Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

A

SET-Y

UG-4Yr.-EE-June, 2025

SUBJECT : Bachelor of Public Health Sciences

Sr. No. 10061

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **130**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

(Signature of the Candidate) (Signature of the Invigilator)

SEAL

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions of **Section-A** are ***compulsory***. Students are required to attempt either **Section-B** or **Section-C**. All questions carry equal marks i.e. one mark each.
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

SECTION – A

1. Which hormone is known as the 'stress hormone' ?
   (1) Adrenaline (2) Thyroxine
   (3) Insulin (4) Cortisol

2. What is the function of alveoli in the lungs ?
   (1) Exchange gases (2) Store oxygen
   (3) Filter blood (4) Produce mucus

3. Which disease is caused by a deficiency of Vitamin B1 ?
   (1) Pellagra (2) Rickets
   (3) Beriberi (4) Scurvy

4. Which organ stores bile ?
   (1) Liver (2) Pancreas
   (3) Gallbladder (4) Stomach

5. What does HIV attack in the human body?
   (1) Red blood cells (2) Nerves
   (3) Platelets (4) Immune cells

6. **Which part of the brain controls breathing and heart rate?**
   (1) Cerebrum (2) Cerebellum
   (3) Medulla oblongata (4) Pons

7. **What is the main cause of rickets in children?**
   (1) Lack of Vitamin D (2) Lack of protein
   (3) Lack of iron (4) Lack of Vitamin A

8. **Which hormone regulates the sleep-wake cycle ?**
   (1) Insulin (2) Melatonin
   (3) Cortisol (4) Estrogen

9. What is the largest internal organ in the human body ?

(1) Brain (2) Heart

(3) Liver (4) Kidney

10. Which blood group is known as the universal recipient ?

(1) A (2) B

(3) O (4) AB

11. The work done by a force is zero when the displacement is ?

(1) In the same direction as force (2) Perpendicular to the force

(3) Opposite to the force (4) None of these

12. A car moves with uniform acceleration. Its velocity-time graph is :

(1) Horizontal (2) Parabolic

(3) Linear (4) Exponential

13. A train is moving with a uniform acceleration. The ratio of distances covered in the 1st, 2nd and 3rd seconds is :

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

(3) 1:4:9 (4) 1:3:5

14. The pressure exerted by a fluid in a container is ?

(1) Same at all points (2) Maximum at the top

(3) Zero at the bottom (4) Varies linearly with depth

15. Which of the following is a scalar quantity ?

(1) Displacement (2) Velocity

(3) Speed (4) Force

16. The buoyant force on an object submerged in a fluid is equal to ?

(1) Weight of the object (2) Weight of fluid displaced

(3) Volume of object (4) Mass of object

17. What is the energy conversion in a hydroelectric power plant ?

(1) Electrical to Mechanical
(2) Mechanical to Electrical
(3) Chemical to Electrical
(4) Thermal to Mechanical

18. The concept of inertia is associated with which law of motion ?

(1) First Law
(2) Second Law
(3) Third Law
(4) Law of Gravitation

19. A car accelerates from rest and covers 100 m in 5 s. What is its acceleration ?

(1) $5\ m/s^2$
(2) $8\ m/s^2$
(3) $10\ m/s^2$
(4) $20\ m/s^2$

20. Which lens is used to correct myopia (nearsightedness) ?

(1) Convex lens
(2) Concave lens
(3) Cylindrical lens
(4) None of these

21. Calculate the refractive index of the material of an equilateral prism for which the angle of minimum deviation is 60°.

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

22. Total internal reflection occurs when light travels from ?

(1) Dense to rarer medium beyond critical angle
(2) Rarer to denser medium beyond critical angle
(3) Dense to denser medium beyond critical angle
(4) None of these

23. The human eye focuses light on the ?

(1) Cornea
(2) Retina
(3) Iris
(4) Lens

24. Chromatic aberration in lenses due to ?

(1) Dispersion of light
(2) Reflection of light
(3) Refraction of light
(4) Diffraction of light

25. The image formed by a plane mirror is ?

(1) Real and inverted
(2) Real and erect
(3) Virtual and inverted
(4) Virtual and erect

26. Which of the following has the smallest wavelength ?

(1) Radio waves
(2) Microwaves
(3) Ultraviolet rays
(4) Infrared rays

27. The unit of refractive index is ?

(1) Meter
(2) Hertz
(3) Candela
(4) Dimensionless (no unit)

28. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then what is its focal length ?

(1) Focal Length will become zero
(2) Focal Length will become infinite
(3) Focal length will reduce, but not become zero
(4) Remains unchanged

29. If a glass prism is dipped in water, what happens to its dispersive power ?

(1) Increases
(2) Decreases
(3) Does not change
(4) No effect

36. The temperature at which vapor pressure equals atmospheric pressure is ?

(1) Boiling point (2) Melting point

(3) Freezing point (4) Critical point

37. The wavelength corresponding to maximum energy in the electromagnetic spectrum lies in ?

(1) Radio waves (2) Gamma rays

(3) Visible light (4) Infrared

38. Which of the following does the wave theory of light not explain ?

(1) Diffraction (2) Photocurrent

(3) Polarization (4) Interference

39. In nuclear reactions, there is a conservation of :

(1) Energy only (2) Mass only

(3) Mass, energy and momentum (4) Momentum only

40. What happens when the radio wave reaches the ionizing medium ?

(1) Will bend towards normal (2) Will bend away from the normal

(3) Will follow a straight path (4) None of these

41. Which element has the highest electronegativity ?

(1) Oxygen (2) Nitrogen

(3) Chlorine (4) Fluorine

42. The bond formed by the sharing of electron pairs between atoms is called ?

(1) Ionic bond (2) Metallic bond

(3) Covalent bond (4) Hydrogen bond

30. Two plane mirrors A and B are placed parallel to each other and spaced 20 cm apart. An object is kept in between them 15 cm from A. Out of the following at which point is an image not formed in mirror A.

(1) 15 cm (2) 25 cm

(3) 45 cm (4) 55 cm

31. A boy 1.50 m tall with his eye level at 1.38 m from the ground stands before a mirror fixed on a wall. What should be the minimum length of the mirror so that he can view himself fully ?

(1) 0.8 m (2) 0.75 m

(3) 0.69 m (4) none of these

32. Which scientist proposed the dual nature of matter ?

(1) de Broglie (2) Einstein

(3) Newton (4) Planck

33. The electrochemical cell converts ?

(1) Electrical energy into chemical energy

(2) Mechanical energy into electrical energy

(3) Chemical energy into electrical energy

(4) Electrical energy into mechanical energy

34. The entropy of a perfectly crystalline substance at absolute zero is ?

(1) Maximum (2) Zero

(3) Infinite (4) Undefined

35. In the photoelectric effect, the emission of electrons depends on ?

(1) Frequency of incident light (2) Intensity of incident light

(3) Both frequency and intensity (4) None of the above

43. Which of the following is paramagnetic ?

(1) N_2 (2) O_2

(3) $C0_2$ (4) CH_4

44. What type of hybridization is present in methane (CH_4) ?

(1) sp (2) Sp^2

(3) Sp^3 (4) dsp^2

45. The atomic radius generally ..... across a period from left to right.

(1) Increase (2) Decreases

(3) Remains same (4) Varies irregularly

46. The color of transition metal complexes is due to ?

(1) Nuclear reactions (2) Atomic mass

(3) Ionization energy (4) d-d electronic transitions

47. Which of the following is a property of f-block elements ?

(1) High ionization energy (2) Exhibiting variable oxidation states

(3) Low melting points (4) None of these

48. Which bond is strongest ?

(1) Single bond (2) Double bond

(3) Triple bond (4) Hydrogen bond

49. The ionic bond is formed by ?

(1) Transfer of electrons (2) Sharing of electrons

(3) Attraction of dipoles (4) Hydrogen bonding

50. The shape of BF_3 molecule is ?

(1) Tetrahedral (2) Linear

(3) Trigonal planar (4) Octahedral

51. Which of the following is an aromatic hydrocarbon ?

(1) Ethane (2) Benzene

(3) Ethene (4) Propane

52. Which compound contains a carbonyl group ?

(1) Alcohol (2) Alkane

(3) Amine (4) Aldehyde

53. Which reagent is commonly used to test for unsaturation in hydrocarbons ?

(1) Tollen's reagent (2) Fehling's solution

(3) $KMn0_4$ (4) Bromine water

54. The IUPAC name of CH_3-CH_2-CH_2-OH is ?

(1) Methanol (2) Ethanol

(3) Propanol (4) Butanol

55. Which of the following contains nitrogen ?

(1) Alcohol (2) Amine

(3) Ketone (4) Ether

56. Polymerization is a process of ?

(1) Breaking down molecules

(2) Formation of large molecules from small ones

(3) Crystallization

(4) Distillation

57. The empirical formula of glucose is ?

(1) $C_6H_{12}O_6$ (2) $C_6H_{10}O_5$

(3) CH_2O (4) $C_3H_6O_3$

58. Which of the following organic compounds is responsible for the sweet smell of fruits ?

(1) Alcohols (2) Esters

(3) Aldehydes (4) Ketones

59. What type of bond is found in benzene ?

(1) Single bonds only

(2) Alternating single and double bonds (resonance)

(3) Triple bonds

(4) Ionic bonds

60. Which of the following organic compounds contains an ether group ?

(1) R-O-R' (2) R-COOH

(3) $R\text{-}NH_2$ (4) R-CHO

61. The first law of thermodynamics deals with ?

(1) Conservation of mass (2) Conservation of energy

(3) Entropy (4) Enthalpy

62. In electrochemistry, the cathode is where ?

(1) Oxidation occurs (2) Reduction occurs

(3) Both oxidation and reduction occur (4) No reaction occurs

63. The unit of rate constant for a first-order reaction is ?

(1) S^{-1} (2) $mol\ L^{-1}\ s^{-1}$

(3) $L\ mol^{-1}\ s^{-1}$ (4) Unitless

64. What does the term "activation energy" mean ?

(1) Energy released during a reaction

(2) Minimum energy required for a reaction to occur

(3) Total energy in reactants

(4) Energy lost as heat

65. The entropy of an isolated system always ?

(1) Decreases

(2) Increases or remains constant

(3) Remains constant

(4) Fluctuates randomly

66. The potential difference between the electrodes of a galvanic cell is called ?

(1) EMF

(2) Current

(3) Resistance

(4) Voltage drop

67. In which reaction does the catalyst remain unchanged ?

(1) Homogeneous catalyst reaction

(2) Heterogeneous catalyst reaction

(3) Both A and B

(4) None of these

68. For the following reaction at 300 K

$A_2(g) + 3B_2(g) \rightarrow 2AB_3(g)$

the enthalpy change is + 15 kJ, then the internal energy change is :

(1) 19988.4 J

(2) 200 J

(3) 1999 J

(4) 1.9988 kJ

69. At a given temperature and pressure, the equilibrium constant values for the equilibria are given below :

$3A_2 + B_2 \rightleftharpoons 2A_3B$, K_1

$A_3B \rightleftharpoons 3/2A_2 + 1/2B_2$, K_2

The relation between K, and K_2 is :

(1) $K_1^2 = 2K_2$ (2) $K_2 = K_1/2$

(3) $K_1 = 1/\text{sqrt}(K_2)$ (4) $K_2 = 1/\text{sqrt}(K_1)$

70. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is (Given: Molar mass of Cu : 63 $g\ mol^{-1}$, 1 F = 96487C) :

(1) 3.15g (2) 0.315g

(3) 31.5g (4) 0.0315g

SECTION – B
(MATHEMATICS)

71. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are equal, then the discriminant is :

(1) Greater than zero (2) Less than zero

(3) Zero (4) None of these

72. The sum of the first n natural numbers is :

(1) n(n+1)/2 (2) n^2

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

73. Find the number of terms if the sum of an AP is 100, the first term is 5, and the last term is 20 :

(1) 15 (2) 10

(3) 20 (4) 25

74. If $A=\begin{bmatrix}2 & 2\\ 9 & 4\end{bmatrix}$ and $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

Then $10A^{-1}$ is equal to :

(1) A –4I (2) 6I – A

(3) A –6I (4) 4I – A

75. If $S_n = 3n^2 + 5n$, then the first term is :

(1) 8 (2) 6

(3) 7 (4) 3

76. For equation $x^2 + px + q = 0$, $\alpha^2 + \beta^2$ equals:

(1) $p^2 - 2q$ (2) $p^2 + 2q$

(3) $q^2 - 2p$ (4) $q^2 + 2p$

77. Sum of GP is given by :

(1) $a(1 - r^n)/(1 - r)$ (2) $a(r^n - 1)/(r - 1)$

(3) Both A & B (4) None

78. If A is a 3 x 3 non-singular matrix such that $AA^T = A^T A$ and $B = A^{-1}A^T$, then BB^T equals :

(1) I+B (2) I

(3) B^{-1} (4) $(B^{-1})^T$

79. If α is a root of the equation $2x(2x+1) = 1$, then the other root is :

(1) $3\alpha^3 + 4\alpha$ (2) α^2

(3) $-2\alpha(\alpha+1)$ (4) none of these

80. A value of b for which the equations $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have one root in common is :

(1) $-\sqrt{2}$ (2) $-i-\sqrt{3}$

(3) $i\sqrt{5}$ (4) 2

81. $\sin(2\theta)$ is equal to :

(1) $2\sin\theta\cos\theta$ (2) $\sin^2\theta + \cos^2\theta$

(3) $\sin\theta + \cos\theta$ (4) None

82. $\tan^2\theta + 1$ equals:

(1) $\sec^2\theta$ (2) $\text{cosec}^2\theta$

(3) 1 (4) $\sin^2\theta$

83. If $\sin\theta$ and $\cos\theta$ are the roots of $ax^2 - bx + c = 0$, then the relation between a, b and c will be :

(1) $a^2 + b^2 + 2ac = 0$ (2) $a^2 - b^2 + 2ac = 0$

(3) $a^2 + c^2 + 2ab = 0$ (4) $a^2 - b^2 - 2ac = 0$

84. The value of $\cos 1° \cos 2° \cos 3° \ldots \cos 179°$ is :

(1) $1/\sqrt{2}$ (2) 0

(3) 1 (4) -1

85. If A lies in the second quadrant and $3\tan A + 4 = 0$, then the value of $(2\cot A - 5\cos A + \sin A)$ is equal to :

(1) $-53/10$ (2) $7/10$

(3) $37/10$ (4) $23/10$

86. Number of solutions of the equation $\tan x + \sec x = 2\cos x$ lying in the interval $[0, 2\pi]$ is :

(1) 0 (2) 1

(3) 2 (4) 3

87. Standard form of a parabola opening rightward :

(1) $y^2 = 4ax$ (2) $x^2 = 4ay$

(3) $y^2 + 4ax$ (4) $x^2 + 4ay$

88. Equation of a line with slope m and passing through (X_1, Y_1):

(1) $y = mx + c$ (2) $y - y_1 = m(x - x_1)$

(3) $y = m + X$ (4) None

89. A hyperbola has :

(1) One focus (2) Two foci

(3) No focus (4) Three foci

90. Eccentricity of ellipse is :

(1) >1 (2) 0

(3) 1 (4) Between 0 and 1

91. If the line $2x + y = k$ passes through the point which divides the line segment joining the points (11) and (2, 4) in the ratio 3 : 2, then k equals

(1) 29/5 (2) 5

(3) 6 (4) 11/5

92. For the ellipse $3x^2 + 4y^2 = 12$, the length of the latus rectum is :

(1) 2/5 (2) 3/5

(3) 3 (4) 4

93. Let E be the ellipse $x^2 / 9 + y^2 /4 = 1$ and C be the circle $x^2 + y^2 = 9$. Let P and Q be the points (1, 2) and (2, 1), respectively. Then

(1) Q lies inside C but outside E

(2) Q lies outside both C and E

(3) P lies inside both C and E

(4) P lies inside C but outside E

94. The locus of the mid-point of the line segment joining the focus of the parabola $y^2 = 4ax$ to a moving point of the parabola, is another parabola whose directrix is

(1) $x = a$

(2) $x = 0$

(3) $x = -a/2$

(4) $x = a/2$

95. Consider the lines Ll: $x-1 = Y - 2 = z$ and L2: $x - 2 = y = z - 1$. Let the feet of the perpendiculars from the point P(5, 1, -3) on the lines Ll and L2 be Q and R respectively. If the area of the triangle PQR is A, then $4A^2$ is equal to :

(1) 151

(2) 147

(3) 139

(4) 143

96. Number of permutations of 5 different objects taken 3 at a time :

(1) 60

(2) 20

(3) 120

(4) 10

97. How many ways to arrange 3 boys and 2 girls in a row ?

(1) 120

(2) 60

(3) 20

(4) 30

98. From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include atleast 4 batsmen and atleast 4 bowlers. One batsmen and one bowler who are captain and vice-captain respectively of the team should be included. Then the total number of ways such a selection can be made, is

(1) 14 (2) 165

(3) 155 (4) 135

99. From all the English alphabets, five letters are chosen and are arranged in alphabetical order. The total number of ways, in which the middle letter is 'M' is :

(1) 6084 (2) 5148

(3) 14950 (4) 4356

100. 60 words can be made using all the letters of the word BHBJO, with or without meaning. If these words are written as in a dictionary, then the 50th word is :

(1) OBBJH (2) HBBJO

(3) OBBHJ (4) JBBOH

SECTION – C
(BIOLOGY AND BIOTECHNOLOGY)

101. Which of the following is a characteristic of mammals ?

(1) Feathers (2) Mammary glands

(3) Gills (4) Exoskeleton

102. In which group of animals is the body divided into head, thorax, and abdomen ?

(1) Annelida (2) Insects

(3) Mollusks (4) Cnidarians

103. Amphibians can breathe through :

(1) Lungs only (2) Skin only

(3) Lungs and skin (4) Gills only

104. Which animal is an invertebrate ?

(1) Earthworm (2) Dog

(3) Frog (4) Bat

105. Which animal lacks a true body cavity (coelom) ?

(1) Earthworm (2) Roundworm

(3) Spider (4) Flatworm

106. Which of the following exhibits radial symmetry ?

(1) Human (2) Fish

(3) Jellyfish (4) Snake

107. What is the main characteristic of vertebrates ?

(1) Exoskeleto (2) Segmented body

(3) Open circulatory system (4) Backbone

108. Which of the following is the most evolved?

(1) Mammalia (2) Aves

(3) Amphibia (4) Reptilia

109. The presence of a four-chambered heart is seen in :

(1) Reptiles (2) Amphibians

(3) Birds and mammals (4) Fish

110. What feature distinguishes vertebrates from invertebrates ?

(1) Presence of limbs (2) Notochord

(3) Closed circulatory system (4) Exoskeleton

111. Which of the following is not a connective tissue ?

(1) Blood (2) Cartilage

(3) Muscle (4) Bone

112. The lining of blood vessels is made up of :

(1) Cuboidal epithelium (2) Columnar epithelium

(3) Squamous epithelium (4) Ciliated epithelium

113. Which organ system is responsible for the transport of nutrients and gases ?

(1) Excretory (2) Nervous

(3) Digestive (4) Circulatory

114. Which type of epithelium is found in the kidney tubules ?

(1) Columnar (2) Squamous

(3) Cuboidal (4) Ciliated

115. What type of connective tissue connects muscles to bones ?

(1) Ligaments (2) Tendons

(3) Cartilage (4) Adipose

116. Which muscle is under voluntary control ?

(1) Cardiac (2) Skeletal

(3) Smooth (4) None

117. Which of the following is NOT an epithelial tissue ?

(1) Columnar (2) Cuboidal

(3) Skeletal (4) Squamous

118. Which part of the neuron receives signals ?

(1) Axon (2) Dendrite

(3) Myelin (4) Node of Ranvier

119. Which gland is considered both endocrine and exocrine ?

(1) Thyroid (2) Pituitary

(3) Pancreas (4) Adrenal

120. Which system is primarily responsible for hormone secretion ?

(1) Endocrine (2) Digestive

(3) Lymphatic (4) Respiratory

121. Which of the following statements is incorrect about agar ?

(1) Remains stable at incubation temperature

(2) Does not react with media constituents

(3) Does not use in micropropagation work

(4) Not digested by plant enzymes

122. The ability of single cells to divide and produce all differentiated cells in the entity.

(1) Totipotency (2) Multipotent

(3) Pluripotent (4) Unipotent

123. Growth of plant tissues in artificial media is called :

(1) cell hybridization (2) plant tissue culture

(3) transgenesis (4) gene expression

124. Louis Pasteur created the first vaccines for :

(1) Rabies (2) Cholera

(3) Anthrax (4) All of the above

125. Which of the following is the combined vaccine given to children for protection against Diphtheria, whooping cough and tetanus ?

(1) DPT vaccine (2) BCG vaccine

(3) TAB vaccine (4) HIB vaccine

126. Increased IMR and decreased MMR in a population will :

(1) Cause rapid increase in growth rate

(2) Result in decline in growth rate

(3) Not cause significant change in growth

(4) Result in an explosive population

127. Which one of the following enzymes is responsible for the synthesis of DNA from RNA ?

(1) Reverse transcriptase (2) DNA polymerase

(3) RNA polymerase (4) DNA ligase.

128. To make the recombinant plasmid permeable to DNA molecules, which of the chemicals is added ?

(1) $MgCl_2$ (2) $CaCl_2$

(3) NaCI (4) HCI

129. Match the following :

Disease	Vaccine
1. Measles	a. Varicella vaccine
2. Tuberculosis	b. MMR
3. Chickenpox	c. Shingrix or Zostavax
4. Shingles	d. BCG vaccine

(1) l-c, 2-d, 3-b, 4-a (2) I-b, 2-d, 3-c, 4-a

(3) l-b, 2-d, 3-a, 4-c (4) l-d, 2-c, 3-a, 4-b

130. This is not a basic component of culture media for plant cultivation :

(1) amino acids (2) sucrose/sugar

(3) a complex mixture of salts (4) serum albumin

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B

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(Signature of the Candidate) (Signature of the Invigilator)

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7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
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SECTION – A

1. The first law of thermodynamics deals with ?

   (1) Conservation of mass
   (2) Conservation of energy
   (3) Entropy
   (4) Enthalpy

2. In electrochemistry, the cathode is where ?

   (1) Oxidation occurs
   (2) Reduction occurs
   (3) Both oxidation and reduction occur
   (4) No reaction occurs

3. The unit of rate constant for a first-order reaction is ?

   (1) S^{-1}
   (2) mol L^{-1} s^{-1}
   (3) L mol^{-1} s^{-1}
   (4) Unitless

4. What does the term "activation energy" mean ?

   (1) Energy released during a reaction
   (2) Minimum energy required for a reaction to occur
   (3) Total energy in reactants
   (4) Energy lost as heat

5. The entropy of an isolated system always ?

   (1) Decreases
   (2) Increases or remains constant
   (3) Remains constant
   (4) Fluctuates randomly

6. The potential difference between the electrodes of a galvanic cell is called ?

   (1) EMF
   (2) Current
   (3) Resistance
   (4) Voltage drop

7. In which reaction does the catalyst remain unchanged ?

(1) Homogeneous catalyst reaction
(2) Heterogeneous catalyst reaction
(3) Both A and B
(4) None of these

8. For the following reaction at 300 K

$A_2(g) + 3B_2(g) \rightarrow 2AB_3(g)$

the enthalpy change is + 15 kJ, then the internal energy change is :

(1) 19988.4 J
(2) 200 J
(3) 1999 J
(4) 1.9988 kJ

9. At a given temperature and pressure, the equilibrium constant values for the equilibria are given below :

$3A_2 + B_2 \rightleftharpoons 2A_3B$, K_1

$A_3B \rightleftharpoons 3/2A_2 + 1/2B_2$, K_2

The relation between K, and K_2 is :

(1) $K_1^2 = 2K_2$
(2) $K_2 = K_1/2$
(3) $K_1 = 1/\text{sqrt}(K_2)$
(4) $K_2 = 1/\text{sqrt}(K_1)$

10. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is (Given: Molar mass of Cu : 63 g mol^{-1}, 1 F = 96487C) :

(1) 3.15g
(2) 0.315g
(3) 31.5g
(4) 0.0315g

11. Calculate the refractive index of the material of an equilateral prism for which the angle of minimum deviation is 60°.

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

12. Total internal reflection occurs when light travels from ?

(1) Dense to rarer medium beyond critical angle

(2) Rarer to denser medium beyond critical angle

(3) Dense to denser medium beyond critical angle

(4) None of these

13. The human eye focuses light on the ?

(1) Cornea (2) Retina

(3) Iris (4) Lens

14. Chromatic aberration in lenses due to ?

(1) Dispersion of light (2) Reflection of light

(3) Refraction of light (4) Diffraction of light

15. The image formed by a plane mirror is ?

(1) Real and inverted (2) Real and erect

(3) Virtual and inverted (4) Virtual and erect

16. Which of the following has the smallest wavelength ?

(1) Radio waves (2) Microwaves

(3) Ultraviolet rays (4) Infrared rays

17. The unit of refractive index is ?

(1) Meter (2) Hertz

(3) Candela (4) Dimensionless (no unit)

18. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then what is its focal length ?

(1) Focal Length will become zero

(2) Focal Length will become infinite

(3) Focal length will reduce, but not become zero

(4) Remains unchanged

19. If a glass prism is dipped in water, what happens to its dispersive power ?

(1) Increases (2) Decreases

(3) Does not change (4) No effect

20. Two plane mirrors A and B are placed parallel to each other and spaced 20 cm apart. An object is kept in between them 15 cm from A. Out of the following at which point is an image not formed in mirror A.

(1) 15 cm (2) 25 cm

(3) 45 cm (4) 55 cm

21. A boy 1.50 m tall with his eye level at 1.38 m from the ground stands before a mirror fixed on a wall. What should be the minimum length of the mirror so that he can view himself fully ?

(1) 0.8 m (2) 0.75 m

(3) 0.69 m (4) none of these

22. Which scientist proposed the dual nature of matter ?

(1) de Broglie (2) Einstein

(3) Newton (4) Planck

23. The electrochemical cell converts ?

(1) Electrical energy into chemical energy

(2) Mechanical energy into electrical energy

(3) Chemical energy into electrical energy

(4) Electrical energy into mechanical energy

24. The entropy of a perfectly crystalline substance at absolute zero is ?

(1) Maximum (2) Zero

(3) Infinite (4) Undefined

25. In the photoelectric effect, the emission of electrons depends on ?

(1) Frequency of incident light (2) Intensity of incident light

(3) Both frequency and intensity (4) None of the above

26. The temperature at which vapor pressure equals atmospheric pressure is ?

(1) Boiling point (2) Melting point

(3) Freezing point (4) Critical point

27. The wavelength corresponding to maximum energy in the electromagnetic spectrum lies in ?

(1) Radio waves (2) Gamma rays

(3) Visible light (4) Infrared

28. Which of the following does the wave theory of light not explain ?

(1) Diffraction (2) Photocurrent

(3) Polarization (4) Interference

29. In nuclear reactions, there is a conservation of :

(1) Energy only (2) Mass only

(3) Mass, energy and momentum (4) Momentum only

30. What happens when the radio wave reaches the ionizing medium ?

(1) Will bend towards normal (2) Will bend away from the normal

(3) Will follow a straight path (4) None of these

31. Which element has the highest electronegativity ?

(1) Oxygen (2) Nitrogen

(3) Chlorine (4) Fluorine

32. The bond formed by the sharing of electron pairs between atoms is called ?

(1) Ionic bond (2) Metallic bond

(3) Covalent bond (4) Hydrogen bond

33. Which of the following is paramagnetic ?

(1) N_2 (2) O_2

(3) $C0_2$ (4) CH_4

34. What type of hybridization is present in methane (CH_4) ?

(1) sp (2) Sp^2

(3) Sp^3 (4) dsp^2

35. The atomic radius generally ..... across a period from left to right.

(1) Increase (2) Decreases

(3) Remains same (4) Varies irregularly

36. The color of transition metal complexes is due to ?

(1) Nuclear reactions (2) Atomic mass

(3) Ionization energy (4) d-d electronic transitions

37. Which of the following is a property of f-block elements ?

(1) High ionization energy (2) Exhibiting variable oxidation states

(3) Low melting points (4) None of these

38. Which bond is strongest ?

(1) Single bond (2) Double bond

(3) Triple bond (4) Hydrogen bond

39. The ionic bond is formed by ?

(1) Transfer of electrons (2) Sharing of electrons

(3) Attraction of dipoles (4) Hydrogen bonding

40. The shape of BF_3 molecule is ?

(1) Tetrahedral (2) Linear

(3) Trigonal planar (4) Octahedral

41. Which of the following is an aromatic hydrocarbon ?

(1) Ethane (2) Benzene

(3) Ethene (4) Propane

42. Which compound contains a carbonyl group ?

(1) Alcohol (2) Alkane

(3) Amine (4) Aldehyde

43. Which reagent is commonly used to test for unsaturation in hydrocarbons ?

(1) Tollen's reagent (2) Fehling's solution

(3) $KMn0_4$ (4) Bromine water

44. The IUPAC name of CH_3-CH_2-CH_2-OH is ?

(1) Methanol (2) Ethanol

(3) Propanol (4) Butanol

45. Which of the following contains nitrogen ?

(1) Alcohol (2) Amine

(3) Ketone (4) Ether

46. Polymerization is a process of ?

(1) Breaking down molecules

(2) Formation of large molecules from small ones

(3) Crystallization

(4) Distillation

47. The empirical formula of glucose is ?

(1) $C_6H_{12}O_6$ (2) $C_6H_{10}O_5$

(3) CH_2O (4) $C_3H_6O_3$

48. Which of the following organic compounds is responsible for the sweet smell of fruits ?

(1) Alcohols (2) Esters

(3) Aldehydes (4) Ketones

49. What type of bond is found in benzene ?

(1) Single bonds only

(2) Alternating single and double bonds (resonance)

(3) Triple bonds

(4) Ionic bonds

50. Which of the following organic compounds contains an ether group ?

(1) R-O-R' (2) R-COOH

(3) $R-NH_2$ (4) R-CHO

51. The work done by a force is zero when the displacement is ?

(1) In the same direction as force (2) Perpendicular to the force

(3) Opposite to the force (4) None of these

52. A car moves with uniform acceleration. Its velocity-time graph is :

(1) Horizontal (2) Parabolic

(3) Linear (4) Exponential

53. A train is moving with a uniform acceleration. The ratio of distances covered in the 1st, 2nd and 3rd seconds is :

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

(3) 1:4:9 (4) 1:3:5

54. The pressure exerted by a fluid in a container is ?

(1) Same at all points (2) Maximum at the top

(3) Zero at the bottom (4) Varies linearly with depth

55. Which of the following is a scalar quantity ?

(1) Displacement (2) Velocity

(3) Speed (4) Force

56. The buoyant force on an object submerged in a fluid is equal to ?

(1) Weight of the object
(2) Weight of fluid displaced
(3) Volume of object
(4) Mass of object

57. What is the energy conversion in a hydroelectric power plant ?

(1) Electrical to Mechanical
(2) Mechanical to Electrical
(3) Chemical to Electrical
(4) Thermal to Mechanical

58. The concept of inertia is associated with which law of motion ?

(1) First Law
(2) Second Law
(3) Third Law
(4) Law of Gravitation

59. A car accelerates from rest and covers 100 m in 5 s. What is its acceleration ?

(1) 5 m/s^2
(2) 8 m/s^2
(3) 10 m/s^2
(4) 20 m/s^2

60. Which lens is used to correct myopia (nearsightedness) ?

(1) Convex lens
(2) Concave lens
(3) Cylindrical lens
(4) None of these

61. Which hormone is known as the 'stress hormone' ?

(1) Adrenaline
(2) Thyroxine
(3) Insulin
(4) Cortisol

62. What is the function of alveoli in the lungs ?

(1) Exchange gases
(2) Store oxygen
(3) Filter blood
(4) Produce mucus

63. Which disease is caused by a deficiency of Vitamin B1 ?

(1) Pellagra
(2) Rickets
(3) Beriberi
(4) Scurvy

64. Which organ stores bile ?

(1) Liver (2) Pancreas

(3) Gallbladder (4) Stomach

65. What does HIV attack in the human body?

(1) Red blood cells (2) Nerves

(3) Platelets (4) Immune cells

66. **Which part of the brain controls breathing and heart rate?**

(1) Cerebrum (2) Cerebellum

(3) Medulla oblongata (4) Pons

67. **What is the main cause of rickets in children?**

(1) Lack of Vitamin D (2) Lack of protein

(3) Lack of iron (4) Lack of Vitamin A

68. **Which hormone regulates the sleep-wake cycle ?**

(1) Insulin (2) Melatonin

(3) Cortisol (4) Estrogen

69. What is the largest internal organ in the human body ?

(1) Brain (2) Heart

(3) Liver (4) Kidney

70. Which blood group is known as the universal recipient ?

(1) A (2) B

(3) O (4) AB

SECTION – B
(MATHEMATICS)

71. If the line $2x + y = k$ passes through the point which divides the line segment joining the points (11) and (2, 4) in the ratio 3 : 2, then k equals

(1) 29/5 (2) 5

(3) 6 (4) 11/5

72. For the ellipse $3x^2 + 4y^2 = 12$, the length of the latus rectum is :

(1) 2/5 (2) 3/5

(3) 3 (4) 4

73. Let E be the ellipse $x^2 / 9 + y^2 /4= 1$ and C be the circle $x^2 + y^2 = 9$. Let P and Q be the points (1, 2) and (2, 1), respectively. Then

(1) Q lies inside C but outside E (2) Q lies outside both C and E

(3) P lies inside both C and E (4) P lies inside C but outside E

74. The locus of the mid-point of the line segment joining the focus of the parabola $y^2 = 4ax$ to a moving point of the parabola, is another parabola whose directrix is

(1) $x = a$ (2) $x = 0$

(3) $x = -a/2$ (4) $x = a/2$

75. Consider the lines Ll: x-1 = Y - 2 = z and L2: x - 2 = y = z - 1. Let the feet of the perpendiculars from the point P(5, 1, -3) on the lines Ll and L2 be Q and R respectively. If the area of the triangle PQR is A, then $4A^2$ is equal to :

(1) 151 (2) 147

(3) 139 (4) 143

76. Number of permutations of 5 different objects taken 3 at a time :

(1) 60 (2) 20

(3) 120 (4) 10

77. How many ways to arrange 3 boys and 2 girls in a row ?

(1) 120 (2) 60

(3) 20 (4) 30

78. From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include atleast 4 batsmen and atleast 4 bowlers. One batsmen and one bowler who are captain and vice-captain respectively of the team should be included. Then the total number of ways such a selection can be made, is

(1) 14 (2) 165

(3) 155 (4) 135

79. From all the English alphabets, five letters are chosen and are arranged in alphabetical order. The total number of ways, in which the middle letter is 'M' is :

(1) 6084 (2) 5148

(3) 14950 (4) 4356

80. 60 words can be made using all the letters of the word BHBJO, with or without meaning. If these words are written as in a dictionary, then the 50th word is :

(1) OBBJH (2) HBBJO

(3) OBBHJ (4) JBBOH

81. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are equal, then the discriminant is :

(1) Greater than zero (2) Less than zero

(3) Zero (4) None of these

82. The sum of the first n natural numbers is :

(1) n(n+l)/2 (2) n^2

(3) n(n-l)/2 (4) n(n+l)

83. Find the number of terms if the sum of an AP is 100, the first term is 5, and the last term is 20 :

(1) 15 (2) 10

(3) 20 (4) 25

84. If $A=\begin{bmatrix}2 & 2\\ 9 & 4\end{bmatrix}$ and $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

Then $10A^{-1}$ is equal to :

(1) A –4I (2) 6I – A

(3) A –6I (4) 4I – A

85. If $S_n = 3n^2 + 5n$, then the first term is :

(1) 8 (2) 6

(3) 7 (4) 3

86. For equation $x^2 + px + q = 0$, $\alpha^2 + \beta^2$ equals:

(1) $p^2 - 2q$ (2) $p^2 + 2q$

(3) $q^2 - 2p$ (4) $q^2 + 2p$

87. Sum of GP is given by :

(1) $a(1 - r^n)/(1 - r)$ (2) $a(r^n - 1)/(r - 1)$

(3) Both A & B (4) None

88. If A is a 3 x 3 non-singular matrix such that $AA^T = A^T A$ and $B = A^{-1}A^T$, then BB^T equals :

(1) I+B (2) I

(3) B^{-1} (4) $(B^{-1})^T$

89. If α is a root of the equation $2x(2x+1) = 1$, then the other root is :

(1) $3\alpha^3 + 4\alpha$ (2) α^2

(3) $-2\alpha(\alpha+1)$ (4) none of these

90. A value of b for which the equations $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have one root in common is :

(1) $-\sqrt{2}$ (2) $-i-\sqrt{3}$

(3) $i\sqrt{5}$ (4) 2

91. $\sin(2\theta)$ is equal to :

(1) $2\sin\theta\cos\theta$ (2) $\sin^2\theta + \cos^2\theta$

(3) $\sin\theta + \cos\theta$ (4) None

92. $\tan^2\theta + 1$ equals:

(1) $\sec^2\theta$ (2) $\text{cosec}^2\theta$

(3) 1 (4) $\sin^2\theta$

93. If $\sin\theta$ and $\cos\theta$ are the roots of $ax^2 - bx + c = 0$, then the relation between a, b and c will be :

(1) $a^2 + b^2 + 2ac = 0$ (2) $a^2 - b^2 + 2ac = 0$

(3) $a^2 + c^2 + 2ab = 0$ (4) $a^2 - b^2 - 2ac = 0$

94. The value of $\cos 1° \cos 2° \cos 3° \ldots \cos 179°$ is :

(1) $1/\sqrt{2}$ (2) 0

(3) 1 (4) –1

95. If A lies in the second quadrant and $3\tan A + 4 = 0$, then the value of $(2\cot A - 5\cos A + \sin A)$ is equal to :

(1) –53/10 (2) 7/10

(3) 37/10 (4) 23/10

96. Number of solutions of the equation $\tan x + \sec x = 2\cos x$ lying in the interval $[0, 2\pi]$ is :

(1) 0 (2) 1

(3) 2 (4) 3

97. Standard form of a parabola opening rightward :

(1) $y^2 = 4ax$ (2) $x^2 = 4ay$

(3) $y^2 + 4ax$ (4) $x^2 + 4ay$

98. Equation of a line with slope m and passing through (X_1, Y_1):

(1) $y = mx + c$ (2) $y - y_1 = m(x - x_1)$

(3) $y = m + X$ (4) None

99. A hyperbola has :

(1) One focus (2) Two foci

(3) No focus (4) Three foci

100. Eccentricity of ellipse is :

(1) >1 (2) 0

(3) 1 (4) Between 0 and 1

SECTION – C

(BIOLOGY AND BIOTECHNOLOGY)

101. Which of the following statements is incorrect about agar ?

(1) Remains stable at incubation temperature

(2) Does not react with media constituents

(3) Does not use in micropropagation work

(4) Not digested by plant enzymes

102. The ability of single cells to divide and produce all differentiated cells in the entity.

(1) Totipotency (2) Multipotent

(3) Pluripotent (4) Unipotent

103. Growth of plant tissues in artificial media is called :

(1) cell hybridization (2) plant tissue culture

(3) transgenesis (4) gene expression

104. Louis Pasteur created the first vaccines for :

(1) Rabies (2) Cholera

(3) Anthrax (4) All of the above

105. Which of the following is the combined vaccine given to children for protection against Diphtheria, whooping cough and tetanus ?

(1) DPT vaccine (2) BCG vaccine

(3) TAB vaccine (4) HIB vaccine

106. Increased IMR and decreased MMR in a population will :

(1) Cause rapid increase in growth rate

(2) Result in decline in growth rate

(3) Not cause significant change in growth

(4) Result in an explosive population

107. Which one of the following enzymes is responsible for the synthesis of DNA from RNA ?

(1) Reverse transcriptase (2) DNA polymerase

(3) RNA polymerase (4) DNA ligase.

108. To make the recombinant plasmid permeable to DNA molecules, which of the chemicals is added ?

(1) $MgCl_2$ (2) $CaCl_2$

(3) NaCI (4) HCI

109. Match the following :

Disease	Vaccine
1. Measles	a. Varicella vaccine
2. Tuberculosis	b. MMR
3. Chickenpox	c. Shingrix or Zostavax
4. Shingles	d. BCG vaccine

(1) l-c, 2-d, 3-b, 4-a

(2) I-b, 2-d, 3-c, 4-a

(3) l-b, 2-d, 3-a, 4-c

(4) l-d, 2-c, 3-a, 4-b

110. This is not a basic component of culture media for plant cultivation :

(1) amino acids

(2) sucrose/sugar

(3) a complex mixture of salts

(4) serum albumin

111. Which of the following is a characteristic of mammals ?

(1) Feathers

(2) Mammary glands

(3) Gills

(4) Exoskeleton

112. In which group of animals is the body divided into head, thorax, and abdomen ?

(1) Annelida

(2) Insects

(3) Mollusks

(4) Cnidarians

113. Amphibians can breathe through :

(1) Lungs only

(2) Skin only

(3) Lungs and skin

(4) Gills only

114. Which animal is an invertebrate ?

(1) Earthworm

(2) Dog

(3) Frog

(4) Bat

115. Which animal lacks a true body cavity (coelom) ?

(1) Earthworm (2) Roundworm

(3) Spider (4) Flatworm

116. Which of the following exhibits radial symmetry ?

(1) Human (2) Fish

(3) Jellyfish (4) Snake

117. What is the main characteristic of vertebrates ?

(1) Exoskeleto (2) Segmented body

(3) Open circulatory system (4) Backbone

118. Which of the following is the most evolved?

(1) Mammalia (2) Aves

(3) Amphibia (4) Reptilia

119. The presence of a four-chambered heart is seen in :

(1) Reptiles (2) Amphibians

(3) Birds and mammals (4) Fish

120. What feature distinguishes vertebrates from invertebrates ?

(1) Presence of limbs (2) Notochord

(3) Closed circulatory system (4) Exoskeleton

121. Which of the following is not a connective tissue ?

(1) Blood (2) Cartilage

(3) Muscle (4) Bone

122. The lining of blood vessels is made up of :

(1) Cuboidal epithelium (2) Columnar epithelium

(3) Squamous epithelium (4) Ciliated epithelium

123. Which organ system is responsible for the transport of nutrients and gases ?

(1) Excretory (2) Nervous

(3) Digestive (4) Circulatory

124. Which type of epithelium is found in the kidney tubules ?

(1) Columnar (2) Squamous

(3) Cuboidal (4) Ciliated

125. What type of connective tissue connects muscles to bones ?

(1) Ligaments (2) Tendons

(3) Cartilage (4) Adipose

126. Which muscle is under voluntary control ?

(1) Cardiac (2) Skeletal

(3) Smooth (4) None

127. Which of the following is NOT an epithelial tissue ?

(1) Columnar (2) Cuboidal

(3) Skeletal (4) Squamous

128. Which part of the neuron receives signals ?

(1) Axon (2) Dendrite

(3) Myelin (4) Node of Ranvier

129. Which gland is considered both endocrine and exocrine ?

(1) Thyroid (2) Pituitary

(3) Pancreas (4) Adrenal

130. Which system is primarily responsible for hormone secretion ?

(1) Endocrine (2) Digestive

(3) Lymphatic (4) Respiratory

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

C

SET-Y

UG-4Yr.-EE-June, 2025

SUBJECT : Bachelor of Public Health Sciences

Sr. No. ..... 10055 .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **130**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

SEAL

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions of **Section-A** are ***compulsory***. Students are required to attempt either **Section-B** or **Section-C**. All questions carry equal marks i.e. one mark each.
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
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SECTION – A

1. Calculate the refractive index of the material of an equilateral prism for which the angle of minimum deviation is 60°.

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

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

2. Total internal reflection occurs when light travels from ?

(1) Dense to rarer medium beyond critical angle

(2) Rarer to denser medium beyond critical angle

(3) Dense to denser medium beyond critical angle

(4) None of these

3. The human eye focuses light on the ?

(1) Cornea (2) Retina

(3) Iris (4) Lens

4. Chromatic aberration in lenses due to ?

(1) Dispersion of light (2) Reflection of light

(3) Refraction of light (4) Diffraction of light

5. The image formed by a plane mirror is ?

(1) Real and inverted (2) Real and erect

(3) Virtual and inverted (4) Virtual and erect

6. Which of the following has the smallest wavelength ?

(1) Radio waves (2) Microwaves

(3) Ultraviolet rays (4) Infrared rays

7. The unit of refractive index is ?

(1) Meter (2) Hertz

(3) Candela (4) Dimensionless (no unit)

8. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then what is its focal length ?

(1) Focal Length will become zero

(2) Focal Length will become infinite

(3) Focal length will reduce, but not become zero

(4) Remains unchanged

9. If a glass prism is dipped in water, what happens to its dispersive power ?

(1) Increases (2) Decreases

(3) Does not change (4) No effect

10. Two plane mirrors A and B are placed parallel to each other and spaced 20 cm apart. An object is kept in between them 15 cm from A. Out of the following at which point is an image not formed in mirror A.

(1) 15 cm (2) 25 cm

(3) 45 cm (4) 55 cm

11. Which hormone is known as the 'stress hormone' ?

(1) Adrenaline (2) Thyroxine

(3) Insulin (4) Cortisol

12. What is the function of alveoli in the lungs ?

(1) Exchange gases (2) Store oxygen

(3) Filter blood (4) Produce mucus

13. Which disease is caused by a deficiency of Vitamin B1 ?
(1) Pellagra (2) Rickets
(3) Beriberi (4) Scurvy

14. Which organ stores bile ?
(1) Liver (2) Pancreas
(3) Gallbladder (4) Stomach

15. What does HIV attack in the human body?
(1) Red blood cells (2) Nerves
(3) Platelets (4) Immune cells

16. **Which part of the brain controls breathing and heart rate?**
(1) Cerebrum (2) Cerebellum
(3) Medulla oblongata (4) Pons

17. **What is the main cause of rickets in children?**
(1) Lack of Vitamin D (2) Lack of protein
(3) Lack of iron (4) Lack of Vitamin A

18. **Which hormone regulates the sleep-wake cycle ?**
(1) Insulin (2) Melatonin
(3) Cortisol (4) Estrogen

19. What is the largest internal organ in the human body ?
(1) Brain (2) Heart
(3) Liver (4) Kidney

20. Which blood group is known as the universal recipient ?
(1) A (2) B
(3) O (4) AB

21. Which element has the highest electronegativity ?

(1) Oxygen
(2) Nitrogen
(3) Chlorine
(4) Fluorine

22. The bond formed by the sharing of electron pairs between atoms is called ?

(1) Ionic bond
(2) Metallic bond
(3) Covalent bond
(4) Hydrogen bond

23. Which of the following is paramagnetic ?

(1) N_2
(2) O_2
(3) $C0_2$
(4) CH_4

24. What type of hybridization is present in methane (CH_4) ?

(1) sp
(2) Sp^2
(3) Sp^3
(4) dsp^2

25. The atomic radius generally ..... across a period from left to right.

(1) Increase
(2) Decreases
(3) Remains same
(4) Varies irregularly

26. The color of transition metal complexes is due to ?

(1) Nuclear reactions
(2) Atomic mass
(3) Ionization energy
(4) d-d electronic transitions

27. Which of the following is a property of f-block elements ?

(1) High ionization energy
(2) Exhibiting variable oxidation states
(3) Low melting points
(4) None of these

28. Which bond is strongest ?

(1) Single bond (2) Double bond

(3) Triple bond (4) Hydrogen bond

29. The ionic bond is formed by ?

(1) Transfer of electrons (2) Sharing of electrons

(3) Attraction of dipoles (4) Hydrogen bonding

30. The shape of BF_3 molecule is ?

(1) Tetrahedral (2) Linear

(3) Trigonal planar (4) Octahedral

31. Which of the following is an aromatic hydrocarbon ?

(1) Ethane (2) Benzene

(3) Ethene (4) Propane

32. Which compound contains a carbonyl group ?

(1) Alcohol (2) Alkane

(3) Amine (4) Aldehyde

33. Which reagent is commonly used to test for unsaturation in hydrocarbons ?

(1) Tollen's reagent (2) Fehling's solution

(3) $KMn0_4$ (4) Bromine water

34. The IUPAC name of CH_3-CH_2-CH_2-OH is ?

(1) Methanol (2) Ethanol

(3) Propanol (4) Butanol

35. Which of the following contains nitrogen ?

(1) Alcohol (2) Amine

(3) Ketone (4) Ether

36. Polymerization is a process of ?

(1) Breaking down molecules

(2) Formation of large molecules from small ones

(3) Crystallization

(4) Distillation

37. The empirical formula of glucose is ?

(1) $C_6H_{12}O_6$ (2) $C_6H_{10}O_5$

(3) CH_2O (4) $C_3H_6O_3$

38. Which of the following organic compounds is responsible for the sweet smell of fruits ?

(1) Alcohols (2) Esters

(3) Aldehydes (4) Ketones

39. What type of bond is found in benzene ?

(1) Single bonds only

(2) Alternating single and double bonds (resonance)

(3) Triple bonds

(4) Ionic bonds

40. Which of the following organic compounds contains an ether group ?

(1) R-O-R' (2) R-COOH

(3) $R\text{-}NH_2$ (4) R-CHO

41. The work done by a force is zero when the displacement is ?

(1) In the same direction as force
(2) Perpendicular to the force
(3) Opposite to the force
(4) None of these

42. A car moves with uniform acceleration. Its velocity-time graph is :

(1) Horizontal
(2) Parabolic
(3) Linear
(4) Exponential

43. A train is moving with a uniform acceleration. The ratio of distances covered in the 1st, 2nd and 3rd seconds is :

(1) 1:1:1
(2) 1:2:3
(3) 1:4:9
(4) 1:3:5

44. The pressure exerted by a fluid in a container is ?

(1) Same at all points
(2) Maximum at the top
(3) Zero at the bottom
(4) Varies linearly with depth

45. Which of the following is a scalar quantity ?

(1) Displacement
(2) Velocity
(3) Speed
(4) Force

46. The buoyant force on an object submerged in a fluid is equal to ?

(1) Weight of the object
(2) Weight of fluid displaced
(3) Volume of object
(4) Mass of object

47. What is the energy conversion in a hydroelectric power plant ?

(1) Electrical to Mechanical
(2) Mechanical to Electrical
(3) Chemical to Electrical
(4) Thermal to Mechanical

48. The concept of inertia is associated with which law of motion ?

(1) First Law
(2) Second Law
(3) Third Law
(4) Law of Gravitation

49. A car accelerates from rest and covers 100 m in 5 s. What is its acceleration ?

(1) $5\ m/s^2$ (2) $8\ m/s^2$

(3) $10\ m/s^2$ (4) $20\ m/s^2$

50. Which lens is used to correct myopia (nearsightedness) ?

(1) Convex lens (2) Concave lens

(3) Cylindrical lens (4) None of these

51. The first law of thermodynamics deals with ?

(1) Conservation of mass (2) Conservation of energy

(3) Entropy (4) Enthalpy

52. In electrochemistry, the cathode is where ?

(1) Oxidation occurs (2) Reduction occurs

(3) Both oxidation and reduction occur (4) No reaction occurs

53. The unit of rate constant for a first-order reaction is ?

(1) S^{-1} (2) $mol\ L^{-1}\ s^{-1}$

(3) $L\ mol^{-1}\ s^{-1}$ (4) Unitless

54. What does the term "activation energy" mean ?

(1) Energy released during a reaction

(2) Minimum energy required for a reaction to occur

(3) Total energy in reactants

(4) Energy lost as heat

55. The entropy of an isolated system always ?

(1) Decreases (2) Increases or remains constant

(3) Remains constant (4) Fluctuates randomly

56. The potential difference between the electrodes of a galvanic cell is called ?

(1) EMF (2) Current

(3) Resistance (4) Voltage drop

57. In which reaction does the catalyst remain unchanged ?

(1) Homogeneous catalyst reaction (2) Heterogeneous catalyst reaction

(3) Both A and B (4) None of these

58. For the following reaction at 300 K

$A_2(g) + 3B_2(g) \rightarrow 2AB_3(g)$

the enthalpy change is + 15 kJ, then the internal energy change is :

(1) 19988.4 J (2) 200 J

(3) 1999 J (4) 1.9988 kJ

59. At a given temperature and pressure, the equilibrium constant values for the equilibria are given below :

$3A_2 + B_2 \rightleftharpoons 2A_3B$, K_1

$A_3B \rightleftharpoons 3/2A_2 + 1/2B_2$, K_2

The relation between K, and K_2 is :

(1) $K_1^2 = 2K_2$ (2) $K_2 = K_1/2$

(3) $K_1 = 1/\text{sqrt}(K_2)$ (4) $K_2 = 1/\text{sqrt}(K_1)$

60. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is (Given: Molar mass of Cu : 63 g mol^{-1}, 1 F = 96487C) :

(1) 3.15g (2) 0.315g

(3) 31.5g (4) 0.0315g

61. A boy 1.50 m tall with his eye level at 1.38 m from the ground stands before a mirror fixed on a wall. What should be the minimum length of the mirror so that he can view himself fully ?

(1) 0.8 m (2) 0.75 m

(3) 0.69 m (4) none of these

62. Which scientist proposed the dual nature of matter ?

(1) de Broglie (2) Einstein

(3) Newton (4) Planck

63. The electrochemical cell converts ?

(1) Electrical energy into chemical energy

(2) Mechanical energy into electrical energy

(3) Chemical energy into electrical energy

(4) Electrical energy into mechanical energy

64. The entropy of a perfectly crystalline substance at absolute zero is ?

(1) Maximum (2) Zero

(3) Infinite (4) Undefined

65. In the photoelectric effect, the emission of electrons depends on ?

(1) Frequency of incident light (2) Intensity of incident light

(3) Both frequency and intensity (4) None of the above

66. The temperature at which vapor pressure equals atmospheric pressure is ?

(1) Boiling point (2) Melting point

(3) Freezing point (4) Critical point

67. The wavelength corresponding to maximum energy in the electromagnetic spectrum lies in ?

(1) Radio waves (2) Gamma rays

(3) Visible light (4) Infrared

68. Which of the following does the wave theory of light not explain ?

(1) Diffraction (2) Photocurrent

(3) Polarization (4) Interference

69. In nuclear reactions, there is a conservation of :

(1) Energy only (2) Mass only

(3) Mass, energy and momentum (4) Momentum only

70. What happens when the radio wave reaches the ionizing medium ?

(1) Will bend towards normal (2) Will bend away from the normal

(3) Will follow a straight path (4) None of these

SECTION – B
(MATHEMATICS)

71. Number of solutions of the equation $\tan x + \sec x = 2 \cos x$ lying in the interval $[0, 2\pi]$ is :

(1) 0 (2) 1

(3) 2 (4) 3

72. Standard form of a parabola opening rightward :

(1) $y^2 = 4ax$ (2) $x^2 = 4ay$

(3) $y^2 + 4ax$ (4) $x^2 + 4ay$

73. Equation of a line with slope m and passing through (X_1, Y_1):

(1) $y = mx + c$ (2) $y - y_1 = m(x - x_1)$

(3) $y = m + X$ (4) None

74. A hyperbola has :

(1) One focus

(2) Two foci

(3) No focus

(4) Three foci

75. Eccentricity of ellipse is :

(1) >1

(2) 0

(3) 1

(4) Between 0 and 1

76. $\sin(2\theta)$ is equal to :

(1) $2\sin\theta\cos\theta$

(2) $\sin^2\theta + \cos^2\theta$

(3) $\sin\theta + \cos\theta$

(4) None

77. $\tan^2\theta + 1$ equals:

(1) $\sec^2\theta$

(2) $\text{cosec}^2\theta$

(3) 1

(4) $\sin^2\theta$

78. If $\sin\theta$ and $\cos\theta$ are the roots of $ax^2 - bx + c = 0$, then the relation between a, b and c will be :

(1) $a^2 + b^2 + 2ac = 0$

(2) $a^2 - b^2 + 2ac = 0$

(3) $a^2 + c^2 + 2ab = 0$

(4) $a^2 - b^2 - 2ac = 0$

79. The value of $\cos 1° \cos 2° \cos 3° \ldots \cos 179°$ is :

(1) $1/\sqrt{2}$

(2) 0

(3) 1

(4) -1

80. If A lies in the second quadrant and $3\tan A + 4 = 0$, then the value of $(2\cot A - 5\cos A + \sin A)$ is equal to :

(1) $-53/10$

(2) $7/10$

(3) $37/10$

(4) $23/10$

81. If the line $2x + y = k$ passes through the point which divides the line segment joining the points (11) and (2, 4) in the ratio 3 : 2, then k equals

(1) 29/5 (2) 5

(3) 6 (4) 11/5

82. For the ellipse $3x^2 + 4y^2 = 12$, the length of the latus rectum is :

(1) 2/5 (2) 3/5

(3) 3 (4) 4

83. Let E be the ellipse $x^2 / 9 + y^2 /4= 1$ and C be the circle $x^2 + y^2 = 9$. Let P and Q be the points (1, 2) and (2, 1), respectively. Then

(1) Q lies inside C but outside E (2) Q lies outside both C and E

(3) P lies inside both C and E (4) P lies inside C but outside E

84. The locus of the mid-point of the line segment joining the focus of the parabola $y^2 = 4ax$ to a moving point of the parabola, is another parabola whose directrix is

(1) $x = a$ (2) $x = 0$

(3) $x = -a/2$ (4) $x = a/2$

85. Consider the lines Ll: $x-1 = Y - 2 = z$ and L2: $x - 2 = y = z - 1$. Let the feet of the perpendiculars from the point P(5, 1, -3) on the lines Ll and L2 be Q and R respectively. If the area of the triangle PQR is A, then $4A^2$ is equal to :

(1) 151 (2) 147

(3) 139 (4) 143

86. Number of permutations of 5 different objects taken 3 at a time :

(1) 60 (2) 20

(3) 120 (4) 10

87. How many ways to arrange 3 boys and 2 girls in a row ?

(1) 120 (2) 60

(3) 20 (4) 30

88. From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include atleast 4 batsmen and atleast 4 bowlers. One batsmen and one bowler who are captain and vice-captain respectively of the team should be included. Then the total number of ways such a selection can be made, is

(1) 14 (2) 165

(3) 155 (4) 135

89. From all the English alphabets, five letters are chosen and are arranged in alphabetical order. The total number of ways, in which the middle letter is 'M' is :

(1) 6084 (2) 5148

(3) 14950 (4) 4356

90. 60 words can be made using all the letters of the word BHBJO, with or without meaning. If these words are written as in a dictionary, then the 50th word is :

(1) OBBJH (2) HBBJO

(3) OBBHJ (4) JBBOH

91. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are equal, then the discriminant is :

(1) Greater than zero (2) Less than zero

(3) Zero (4) None of these

92. The sum of the first n natural numbers is :

(1) $n(n+1)/2$ (2) n^2

(3) $n(n-1)/2$ (4) $n(n+1)$

93. Find the number of terms if the sum of an AP is 100, the first term is 5, and the last term is 20 :

(1) 15 (2) 10

(3) 20 (4) 25

94. If $A=\begin{bmatrix}2 & 2\\ 9 & 4\end{bmatrix}$ and $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

Then $10A^{-1}$ is equal to :

(1) $A-4I$ (2) $6I-A$

(3) $A-6I$ (4) $4I-A$

95. If $S_n = 3n^2 + 5n$, then the first term is :

(1) 8 (2) 6

(3) 7 (4) 3

96. For equation $x^2 + px + q = 0$, $\alpha^2 + \beta^2$ equals:

(1) $p^2 - 2q$ (2) $p^2 + 2q$

(3) $q^2 - 2p$ (4) $q^2 + 2p$

97. Sum of GP is given by :

(1) $a(1-r^n)/(1-r)$ (2) $a(r^n - 1)/(r - 1)$

(3) Both A & B (4) None

98. If A is a 3 x 3 non-singular matrix such that $AA^T = A^T A$ and $B = A^{-1}A^T$, then BB^T equals :

(1) I+B

(2) I

(3) B^{-1}

(4) $(B^{-1})^T$

99. If α is a root of the equation $2x(2x+1) = 1$, then the other root is :

(1) $3\alpha^3 + 4\alpha$

(2) α^2

(3) $-2\alpha(\alpha+1)$

(4) none of these

100. A value of b for which the equations $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have one root in common is :

(1) $-\sqrt{2}$

(2) $-i-\sqrt{3}$

(3) $i\sqrt{5}$

(4) 2

SECTION – C
(BIOLOGY AND BIOTECHNOLOGY)

101. Which muscle is under voluntary control ?

(1) Cardiac

(2) Skeletal

(3) Smooth

(4) None

102. Which of the following is NOT an epithelial tissue ?

(1) Columnar

(2) Cuboidal

(3) Skeletal

(4) Squamous

103. Which part of the neuron receives signals ?

(1) Axon

(2) Dendrite

(3) Myelin

(4) Node of Ranvier

104. Which gland is considered both endocrine and exocrine ?
(1) Thyroid (2) Pituitary
(3) Pancreas (4) Adrenal

105. Which system is primarily responsible for hormone secretion ?
(1) Endocrine (2) Digestive
(3) Lymphatic (4) Respiratory

106. Which of the following is not a connective tissue ?
(1) Blood (2) Cartilage
(3) Muscle (4) Bone

107. The lining of blood vessels is made up of :
(1) Cuboidal epithelium (2) Columnar epithelium
(3) Squamous epithelium (4) Ciliated epithelium

108. Which organ system is responsible for the transport of nutrients and gases ?
(1) Excretory (2) Nervous
(3) Digestive (4) Circulatory

109. Which type of epithelium is found in the kidney tubules ?
(1) Columnar (2) Squamous
(3) Cuboidal (4) Ciliated

110. What type of connective tissue connects muscles to bones ?
(1) Ligaments (2) Tendons
(3) Cartilage (4) Adipose

111. Which of the following statements is incorrect about agar ?
(1) Remains stable at incubation temperature
(2) Does not react with media constituents
(3) Does not use in micropropagation work
(4) Not digested by plant enzymes

112. The ability of single cells to divide and produce all differentiated cells in the entity.

(1) Totipotency (2) Multipotent

(3) Pluripotent (4) Unipotent

113. Growth of plant tissues in artificial media is called :

(1) cell hybridization (2) plant tissue culture

(3) transgenesis (4) gene expression

114. Louis Pasteur created the first vaccines for :

(1) Rabies (2) Cholera

(3) Anthrax (4) All of the above

115. Which of the following is the combined vaccine given to children for protection against Diphtheria, whooping cough and tetanus ?

(1) DPT vaccine (2) BCG vaccine

(3) TAB vaccine (4) HIB vaccine

116. Increased IMR and decreased MMR in a population will :

(1) Cause rapid increase in growth rate

(2) Result in decline in growth rate

(3) Not cause significant change in growth

(4) Result in an explosive population

117. Which one of the following enzymes is responsible for the synthesis of DNA from RNA ?

(1) Reverse transcriptase (2) DNA polymerase

(3) RNA polymerase (4) DNA ligase.

118. To make the recombinant plasmid permeable to DNA molecules, which of the chemicals is added ?

(1) $MgCl_2$ (2) $CaCl_2$

(3) NaCI (4) HCI

119. Match the following :

Disease	Vaccine
1. Measles	a. Varicella vaccine
2. Tuberculosis	b. MMR
3. Chickenpox	c. Shingrix or Zostavax
4. Shingles	d. BCG vaccine

(1) l-c, 2-d, 3-b, 4-a (2) I-b, 2-d, 3-c, 4-a

(3) l-b, 2-d, 3-a, 4-c (4) l-d, 2-c, 3-a, 4-b

120. This is not a basic component of culture media for plant cultivation :

(1) amino acids (2) sucrose/sugar

(3) a complex mixture of salts (4) serum albumin

121. Which of the following is a characteristic of mammals ?

(1) Feathers (2) Mammary glands

(3) Gills (4) Exoskeleton

122. In which group of animals is the body divided into head, thorax, and abdomen ?

(1) Annelida (2) Insects

(3) Mollusks (4) Cnidarians

123. Amphibians can breathe through :

(1) Lungs only (2) Skin only

(3) Lungs and skin (4) Gills only

124. Which animal is an invertebrate ?

(1) Earthworm (2) Dog

(3) Frog (4) Bat

125. Which animal lacks a true body cavity (coelom) ?

(1) Earthworm (2) Roundworm

(3) Spider (4) Flatworm

126. Which of the following exhibits radial symmetry ?

(1) Human (2) Fish

(3) Jellyfish (4) Snake

127. What is the main characteristic of vertebrates ?

(1) Exoskeleto (2) Segmented body

(3) Open circulatory system (4) Backbone

128. Which of the following is the most evolved?

(1) Mammalia (2) Aves

(3) Amphibia (4) Reptilia

129. The presence of a four-chambered heart is seen in :

(1) Reptiles (2) Amphibians

(3) Birds and mammals (4) Fish

130. What feature distinguishes vertebrates from invertebrates ?

(1) Presence of limbs (2) Notochord

(3) Closed circulatory system (4) Exoskeleton

Total No. of Printed Pages : 21

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D

UG-4Yr.-EE-June, 2025

SET-Y

SUBJECT : Bachelor of Public Health Sciences

Sr. No. 10052

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **130**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

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1. All questions of **Section-A** are ***compulsory***. Students are required to attempt either **Section-B** or **Section-C**. All questions carry equal marks i.e. one mark each.
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
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6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
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SEAL

SECTION – A

1. The work done by a force is zero when the displacement is ?

   (1) In the same direction as force
   (2) Perpendicular to the force
   (3) Opposite to the force
   (4) None of these

2. A car moves with uniform acceleration. Its velocity-time graph is :

   (1) Horizontal
   (2) Parabolic
   (3) Linear
   (4) Exponential

3. A train is moving with a uniform acceleration. The ratio of distances covered in the 1st, 2nd and 3rd seconds is :

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   (2) 1:2:3
   (3) 1:4:9
   (4) 1:3:5

4. The pressure exerted by a fluid in a container is ?

   (1) Same at all points
   (2) Maximum at the top
   (3) Zero at the bottom
   (4) Varies linearly with depth

5. Which of the following is a scalar quantity ?

   (1) Displacement
   (2) Velocity
   (3) Speed
   (4) Force

6. The buoyant force on an object submerged in a fluid is equal to ?

   (1) Weight of the object
   (2) Weight of fluid displaced
   (3) Volume of object
   (4) Mass of object

7. What is the energy conversion in a hydroelectric power plant ?

   (1) Electrical to Mechanical
   (2) Mechanical to Electrical
   (3) Chemical to Electrical
   (4) Thermal to Mechanical

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   (4) Law of Gravitation

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10. Which lens is used to correct myopia (nearsightedness) ?

(1) Convex lens (2) Concave lens

(3) Cylindrical lens (4) None of these

11. The first law of thermodynamics deals with ?

(1) Conservation of mass (2) Conservation of energy

(3) Entropy (4) Enthalpy

12. In electrochemistry, the cathode is where ?

(1) Oxidation occurs (2) Reduction occurs

(3) Both oxidation and reduction occur (4) No reaction occurs

13. The unit of rate constant for a first-order reaction is ?

(1) S^{-1} (2) $mol\ L^{-1}\ s^{-1}$

(3) $L\ mol^{-1}\ s^{-1}$ (4) Unitless

14. What does the term "activation energy" mean ?

(1) Energy released during a reaction

(2) Minimum energy required for a reaction to occur

(3) Total energy in reactants

(4) Energy lost as heat

15. The entropy of an isolated system always ?

(1) Decreases (2) Increases or remains constant

(3) Remains constant (4) Fluctuates randomly

16. The potential difference between the electrodes of a galvanic cell is called ?

(1) EMF (2) Current

(3) Resistance (4) Voltage drop

17. In which reaction does the catalyst remain unchanged ?

(1) Homogeneous catalyst reaction (2) Heterogeneous catalyst reaction

(3) Both A and B (4) None of these

18. For the following reaction at 300 K

$A_2(g) + 3B_2(g) \rightarrow 2AB_3(g)$

the enthalpy change is + 15 kJ, then the internal energy change is :

(1) 19988.4 J (2) 200 J

(3) 1999 J (4) 1.9988 kJ

19. At a given temperature and pressure, the equilibrium constant values for the equilibria are given below :

$3A_2 + B_2 \rightleftharpoons 2A_3B$, K_1

$A_3B \rightleftharpoons 3/2A_2 + 1/2B_2$, K_2

The relation between K, and K_2 is :

(1) $K_1^2 = 2K_2$ (2) $K_2 = K_1/2$

(3) $K_1 = 1/\text{sqrt}(K_2)$ (4) $K_2 = 1/\text{sqrt}(K_1)$

20. Mass in grams of copper deposited by passing 9.6487 A current through a voltmeter containing copper sulphate solution for 100 seconds is (Given: Molar mass of Cu : 63 g mol^{-1}, 1 F = 96487C) :

(1) 3.15g (2) 0.315g

(3) 31.5g (4) 0.0315g

21. Which of the following is an aromatic hydrocarbon ?

(1) Ethane (2) Benzene

(3) Ethene (4) Propane

22. Which compound contains a carbonyl group ?

(1) Alcohol (2) Alkane

(3) Amine (4) Aldehyde

23. Which reagent is commonly used to test for unsaturation in hydrocarbons ?

(1) Tollen's reagent (2) Fehling's solution

(3) $KMn0_4$ (4) Bromine water

24. The IUPAC name of CH_3-CH_2-CH_2-OH is ?

(1) Methanol (2) Ethanol

(3) Propanol (4) Butanol

25. Which of the following contains nitrogen ?

(1) Alcohol (2) Amine

(3) Ketone (4) Ether

26. Polymerization is a process of ?

(1) Breaking down molecules

(2) Formation of large molecules from small ones

(3) Crystallization

(4) Distillation

27. The empirical formula of glucose is ?

(1) $C_6H_{12}O_6$ (2) $C_6H_{10}O_5$

(3) CH_2O (4) $C_3H_6O_3$

28. Which of the following organic compounds is responsible for the sweet smell of fruits ?

(1) Alcohols
(2) Esters
(3) Aldehydes
(4) Ketones

29. What type of bond is found in benzene ?

(1) Single bonds only
(2) Alternating single and double bonds (resonance)
(3) Triple bonds
(4) Ionic bonds

30. Which of the following organic compounds contains an ether group ?

(1) R-O-R'
(2) R-COOH
(3) $R\text{-}NH_2$
(4) R-CHO

31. Calculate the refractive index of the material of an equilateral prism for which the angle of minimum deviation is 60°.

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

32. Total internal reflection occurs when light travels from ?

(1) Dense to rarer medium beyond critical angle
(2) Rarer to denser medium beyond critical angle
(3) Dense to denser medium beyond critical angle
(4) None of these

33. The human eye focuses light on the ?

(1) Cornea
(2) Retina
(3) Iris
(4) Lens

34. Chromatic aberration in lenses due to ?

(1) Dispersion of light
(2) Reflection of light
(3) Refraction of light
(4) Diffraction of light

35. The image formed by a plane mirror is ?

(1) Real and inverted
(2) Real and erect
(3) Virtual and inverted
(4) Virtual and erect

36. Which of the following has the smallest wavelength ?

(1) Radio waves
(2) Microwaves
(3) Ultraviolet rays
(4) Infrared rays

37. The unit of refractive index is ?

(1) Meter
(2) Hertz
(3) Candela
(4) Dimensionless (no unit)

38. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then what is its focal length ?

(1) Focal Length will become zero
(2) Focal Length will become infinite
(3) Focal length will reduce, but not become zero
(4) Remains unchanged

39. If a glass prism is dipped in water, what happens to its dispersive power ?

(1) Increases
(2) Decreases
(3) Does not change
(4) No effect

40. Two plane mirrors A and B are placed parallel to each other and spaced 20 cm apart. An object is kept in between them 15 cm from A. Out of the following at which point is an image not formed in mirror A.

(1) 15 cm (2) 25 cm

(3) 45 cm (4) 55 cm

41. A boy 1.50 m tall with his eye level at 1.38 m from the ground stands before a mirror fixed on a wall. What should be the minimum length of the mirror so that he can view himself fully ?

(1) 0.8 m (2) 0.75 m

(3) 0.69 m (4) none of these

42. Which scientist proposed the dual nature of matter ?

(1) de Broglie (2) Einstein

(3) Newton (4) Planck

43. The electrochemical cell converts ?

(1) Electrical energy into chemical energy

(2) Mechanical energy into electrical energy

(3) Chemical energy into electrical energy

(4) Electrical energy into mechanical energy

44. The entropy of a perfectly crystalline substance at absolute zero is ?

(1) Maximum (2) Zero

(3) Infinite (4) Undefined

45. In the photoelectric effect, the emission of electrons depends on ?

(1) Frequency of incident light (2) Intensity of incident light

(3) Both frequency and intensity (4) None of the above

46. The temperature at which vapor pressure equals atmospheric pressure is ?

(1) Boiling point
(2) Melting point
(3) Freezing point
(4) Critical point

47. The wavelength corresponding to maximum energy in the electromagnetic spectrum lies in ?

(1) Radio waves
(2) Gamma rays
(3) Visible light
(4) Infrared

48. Which of the following does the wave theory of light not explain ?

(1) Diffraction
(2) Photocurrent
(3) Polarization
(4) Interference

49. In nuclear reactions, there is a conservation of :

(1) Energy only
(2) Mass only
(3) Mass, energy and momentum
(4) Momentum only

50. What happens when the radio wave reaches the ionizing medium ?

(1) Will bend towards normal
(2) Will bend away from the normal
(3) Will follow a straight path
(4) None of these

51. Which hormone is known as the 'stress hormone' ?

(1) Adrenaline
(2) Thyroxine
(3) Insulin
(4) Cortisol

52. What is the function of alveoli in the lungs ?

(1) Exchange gases
(2) Store oxygen
(3) Filter blood
(4) Produce mucus

53. Which disease is caused by a deficiency of Vitamin B1 ?

(1) Pellagra (2) Rickets

(3) Beriberi (4) Scurvy

54. Which organ stores bile ?

(1) Liver (2) Pancreas

(3) Gallbladder (4) Stomach

55. What does HIV attack in the human body?

(1) Red blood cells (2) Nerves

(3) Platelets (4) Immune cells

56. **Which part of the brain controls breathing and heart rate?**

(1) Cerebrum (2) Cerebellum

(3) Medulla oblongata (4) Pons

57. **What is the main cause of rickets in children?**

(1) Lack of Vitamin D (2) Lack of protein

(3) Lack of iron (4) Lack of Vitamin A

58. **Which hormone regulates the sleep-wake cycle ?**

(1) Insulin (2) Melatonin

(3) Cortisol (4) Estrogen

59. What is the largest internal organ in the human body ?

(1) Brain (2) Heart

(3) Liver (4) Kidney

60. Which blood group is known as the universal recipient ?

(1) A (2) B

(3) O (4) AB

61. Which element has the highest electronegativity ?

(1) Oxygen (2) Nitrogen

(3) Chlorine (4) Fluorine

62. The bond formed by the sharing of electron pairs between atoms is called ?

(1) Ionic bond (2) Metallic bond

(3) Covalent bond (4) Hydrogen bond

63. Which of the following is paramagnetic ?

(1) N_2 (2) O_2

(3) $C0_2$ (4) CH_4

64. What type of hybridization is present in methane (CH_4) ?

(1) sp (2) Sp^2

(3) Sp^3 (4) dsp^2

65. The atomic radius generally ..... across a period from left to right.

(1) Increase (2) Decreases

(3) Remains same (4) Varies irregularly

66. The color of transition metal complexes is due to ?

(1) Nuclear reactions (2) Atomic mass

(3) Ionization energy (4) d-d electronic transitions

67. Which of the following is a property of f-block elements ?

(1) High ionization energy (2) Exhibiting variable oxidation states

(3) Low melting points (4) None of these

68. Which bond is strongest ?

(1) Single bond (2) Double bond

(3) Triple bond (4) Hydrogen bond

69. The ionic bond is formed by ?

(1) Transfer of electrons (2) Sharing of electrons

(3) Attraction of dipoles (4) Hydrogen bonding

70. The shape of BF_3 molecule is ?

(1) Tetrahedral (2) Linear

(3) Trigonal planar (4) Octahedral

SECTION – B
(MATHEMATICS)

71. Number of permutations of 5 different objects taken 3 at a time :

(1) 60 (2) 20

(3) 120 (4) 10

72. How many ways to arrange 3 boys and 2 girls in a row ?

(1) 120 (2) 60

(3) 20 (4) 30

73. From a group of 7 batsmen and 6 bowlers, 10 players are to be chosen for a team, which should include atleast 4 batsmen and atleast 4 bowlers. One batsmen and one bowler who are captain and vice-captain respectively of the team should be included. Then the total number of ways such a selection can be made, is

(1) 14 (2) 165

(3) 155 (4) 135

74. From all the English alphabets, five letters are chosen and are arranged in alphabetical order. The total number of ways, in which the middle letter is 'M' is :

(1) 6084 (2) 5148

(3) 14950 (4) 4356

75. 60 words can be made using all the letters of the word BHBJO, with or without meaning. If these words are written as in a dictionary, then the 50th word is :

(1) OBBJH (2) HBBJO

(3) OBBHJ (4) JBBOH

76. If the line $2x + y = k$ passes through the point which divides the line segment joining the points (11) and (2, 4) in the ratio 3 : 2, then k equals

(1) 29/5 (2) 5

(3) 6 (4) 11/5

77. For the ellipse $3x^2 + 4y^2 = 12$, the length of the latus rectum is :

(1) 2/5 (2) 3/5

(3) 3 (4) 4

78. Let E be the ellipse $x^2 / 9 + y^2 /4= 1$ and C be the circle $x^2 + y^2 = 9$. Let P and Q be the points (1, 2) and (2, 1), respectively. Then

(1) Q lies inside C but outside E (2) Q lies outside both C and E

(3) P lies inside both C and E (4) P lies inside C but outside E

79. The locus of the mid-point of the line segment joining the focus of the parabola $y^2 = 4ax$ to a moving point of the parabola, is another parabola whose directrix is

(1) $x = a$ (2) $x = 0$

(3) $x = -a/2$ (4) $x = a/2$

80. Consider the lines Ll: x-1 = Y - 2 = z and L2: x - 2 = y = z - 1. Let the feet of the perpendiculars from the point P(5, 1, -3) on the lines Ll and L2 be Q and R respectively. If the area of the triangle PQR is A, then $4A^2$ is equal to :

(1) 151 (2) 147

(3) 139 (4) 143

81. Number of solutions of the equation tan x + sec x = 2 cos x lying in the interval $[0, 2\pi]$ is :

(1) 0 (2) 1

(3) 2 (4) 3

82. Standard form of a parabola opening rightward :

(1) $y^2 = 4ax$ (2) $x^2 = 4ay$

(3) $y^2 + 4ax$ (4) $x^2 + 4ay$

83. Equation of a line with slope m and passing through (X_1, Y_1):

(1) $y = mx + c$ (2) $y - y_1 = m(x - x_1)$

(3) $y = m + X$ (4) None

84. A hyperbola has :

(1) One focus (2) Two foci

(3) No focus (4) Three foci

85. Eccentricity of ellipse is :

(1) >1 (2) 0

(3) 1 (4) Between 0 and 1

86. If the roots of the quadratic equation $ax^2 + bx + c = 0$ are equal, then the discriminant is :

(1) Greater than zero (2) Less than zero

(3) Zero (4) None of these

87. The sum of the first n natural numbers is :

(1) n(n+l)/2 (2) n^2

(3) n(n-l)/2 (4) n(n+l)

88. Find the number of terms if the sum of an AP is 100, the first term is 5, and the last term is 20 :

(1) 15 (2) 10

(3) 20 (4) 25

89. If $A=\begin{bmatrix}2 & 2\\ 9 & 4\end{bmatrix}$ and $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

Then $10A^{-1}$ is equal to :

(1) A –4I (2) 6I – A

(3) A –6I (4) 4I – A

90. If $S_n = 3n^2 + 5n$, then the first term is :

(1) 8 (2) 6

(3) 7 (4) 3

91. For equation $x^2 + px + q = 0$, $\alpha^2 + \beta^2$ equals :

(1) $p^2 - 2q$ (2) $p^2 + 2q$

(3) $q^2 - 2p$ (4) $q^2 + 2p$

92. Sum of GP is given by :

(1) $a(1-r^n)/(1-r)$ (2) $a(r^n-1)/(r-1)$

(3) Both A & B (4) None

93. If A is a 3 x 3 non-singular matrix such that $AA^T = A^T A$ and $B = A^{-1}A^T$, then BB^T equals :

(1) I+B (2) I

(3) B^{-1} (4) $(B^{-1})^T$

94. If α is a root of the equation $2x(2x+1) = 1$, then the other root is :

(1) $3\alpha^3 + 4\alpha$ (2) α^2

(3) $-2\alpha(\alpha+1)$ (4) none of these

95. A value of b for which the equations $x^2 + bx - 1 = 0$ and $x^2 + x + b = 0$ have one root in common is :

(1) $-\sqrt{2}$ (2) $-i-\sqrt{3}$

(3) $i\sqrt{5}$ (4) 2

96. $\sin(2\theta)$ is equal to :

(1) $2\sin\theta\cos\theta$ (2) $\sin^2\theta + \cos^2\theta$

(3) $\sin\theta + \cos\theta$ (4) None

97. $\tan^2\theta + 1$ equals:

(1) $\sec^2\theta$ (2) $\text{cosec}^2\theta$

(3) 1 (4) $\sin^2\theta$

98. If $\sin\theta$ and $\cos\theta$ are the roots of $ax^2 - bx + c = 0$, then the relation between a, b and c will be :

(1) $a^2 + b^2 + 2ac = 0$ (2) $a^2 - b^2 + 2ac = 0$

(3) $a^2 + c^2 + 2ab = 0$ (4) $a^2 - b^2 - 2ac = 0$

99. The value of cos 1° cos 2° cos 3° ... cos 179° is :

(1) $1/\sqrt{2}$ (2) 0

(3) 1 (4) –1

100. If A lies in the second quadrant and 3 tan A + 4 = 0, then the value of (2 cot A – 5 cos A + sin A) is equal to :

(1) –53/10 (2) 7/10

(3) 37/10 (4) 23/10

SECTION – C
(BIOLOGY AND BIOTECHNOLOGY)

101. Increased IMR and decreased MMR in a population will :

(1) Cause rapid increase in growth rate

(2) Result in decline in growth rate

(3) Not cause significant change in growth

(4) Result in an explosive population

102. Which one of the following enzymes is responsible for the synthesis of DNA from RNA ?

(1) Reverse transcriptase (2) DNA polymerase

(3) RNA polymerase (4) DNA ligase.

103. To make the recombinant plasmid permeable to DNA molecules, which of the chemicals is added ?

(1) $MgCl_2$ (2) $CaCl_2$

(3) NaCI (4) HCI

99. The value of $\cos 1^\circ \cos 2^\circ \cos 3^\circ \ldots \cos 179^\circ$ is :

(1) $1/\sqrt{2}$ (2) 0

(3) 1 (4) -1

100. If A lies in the second quadrant and $3 \tan A + 4 = 0$, then the value of $(2 \cot A - 5 \cos A + \sin A)$ is equal to :

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(3) $37/10$ (4) $23/10$

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104. Match the following :

Disease	Vaccine
1. Measles	a. Varicella vaccine
2. Tuberculosis	b. MMR
3. Chickenpox	c. Shingrix or Zostavax
4. Shingles	d. BCG vaccine

(1) l-c, 2-d, 3-b, 4-a (2) I-b, 2-d, 3-c, 4-a

(3) l-b, 2-d, 3-a, 4-c (4) l-d, 2-c, 3-a, 4-b

105. This is not a basic component of culture media for plant cultivation :

(1) amino acids (2) sucrose/sugar

(3) a complex mixture of salts (4) serum albumin

106. Which of the following statements is incorrect about agar ?

(1) Remains stable at incubation temperature

(2) Does not react with media constituents

(3) Does not use in micropropagation work

(4) Not digested by plant enzymes

107. The ability of single cells to divide and produce all differentiated cells in the entity.

(1) Totipotency (2) Multipotent

(3) Pluripotent (4) Unipotent

108. Growth of plant tissues in artificial media is called :

(1) cell hybridization (2) plant tissue culture

(3) transgenesis (4) gene expression

109. Louis Pasteur created the first vaccines for :

(1) Rabies (2) Cholera

(3) Anthrax (4) All of the above

110. Which of the following is the combined vaccine given to children for protection against Diphtheria, whooping cough and tetanus ?

(1) DPT vaccine (2) BCG vaccine

(3) TAB vaccine (4) HIB vaccine

111. Which muscle is under voluntary control ?

(1) Cardiac (2) Skeletal

(3) Smooth (4) None

112. Which of the following is NOT an epithelial tissue ?

(1) Columnar (2) Cuboidal

(3) Skeletal (4) Squamous

113. Which part of the neuron receives signals ?

(1) Axon (2) Dendrite

(3) Myelin (4) Node of Ranvier

114. Which gland is considered both endocrine and exocrine ?

(1) Thyroid (2) Pituitary

(3) Pancreas (4) Adrenal

115. Which system is primarily responsible for hormone secretion ?

(1) Endocrine (2) Digestive

(3) Lymphatic (4) Respiratory

116. Which of the following is a characteristic of mammals ?

(1) Feathers (2) Mammary glands

(3) Gills (4) Exoskeleton

117. In which group of animals is the body divided into head, thorax, and abdomen ?

(1) Annelida (2) Insects

(3) Mollusks (4) Cnidarians

118. Amphibians can breathe through :

(1) Lungs only (2) Skin only

(3) Lungs and skin (4) Gills only

119. Which animal is an invertebrate ?

(1) Earthworm (2) Dog

(3) Frog (4) Bat

120. Which animal lacks a true body cavity (coelom) ?

(1) Earthworm (2) Roundworm

(3) Spider (4) Flatworm

121. Which of the following exhibits radial symmetry ?

(1) Human (2) Fish

(3) Jellyfish (4) Snake

122. What is the main characteristic of vertebrates ?

(1) Exoskeleto (2) Segmented body

(3) Open circulatory system (4) Backbone

123. Which of the following is the most evolved?

(1) Mammalia (2) Aves

(3) Amphibia (4) Reptilia

124. The presence of a four-chambered heart is seen in :

(1) Reptiles (2) Amphibians

(3) Birds and mammals (4) Fish

125. What feature distinguishes vertebrates from invertebrates ?

(1) Presence of limbs (2) Notochord

(3) Closed circulatory system (4) Exoskeleton

126. Which of the following is not a connective tissue ?

(1) Blood (2) Cartilage

(3) Muscle (4) Bone

127. The lining of blood vessels is made up of :

(1) Cuboidal epithelium (2) Columnar epithelium

(3) Squamous epithelium (4) Ciliated epithelium

128. Which organ system is responsible for the transport of nutrients and gases ?

(1) Excretory (2) Nervous

(3) Digestive (4) Circulatory

129. Which type of epithelium is found in the kidney tubules ?

(1) Columnar (2) Squamous

(3) Cuboidal (4) Ciliated

130. What type of connective tissue connects muscles to bones ?

(1) Ligaments (2) Tendons

(3) Cartilage (4) Adipose

The Answer Key of BPHS Entrance Examination, Date:19.06.2025

S.NO.	SET A	SET B	SET C	SET D
1	4	2	2	2
2	1	2	1	3
3	3	1	2	4
4	3	2	1	4
5	4	2	4	3
6	3	1	3	2
7	1	3	4	2
8	2	1	2	1
9	3	4	2	2
10	4	2	3	2
11	2	2	4	2
12	3	1	1	2
13	4	2	3	1
14	4	1	3	2
15	3	4	4	2
16	2	3	3	1
17	2	4	1	3
18	1	2	2	1
19	2	2	3	4
20	2	3	4	2
21	2	2	4	2
22	1	1	3	4
23	2	3	2	4
24	1	2	3	3
25	4	1	2	2
26	3	1	4	2
27	4	2	2	3
28	2	2	3	2
29	2	4	1	2
30	3	1	3	1
31	2	4	2	2
32	1	3	4	1
33	3	2	4	2
34	2	3	3	1
35	1	2	2	4
36	1	4	2	3
37	2	2	3	4
38	2	3	2	2
39	4	1	2	2
40	1	3	1	3
41	4	2	2	2
42	3	4	3	1
43	2	4	4	3
44	3	3	4	2
45	2	2	3	1

19/6/25

46	4	2	2	1
47	2	3	2	2
48	3	2	1	2
49	1	2	2	4
50	3	1	2	1
51	2	2	2	4
52	4	3	2	1
53	4	4	1	3
54	3	4	2	3
55	2	3	2	4
56	2	2	1	3
57	3	2	3	1
58	2	1	1	2
59	2	2	4	3
60	1	2	2	4
61	2	4	2	4
62	2	1	1	3
63	1	3	3	2
64	2	3	2	3
65	2	4	1	2
66	1	3	1	4
67	3	1	2	2
68	1	2	2	3
69	4	3	4	1
70	2	4	1	3
71	3	3	3	1
72	1	3	1	2
73	1	4	2	3
74	3	2	2	2
75	3	2	4	1
76	1	1	1	3
77	3	2	1	3
78	2	3	2	4
79	3	2	2	2
80	2	1	4	2
81	1	3	3	3
82	1	1	3	1
83	2	1	4	2
84	2	3	2	2
85	4	3	2	4
86	3	1	1	3
87	1	3	2	1
88	2	2	3	1
89	2	3	2	3
90	4	2	1	3
91	3	1	3	1
92	3	1	1	3

19/6/25

93	4	2	1	2
94	2	2	3	3
95	2	4	3	2
96	1	3	1	1
97	2	1	3	1
98	3	2	2	2
99	2	2	3	2
100	1	4	2	4
101	2	3	2	3
102	2	1	3	1
103	3	2	2	2
104	1	1	3	3
105	4	1	1	4
106	3	3	3	3
107	4	1	3	1
108	1	2	4	2
109	3	3	3	1
110	2	4	2	1
111	3	2	3	2
112	3	2	1	3
113	4	3	2	2
114	3	1	1	3
115	2	4	1	1
116	2	3	3	2
117	3	4	1	2
118	2	1	2	3
119	3	3	3	1
120	1	2	4	4
121	3	3	2	3
122	1	3	2	4
123	2	4	3	1
124	1	3	1	3
125	1	2	4	2
126	3	2	3	3
127	1	3	4	3
128	2	2	1	4
129	3	3	3	3
130	4	1	2	2

19/06/21