Bioinformatic

Set No. 1 **Question Booklet No.** 80

12P/212/25

(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 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 prvided above.
5. ***On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.***
6. ***No overwriting is allowed in the entries of Roll No., Question Booklet no. and Set no. (if any) on OMR sheet and Roll No. and OMR sheet no. on the Queston Booklet.***
7. ***Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfairmeans.***
8. ***Each question in this Booklet is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.***
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit only **OMR** ***Answer Sheet*** at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

Total No. of Printed Pages : 16 *[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण पृष्ठ पर दिये गए हैं।]*

No. of Questions/प्रश्नों की संख्या : 150

Time/समय : 2½ Hours/घण्टे **Full Marks/पूर्णांक :** 450

Note/नोट : (1) This paper comprises of Two Sections, viz., Section—A and Section—B having 30 Multiple Choice Questions in Section—A, and 120 Multiple Choice Questions in Section—B comprising 40 questions of Biology, 40 questions of Chemistry and 40 questions of Physics. A candidate has to attempt all **150** questions.

(2) 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.

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

Section—A

MATHEMATICS

1. If x is real, then $\left|\frac{5-x}{3}\right| < 2$ if and only if

(1) $-1 < x < 11$ (2) $+1 < x < 11$ (3) $x < 11$ (4) $x > 11$

2. If $\left(\frac{x}{y}\right)=\left(\frac{5}{3}\right)$, then $\frac{(x+y)}{(x-y)}$ is equal to

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

3. The value of following expression is

$$\left(\frac{x^a}{x^b}\right)^{1/ab}\left(\frac{x^b}{x^c}\right)^{1/bc}\cdot\left(\frac{x^c}{x^a}\right)^{1/ca}$$

(1) 1 (2) 0 (3) $x^{1/abc}$ (4) $x^{1/(ab+bc+ac)}$

4. The quadratic equation whose one root is $3+2\sqrt{3}$ will be

(1) $x^2+6x-3=0$ (2) $x^2-6x-3=0$

(3) $x^2+6x+3=0$ (4) $x^2-6x+3=0$

5. The one value of x in following equation is

$$\sqrt{\frac{x}{1-x}}+\sqrt{\frac{1-x}{x}}=\left(\frac{13}{6}\right)$$

(1) $\frac{5}{13}$ (2) $\frac{7}{13}$ (3) $\frac{9}{13}$ (4) $\frac{11}{13}$

6. The set $\{x:(x-2)(x-3)>0\}$ is equal to

(1) $\{x:2<x<3\}$ (2) $\{x:x<3\}\cup\{x:x<2\}$

(3) $\{x:x>3\}\cup\{x:x<2\}$ (4) $\{x:<2\le x\le 3\}$

7. If $f(x)=x^2$ and $g(x)=x^3$, x being real, then

(1) f is one-one but g is not one-one (2) f is not one-one but g is one-one

(3) neither f nor g is one-one (4) both f and g are one-one

8. A boy goes to the school with the speed of 3 kmph and returns with the speed of 2 kmph. If he takes 5 hours in all, then the distance between village and school is

(1) 6 km (2) 7 km (3) 8 km (4) 9 km

9. $\sin^2\theta = \frac{(p^2+q^2)}{(2pq)}$ will be true relation only if

(1) $p = q$ (2) $p = -q$ (3) $2p = 3q$ (4) $p = 2q$

10. If two angles, in a triangle, are complementary, then each of these angles is

(1) an obtuse angle (2) a right angle

(3) an acute angle (4) a supplementary angle

STATISTICS

11. If the data has very high fluctuating values, then which of the measure of central tendency will be the best?

(1) Arithmetic mean (2) Geometric mean

(3) Median (4) Mode

12. The mean deviation about mean of data 9, 10, 16, 21, 24 is

(1) 5·0 (2) 5·1 (3) 5·2 (4) 5·3

13. The average value of the median of 2, 8, 3, 7, 4, 6, 7 and the mode of 2, 9, 3, 4, 9, 6, 9 is

(1) 9 (2) 8 (3) 7·5 (4) 6

14. The sum of all the relative frequencies in a sample is equal to

(1) the sample size (2) half of sample size

(3) one (4) infinity

15. The following is data of wages per day

5, 4, 7, 5, 8, 5, 8, 3, 8, 5, 7, 9, 5, 7, 9, 10, 8, 2, 8, 6, 1, 8

The mode of this data is

(1) 7 (2) 5 (3) 8 (4) 3

16. The standard deviation of data [7, 9, 11, 13, 15] is

(1) 2·4 (2) 2·5 (3) 2·7 (4) 2·8

17. A frequency polygon is constructed by plotting frequency of the class-interval at the

(1) upper limit of class-interval (2) lower limit of class-interval

(3) mid-value of class-interval (4) any value of class-interval

18. The median of a given frequency distribution is graphically found with the help of

(1) histogram (2) pie-chart

(3) frequency curve (4) ogives

19. A mode is

(1) least frequent value (2) most frequent value

(3) highest value (4) middle most value

20. If numbers are 1, 2, 3, 4, 5, 6 $\cdots (n-2), (n-1), n$, then mean of these numbers is

(1) $\frac{(n+1)}{2}$ (2) $\left(\frac{n}{2}+1\right)$ (3) $\frac{n}{2}$ (4) $\frac{(n-1)}{2}$

COMPUTER

21. Which of following is primary memory?

(1) CD (2) Hard disk (3) DVD (4) RAM

22. Which of the following printers is best one for print quality?

(1) Dot-matrix printer (2) Drum printer

(3) Daisey chain printer (4) Laser printer

23. The term VGA is related to

(1) CD (2) hard disk (3) printer (4) monitor

24. Which of the following is input and output device both?

(1) Mouse (2) CD (3) Monitor (4) Keyboard

25. The software which manages all the resources of a computer system is called

(1) language software (2) operating system

(3) anti-virus (4) MS-Office

26. The URL is called

(1) Uniform Resource Locator (2) Universal Resource Locator

(3) Universal Read Line (4) Uniform Read Line

27. The WWW is called

(1) Word Wide Web (2) Word With Web

(3) World With Web (4) World Wide Web

28. FTP is known as

(1) File Transfer Procedure (2) File Transfer Protocol

(3) Folder Transfer Protocol (4) Folder Transfer Procedure

29. MICR is known as

(1) Magnetic Instruction Computer Recorder

(2) Magnetic Ink Character Recorder

(3) Magnetic Instruction Character Recogniser

(4) Magnetic Ink Character Recogniser

30. Which of the following is not a well-known file type?

(1) System file (2) Program file (3) Data file (4) Character file

Section—B

BIOLOGY

31. The scientist who proposed the five kingdom systems of classification of organism was

(1) Lamarck (2) John Ray (3) Linnaeus (4) Whittakar

32. The specific epithet of potato is

(1) *Solanum* (2) *Solanum tuberosum*

(3) *Tuberosum* (4) *Solanum tuberosum linn*

33. The phenomenon which helps in maintaining a constant internal environment in a living system is

(1) feedback mechanism (2) operon concept

(3) homeostasis (4) osmoregulation

34. In syngenesious type of stamens

(1) both anthers and filaments are free

(2) both anthers and filaments are fused

(3) filaments are fused and anthers are free

(4) anthers are fused and filaments are free

35. Gymnosperms differ from angiospermous taxa in

(1) presence of fibres and tracheids

(2) absence of torus and boarded pits

(3) presence of naked seeds and absence of vessels

(4) absence of polyembryony

36. Endosperm in aggiosperms is

(1) haploid (2) diploid (3) triploid (4) tetraploid

37. Anthocyanin pigment is present in

(1) chloroplast (2) chromoplast (3) leucoplast (4) vacuole

38. Climbing roots are found in

(1) *Asparagus* (2) betel (3) orchids (4) screw pine

39. The elongated thick walled and tapering cells are

(1) parenchyma cells (2) sclerenchymatous fibres

(3) collenchyma cells (4) aerenchyma cells

40. Which one of the following statements/definitions is correct?

(1) The helicase enzyme winds the two DNA strands

(2) The short stretches of DNA, each primed by RNA are called Okazaki fragments

(3) Transcription is accomplished by RNA polymerase

(4) the coiling tension in replicating DNA is reduced by Topoisomerases

41. Subviral entities devoid of their own DNA/RNA are called

(1) Gemini viruses (2) meta viruses (3) prions (4) Caulimo viruses

42. Plasmids are groups of genes found in the extra chromosomal state and composed of

(1) circular double stranded DNA (2) single stranded DNA

(3) double stranded RNA (4) single stranded RNA

43. Select the incorrect statement

(1) *Vaucheria* possesses multiflagellate zoospores called synzoospores

(2) *Chlamydomonas nivalis* causes the red snow

(3) The red colouration of real sea is due to a blue green alga *Trichodesmium erythreum*

(4) *Batrachospermum* is a marine alga

44. Which one of the following is the incorrect statement?

(1) Claviceps purpurea is the source of ergot

(2) Work on *Nurospora* resulted in one gene one enzyme concept

(3) Parasexuality was discovered in *Aspergillus nidulans*

(4) In *Pencillium* the condidiophores arise from the foot cell

45. Select out the incorrect statement

(1) Sporophyte of *Riccia* is simplest consisting of capsules only

(2) In *Marchantia* Anthridia and Archegonia are borne on Anthridiophores and Archegoniophores

(3) *Lycopodium* is homosporous and *Selaginella* is heterosporous

(4) Origin of seed habit is indicated by the bryophytes like *Polytrichum* or *Funarea*

46. The vascular system in the rhizome of maiden hair fern is usually

(1) protostele (2) saprophytic (3) symbiotic (4) epiphytic

47. In a test cross which one of the following is always used?

(1) Homozygous recessive (2) Heterozygous recessive

(3) Dominant factor (4) Removal of the nucleotide

48. Choose the incorrect statement

(1) DNA replication is unidirectional

(2) DNA replication begins at a specific nucleotide sequence

(3) Synthesis of new DNA strand is catalysed by the enzyme DNA polymerage

(4) Okazaki fragments are joined together by DNA ligase

49. Nutmeg of commerce which is extensively used as spice belongs to the genus

(1) Myristica (2) Eugenia (3) Cinnamomum (4) Strychonos

50. Which of the following plants is the source of Bhang Banja Charas and fiber?

(1) *Linum usitassimum* (2) *Cannabis sativa*

(3) *Crotolaria juncea* (4) *Corchorus capsularis*

51. Which of the following polymerases does not require template for the synthesis of a polynucleotide chain?

(1) RNA polymerase (2) DNA polymerase

(3) Poly A polymerase (4) Telomerase

52. Thyrotropin is secreted from

(1) thyroid gland (2) pituitary gland

(3) parathyroid gland (4) hypothalamus

53. In human total number of cranial nerves is

(1) 10 pairs (2) 12 pairs (3) 31 pairs (4) 43 pairs

54. Jointed appendages are the characteristics of the phylum

(1) Arthropoda (2) Mollusca

(3) Echinodermata (4) Annelida

55. The basal metabolic rate is controlled by

(1) pituitary gland (2) adrenal gland

(3) gonads (4) thyroid gland

56. How many polar bodies are formed during oogenesis in ovary?

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

57. Yellow fever is transmitted by

(1) Culex (2) Aedes (3) Anopheles (4) Bedbug

58. Parental care in male is done in

(1) Hippocampus (2) Labeo (3) Anabas (4) Scoliodon

59. The correct sequence of protein (P) and lipid (L) in the cell membrane is

(1) L-P-L-P (2) L-L-P-P (3) L-P-P-L (4) P-L-L-P

60. The enzymes of Electron Transport Chain (ETC) are present in

(1) inner membrane of mitochondria

(2) outer membrane of mitochondria

(3) mitochondrial matrix

(4) cytosol

61. The largest living invertebrate is

(1) giant squid (2) giant snail (3) giant octopus (4) giant starfish

62. Insulin is secreted in islets of Langerhans by

(1) α cells (2) β cells (3) γ cells (4) pancreatic acini

63. The concept of 'Mobile Gene' was first given by

(1) Crick (2) Khorana

(3) Barbara McClintock (4) Lamarck

64. For explaining the mechanism of enzyme action, the 'lock and key model' was proposed by

(1) Koshland (2) Lehninger (3) Krebs (4) Fischer

65. The gene required for male sex determination is

(1) TRY (2) GRY (3) SRY (4) HRY

66. The DNA site for folding the specific protein can be identified by the technique

(1) DNA sequencing (2) DNA fingerprinting

(3) DNA imprinting (4) DNA foot printing

67. The molecular photocopier is

(1) PCR (2) electroporator (3) sequencer (4) gel DOC

68. The folding of individual polypeptide is made possible by

(1) kistones (2) non-histones (3) chaperons (4) zinc finger

69. The repressible operon is

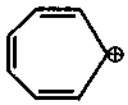
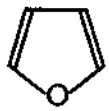
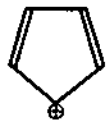
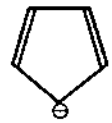
(1) trp operon (2) lac operon (3) met operon (4) arab operon

70. The termination codon is

(1) AUG (2) UUU (3) UAA (4) UUA

CHEMISTRY

71. The species that is not aromatic according to Hückel's rule as

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

72. Total number of all the chloroethanes that could be produced by free-radical chlorination of ethane is

(1) ten (2) nine (3) seven (4) six

73. Arrange the following compounds in order of increasing acidity

(A) Benzoic acid (B) *p*-Chlorobenzoic acid

(C) *p*-Toluic acid (D) *p*-Nitrobenzoic acid

Code :

(1) A < B < C < D (2) A < C < B < D (3) C < B < A < D (4) C < A < B < D

74. The end product in the following sequence of reactions is

$$PhCH_2COOH \xrightarrow{NH_3} A \xrightarrow{\Delta} B \xrightarrow{P_2O_5} ?$$

(1) $PhCH_2CN$ (2) $PhCH_2CONH_2$

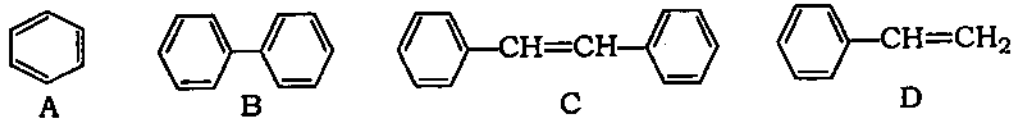
(3) PhCH=NOH (4) $PhCH_2CH_2NH_2$

75. Phenolic esters upon heating with anhydrous $AlCl_3$ are converted into *o*- and *p*-hydroxy ketones. This reaction is called

(1) Claisen rearrangement (2) Fries rearrangement

(3) Friedel-Crafts reaction (4) Houben-Hoesch reaction

76. Arrange the following compounds in order of their decreasing λ_{max}

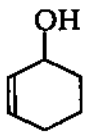


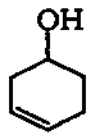
(1) C > B > D > A (2) A > D > C > B (3) B > C > D > A (4) B > D > C > A

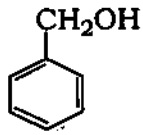
77. A hydrocarbon of formula $C_{10}H_{16}$ absorbs one mole of hydrogen upon hydrogenation. How many rings does it contain?

(1) One (2) Two (3) Three (4) Zero

78. Which of the following compounds will give violet colour with $FeCl_3$?

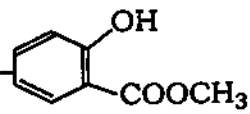
(1) 

(2) 

(3) 

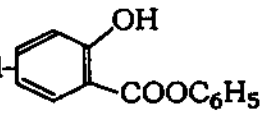
(4) $CH_3COCH_2COOC_2H_5$

79. Which of the following is not correctly matched?

(1) Aspirin- 

(2) Fullerene–C_{60}

(3) Dry ice–CO_2

(4) Salol- 

80. Which one of the following substrates will undergo nucleophilic substitution reaction most readily?

(1) $CH_3CH=CHCl$ (2) $CH_3CHClCH_3$

(3) CH_3CH_2COCl (4) $CH_2=CHCH_2Cl$

81. Base catalysed hydrolysis of oils or fats is called

(1) neutralization (2) saponification (3) denaturation (4) polymerization

82. Which of the following are not permissible sets of quantum numbers for an electron in an atom?

	n	l	m	s
(A)	3	2	1	$\frac{1}{2}$
(B)	2	3	-1	$-\frac{1}{2}$
(C)	3	2	-3	$\frac{1}{2}$
(D)	3	2	0	$-\frac{1}{2}$

Code :

(1) (A) and (B) (2) (C) and (D)

(3) (A) and (C) (4) (B) and (C)

83. The increasing order of electronegativities of C, N, F and O elements is

(1) C < N < O < F (2) F < O < N < C (3) C < O < N < F (4) O < N < C < F

84. The substance used as moderator and coolant in nuclear reactors is

(1) liquid H_2 (2) heavy water

(3) ordinary water (4) liquid NH_3

85. The azimuthal quantum number (l) of $3d^1$ electron is

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

86. The number of electrons (n) taking part in the following chemical reaction is

$$Cr_2O_7^{2-} + 14H^+ + ne^- \longrightarrow 2Cr^{3+} + 7H_2O$$

(1) 3 (2) 14 (3) 7 (4) 6

87. Which one of the following is a basic oxide?

(1) Li_2O (2) Al_2O_3 (3) CO_2 (4) ZnO

88. The oxidation state of Cl in $HClO_4$ is

(1) + I (2) + III (3) + IV (4) + VII

89. The outer electronic configuration of vanadium is

(1) $4s^2 3d^3$ (2) $4s^1 3d^4$ (3) $4s^0 3d^5$ (4) $3d^3 4p^2$

90. Which of the following has tetrahedral geometry?

(1) $Fe(H_2O)_6^{2+}$ (2) $[Co(NH_3)_6]^{3+}$

(3) $Ni(CO)_4$ (4) $Zn(NH_3)_6^{2+}$

91. $[ICl_2]^-$ has

(1) two lone pairs (2) three lone pairs

(3) one lone pairs (4) no lone pairs

92. Which of the following ions is colourless in aqueous solution?

(1) Fe^{3+} (2) Mn^{3+} (3) Ti^{3+} (4) Sc^{3+}

93. The acid rain is not associated with

(1) NO_2 (2) SO_2 (3) CO (4) CO_2

94. The compound having the largest bond angle is

(1) H_2S (2) NH_3 (3) CH_4 (4) CO_2

95. For a second order reaction

(1) $t_{1/2} \propto a$ (2) $t_{1/2} \propto \frac{1}{a}$ (3) $t_{1/2} \propto \frac{1}{a^2}$ (4) $t_{1/2} \propto a^2$

96. The ionic theory of electrolysis was given by

(1) Arrhenius (2) Dalton (3) Faraday (4) Bohr

97. The structure of diamond is

(1) tetrahedral (2) hexagonal (3) octahedral (4) cubic

98. Joule-Thomson coefficient for an ideal gas is

(1) zero (2) positive (3) negative (4) infinite

99. The half-life period of a radioactive element is 20 days. If 64 g of this element is stored for 100 days, the amount of remaining radioactive element would be

(1) 16 g (2) 6 g (3) 8 g (4) 2 g

100. 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

101. $k = Ae^{-E/RT}$ is known as

(1) Eyring equation (2) Arrhenius equation

(3) Gibbs equation (4) Maxwell equation

102. The quantum yield of the reaction $2HBr \xrightarrow{h\nu} H_2 + Br_2$ is

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

103. Which of the following equilibria is heterogeneous?

(1) $2SO_2 + O_2 \rightleftharpoons 2SO_3$ (2) $C_2H_6 \rightleftharpoons C_2H_4 + H_2$

(3) $Fe_2O_3 + CO \rightleftharpoons CO_2 + 2FeO$ (4) $3O_2 \rightleftharpoons 2O_3$

104. Clapeyron-Clausius equation is

(1) $\frac{dP}{dT} = \frac{\Delta H}{T\Delta V}$ (2) $\frac{dG}{dP} = \frac{\Delta H}{T}$

(3) $\frac{dG}{dT} = \frac{\Delta S}{T\Delta V}$ (4) $\frac{dH}{dT} = \frac{dS}{T}$

105. The order of radioactive decay reaction is

(1) first (2) second (3) third (4) zero

106. Unit of dipole moment is

(1) Coulomb (2) Dalton (3) Einstein (4) Debye

107. The extent of hydrogen bonding is maximum in

(1) dimethylamine (2) diethyl ether

(3) ethanol (4) ethyl acetate

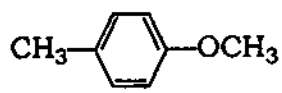
108. The rate constant of reaction depends on

(1) time (2) temperature (3) mass (4) weight

109. A compound shows absorption bands at 1800 cm^{-1} and 1750 cm^{-1} in its IR spectrum. Identify the compound

(1) R—CHO (2) RCOR (3) RCOCl (4) $(RCO)_2O$

110. How many signals would be seen in the ^1H NMR spectrum of the following compound?



(1) Three (2) Four (3) Seven (4) Ten

PHYSICS

111. The dimensions of the quantities in one of the following pairs are the same. Identify that pair

(1) Torque and work

(2) Angular momentum and work

(3) Energy and Young's modulus

(4) Light year and velocity of light

112. A particle is moving towards east with a velocity 5 m/sec. In 10 sec the velocity changes to 5 m/sec towards north. The average acceleration in this case is

(1) $\frac{1}{2}$ m/sec^2 towards north-west

(2) $\frac{1}{2}$ m/sec^2 towards north-east

(3) $\frac{1}{\sqrt{2}}$ m/sec^2 towards north-west

(4) $\frac{1}{\sqrt{2}}$ m/sec^2 towards north-east

113. A large mass M and a small mass m hang at the two ends of a string that passes over a smooth tube. The mass m moves around a circular path which lies in a horizontal plane. The length of the string from the mass m to the top of the tube which is vertical makes the angle θ. What should be the frequency of rotation of the mass m so that the mass M remains stationary?

(1) $\frac{1}{2\pi}\sqrt{\frac{ml}{Mg}}$ (2) $\frac{1}{2\pi}\sqrt{\frac{Ml}{mg}}$ (3) $\frac{1}{2\pi}\sqrt{\frac{mg}{Ml}}$ (4) $\frac{1}{2\pi}\sqrt{\frac{Mg}{ml}}$

114. Indicate the correct statement about the reference frame attached to earth

(1) It is an inertial frame because the earth is rotating with constant speed about its own axis

(2) It is an inertial frame because Newton's laws are applicable in this frame

(3) It cannot be inertial frame because the earth is revolving around the sun

(4) It is an inertial frame by definition

115. A carpet of mass M made of inextensible material is rolled along its length in the form of cylinder of radius R and is kept on a rough floor. The carpet starts unrolling without sliding on the floor when a negligible small push is given to it. The horizontal velocity of the axis of the cylindrical part of the carpet when its radius reduces to $\frac{R}{2}$ is

(1) $V=\sqrt{\frac{7gR}{3}}$ (2) $V=\sqrt{\frac{14gR}{3}}$ (3) $V=\sqrt{\frac{5gR}{3}}$ (4) $V=\sqrt{\frac{10gR}{3}}$

116. The relation between the displacement x and the time t of a body of mass 2 kg moving under the action of a force is given by $x=\frac{t^3}{3}$, where x is in metre and t in second. The work done by the force on the body in the first 2 sec is

(1) 1600 joules (2) 160 joules (3) 80 joules (4) 16 joules

117. An artificial satellite is moving in a circular orbit around the earth with a speed equal to half the magnitude of escape velocity from earth. If the satellite is stopped suddenly in its orbit and allowed to fall freely onto the earth, then the speed with which it hits the surface of the earth ($g=98\ m/sec^2$ and radius of earth $=6400$ km) is

(1) 11·2 km/sec (2) 22·4 km/sec (3) 5·6 km/sec (4) 25·8 km/sec

118. The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied?

(1) Length 300 cm, diameter 3 mm

(2) Length 200 cm, diameter 2 mm

(3) Length 100 cm, diameter 1 mm

(4) Length 50 cm, diameter 0·5 mm

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

120. Two cells of 1·25 V and 0·75 V are connected in parallel, the effective voltage will be

(1) 2 V (2) 0·5 V (3) 0·75 V (4) 1·25 V

121. A wire of length 0·5 m and carrying a current of 1·2 amp is placed in a uniform magnetic field of induction of 2 tesla. If the magnetic field is perpendicular to the length of wire, then the force on the wire will be

(1) 0·4 N (2) 4·8 N (3) 2·4 N (4) 1·2 N

122. The work function of a photoelectric material as 3·3 eV. Its threshold frequency will be

(1) 8×10^{16} Hz (2) 8×10^{14} Hz (3) $1{\cdot}6\times10^{15}$ Hz (4) $2{\cdot}4\times10^{15}$ Hz

123. At frequencies above resonance frequency in a series resonant circuit the impedance of the circuit is

(1) inductive (2) capacitative (3) resistive (4) substantive

124. On increasing the temperature of N-type semiconductor its Fermi level

(1) moves towards conduction band

(2) moves into the conduction land

(3) moves towards the position of intrinsic Fermi level

(4) moves below the intrinsic Fermi level

125. In Zener diode the Zener breakdown is caused due to

(1) breaking of valence bands due to high velocity of minority carriers in depletion region

(2) breaking of valence bands due to high electric field in the depletion region

(3) breaking of valence bands due to high velocity of majority carriers in neutral region

(4) electron hole pair generation due to thermal agitation

126. A carrier wave of 1 kW is amplitude modulated by an audio signal. If the modulation index is 60%, then the total power in the wave will be

(1) 1·36 kW (2) 0·36 kW (3) 0·18 kW (4) 1·18 kW

127. A black body events radiation of maximum intensity at a wavelength of 5000 Å when the temperature of the black body is 1227 °C. If the temperature is increased by 1000 °C, the maximum intensity would be observed at

(1) 2754 Å (2) 3000 Å (3) 3260 Å (4) 5000 Å

128. Which of the following particles cannot be accelerated by cyclotron?

(1) Proton (2) Deuteron (3) Electron (4) α particle

129. Weizsacker's semi-empirical mass formula does not include

(1) pairing energy (2) magicity energy

(3) Coulomb energy (4) asymmetry energy

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

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

131. The Fourier series given below

$$y = A + \frac{2A}{\pi} \sum_{r=1}^{\infty} \frac{1}{r} \sin r\omega t$$

represents a

(1) sawtooth wave (2) square wave

(3) triangular wave (4) rectangular wave

132. If the equation for the electric field of an electromagnetic wave propagating in a medium is given by

$$E = 10 \sin 2\pi \left[\frac{4t}{10^{-9}} - \frac{2x}{\cdot 03} \right] \text{volt/metre}$$

then the velocity and wavelength of the wave are

(1) $0 \cdot 3 \times 10^8$ m/sec, 0·03 metre (2) $0 \cdot 6 \times 10^8$ m/sec, ·015 metre

(3) 3×10^8 m/sec, 0·3 metre (4) 6×10^8 m/sec, 0·03 metre

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

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

(3) Biot-Savart law (4) Faraday's law

134. The condition that any vector $\vec{A}$ should be the curl of another vector is that

(1) $\vec{\nabla} \times \vec{A} = 0$ (2) $\vec{\nabla} \cdot \vec{A} = 0$

(3) $\vec{\nabla} \times \vec{A} - \nabla^2 \vec{A} = 0$ (4) $\vec{A} = -\nabla\phi$

135. Which of the following Boolean expressions is equivalent to an OR gate?

(1) $Y = A + \overline{A} \cdot B$ (2) $Y = \overline{A \cdot B}$ (3) $Y = A + A\overline{B}$ (4) $Y = \overline{(A + B)}$

136. A solenoid has an inductance of 50 henry and a resistance of 30 Ω. If it is connected to a 300 V battery, then how long will it take for the current to reach one-half of its final steady state value?

(1) 1·6 sec (2) 1·55 sec (3) 1·28 sec (4) 1·15 sec

137. Indicate the false statement regarding the early effect in case of the transistor

(1) Base current decreases with increasing $|V_{CB}|$

(2) Emitter current increases with increasing $|V_{CB}|$

(3) Common base current gain decreases with increasing $|V_{CB}|$

(4) Common emitter current gain increases with increasing $|V_{CB}|$

138. Indicate the false statement about the high frequency ($\omega > \omega_p$) electromagnetic wave propagation through low pressure ionized gases

(1) Phase velocity is greater than the velocity of light in free space

(2) $\vec{E}$ and $\vec{H}$ waves are in phase

(3) Waves are attenuated in passing through the ionized gas

(4) E/H in ionized gases is larger than in free space

139. Indicate the false statement about the rectifiers

(1) Peak inverse voltage for FW rectifier is twice that of half-wave rectifier

(2) Output DC voltage for FW rectifier is twice that of half-wave rectifier

(3) Ripple factor for FW rectifier is about half of that for HW rectifier

(4) Rectification efficiency for FW rectifier is about half of that for HW rectifier

140. Copper has a conductivity σ of $5{\cdot}80 \times 10^7$ mhos/metre. The skin depth at 1 MHz in copper is

(1) 56 microns (2) 66 microns (3) 44 microns (4) 27 microns

141. At 1 atmospheric pressure ($P = 1{\cdot}03 \times 10^8$ N/m^2), 1 gm of water having a volume of 1 cm^3 becomes 1671 cm^3 of steam when boiled. The heat of vaporization of water is 539 cal/gm at 1 atm. The internal energy of the system during this process

(1) increases by 498 cal
(2) decreases by 370 cal
(3) increases by 580 cal
(4) decreases by 710 cal

142. According to van der Waals equation of state of a gas the critical temperature of any gas is given by

(1) $\frac{2a}{Rb}$ (2) $\frac{4a}{25Rb}$ (3) $\frac{a}{27b^2}$ (4) $\frac{8a}{27Rb}$

143. An ideal gas heat engine operates in a Carnot cycle between 227 °C and 127 °C. It absorbs $6{\cdot}0 \times 10^4$ cal at the higher temperature. How much work per cycle is this engine capable of performing?

(1) $2{\cdot}0 \times 10^4$ joules
(2) $5{\cdot}0 \times 10^4$ joules
(3) $12{\cdot}0 \times 10^4$ joules
(4) $3{\cdot}0 \times 10^4$ joules

144. If we pour some drops of water between the plate and lens in Newton's ring experiment, then the rings

(1) will decrease in diameter
(2) will increase in diameter
(3) will become elliptical
(4) will disappear

145. A circularly polarized light can be distinguished from unpolarized light by passing it through a

(1) polarizing sheet
(2) half-wave plate
(3) quarter-wave plate
(4) Nicol prism

146. If α is equal to half of the phase difference between the rays from the top and bottom of the single slit, then the values of α, at which intensity maxima for single slit diffraction are obtained, are given by

(1) $\sin\alpha = \alpha$ (2) $\tan\alpha = \alpha$ (3) $\cot\alpha = \alpha$ (4) $\sin^2\alpha = \alpha$

147. X-rays of wavelength 10×10^{-12} metre are scattered from a target. If the value of the constant $\frac{h}{mc} = 2{\cdot}425\times10^{-12}$ metre, then the maximum wavelength present in the scattered X-rays will be

(1) $11{\cdot}21\times10^{-12}$ metre (2) $14{\cdot}85\times10^{-12}$ metre

(3) $12{\cdot}425\times10^{-12}$ metre (4) $17{\cdot}28\times10^{-12}$ metre

148. What guide wavelength does 10 cm radiation (free space wavelength) exhibit in a rectangular waveguide whose width is 6·0 cm? Assume the dominant mode

(1) 12 cm (2) 24 cm (3) 36 cm (4) 18 cm

149. An electron has a speed of 300 metres/sec accurate to 0·01%. With what fundamental accuracy can we locate the position of electron? Mass of electron is $9{\cdot}1\times10^{-31}$ kg and Planck's constant $= 6{\cdot}6\times10^{-34}$ joules/sec

(1) 2·4 cm (2) 1·2 cm (3) 1·8 cm (4) 3·6 cm

150. A diffraction grating has 10^4 lines over 1 inch. It is illuminated at normal incidence by sodium light ($\lambda_1 = 5890$ Å and $\lambda_2 = 5896$ Å). What is the angular separation between the first-order maxima of these lines?

(1) $1{\cdot}2\times10^{-4}$ radian (2) $2{\cdot}4\times10^{-4}$ radian

(3) $0{\cdot}6\times10^{-4}$ radian (4) $1{\cdot}8\times10^{-4}$ radian

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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 केवल *ओ०एम०आर० 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।