Schist—Slate

175. Ripple formed by water and wind differ in their

(1) ripple index (2) azimuth (3) symmetry (4) scale

176. Which one of the following are characteristically associated with transitional environments?

(1) Orthoquartzite (2) Arkoses

(3) Graywackes (4) Orthoconglomerate

177. Select a metamorphic rock from the following

(1) Marble (2) Granite

(3) Basalt (4) Conglomerate

178. Which one of the following is the glassy modification of acidic lava?

(1) Tektite (2) Tachylite (3) Obsidian (4) Limburgite

179. An impermeable formation that neither contains nor transmits water is called

(1) Aquitard (2) Aquifer (3) Aquiclude (4) Aquifuge

180. Consider the following processes :

(i) Evaporation (ii) Oxidation

(iii) Injection (iv) Leaching

The supergene enrichment zone is developed by

(1) (i) and (ii) (2) (ii) and (iii) (3) (ii) and (iv) (4) (i) and (iv)

★★★

SPACE FOR ROUGH WORK

रफ़ कार्य के लिए जगह

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा ओ०एम०आर० उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली/काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न-पुस्तिका मिलने के 30 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई पृष्ठ या 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 *प्रवेश-पत्र के अतिरिक्त*, लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. ओ०एम०आर० उत्तर-पत्र अलग से दिया गया है। ***इसे न तो मोड़ें और न ही विकृत करें। दूसरा ओ०एम०आर० उत्तर-पत्र नहीं दिया जायेगा। केवल ओ०एम०आर० उत्तर-पत्र का ही मूल्यांकन किया जायेगा।***
4. सभी प्रविष्टियां प्रथम आवरण-पृष्ठ पर नीली/काली बाल पेन से निर्धारित स्थान पर लिखें।
5. **ओ०एम०आर० 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 एवं केन्द्र कोड नम्बर तथा सेट का नम्बर उचित स्थानों पर लिखें।**
6. ओ०एम०आर० उत्तर-पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक सं० और ओ०एम०आर० उत्तर-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 ओ०एम०आर० उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को ओ०एम०आर० 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 की समाप्ति के बाद अभ्यर्थी अपना ओ०एम०आर० उत्तर-पत्र परीक्षा कक्ष/हाल में कक्ष निरीक्षक को सौंप दें। अभ्यर्थी अपने साथ प्रश्न-पुस्तिका तथा ओ०एम०आर० उत्तर-पत्र की प्रति ले जा सकते हैं।
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।