

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

Roll No.

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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 changes 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 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 the 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.

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

Total No. of Printed Pages : 30

15P/290/16

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.

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

Life Science (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. Natural resources are :

(1) Always renewable

(2) Always non-renewable

(3) Both

(4) None

2. Biotic resources are obtained from :

(1) Biosphere

(2) Atmosphere

(3) Environment

(4) Minerals

(1)

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3. Insectivorous plants are placed in ecosystem in :
- (1) Trophic level-1 (2) Trophic level-2
(3) Trophic level-3 (4) None of the above
4. In a dense forest competition develops between :
- (1) Herbs and herbs (2) Shrubs and shrubs
(3) Trees and trees (4) All of the above
5. Relationship of an epiphyte with its support represents :
- (1) Amensalism (2) Commensalism
(3) Mutualism (4) Competition
6. Biodiversity degradation is due to :
- (1) Over exploitation (2) Population pressure
(3) Over use (4) All of the above
7. Which of the following statement is *correct* ?
- (1) Plant interacts only with plants
(2) Animal interacts only with animals
(3) Microorganism interact only with microorganism
(4) Plants, animals and microorganisms interact with each other
8. Ecosystem diversity means :
- (1) Species diversity (2) Genetic diversity
(3) Landscape diversity (4) None of the above
9. Bishnois community emphasize :
- (1) Non-violence for all life (2) Violence for all life
(3) Both (1) & (2) (4) None of the above
10. Apiko movement is for :
- (1) Wildlife protection (2) Air protection
(3) Water protection (4) Mineral protection

19. Ecology deals with :

- (1) Biotic factor
- (2) Abiotic factor
- (3) Both
- (4) None of the above

20. In situ conservation means :

- (1) Within natural system
- (2) Outside natural system
- (3) Both
- (4) None

21. Ex situ conservation means :

- (1) Outside natural system
- (2) within natural system
- (3) Both
- (4) None

22. Key stone species are :

- (1) High impact species
- (2) low impact species
- (3) Middle impact species
- (4) None

23. Umbrella species :

- (1) Conservation focus species
- (2) Non focus species
- (3) Both
- (4) None of the above

24. Biosphere reserve has :

- (1) Core area
- (2) Non-core area
- (3) Only Buffer area
- (4) All

25. FAO stand for :

- (1) Food and agriculture organization
- (2) Fertilizer and agriculture organization
- (3) Both
- (4) None

26. Ramsar Convention is for :

- (1) Wetlands
- (2) Dry lands
- (3) Water
- (4) None

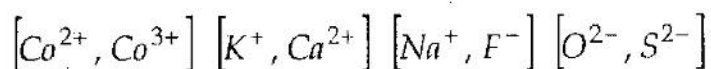
27. Homeostasis in ecosystem is maintained by :
- (1) Check and balance (2) Prey-predator interaction
 (3) Flow of energy (4) All
28. In ecosystem, plants parasites are classified as :
- (1) Herbivores (2) Carnivores (3) Omnivores (4) Reducers
29. Commensalism is :
- (1) Obligatory (2) Non-obligatory
 (3) Parasitic (4) Non-symbiotic
30. Minimum diversity is observed in :
- (1) Climax community (2) Seral community
 (3) Pioneers (4) None of the above

CHEMISTRY
(Compulsory for all)

31. Which among the following properties of water is/are greatly influenced by hydrogen bonding ?
- (i) Absorption in the visible spectrum;
 (ii) Boiling point;
 (iii) Density near the freezing point;
 (iv) Dipole moment
- (1) (i) and (ii) (2) (i), (ii) and (iii)
 (3) (iii) and (iv) (4) (ii) and (iii)
32. Which of the following molecules/ions have planar structures ?
- (i) NH_3 (ii) NO_3^- (iii) CO_3^{2-} (iv) BF_3
- (1) all four (2) (ii), (iii), (iv) (3) (iii) and (iv) (4) only (iv)
33. Which of the following is *not* a green house gas ?
- (1) water vapour (2) nitrogen
 (3) methane (4) ozone

34. Which of the following wave length falls in the infrared region ?
(1) 100 nm (2) 400 nm (3) 700 nm (4) 1200 nm
35. Which element is associated with oxygen transport in blood ?
(1) copper (2) iron (3) vanadium (4) chromium
36. Arrhenius equation relates
- (1) volume of a real gas to temperature at constant pressure
(2) rate of a chemical reaction to temperature
(3) rate constant of a chemical reaction to temperature
(4) equilibrium constant for a chemical reaction to temperature
37. Atomic orbital
- (1) is a wave function for an electron in an atom
(2) gives the trajectory of an electron in an atom
(3) is a number which is proportional to the energy of an electron in an atom in its ground state
(4) is a number which is proportional to the probability of finding the electron at one atomic radius away from the nucleus of an atom
38. If one mole of an ideal gas confined in a bulb at 100 K is to exert a pressure of 100 atm, then the volume of the bulb should be
- (1) 224 ml (2) 22.4 L (3) 8.2 ml (4) 82 ml
39. The standard electrode potentials (for M^{2+} / M , $M = Zn, Fe, Cu$) are in the order $Zn < Fe < Cu$. If two electrochemical cells are made by coupling Zn with Cu and another by coupling Fe with Cu what will be the anode in each case ?
(1) Cu in both (2) Zn and Fe (3) Zn and Cu (4) Cu and Fe
40. The bond order in H_2^+ is
- (1) 0 (2) 0.5 (3) 1 (4) 1.5

41. From each pair given below identify the ion which is larger in size :



- (1) $Co^{2+}, K^+, F^-, S^{2-}$ (2) $Co^{3+}, Ca^{2+}, Na^+, S^{2-}$
 (3) $Co^{2+}, Ca^{2+}, F^-, S^{2-}$ (4) $Co^{3+}, K^+, Na^+, O^{2-}$

42. The bond angles in ammonia molecule are :

- (1) 90 degrees (2) 110 degrees (3) 115 degrees (4) 108 degrees

43. Which one of the following set contains one element each from s-block, p-block and d-block ?

- (1) K, Cs, V (2) Li, Ru, Bi (3) Al, F, Fe (4) Ti, Pd, Se

44. 20 ml of 0.10 N sodium hydroxide is added to 10 ml 0.10 N sulphuric acid and the resultant solution is titrated against 0.10 N hydrochloric acid. What will be the titre value at the end point ?

- (1) 10 ml (2) 20 ml (3) 30 ml (4) 40 ml

45. A Lewis base

- (1) acts as an electron pair donor
 (2) acts as an electron pair acceptor
 (3) always ionizes to give protons
 (4) always ionizes to give hydroxide ions

46. Which one of the following hydroxides will dissolve in dilute sodium hydroxide ?

- (1) barium hydroxide (2) manganese hydroxide
 (3) ferrous hydroxide (4) aluminium hydroxide

47. Which is the most common oxidation state observed for the lanthanide elements in their compounds ?

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

(7)

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55. How many stereoisomers are possible for butane-2,3-dicarboxylic acid ?
(1) 1 (2) 2 (3) 3 (4) 4
56. Which of the following compounds does not contain a C = O group?
(1) acetic acid (2) formaldehyde
(3) cyclopentanone (4) furan
57. Which of the following compounds has the most acidic H atom ?
(1) ethane (2) ethylene (3) acetylene (4) benzene
58. What will be the major product when nitrobenzene is nitrated ?
(1) *o*-dinitrobenzene (2) *m*-dinitrobenzene
(3) *p*-nitrobenzene (4) 1,3, 5-trinitrobenzene
59. How many mononitro derivatives are possible for *o*-dibromobenzene ?
(1) 1 (2) 2 (3) 3 (4) 4
60. Which of the following is *true* of S_N2 reaction ?
(1) first order kinetics and inversion of configuration
(2) first order kinetics and racemization
(3) second order kinetics and retention of configuration
(4) second order kinetics and inversion of configuration
61. Which nucleus is useful for dating of archaeological samples ?
(1) ^{13}C (2) ^{14}C (3) ^{14}N (4) ^{15}N
62. An element crystallizes in a BCC lattice. How many atoms are there per unit cell ?
(1) 1 (2) 2 (3) 3 (4) 4

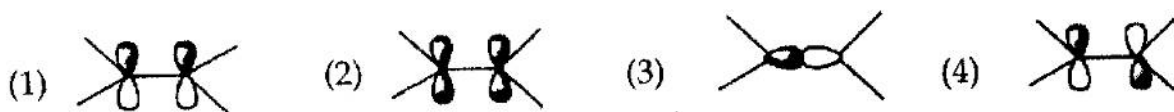
63. The laws of thermodynamics are :
- (1) derived from theoretical calculations
 - (2) deduced from certain axioms (an axiom is a self-evident assertion)
 - (3) based on experience
 - (4) given to us by philosophers
64. For which one among the following reactions does ΔH° of the reaction represent an enthalpy 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) $C_2H_2(g) + H_2(g) \rightarrow C_2H_4(g)$
65. 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?
- $$CO(g) + Cl_2(g) = COCl_2(g)$$
- (1) the rate will decrease to 50% of the original value
 - (2) the rate will decrease to 25% of the original value
 - (3) the rate will be doubled
 - (4) the rate will increase four times
66. What is the pH of a 10^{-2} M solution of sodium hydroxide?
- (1) -2 (2) 2 (3) 12 (4) 7
67. What happens to the pH when a small amount of NH_4Cl is added to 1M solution of NH_4Cl ?
- (1) pH decreases
 - (2) pH remains at 7
 - (3) pH increases
 - (4) pH does not change

68. How many degrees of freedom are there at the boiling point of water ?
(1) zero (2) one (3) two (4) three
69. Steady state approximation for the reaction $A \longrightarrow B \longrightarrow C$ makes the assumption :
(1) $d[C]/dt = -d[A]/dt$ (2) $d[C]/dt = 0$
(3) $d[A]/dt = 0$ (4) $d[B]/dt = 0$
70. Sulphur dioxide dissolves in water to produce hydroxonium ions and sulphite ions. In this reaction, sulphur dioxide molecules are
(1) hydrolysed (2) disproportionated
(3) oxidised (4) reduced
71. In which pair do the two compounds have the same type of crystal structure (at room temperature) ?
(1) (NaCl, KCl) (2) (NaCl, CsCl)
(3) (KCl, CsCl) (4) (RbCl, CsCl)
72. The colour of aqueous solutions of potassium permanganate is caused by
(1) $d-d$ transitions (2) charge transfer transitions
(3) vibrational transitions (4) ultraviolet absorption
73. Identify the molecule/ion whose preparation is made facile by the operation of the chelate effect.
(1) $Cu(\text{pyridine})_6^{2+}$ (2) $Fe(NH_3)_4Cl_2$
(3) $Ni(\text{dimethylglyoximate})_2$ (4) $Ni(CO)_4$
74. Which salt upon heating produces oxygen ?
(1) potassium oxide (2) potassium chlorate
(3) potassium chloride (4) potassium carbonate

75. Which ligand can lead to linkage isomers ?
(1) azide (2) nitrite (3) oxalate (4) nitrate
76. What is the oxidation state of iron in $K[Co(CO)_4]$?
(1) 2 (2) 0 (3) -1 (4) -2
77. Which one among the following statements regarding entropy change and enthalpy change of chemical reaction is *false* ?
(1) it is possible to have same sign for both enthalpy change and entropy change
(2) endothermic reactions have positive enthalpy change
(3) free energy change at a given temperature depends on both entropy change and enthalpy change
(4) both entropy and enthalpy are energy quantities
78. Which one among the following statements regarding the atomic orbitals of the hydrogen atom is *false* ?
(1) 3p and 3d orbitals have different energies
(2) angular momentum of the electron is zero when it occupies the 2s orbital
(3) the degeneracy corresponding to principal quantum number 3 is nine
(4) the 1s orbital of He^+ ion can be derived from the 1s orbital of H atom
79. Dichloromethane molecule has planes of symmetry.
(1) zero (2) one (3) two (4) four
80. If an adsorbant substance (such as charcoal) is added to a solution containing a adsorbate substance (such as acetic acid), and if one assume that the system perfectly obeys Langmuir isotherm, then the fraction of the surface of adsorbant covered by the adsorbate molecules will
(1) continuously increase linearly with concentration
(2) increase with concentration up to a point and then decrease
(3) increase with concentration up to a point and then continue to increase, but at a slower rate
(4) increase with concentration up to a point and then remain constant

81. Wittig reaction is useful for
- (1) converting an alkene to a carboxylic acid
 - (2) converting an aldehyde to an alkene
 - (3) oxidising secondary alcohols
 - (4) resolution of optical isomers
82. Which reaction is most convenient to convert aniline to benzonitrile ?
- (1) Friedel-Crafts reaction
 - (2) Diels-Alder reaction
 - (3) Sandmeyer reaction
 - (4) Schmidt reaction
83. Which of the following statements about chirality is(are) *correct* ?
- (i) All L-aminoacids are chiral
 - (ii) All molecules with one asymmetric carbon atom are chiral
 - (iii) Chiral molecules always have one or more asymmetric carbon atoms
 - (iv) All molecules with two asymmetric carbon atoms are chiral
- (1) only (ii) (2) (i) and (ii) (3) (i), (ii) and (iii) (4) (ii), (iii) and (iv)
84. Complete the sentence : Werner proposed his theory to explain
- (1) bonding in transition metal complexes
 - (2) bonding in benzene
 - (3) structure of silicates
 - (4) optical activity of tartaric acid
85. Which of the following molecules does not satisfy the Huckel $4n + 2$ rule ?
- (1) benzene
 - (2) phenanthrene
 - (3) cyclopentane
 - (4) chlorobenzene

86. Which of the following is the *correct* representation of the π -bonding orbital of ethylene?



87. $H_3N^+ - CH_2 - COO^-$ is an example of:

- (1) carbocation (2) zwitter ion (3) carbanion (4) ion radical

88. The compound, 1,3-butadiene, has:

- (1) only sp hybridised carbon atoms
 (2) only sp^2 hybridised carbon atoms
 (3) both sp^2 and sp^3 hybridised carbon atoms
 (4) both sp and sp^2 hybridised carbon atoms

89. Which of the following decolourises alkaline permanganate?

- (1) butane (2) propene (3) cyclohexane (4) benzene

90. What product will be obtained when a ketone is treated with a Grignard reagent, followed by hydrolysis with water?

- (1) a carboxylic acid (2) a secondary alcohol
 (3) a tertiary alcohol (4) an alkane

SECTION – B

LIFE SCIENCE (Sub-section B-1)

(Optional)

91. A fast primary block to polyspermy in sea urchin egg is brought about by:

- (1) Depolarization of egg plasma membrane
 (2) Cortical reaction
 (3) Acrosomal reaction
 (4) Inositol phospholipid cell signalling pathway

92. Which of the following is *not* applicable for HOX genes in vertebrates ?
- (1) specify pattern formation
 - (2) have four paralogous groups
 - (3) mutations in any of these genes cause delation of a given region of the body
 - (4) contain conserved homeobox
93. The dorsal most vegetal region of an amphibian blastula, capable of inducing the organizer, is called as :
- (1) Hensen's node
 - (2) Primary organizer
 - (3) Nieuwkoop centre
 - (4) Koller's sickel
94. The expansion of outer layer of cells covering the entire embryo during gastrulation is known as :
- (1) Imboly
 - (2) Evagination
 - (3) Involution
 - (4) Epiboly
95. Insect eggs have moderate yolk and syncytial cleavage divisions occur in the periphery. Such eggs are considered as :
- (1) Centrolecithal
 - (2) Telolecithal
 - (3) Alecithal
 - (4) Mesolecithal
96. A dedifferentiation followed by repatterning during regeneration is termed as :
- (1) Morphallaxis
 - (2) Epimorphosis
 - (3) Compensatory regeneration
 - (4) Stem cell mediated regeneration
97. In the nervous system of nonchordates, the commisures are those nerves which connect :
- (1) two equal sized dissimilar ganglia
 - (2) one small and one large dissimilar ganglia
 - (3) two similar ganglia
 - (4) two main nerves

98. Contractile vacuole of amoeba is analogous to :
- (1) Sebaceous glands of mammals
 - (2) paragastric cavity of scypha
 - (3) gills of fish
 - (4) uriniferous tubules of kidney of vertebrates
99. Vertebrate with biconcave centra, are known as :
- (1) Procoelous
 - (2) Amphicoelous
 - (3) Opisthocoelous
 - (4) Dispospondyly
100. Nematocytes found in Cnidarians have :
- (1) nutritive function
 - (2) sexual function
 - (3) defensive function
 - (4) endomembrane function
101. The specific feature of order Diptera is :
- (1) one pair of wing and one pair of halteres
 - (2) two pairs of wings
 - (3) one pair of halteres
 - (4) two pairs of wings and one pair of halteres
102. The electron transport chain for cellular respiration is located :
- (1) on inner membrane of mitochondria
 - (2) in the matrix of mitochondria
 - (3) on the luminal face of endoplasmic reticulum membrane
 - (4) on nuclear membrane

103. Bile is produced in :

- (1) liver cells, stored in gall bladder and secreted into the duodenum to help fat emulsification
- (2) gall bladder and secreted into the lower part of stomach for fat and protein digestions
- (3) islets of Langerhans and secreted in large intestine for fat absorption
- (4) spleen and secreted into the stomach

104. Glomerular filtration rate refers to :

- (1) volume of blood plasma delivered to the kidney per unit time
- (2) volume of fluid filtered from glomerular capillaries into Bowman's capsule per unit time
- (3) volume of fluid filtered from Bowman's capsule into glomerulus per unit time
- (4) volume of blood that is cleared of water per unit time

105. Carbondioxide transported from the body cells back to lung mainly as :

- (1) bicarbonate formed when CO_2 released from Krebs cycle combines with H_2O by the enzyme carbonic anhydrase of RBC
- (2) CO_2 gas released from Krebs cycle
- (3) Oxyhemoglobin formed by enzyme carbonic anhydrase in RBC
- (4) bicarbonate as oxyhemoglobin

106. Colour blindness results from :

- | | |
|------------------------------|-----------------------|
| (1) absence of rods | (2) absence of cones |
| (3) absence of sensory cilia | (4) absence of retina |

107. Synaptic fatigue is due to :
- (1) release of extra adrenaline
 - (2) release of additional acetylcholine
 - (3) exhaustion of neurotransmitter
 - (4) exhaustion of water
108. TSH is synthesized and secreted by :
- | | |
|--------------------------------|----------------------------------|
| (1) Neural lobe of pituitary | (2) Pars intermedia of pituitary |
| (3) Pars distalis of pituitary | (4) Pars proximalis of pituitary |
109. Ovarian Follicle Atresia is a degenerative process whereby :
- (1) mature eggs are lost through ovulation
 - (2) single dominant follicle becomes a corpus luteum
 - (3) immature ovarian follicles degenerate and reabsorbed
 - (4) mature oocyte degenerates
110. The zymogen chymotrypsin is converted to active chymotrypsin by :
- (1) binding of a necessary metal ion
 - (2) reduction of disulfide bond
 - (3) proteolytic cleavage
 - (4) phosphorylation of an amino acid side chain
111. If adrenal cortex was producing high levels of aldosterone, it would cause urine to have :
- (1) low Na^+ and high K^+ concentrations
 - (2) high Na^+ and low K^+ concentrations
 - (3) high Na^+ and high K^+ concentrations
 - (4) low Na^+ and low K^+ concentrations

112. In response to a stimulus, if the membrane potential becomes more negative than the resting potential, the membrane is said to be :
- (1) polarized
 - (2) hyperpolarized
 - (3) unpolarized
 - (4) depolarized
113. The first step in the catabolism of most amino acids is :
- (1) removal of carboxylate groups
 - (2) enzymatic hydrolysis of peptide bonds
 - (3) removal of the amino group
 - (4) catabolism of carbon skeleton
114. Erwin Chargaff studied DNA from various organisms and demonstrated that :
- (1) DNA is the genetic material
 - (2) RNA is transcribed from DNA
 - (3) the amount of adenine in a given organism is equal to thymine and guanine is equal to cytosine
 - (4) the double helix is held together by hydrogen bonding between the bases
115. The final step in the process of cellular respiration is the electron transport chain. What best describes the first step in the electron transport chain ?
- (1) Energized electrons from $NADH$ and $FADH_2$ activate electron transport proteins
 - (2) Hydrogen ions diffuse through the outer mitochondrial membrane
 - (3) Electron from $NADH$ and $FADH_2$ bond with hydrogen ions to form water molecules
 - (4) Electrons in the inner membrane are energized by the sun

116. Wernicke-Korsakoff syndrome is caused in alcoholics due to severe deficiency of :
(1) Retinol (2) Tochoferol (3) Cholecalciferol (4) Thiamine
117. When mammalian proteins are expressed in bacteria, cDNA is used rather than genomic DNA. This is because :
(1) most of the eukaryotic gene promoters do not function in bacteria
(2) cDNA is easier to clone than genomic DNA
(3) the entire genomic sequence is difficult to clone
(4) prokaryotes cannot remove introns to make the functional mammalian protein
118. If genetic code consisted four bases as codon in place of three bases, then the maximum number of amino acid coded would have been :
(1) 256 (2) 64 (3) 16 (4) 20
119. All the reactions starting from a single molecule of glucose upto the formation of two molecules of pyruvic acid are accomplished in :
(1) absence of O_2 (2) presence of O_2
(3) presence of nucleotides (4) mitochondria
120. The palindromic sequence recognized by the restriction endonuclease EcoR1 is :
(1) GAAAAG (2) GAATTC (3) GAAGAA (4) CTTTTC

PHYSICS (Sub-section B-2)

(Optional)

121. Formation of droplets water and mercury are due to the phenomenon of :
(1) Surface tension (2) Archimedes Principle
(3) Pascal Law (4) None of these

122. Young's modulus 'Y' modulus of rigidity ' η ' and Poisson's ratio ' σ ' are related as :

(1) $Y = 2\eta(1 + \sigma)$

(2) $\sigma = \frac{2Y}{(1 + \eta)}$

(3) $\frac{Y}{\sigma} = 2(1 + \eta)$

(4) $\eta = \frac{2Y}{(1 + \sigma)}$

123. Zener diode is used in :

(1) Amplifier

(2) Oscillator

(3) Voltage regulation

(4) Modulation

24. 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

25. A virtual image larger than the object can be produced by :

(1) Concave mirror

(2) Convex mirror

(3) Plane mirror

(4) Concave lens

26. Rutherford's alpha scattering experiment lead to the discovery of :

(1) protons

(2) electrons

(3) atomic nucleus

(4) None of these

27. If angular momentum of a system is constant, which of the following will be zero ?

(1) force

(2) torque

(3) linear impulse

(4) linear momentum

128. In Bernoulli's theorem which of the following is conserved ?
(1) Angular momentum (2) Linear momentum
(3) Energy (4) None of these
129. Surface tension of liquid :
(1) increases with area (2) decreases with temperature
(3) increases with temperature (4) decreases with area
130. The displacement of a particle in an simple harmonic motion in one time period is :
(1) A (2) 2A (3) 4A (4) zero
131. X-rays can be deflected by :
(1) an electric field (2) a magnetic field
(3) a gravitational field (4) None of these
132. The photo-electric effect can be understood on :
(1) the electromagnetic theory of liquid
(2) the special theory of relativity
(3) the quantum theory of light
(4) None of the above
133. The energy of Sun is produced by :
(1) gravitation (2) oxidation (3) nuclear fusion (4) nuclear fission
134. Which one is invariant under a Galilion transformation ?
(1) Displacement (2) Velocity (3) Force (4) Momentum
135. Primary cosmic rays are composed of very energetic :
(1) electrons (2) mesons (3) protons (4) neutrons

142. In which of the following configuration of a transistor the voltage gain is highest ?
- (1) Common emitter (2) Common base
(3) Common collector (4) None of the above
143. The angle of incidence at which the light reflected from water would be completely polarized as :
- (1) 53° (2) 45° (3) 40° (4) 48.7°
144. A ring, a disc, a solid sphere and spherical shell have the same mass and radius respectively. The body which has the highest moment of inertia about the central axis is :
- (1) disc (2) ring
(3) solid sphere (4) spherical shell
145. The zeroth law of thermodynamics shows the existence of :
- (1) Internal energy (2) Pressure
(3) Temperature (4) Entropy
146. The base of a transistor is doped :
- (1) lightly (2) heavily
(3) moderate (4) None of the above
147. It is possible to distinguish between transverse and longitudinal waves by studying the property of :
- (1) Interference (2) Diffraction
(3) Reflection (4) Polarization
148. In a single slit diffraction pattern, for a slit width 'd' and wavelength ' λ ', the separation between central maximum and first minimum is :
- (1) $\theta = \lambda/d$ (2) $\lambda/2d$ (3) $\theta = \lambda/4d$ (4) $\theta = \pi/2$

149. Interference may be seen using two independent :
- (1) sodium lamps (2) fluorescent tubes
(3) lasers (4) mercury lamps
150. Gravitational field is :
- (1) Non-conservative (2) Conservative
(3) Electromagnetic (4) Magnetic

GEOLOGY (Sub-section B-3)

(Optional)

151. The crust and upper part mantle together constitute :
- (1) Troposphere (2) Asthenosphere
(3) Lithosphere (4) Biosphere
152. Long, narrow and sinuous ridges of sands and gravels situated in the middle of ground moraines are :
- (1) Drumlins (2) Crag and tail (3) Eskers (4) Kames
153. Which one among the following is a feature produced by wind ?
- (1) Drumlins (2) Loess (3) Delta (4) Canyons
154. 'Conorad discontinuity' lies between :
- (1) Crust and mantle (2) Sial and sima
(3) Sima and mantle (4) Mantle and core
155. Newly deposited clays have porosity :
- (1) up to 5% (2) up to 100%
(3) up to 70% (4) up to 30%

164. Cephalopods with complex suture are :
- (1) *Ceratites* (2) *Nautilus*
 (3) *Goniatites* (4) *Ammonites*
165. Which one is *not* a bivalve ?
- (1) *Nautilus* (2) *Lima* (3) *Nucula* (4) *Trigonia*
166. Abrupt termination of strata marks the presence of :
- (1) Fold and Joint (2) Joint
 (3) Fold (4) Fault
167. The structure having dip towards a common central point from all sides is :
- (1) Basin (2) fault (3) Dome (4) Joint
168. Joints developed perpendicular to the fold axis are termed as :
- (1) Columnar joints (2) Release joints
 (3) Extension joints (4) Cross joints
169. Which one is *not* a potash felspar ?
- (1) Orthoclase (2) Oligoclase (3) Sanidine (4) Microcline
170. Diamond crystallizes in :
- (1) Orthorhombic system (2) Tetragonal system
 (3) Cubic system (4) Monoclinic system
171. Which of the following system has all closed forms ?
- (1) Triclinic (2) Cubic (3) Trigonal (4) Monoclinic
172. Which of the following has 3 axes of 4-fold symmetry ?
- (1) Baryte (2) Gypsum (3) Galena (4) Rutile

173. Texture in which phenocrysts are embedded in fine grained ground mass is :
(1) Perthite (2) Porphyritic
(3) Graphic texture (4) Seriate texture
174. Peridotite is :
(1) An amphibole (2) A pyroxene
(3) An acid igneous rock (4) An ultra mafic rock
175. Lavas containing numerous gas cavities of irregular shape are :
(1) Scoria (2) Pumice (3) Amygdales (4) Ignimbrites
176. Fibrous variety of quartz is :
(1) Flint (2) Chalcedony (3) Chert (4) Amethyst
177. Which of the following is *not* a magnetic mineral ?
(1) Pyrrhotite (2) Hematite (3) Orthoclase (4) Magnetite
178. The native mineral having hackly fracture is :
(1) Sulphur (2) Copper (3) Gold (4) Borax
179. Which of the following properties is *not* observed under ordinary light ?
(1) Colour (2) Inclusions
(3) Pleochroism (4) Refractive Index
180. The Lower Gondwana rocks are of age.
(1) Cambrian (2) Permian (3) Jurassic (4) Triassic

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली/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 वृत्त 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 संख्या और ओ० एम० आर० पत्र संख्या 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 बाल-प्वाइंट 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. रफ कार्य के लिये इस पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा अंतिम खाली पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ओ० एम० आर० उत्तर-पत्र ही परीक्षा भवन में जमा करें।
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।