Total No. of Printed Pages : 29

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CPG-EE-2018 (Forensic Science)-(SET-X)

A

10377

Sr. No. .....

Time : **1½ Hours** Total Questions : **166** Max. Marks : **100**

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

Candidate's Name _____ Date of Birth _____

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1. All questions of **Section-"A"** are ***compulsory***. Students are required to attempt either **Section "B"** or **Section "C"**. Students of *Medical Group* are required to attempt **Section "B"**. Students of *Non-Medical Group* are required to attempt **Section "C"**. All questions carry equal marks i.e. one mark each.
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3. 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.
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7. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after the start of examination.*

SECTION – A

1. Nineteenth electron of Cr-atom has which of the following sets of quantum numbers ?

(1) $n = 3, l = 0, m = 0, s = 1/2$ (2) $n = 3, l = 2, m = -2, s = 1/2$

(3) $n = 4, l = 0, m = 0, s = 1/2$ (4) $n = 4, l = 1, m = -1, s = 1/2$

2. Which of the following compound is expected to be coloured ?

(1) Ag_2SO_4 (2) CuF_2

(3) MgF_2 (4) $CuCl$

3. Which pair among the following is isostructural ?

(1) XeF_2, IF_2^- (2) NH_3, BF_3

(3) CO_3^{2-}, SO_3^{2-} (4) PCl_5, ICl_5

4. Which of the following ions does not contain S-S linkage ?

(1) $S_2O_3^{2-}$ (2) $S_2O_4^{2-}$ (3) $S_2O_6^{2-}$ (4) $S_2O_8^{2-}$

5. The term that accounts for intermolecular force in Vander Waal's equation for non ideal gas is :

(1) RT (2) $V - b$

(3) $\left(P + \frac{a}{V^2}\right)$ (4) $[RT]^{-1}$

6. The critical temperature of water is higher than that of O_2 because the H_2O molecule has :

(1) fewer electrons than O_2 (2) two covalent bonds

(3) V-shape (4) dipole moment

7. The pH of blood is maintained by CO_2 and H_2CO_3 in the body and chemical constituents of blood. This phenomenon is called :

(1) Colloidal
(2) Buffer action
(3) Acidity
(4) Salt balance

8. What is the state of hybridization of carbon in Carbanion ?

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

9. Mesotartaric acid is optically inactive because of :

(1) Plane of symmetry
(2) Two chiral or asymmetric carbon atoms
(3) External compensation
(4) It is asymmetric

10. Chlorobenzene can be prepared by reacting aniline with :

(1) Zn and HCl
(2) Cuprous chloride
(3) Chlorine in presence of anhydrous $AlCl_3$
(4) Nitrous acid followed by heating with Cuprous chloride

11. The type of hybridization involved in the complex $[Ni(CN)_4]^{2-}$ is :

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

12. What will be the effect of adding KNH_2 to liquid NH_3 in respect of acidity ?

(1) Acidity will decrease
(2) Acidity will increase
(3) Acidity will increase drastically
(4) No effect on acidity

13. Which of the following is least basic ?

(1) $La(OH)_3$ (2) $Lu(OH)_3$

(3) $Ce(OH)_3$ (4) $Nd(OH)_3$

14. Which of the following will not give positive chromyl chloride test ?

(1) $CuCl_2$ (2) $ZnCl_2$

(3) $HgCl_2$ (4) $C_6H_5NH_3Cl$

15. The following data is known about the melting of a compound AB, $\Delta H = 9.2$ kJ mol^{-1}, $\Delta S = 0.008$ kJ K^{-1} mol^{-1}. Its melting point is :

(1) 736 K (2) 1050 K

(3) 1150 K (4) 1150°C

16. For the cell reaction $Fe(s)/Fe^{2+}(0.1\,M)||H^{+}(1M)|H_2(1\,atm)$, Pt. $E^{\circ} = 0.44\,V$. The cell emf is :

(1) 0.41 V (2) 0.47 V

(3) 1.26 V (4) 1.20 V

17. In an isothermal expansion of an ideal gas :

(1) $q = 0$ (2) $\Delta V = 0$

(3) $\Delta U = 0$ (4) $W = 0$

18. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

(1) $C-O$ (2) $C-N$

(3) $C-C$ (4) $C-H$

19. The end product in the following sequence is :

$$Phenol \xrightarrow{NaOH} A \xrightarrow[140°C]{CO_2} B \xrightarrow{H^+, H_2O} C \xrightarrow{(CH_3CO)_2O} D$$

(1) Aspirin
(2) Salicylic acid
(3) Phenyl acetate
(4) Salicyldehyde

20. The Cannizzaro's reaction is ***not*** given by :

(1) Trimethyl acetaldehyde
(2) Acetaldehyde
(3) Benzaldehyde
(4) Formaldehyde

21. CFSE for d^4 tetrahedral is :

(1) –4 Dq
(2) –20 Dq
(3) –8 Dq
(4) –12 Dq

22. State the theory by which the reaction $6CaO + P_4O_{10} \rightarrow 2Ca_3(PO_4)_2$ is regarded as acid base reaction :

(1) Lewis Concept
(2) Bronsted Lowry Concept
(3) Lux-Flood Concept
(4) Is not a acid base reaction

23. Which symbiotic bacteria is capable of fixing N_2 ?

(1) Clostridium-pasteurianum
(2) Rhizobia
(3) Azobacter
(4) Nitrogenase

24. Mulliken symbol for spectroscopic term P in octahedral field is :

(1) A_{1g}
(2) T_{1g}
(3) T_{2g}
(4) E_g

25. The expected spin magnetic moment for Ni^{2+} ion is :

(1) 2.82 BM (2) 1.73 BM

(3) 5.96 BM (4) 3.87 BM

26. The molecule which is IR inactive and Raman active is :

(1) Protein (2) HCl

(3) SO_2 (4) N_2

27. When 0.1 mole of glucose is dissolved in 10 mole of water, the vapour pressure of water is :

(1) Increased by 1% (2) Increased by 10%

(3) Decreased by 1% (4) Decreased by 10%

28. Fluorescence is an instantaneous process having the life time of :

(1) $10^{-2} s$ (2) $10^{-9} s$

(3) 100 s (4) 1000 s

29. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

(1) 0.5 B (2) B

(3) 1.5 B (4) 2 B

(where B is rotational constant)

30. How many signals will be observed in the ^{1}HNMR spectrum of 1, 2, 2-tribromo-ethane and pure ethanol, respectively ?

(1) 2 and 2 (2) 3 and 3

(3) 3 and 2 (4) 2 and 3

31. Starch is composed of :

(1) Amylose and Glycogen
(2) Amylopectin and Glycogen
(3) Amylose and Amylopectin
(4) Glucose and Glycogen

32. Methyl lithium exists in the solid state as :

(1) Monomeric structure
(2) Dimeric structure
(3) Tetrameric structure
(4) Pentameric structure

33. Which of the following is ***not*** an α-amino acid ?

(1) Serine
(2) Aspartic acid
(3) Phenylalanine
(4) Thymine

34. Natural rubber is a polymer of :

(1) Isoprene
(2) Ethylene
(3) Acrylic acid
(4) 1, 4-butadiene

SECTION – B

35. An example of green algae occurring in colonial form is the organism :

(1) Oedogonium
(2) Volvox
(3) Chlamydomonas
(4) Spirogyra

36. The Phages that show lysogenic cycle are called :

(1) Temperate phages
(2) Lytic phases
(3) Virulent phages
(4) Quiescent phages

37. Which of the following belongs to Basidiomycetes ?

(1) *Fusarium*
(2) *Neurospora*
(3) *Agaricus*
(4) *Mucor*

38. Which of the following eukaryotic cell wall components are nitrogenous compounds ?

(1) Cellulose
(2) Chitin
(3) Lignin
(4) Glucans

39. Ribosomes are made up of :

(1) DNA and RNA
(2) DNA and protein
(3) RNA and protein
(4) Protein and lipid

40. Chromatin is made up of :

(1) DNA and protein
(2) RNA and DNA
(3) Protein and DNA
(4) DNA, RNA and Protein

41. Which of the following occurs in meiosis but not in mitosis ?

(1) Replication of DNA prior to the start of cell division
(2) Pairing of homologous chromosomes at the metaphase plate
(3) Attachment of spindle fibres to the kinetochore
(4) Separation of sister chromatids at anaphase

42. The most common chromosome abnormality in first trimester spontaneous miscarriages is :

(1) Monosomy
(2) Trisomy
(3) Tetrasomy
(4) Triploidy

43. XY sex chromosome were discovered by :

(1) Nettil Stevans
(2) M. J. D. White
(3) T. A. Brown
(4) S. Sutton

44. Which of the following can cause mutations which contribute to development of cancers ?

(1) Chemicals in food
(2) UV and ionising radiation
(3) Reactive oxygen species
(4) All of these

45. Function of elaters is :

(1) To provide support
(2) Spore dispersal
(3) Conduction of sap
(4) Absorption of food

46. In Selaginella, an "organ suigeneris" is :

(1) Root
(2) Rhizoid
(3) Rhizophore
(4) Ligule

47. The Dihybrid test cross ratio is :

(1) 9 : 3 : 3 : 1
(2) 1 : 1 : 1 : 1
(3) 12 : 3 : 1
(4) 15 : 1

48. The gene which is suppressed from expressing its effect by the other gene is called :

(1) Complementary
(2) Epistasis
(3) Hypostatic
(4) Supplementary

49. The eukaryotic mRNA binding to the ribosomes is facilitated by :

(1) 7 -methyl guanosine cap
(2) T-RNA
(3) Poly-A tail
(4) Shine Dalgarno sequence

50. How many molecules of DNA are present in one chromosome ?

(1) One
(2) Two
(3) Four
(4) Multiple

51. Who discovered the blood group ?

(1) G. Mendel
(2) K. Landsteiner
(3) T. H. Morgan
(4) William Harvey

52. Which technique is used to detect gene expression ?

(1) DNA Foot printing
(2) DNA Fingerprinting
(3) Southern blotting
(4) Western blotting

53. *Entamoeba histolytica* causes :

(1) Typhoid
(2) Filiaria
(3) Dysentery
(4) None of the above

54. The excretory organs of earthworm are :

(1) Nephridia
(2) Green glands
(3) Solenocytes
(4) Kidneys

55. Endoskeleton of calcareous plates is found in :

(1) Cockroach
(2) Pila
(3) Starfish
(4) Earthworm

56. Which of the following is a good source of Sago starch ?

(1) *Cycas revoluta*
(2) *Cycas circinalis*
(3) *Ginkgo biloba*
(4) *Abies balsemea*

57. Angiosperms originated during :

(1) Lower Jurrassic
(2) Upper Cretaceous
(3) Carboniferous
(4) Mid Cretaceous

58. Which of the following Gymnosperm of Cycadeoidea was recovered from rajmahal hills by Prof. Birbal Sahni ?

(1) *Pentoxylon* (2) *Williamsonia*

(3) *Genetum* (4) *Heteroxylon*

59. The most important function of an inflorescence is to help in :

(1) Dispersal of seeds

(2) Release of pollen grains

(3) Attracting insects for cross pollination

(4) Forming large number of fruits

60. In Fabaceae stamens are :

(1) Monadelphous or Diadelphous (2) Monadelphous

(3) Diadelphous (4) Tetradynamous

61. The layer of meristematic cells at the tip of a plant root, which continually cuts off new cells to its outer edge is called :

(1) Tunica (2) Procambium

(3) Calyptrogen (4) Ground meristem

62. Identify the correct order of the components with reference to their arrangement from outer side to inner side in a woody dicot stem.

I. Secondary cortex II. Autumn wood

III. Secondary phloem IV. Phellem

The ***correct*** order is :

(1) III, IV, II, I (2) IV, I, III, II

(3) II, III, I, IV (4) I, II, IV, III

63. Which of the following pairs is suitable for critical study of secondary growth in plants ?

(1) Sugarcane and Sunflower
(2) Wheat and Maize
(3) Deodar and Fern
(4) Teak and Pine

64. Pneumatophores are a kind of modified root seen in mangroves and other plants seen in swampy environments. The main function of pneumatophores is :

(1) Respiration
(2) Photosynthesis
(3) Food storage
(4) No function

65. An embryo develop from a cell of an embryo sac other than egg is called :

(1) Parthenogenesis
(2) Parthenocarpy
(3) Apogamy
(4) Apospory

66. Which one of the following in birds indicates their reptilian ancestry ?

(1) Four-chambered heart
(2) Eggs with a calcareous shell
(3) Two special chambers crop and gizzard in their digestive tract
(4) Scales on their hind limbs

67. Skin of frog contains :

(1) Mucous gland
(2) Mucous and poison gland
(3) Poison gland
(4) Gland are absent

68. Poison glands of snakes are modified :

(1) Maxillary teeth
(2) Submaxillary teeth
(3) Sublingual glands
(4) Parotid glands

69. The largest mammalian order is :

(1) Rodentia (2) Carnivora

(3) Chiroptera (4) Primates

70. In adult urochordate, the dorsal nerve cord of larva is changed into :

(1) Brain and spinal cord (2) Ganglion

(3) Brain and nerve cord (4) No change in nerve cord

71. Some of the enzymes, which are associated in converting fats into carbohydrates are present in :

(1) Golgi bodies (2) Microsomes

(3) Liposomes (4) Glyoxysomes

72. Which is phospholipid ?

(1) Sterol (2) Steroid

(3) Lecithin (4) Cholesterol

73. Arthritis and osteoporosis are classified as :

(1) Disorders of vertebrae (2) Disorders of bones

(3) Disorders of nervous system (4) Disorders of cells

74. The walls of left ventricle are thicker than the walls of right ventricle because :

(1) It has to pump blood to the whole body

(2) Blood reaches this ventricle in huge amount

(3) It has to pump the blood to lungs

(4) Blood reaches this ventricle with extra pressure

75. Which of the following hormones is ***not*** released by the anterior pituitary ?

(1) Melanocyte-stimulating hormone (2) Growth hormone

(3) Gonadotropin-releasing hormone (4) Thyroid-stimulating hormone

76. Transpiration can be influenced by interfering with :

(1) Leaf epidermis (2) Atmospheric temperature

(3) Osmotic pressure (4) Guard cell

77. Favorable conditions for cyclic photophosphorylation are :

(1) Aerobic and optimum light (2) Aerobic condition only

(3) Aerobic and low light intensity (4) Anaerobic and low light intensity

78. Which of the following is natural cytokinin ?

(1) 6-aminopurine (2) 6-isopentenyl adenine

(3) Isopentenyl adenine (4) Zeatin

79. Which pigment detects the photoperiod and the presence of sunlight so as to regulate the life cycle and growth of a plant ?

(1) Chlorophyll (2) Phytochrome

(3) Xanthophyll (4) Carotenoids

80. Which of the following is involved in production of carboxy haemoglobin ?

(1) SO_2 (2) NO_2 (3) CO (4) NO_3

81. What is the minimum quantity of dissolved oxygen that should be present in the treated sewage ?

(1) 6ppm (2) 4ppm

(3) 1ppm (4) 10ppm

82. Which of the following indicates the correct order of the principal layers of the earth's atmosphere from top to bottom ?

(1) Troposphere - Stratosphere - Mesosphere - Thermosphere - Exosphere

(2) Thermosphere - Stratosphere - Troposphere - Mesosphere - Exosphere

(3) Exosphere - Thermosphere - Mesosphere - Stratosphere - Troposphere

(4) Exosphere - Mesosphere - Thermosphere - Stratosphere - Troposphere

83. The evolution of a species is based upon sum total of adaptive changes preserved by :

(1) Natural selection (2) Isolation

(3) Speciation (4) Human conservation

84. Fossil of neanderthal man was discovered by :

(1) Lartlet (2) Pai

(3) Mc Gregor (4) Fuhlrott

85. What term is used for a non-protein organic molecule that is required by some enzymes in order to catalyse a reaction on a substrate ?

(1) Cofactor (2) Prosthetic group

(3) Coenzyme (4) Modulator

86. Which pathway for aerobic cellular respiration is located in the cytoplasm of the cell ?

(1) Kreb cycle (2) Glycolysis

(3) Calvin cycle (4) Electron transport system

87. A segment of DNA that reads from the same forward and backward is called :

(1) Palindromic DNA (2) Plasmid DNA

(3) Complementary DNA (4) Copy DNA

88. RNaseH method and homopolymer tailing method generates blunt ended cDNA molecules. Which of the following can be used for attaching them to vector ?

(1) Blunt ended ligation

(2) Addition of linkers

(3) Using appropriate restriction enzymes

(4) All the methods can be used equivalently

89. If a gene is inactivated by gene targeting then it is called as :

(1) Knock-in gene

(2) Knock-out gene

(3) Gene disruption

(4) Insertional inactivation

90. In the growing oocyte, the nucleus enlarges in size due to an increase in :

(1) Proteins

(2) Nucleoplasm

(3) RNA

(4) DNA

91. During development of chick the fertilized egg is laid ..... hours after fertilization.

(1) 24

(2) 36

(3) 40

(4) 45

92. Superficial cleavage is found in :

(1) Amphibian

(2) Insects

(3) Mammals

(4) Protostomes showing spiral cleavage

93. Grey crescent is present in :

(1) Brain of rabbit

(2) Eye of frog

(3) Zygote of frog

(4) Retina of cockroach

94. What type of fruit is present in wheat ?

(1) Drupe

(2) Caryopsis

(3) Berries

(4) Catkin

95. The flax fibres are obtained from :

(1) *Linum usitatissimum*

(2) *Cocos nucifera*

(3) *Canabis sativa*

(4) *Crotalaria juncea*

96. To make transport fuel the bio ethanol is blended with ..... .

(1) Diesel

(2) Petrol

(3) Oil

(4) Kerosene

97. Which is the river basin with the largest catchment area ?

(1) Indus

(2) Godavari

(3) Krishna

(4) Ganga

98. Which of the following nutrients is ***not*** present in eggs ?

(1) Iron

(2) Riboflavin (vitamin B2)

(3) Vitamin C

(4) Vitamin A

99. Which of the following compounds is ***not*** an organic substance ?

(1) Pyrethrum

(2) Indane

(3) Rotenone

(4) Nicotine

100. Which of the following is pest of Sugarcane ?

(1) *Amrasca devastans*

(2) *Sitophilus oryzae*

(3) *Pyrilla perpusilla*

(4) *Tribolium castaneum*

SECTION – C

101. The asymptotes of the curve $xy(x^2 - y^2) + 25y^2 + 8x^2 - 144 = 0$ are :

(1) $x = 0, y = 0, x = y, x = -y$

(2) $x = 1, y = 0, x = \frac{y}{2}, x = y$

(3) $x = -1, y = 1, x = y, x = -y$

(4) None of these

102. $\int_0^{\pi/2} \sin^6 \theta \, d\theta$ is equal to :

(1) $\frac{32}{35}$

(2) $\frac{35}{32}$

(3) $\frac{64}{35}$

(4) $\frac{35}{64}$

103. If $\vec{f} = z\hat{i} + x\hat{j} + y\hat{k}$, then curl curl $\vec{f}$ is equal to :

(1) $\vec{0}$ (2) $\hat{i}$ (3) $\hat{k}$ (4) $\hat{j}$

104. Particular Integral of the differential equation $(D^3 - 3D^2D' + 4D'^3)z = e^{x+2y}$ is given by :

(1) $\frac{e^{x+2y}}{4}$

(2) $\frac{e^{x+2y}}{27}$

(3) $\frac{e^{x+2y}}{24}$

(4) $\frac{e^{x+2y}}{20}$

105. The partial differential equation r – 2s – 8t = 0 is :

(1) Parabolic

(2) Hyperbolic

(3) Elliptic

(4) None of these

106. Laplace transform of $e^{-at}\sinh bt$ is equal to :

(1) $\frac{b}{s}$

(2) $\frac{b+s}{s}$

(3) $\frac{b}{(s+a)^2}$

(4) None of these

107. Hermite polynomial $H_2(x)$ is given by :

(1) $2-4x^2$

(2) $\frac{x^2}{2}$

(3) $4x^2-2$

(4) 0

108. "If three coplanar forces acting at a point are in equilibrium, then each is proportional to the sine of the angle between the other two" is the statement of :

(1) Triangle Law

(2) Lami's theorem

(3) Parallelogram Law

(4) None of these

109. Kinetic energy of a particle of mass m moving with a velocity v is given by :

(1) $\frac{v^2}{2}$

(2) $\frac{2v^2}{m}$

(3) $\frac{m}{2v^2}$

(4) $\frac{1}{2}mv^2$

110. Time of flight of a projectile is given by :

(1) $\frac{2u\sin\alpha}{g}$

(2) $\frac{u}{2g\sin\alpha}$

(3) $\frac{g\sin\alpha}{2u}$

(4) $\frac{2gu}{\sin\alpha}$

111. If $a^2 = a$, a belongs to group (G, .), then :

(1) $a = -e$ (2) $a = \frac{e}{2}$

(3) $a = e$ (4) $a \neq \frac{e}{4}$

112. Let S be an ideal of a ring R, then S is said to be nilpotent if for some positive integer n :

(1) $S^n = \phi$ (2) $S^n = <0>$

(3) $S^n = <\phi>$ (4) None of these

113. The rank of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is :

(1) 0 (2) 3

(3) 1 (4) 2

114. If roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P. then one of the root is :

(1) 4 (2) 3

(3) 2 (4) 0

115. The conic $8x^2 - 24xy + 15y^2 + 48x - 48y = 0$ represents a :

(1) Circle (2) Ellipse

(3) Parabola (4) Hyperbola

116. If $(a, b) = d$, then $\left(\frac{a}{d}, \frac{b}{d}\right)$ is equal to :

(1) 0 (2) 3

(3) 1 (4) None of these

117. The principal value of Log (–5) is :

(1) $\log 5$ (2) $\log 5 + \pi i$

(3) πi (4) 0

118. The integrating factor for the differential equation $x^2 y dx - \left(x^3 + y^3\right) dy = 0$ to become exact is :

(1) $\frac{-1}{y^4}$ (2) $\frac{1}{y^4}$

(3) $\frac{2}{y^4}$ (4) $\frac{-2}{y^4}$

119. The particular integral for the differential equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{3x}$ is given by :

(1) $\frac{x}{2}e^{3x}$ (2) xe^{3x}

(3) x^2e^{3x} (4) $\frac{x^2}{2}e^{3x}$

120. If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then $x\frac{\partial u}{\partial y} + y\frac{\partial u}{\partial y}$ is equal to :

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

(3) $\tan u$ (4) $\cot u$

121. $\underset{x\to 0^+}{Lim}\left(\frac{1}{x} - \text{cosec}x\right)$ is given by :

(1) 0 (2) 1

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

122. The diameter of an empty set is :

(1) 2 (2) 0

(3) 1 (4) None of these

123. The improper integral $\int_0^1 \frac{dx}{x^2}$ is :

(1) Convergent (2) Divergent

(3) 0 (4) None of these

124. Which one of the following is ***not*** a relational operator ?

(1) = = (2) < =

(3) | | (4) None of these

125. The order of convergence of Newton-Raphson iteration formula is :

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

126. ∇, Δ and E^{-1} are related as :

(1) $\Delta E^{-1} \equiv \nabla$ (2) $\Delta + E^{-1} \equiv \nabla$

(3) $-\Delta + E^{-1} \equiv \nabla$ (4) None of these

127. For a Poisson distribution, the recurrence formula is given by :

(1) $P(r+1) = \lfloor r$ (2) $P(r+1) = \frac{m}{r+1} P(r)$

(3) $P(r+1) = mP(r)$ (4) None of these

128. Let T : U $\rightarrow$ V be a linear transformation. Then T is one-to-one, iff :

(1) $N(T) = \phi$ (2) $N(T) = \{\phi\}$

(3) $N(T) = \{0\}$ (4) None of these

129. The normalized vector corresponding to the vector (2, –3, 6) is :

(1) $\left(\frac{2}{-3}, \frac{-3}{6}, \frac{6}{2}\right)$ (2) $\left(\frac{6}{-3}, \frac{-3}{2}, \frac{2}{6}\right)$

(3) $\left(\frac{2}{7}, \frac{-3}{2}, \frac{6}{7}\right)$ (4) None of these

130. The only limit point of the set $S = \left\{\frac{1}{n}, n \in N\right\}$ is :

(1) 0 (2) 1

(3) ∞ (4) None of these

131. The series $\frac{\lfloor 1}{5} + \frac{\lfloor 2}{5^2} + \frac{\lfloor 3}{5^3} + \ldots\ldots$

(1) Doesn't exist (2) Is convergent

(3) Is divergent (4) None of these

132. The function $e^{\bar{z}}$ is :

(1) Analytic function

(2) Nowhere analytic

(3) Such that C-R conditions are satisfied

(4) None of these

133. If $f(x)$ is even function is (–L, L) and the Fourier Cosine series is $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \frac{\cos n\pi x}{L}$, then a_0 is given by :

(1) $\frac{2}{L}\int_0^L f(x)dx$ (2) $\int_0^L f(x)dx$ (3) $\int_0^{\infty} f(x)dx$ (4) $\int_0^{-L} f(x)dx$

134. Masses m_1 and m_2 are held at a distance 'd' apart. Distance of centre of mass from mass m_1 is :

(1) $\frac{m_1}{m_1+m_2}d$ (2) $\frac{m_2}{m_1+m_2}d$

(3) $\frac{m_1-m_2}{m_1+m_2}d$ (4) $\frac{m_2}{m_1}d$

135. Angular momentum of a particle rotating under a central force is constant due to :

(1) constant torque (2) constant force

(3) constant linear momentum (4) zero torque

136. The angle between the two vectors $-2\hat{i}+3\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}-4\hat{k}$ is :

(1) 0° (2) 90°

(3) 180° (4) None of these

137. The susceptibility of a diamagnetic substance :

(1) decreases with temperature

(2) does not vary with temperature

(3) increases with temperature

(4) first decreases and then increases

138. If S is stress and Y is Young's modulus of material of a wire, the energy stored per unit volume of wire is :

(1) $\frac{S}{2Y}$ (2) $\frac{2Y}{S^2}$

(3) $\frac{S^2}{2Y}$ (4) $2S^2Y$

139. At what temperature the molecules of nitrogen will have the same rms velocity as the molecules of oxygen at 127°C ?

(1) 77°C

(2) 350°C

(3) 273°C

(4) 457°C

140. The rest mass of an electron is m_0, when it moves with a velocity of 0.6 C, then its mass is :

(1) m_0

(2) $\frac{5}{4} m_0$

(3) $\frac{4}{5} m_0$

(4) $2m_0$

141. The value of L, C and R in an LCR series circuit are 4mH, 40pF and 100Ω respectively. The quality factor of the circuit is :

(1) 10,000

(2) 100

(3) 1,000

(4) 10

142. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at $t = 0$. The time at which the energy is stored equally between the electric and magnetic fields is :

(1) $\frac{\pi}{4}\sqrt{LC}$

(2) $2\pi\sqrt{LC}$

(3) $\sqrt{LC}$

(4) $\pi\sqrt{LC}$

143. For detecting intensity of light we use :

(1) Photodiode in forward bias

(2) Photodiode in reverse bias

(3) LED in forward bias

(4) LED in reverse bias

144. When you make ice cubes, the entropy of water :

(1) does not change (2) increases

(3) decreases (4) first increases and then decreases

145. For a transformation that occurs in cooling, the Gibb's free energy per unit volume is :

(1) positive (2) negative

(3) zero (4) infinite

146. In the study of co-axial system of lenses, the number of cardinal or Gauss point is :

(1) 6 (2) 5

(3) 4 (4) 3

147. In Young's double slit experiment, the seventh maximum with wavelength λ_1 is at distance d_1 and same maximum with wavelength λ_2 is at distance d_2. Then $\frac{d_1}{d_2}$ is :

(1) $\frac{\lambda_1}{\lambda_2}$ (2) $\frac{\lambda_2}{\lambda_1}$

(3) $\frac{\lambda_1^2}{\lambda_2^2}$ (4) $\frac{\lambda_2^2}{\lambda_1^2}$

148. The point in phase space is actually a cell whose minimum volume is of the order of :

(1) h (2) h^3

(3) h^2 (4) h^5

149. In Bose-Einstien statistics, the chemical potential is always :

(1) zero (2) positive

(3) infinite (4) negative

150. If w is the thermodynamic probability of the state of the system then the entropy of the system is :

(1) kw

(2) k exp(w)

(3) k log (w)

(4) log (w/k)

151. In Fraunhoffer diffraction at a circular aperture, the condition for minimum intensity is that the path difference is equal to integral multiple of :

(1) λ (2) 2λ (3) $\frac{\lambda}{2}$ (4) $\frac{\lambda}{3}$

152. In Newton's rings, the radii of the rings vary as :

(1) square of natural numbers

(2) square root of natural numbers

(3) cube of natural numbers

(4) fourth power of natural numbers

153. An ink dot is marked on a piece of paper and a calcite crystal is placed over this dot on the paper. How many images will be observed ?

(1) Five

(2) Three

(3) Two

(4) Four

154. The atomic radius of bcc lattice is :

(1) $\frac{a}{2}$

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

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

(4) $\frac{a}{2\sqrt{2}}$

155. A crystallographic plane has the intercepts 1 along a, 2 along b and 3 along c. A parallel plane of this plane will have Miller indices :

(1) (1 2 3)

(2) (2 4 6)

(3) (3 2 1)

(4) (6 3 2)

156. If x-rays of wavelength 2Å are detected at an angle of 30° in the first order, then the spacing between the adjacent planes of the crystal would be :

(1) 2.0 Å
(2) 3.7 Å
(3) 4.3Å
(4) 4.9 Å

157. The packing factor of diamond cubic crystal structure is :

(1) 34%
(2) 54%
(3) 64%
(4) 74%

158. The group velocity of matter waves is :

(1) less than particle velocity
(2) greater than particle velocity
(3) equal to the particle velocity
(4) same as phase velocity

159. The operator associated with total energy is :

(1) $i\hbar\frac{\partial}{\partial t}$
(2) $-\frac{\hbar^2}{2m}\nabla^2 + U$
(3) Hamiltonian operator
(4) All of these

160. Heisenberg's uncertainty principle does not hold for the following pairs :

(1) energy and time
(2) position and linear momentum
(3) angular momentum and angle
(4) linear momentum and angle

161. A spectral line emitted by the excited atoms is split up into a doublet or triplet when the emitting atoms are placed in a magnetic field. The effect of the splitting of a spectral line under the action of magnetic field is known as :

(1) Raman effect
(2) Zeeman effect
(3) Spectra effect
(4) Compton effect

162. Which one of the series of hydrogen spectrum is in the visible region ?

(1) Lyman series
(2) Balmer series
(3) Paschen series
(4) Brackett series

163. The function of He atoms in the He-Ne laser is :

(1) to quench the neon atoms
(2) to provide energy to neon atoms
(3) to make neon atoms inactive
(4) none of the above

164. Two nuclei have their mass numbers in the ratio of 1 : 3. The ratio of their nuclear densities would be :

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

165. The energy released in a typical nuclear fusion reactor is approximately :

(1) 25 MeV
(2) 200 MeV
(3) 800 MeV
(4) 1025 MeV

166. A negative nuclear quadrupole moment indicates that nucleus is :

(1) prolate
(2) oblate
(3) spherical
(4) spheroidal

Total No. of Printed Pages : 29

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CPG-EE-2018 (Forensic Science)-(SET-X)

B

10350

Sr. No. .....

Time : **1½ Hours** Total Questions : **166** Max. Marks : **100**

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

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

_____ _____

(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"**. Students of *Medical Group* are required to attempt **Section "B"**. Students of *Non-Medical Group* are required to attempt **Section "C"**. All questions carry equal marks i.e. one mark each.
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SEAL

SECTION – A

1. For the cell reaction $Fe(s)/Fe^{2+}(0.1\,M)||H^{+}(1M)|H_2(1\,atm), Pt.\ E^{\circ} = 0.44\,V$. The cell emf is :

   (1) 0.41 V
   (2) 0.47 V
   (3) 1.26 V
   (4) 1.20 V

2. In an isothermal expansion of an ideal gas :

   (1) $q = 0$
   (2) $\Delta V = 0$
   (3) $\Delta U = 0$
   (4) $W = 0$

3. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

   (1) $C-O$
   (2) $C-N$
   (3) $C-C$
   (4) $C-H$

4. The end product in the following sequence is :

$$Phenol \xrightarrow{NaOH} A \xrightarrow[140°C]{CO_2} B \xrightarrow{H^{+},H_2O} C \xrightarrow{(CH_3CO)_2O} D$$

   (1) Aspirin
   (2) Salicylic acid
   (3) Phenyl acetate
   (4) Salicyldehyde

5. The Cannizzaro's reaction is ***not*** given by :

   (1) Trimethyl acetaldehyde
   (2) Acetaldehyde
   (3) Benzaldehyde
   (4) Formaldehyde

6. The molecule which is IR inactive and Raman active is :

(1) Protein (2) HCl

(3) SO_2 (4) N_2

7. When 0.1 mole of glucose is dissolved in 10 mole of water, the vapour pressure of water is :

(1) Increased by 1% (2) Increased by 10%

(3) Decreased by 1% (4) Decreased by 10%

8. Fluorescence is an instantaneous process having the life time of :

(1) $10^{-2} s$ (2) $10^{-9} s$

(3) 100 s (4) 1000 s

9. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

(1) 0.5 B (2) B

(3) 1.5 B (4) 2 B

(where B is rotational constant)

10. How many signals will be observed in the ^{1}HNMR spectrum of 1, 2, 2-tribromo-ethane and pure ethanol, respectively ?

(1) 2 and 2 (2) 3 and 3

(3) 3 and 2 (4) 2 and 3

11. Nineteenth electron of Cr-atom has which of the following sets of quantum numbers ?

(1) $n = 3, l = 0, m = 0, s = 1/2$ (2) $n = 3, l = 2, m = -2, s = 1/2$

(3) $n = 4, l = 0, m = 0, s = 1/2$ (4) $n = 4, l = 1, m = -1, s = 1/2$

12. Which of the following compound is expected to be coloured ?

(1) Ag_2SO_4 (2) CuF_2

(3) MgF_2 (4) $CuCl$

13. Which pair among the following is isostructural ?

(1) XeF_2, IF_2^- (2) NH_3, BF_3

(3) CO_3^{2-}, SO_3^{2-} (4) PCl_5, ICl_5

14. Which of the following ions does not contain S-S linkage ?

(1) $S_2O_3^{2-}$ (2) $S_2O_4^{2-}$ (3) $S_2O_6^{2-}$ (4) $S_2O_8^{2-}$

15. The term that accounts for intermolecular force in Vander Waal's equation for non ideal gas is :

(1) RT (2) $V - b$

(3) $\left(P + \frac{a}{V^2}\right)$ (4) $[RT]^{-1}$

16. The critical temperature of water is higher than that of O_2 because the H_2O molecule has :

(1) fewer electrons than O_2 (2) two covalent bonds

(3) V-shape (4) dipole moment

17. The pH of blood is maintained by CO_2 and H_2CO_3 in the body and chemical constituents of blood. This phenomenon is called :

(1) Colloidal (2) Buffer action

(3) Acidity (4) Salt balance

18. What is the state of hybridization of carbon in Carbanion ?

(1) sp (2) sp^2

(3) sp^3 (4) sp^2d

19. Mesotartaric acid is optically inactive because of :

(1) Plane of symmetry (2) Two chiral or asymmetric carbon atoms

(3) External compensation (4) It is asymmetric

20. Chlorobenzene can be prepared by reacting aniline with :

(1) Zn and HCl

(2) Cuprous chloride

(3) Chlorine in presence of anhydrous $AlCl_3$

(4) Nitrous acid followed by heating with Cuprous chloride

21. The type of hybridization involved in the complex $[Ni(CN)_4]^{2-}$ is :

(1) d^2sp^2 (2) d^2sp^3

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

22. What will be the effect of adding KNH_2 to liquid NH_3 in respect of acidity ?

(1) Acidity will decrease (2) Acidity will increase

(3) Acidity will increase drastically (4) No effect on acidity

23. Which of the following is least basic ?

(1) $La(OH)_3$ (2) $Lu(OH)_3$

(3) $Ce(OH)_3$ (4) $Nd(OH)_3$

24. Which of the following will not give positive chromyl chloride test ?

(1) $CuCl_2$ (2) $ZnCl_2$

(3) $HgCl_2$ (4) $C_6H_5NH_3Cl$

25. The following data is known about the melting of a compound AB, $\Delta H = 9.2$ kJ mol^{-1}, $\Delta S = 0.008$ kJ K^{-1} mol^{-1}. Its melting point is :

(1) 736 K (2) 1050 K

(3) 1150 K (4) 1150°C

26. CFSE for d^4 tetrahedral is :

(1) –4 Dq (2) –20 Dq

(3) –8 Dq (4) –12 Dq

27. State the theory by which the reaction $6CaO + P_4O_{10} \rightarrow 2Ca_3(PO_4)_2$ is regarded as acid base reaction :

(1) Lewis Concept (2) Bronsted Lowry Concept

(3) Lux-Flood Concept (4) Is not a acid base reaction

28. Which symbiotic bacteria is capable of fixing N_2 ?

(1) Clostridium-pasteurianum (2) Rhizobia

(3) Azobacter (4) Nitrogenase

29. Mulliken symbol for spectroscopic term P in octahedral field is :

(1) A_{1g} (2) T_{1g}

(3) T_{2g} (4) E_g

30. The expected spin magnetic moment for Ni^{2+} ion is :

(1) 2.82 BM

(2) 1.73 BM

(3) 5.96 BM

(4) 3.87 BM

31. Starch is composed of :

(1) Amylose and Glycogen

(2) Amylopectin and Glycogen

(3) Amylose and Amylopectin

(4) Glucose and Glycogen

32. Methyl lithium exists in the solid state as :

(1) Monomeric structure

(2) Dimeric structure

(3) Tetrameric structure

(4) Pentameric structure

33. Which of the following is ***not*** an α-amino acid ?

(1) Serine

(2) Aspartic acid

(3) Phenylalanine

(4) Thymine

34. Natural rubber is a polymer of :

(1) Isoprene

(2) Ethylene

(3) Acrylic acid

(4) 1, 4-butadiene

SECTION – B

35. In the growing oocyte, the nucleus enlarges in size due to an increase in :

(1) Proteins

(2) Nucleoplasm

(3) RNA

(4) DNA

36. During development of chick the fertilized egg is laid ..... hours after fertilization.

(1) 24

(2) 36

(3) 40

(4) 45

37. Superficial cleavage is found in :

(1) Amphibian
(2) Insects
(3) Mammals
(4) Protostomes showing spiral cleavage

38. Grey crescent is present in :

(1) Brain of rabbit
(2) Eye of frog
(3) Zygote of frog
(4) Retina of cockroach

39. What type of fruit is present in wheat ?

(1) Drupe
(2) Caryopsis
(3) Berries
(4) Catkin

40. The flax fibres are obtained from :

(1) *Linum usitatissimum*
(2) *Cocos nucifera*
(3) *Canabis sativa*
(4) *Crotalaria juncea*

41. To make transport fuel the bio ethanol is blended with ..... .

(1) Diesel
(2) Petrol
(3) Oil
(4) Kerosene

42. Which is the river basin with the largest catchment area ?

(1) Indus
(2) Godavari
(3) Krishna
(4) Ganga

43. Which of the following nutrients is ***not*** present in eggs ?

(1) Iron
(2) Riboflavin (vitamin B2)
(3) Vitamin C
(4) Vitamin A

44. Which of the following compounds is ***not*** an organic substance ?

(1) Pyrethrum
(2) Indane
(3) Rotenone
(4) Nicotine

45. An example of green algae occurring in colonial form is the organism :

(1) Oedogonium
(2) Volvox
(3) Chlamydomonas
(4) Spirogyra

46. The Phages that show lysogenic cycle are called :

(1) Temperate phages
(2) Lytic phases
(3) Virulent phages
(4) Quiescent phages

47. Which of the following belongs to Basidiomycetes ?

(1) *Fusarium*
(2) *Neurospora*
(3) *Agaricus*
(4) *Mucor*

48. Which of the following eukaryotic cell wall components are nitrogenous compounds ?

(1) Cellulose
(2) Chitin
(3) Lignin
(4) Glucans

49. Ribosomes are made up of :

(1) DNA and RNA
(2) DNA and protein
(3) RNA and protein
(4) Protein and lipid

50. Chromatin is made up of :

(1) DNA and protein
(2) RNA and DNA
(3) Protein and DNA
(4) DNA, RNA and Protein

51. Which of the following occurs in meiosis but not in mitosis ?

(1) Replication of DNA prior to the start of cell division

(2) Pairing of homologous chromosomes at the metaphase plate

(3) Attachment of spindle fibres to the kinetochore

(4) Separation of sister chromatids at anaphase

52. The most common chromosome abnormality in first trimester spontaneous miscarriages is :

(1) Monosomy

(2) Trisomy

(3) Tetrasomy

(4) Triploidy

53. XY sex chromosome were discovered by :

(1) Nettil Stevans

(2) M. J. D. White

(3) T. A. Brown

(4) S. Sutton

54. Which of the following can cause mutations which contribute to development of cancers ?

(1) Chemicals in food

(2) UV and ionising radiation

(3) Reactive oxygen species

(4) All of these

55. Function of elaters is :

(1) To provide support

(2) Spore dispersal

(3) Conduction of sap

(4) Absorption of food

56. In Selaginella, an "organ suigeneris" is :

(1) Root

(2) Rhizoid

(3) Rhizophore

(4) Ligule

57. The Dihybrid test cross ratio is :

(1) 9 : 3 : 3 : 1
(2) 1 : 1 : 1 : 1
(3) 12 : 3 : 1
(4) 15 : 1

58. The gene which is suppressed from expressing its effect by the other gene is called :

(1) Complementary
(2) Epistasis
(3) Hypostatic
(4) Supplementary

59. The eukaryotic mRNA binding to the ribosomes is facilitated by :

(1) 7 -methyl guanosine cap
(2) T-RNA
(3) Poly-A tail
(4) Shine Dalgarno sequence

60. How many molecules of DNA are present in one chromosome ?

(1) One
(2) Two
(3) Four
(4) Multiple

61. Who discovered the blood group ?

(1) G. Mendel
(2) K. Landsteiner
(3) T. H. Morgan
(4) William Harvey

62. Which technique is used to detect gene expression ?

(1) DNA Foot printing
(2) DNA Fingerprinting
(3) Southern blotting
(4) Western blotting

63. *Entamoeba histolytica* causes :

(1) Typhoid
(2) Filiaria
(3) Dysentery
(4) None of the above

64. The excretory organs of earthworm are :

(1) Nephridia
(2) Green glands
(3) Solenocytes
(4) Kidneys

65. Endoskeleton of calcareous plates is found in :

(1) Cockroach
(2) Pila
(3) Starfish
(4) Earthworm

66. Which of the following is a good source of Sago starch ?

(1) *Cycas revoluta*
(2) *Cycas circinalis*
(3) *Ginkgo biloba*
(4) *Abies balsemea*

67. Angiosperms originated during :

(1) Lower Jurrassic
(2) Upper Cretaceous
(3) Carboniferous
(4) Mid Cretaceous

68. Which of the following Gymnosperm of Cycadeoidea was recovered from rajmahal hills by Prof. Birbal Sahni ?

(1) *Pentoxylon*
(2) *Williamsonia*
(3) *Genetum*
(4) *Heteroxylon*

69. The most important function of an inflorescence is to help in :

(1) Dispersal of seeds
(2) Release of pollen grains
(3) Attracting insects for cross pollination
(4) Forming large number of fruits

70. In Fabaceae stamens are :

(1) Monadelphous or Diadelphous
(2) Monadelphous
(3) Diadelphous
(4) Tetradynamous

71. The layer of meristematic cells at the tip of a plant root, which continually cuts off new cells to its outer edge is called :

(1) Tunica
(2) Procambium
(3) Calyptrogen
(4) Ground meristem

72. Identify the correct order of the components with reference to their arrangement from outer side to inner side in a woody dicot stem.

I. Secondary cortex
II. Autumn wood
III. Secondary phloem
IV. Phellem

The ***correct*** order is :

(1) III, IV, II, I
(2) IV, I, III, II
(3) II, III, I, IV
(4) I, II, IV, III

73. Which of the following pairs is suitable for critical study of secondary growth in plants ?

(1) Sugarcane and Sunflower
(2) Wheat and Maize
(3) Deodar and Fern
(4) Teak and Pine

74. Pneumatophores are a kind of modified root seen in mangroves and other plants seen in swampy environments. The main function of pneumatophores is :

(1) Respiration
(2) Photosynthesis
(3) Food storage
(4) No function

75. An embryo develop from a cell of an embryo sac other than egg is called :

(1) Parthenogenesis
(2) Parthenocarpy
(3) Apogamy
(4) Apospory

76. Which one of the following in birds indicates their reptilian ancestry ?

(1) Four-chambered heart
(2) Eggs with a calcareous shell
(3) Two special chambers crop and gizzard in their digestive tract
(4) Scales on their hind limbs

77. Skin of frog contains :

(1) Mucous gland
(2) Mucous and poison gland
(3) Poison gland
(4) Gland are absent

78. Poison glands of snakes are modified :

(1) Maxillary teeth
(2) Submaxillary teeth
(3) Sublingual glands
(4) Parotid glands

79. The largest mammalian order is :

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

80. In adult urochordate, the dorsal nerve cord of larva is changed into :

(1) Brain and spinal cord
(2) Ganglion
(3) Brain and nerve cord
(4) No change in nerve cord

81. Some of the enzymes, which are associated in converting fats into carbohydrates are present in :

(1) Golgi bodies (2) Microsomes

(3) Liposomes (4) Glyoxysomes

82. Which is phospholipid ?

(1) Sterol (2) Steroid

(3) Lecithin (4) Cholesterol

83. Arthritis and osteoporosis are classified as :

(1) Disorders of vertebrae (2) Disorders of bones

(3) Disorders of nervous system (4) Disorders of cells

84. The walls of left ventricle are thicker than the walls of right ventricle because :

(1) It has to pump blood to the whole body

(2) Blood reaches this ventricle in huge amount

(3) It has to pump the blood to lungs

(4) Blood reaches this ventricle with extra pressure

85. Which of the following hormones is ***not*** released by the anterior pituitary ?

(1) Melanocyte-stimulating hormone (2) Growth hormone

(3) Gonadotropin-releasing hormone (4) Thyroid-stimulating hormone

86. Transpiration can be influenced by interfering with :

(1) Leaf epidermis (2) Atmospheric temperature

(3) Osmotic pressure (4) Guard cell

87. Favorable conditions for cyclic photophosphorylation are :

(1) Aerobic and optimum light
(2) Aerobic condition only
(3) Aerobic and low light intensity
(4) Anaerobic and low light intensity

88. Which of the following is natural cytokinin ?

(1) 6-aminopurine
(2) 6-isopentenyl adenine
(3) Isopentenyl adenine
(4) Zeatin

89. Which pigment detects the photoperiod and the presence of sunlight so as to regulate the life cycle and growth of a plant ?

(1) Chlorophyll
(2) Phytochrome
(3) Xanthophyll
(4) Carotenoids

90. Which of the following is involved in production of carboxy haemoglobin ?

(1) SO_2 (2) NO_2 (3) CO (4) NO_3

91. What is the minimum quantity of dissolved oxygen that should be present in the treated sewage ?

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

92. Which of the following indicates the correct order of the principal layers of the earth's atmosphere from top to bottom ?

(1) Troposphere - Stratosphere - Mesosphere - Thermosphere - Exosphere
(2) Thermosphere - Stratosphere - Troposphere - Mesosphere - Exosphere
(3) Exosphere - Thermosphere - Mesosphere - Stratosphere - Troposphere
(4) Exosphere - Mesosphere - Thermosphere - Stratosphere - Troposphere

93. The evolution of a species is based upon sum total of adaptive changes preserved by :

(1) Natural selection
(2) Isolation
(3) Speciation
(4) Human conservation

94. Fossil of neanderthal man was discovered by :

(1) Lartlet
(2) Pai
(3) Mc Gregor
(4) Fuhlrott

95. What term is used for a non-protein organic molecule that is required by some enzymes in order to catalyse a reaction on a substrate ?

(1) Cofactor
(2) Prosthetic group
(3) Coenzyme
(4) Modulator

96. Which pathway for aerobic cellular respiration is located in the cytoplasm of the cell ?

(1) Kreb cycle
(2) Glycolysis
(3) Calvin cycle
(4) Electron transport system

97. A segment of DNA that reads from the same forward and backward is called :

(1) Palindromic DNA
(2) Plasmid DNA
(3) Complementary DNA
(4) Copy DNA

98. RNaseH method and homopolymer tailing method generates blunt ended cDNA molecules. Which of the following can be used for attaching them to vector ?

(1) Blunt ended ligation
(2) Addition of linkers
(3) Using appropriate restriction enzymes
(4) All the methods can be used equivalently

99. If a gene is inactivated by gene targeting then it is called as :

(1) Knock-in gene (2) Knock-out gene

(3) Gene disruption (4) Insertional inactivation

100. Which of the following is pest of Sugarcane ?

(1) *Amrasca devastans* (2) *Sitophilus oryzae*

(3) *Pyrilla perpusilla* (4) *Tribolium castaneum*

SECTION – C

101. In Fraunhoffer diffraction at a circular aperture, the condition for minimum intensity is that the path difference is equal to integral multiple of :

(1) λ (2) 2λ (3) $\frac{\lambda}{2}$ (4) $\frac{\lambda}{3}$

102. In Newton's rings, the radii of the rings vary as :

(1) square of natural numbers (2) square root of natural numbers

(3) cube of natural numbers (4) fourth power of natural numbers

103. An ink dot is marked on a piece of paper and a calcite crystal is placed over this dot on the paper. How many images will be observed ?

(1) Five (2) Three

(3) Two (4) Four

104. The atomic radius of bcc lattice is :

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

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

105. A crystallographic plane has the intercepts 1 along a, 2 along b and 3 along c. A parallel plane of this plane will have Miller indices :

(1) (1 2 3)

(2) (2 4 6)

(3) (3 2 1)

(4) (6 3 2)

106. If x-rays of wavelength 2Å are detected at an angle of 30° in the first order, then the spacing between the adjacent planes of the crystal would be :

(1) 2.0 Å

(2) 3.7 Å

(3) 4.3Å

(4) 4.9 Å

107. The packing factor of diamond cubic crystal structure is :

(1) 34%

(2) 54%

(3) 64%

(4) 74%

108. The group velocity of matter waves is :

(1) less than particle velocity

(2) greater than particle velocity

(3) equal to the particle velocity

(4) same as phase velocity

109. The operator associated with total energy is :

(1) $i\hbar\frac{\partial}{\partial t}$

(2) $-\frac{\hbar^2}{2m}\nabla^2 + U$

(3) Hamiltonian operator

(4) All of these

110. Heisenberg's uncertainty principle does not hold for the following pairs :

(1) energy and time

(2) position and linear momentum

(3) angular momentum and angle

(4) linear momentum and angle

111. A spectral line emitted by the excited atoms is split up into a doublet or triplet when the emitting atoms are placed in a magnetic field. The effect of the splitting of a spectral line under the action of magnetic field is known as :

(1) Raman effect
(2) Zeeman effect
(3) Spectra effect
(4) Compton effect

112. Which one of the series of hydrogen spectrum is in the visible region ?

(1) Lyman series
(2) Balmer series
(3) Paschen series
(4) Brackett series

113. The function of He atoms in the He-Ne laser is :

(1) to quench the neon atoms
(2) to provide energy to neon atoms
(3) to make neon atoms inactive
(4) none of the above

114. Two nuclei have their mass numbers in the ratio of 1 : 3. The ratio of their nuclear densities would be :

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

115. The energy released in a typical nuclear fusion reactor is approximately :

(1) 25 MeV
(2) 200 MeV
(3) 800 MeV
(4) 1025 MeV

116. The asymptotes of the curve $xy(x^2 - y^2) + 25y^2 + 8x^2 - 144 = 0$ are :

(1) $x = 0, y = 0, x = y, x = -y$
(2) $x = 1, y = 0, x = \frac{y}{2}, x = y$
(3) $x = -1, y = 1, x = y, x = -y$
(4) None of these

117. $\int_0^{\pi/2} \sin^6\theta \, d\theta$ is equal to :

(1) $\frac{32}{35}$ (2) $\frac{35}{32}$

(3) $\frac{64}{35}$ (4) $\frac{35}{64}$

118. If $\vec{f} = z\hat{i} + x\hat{j} + y\hat{k}$, then curl curl $\vec{f}$ is equal to :

(1) $\vec{0}$ (2) $\hat{i}$ (3) $\hat{k}$ (4) $\hat{j}$

119. Particular Integral of the differential equation $\left(D^3 - 3D^2D' + 4D'^3\right)z = e^{x+2y}$ is given by :

(1) $\frac{e^{x+2y}}{4}$ (2) $\frac{e^{x+2y}}{27}$

(3) $\frac{e^{x+2y}}{24}$ (4) $\frac{e^{x+2y}}{20}$

120. The partial differential equation $r - 2s - 8t = 0$ is :

(1) Parabolic (2) Hyperbolic

(3) Elliptic (4) None of these

121. Laplace transform of $e^{-at}\sinh bt$ is equal to :

(1) $\frac{b}{s}$ (2) $\frac{b+s}{s}$

(3) $\frac{b}{(s+a)^2}$ (4) None of these

122. Hermite polynomial $H_2(x)$ is given by :

(1) $2-4x^2$ (2) $\frac{x^2}{2}$

(3) $4x^2-2$ (4) 0

123. "If three coplanar forces acting at a point are in equilibrium, then each is proportional to the sine of the angle between the other two" is the statement of :

(1) Triangle Law (2) Lami's theorem

(3) Parallelogram Law (4) None of these

124. Kinetic energy of a particle of mass m moving with a velocity v is given by :

(1) $\frac{v^2}{2}$ (2) $\frac{2v^2}{m}$

(3) $\frac{m}{2v^2}$ (4) $\frac{1}{2}mv^2$

125. Time of flight of a projectile is given by :

(1) $\frac{2u\sin\alpha}{g}$ (2) $\frac{u}{2g\sin\alpha}$

(3) $\frac{g\sin\alpha}{2u}$ (4) $\frac{2gu}{\sin\alpha}$

126. If $a^2 = a$, a belongs to group (G, .), then :

(1) $a = -e$ (2) $a = \frac{e}{2}$

(3) $a = e$ (4) $a \neq \frac{e}{4}$

127. Let S be an ideal of a ring R, then S is said to be nilpotent if for some positive integer n :

(1) $S^n = \phi$ (2) $S^n = <0>$

(3) $S^n = <\phi>$ (4) None of these

128. The rank of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is :

(1) 0 (2) 3

(3) 1 (4) 2

129. If roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P. then one of the root is :

(1) 4 (2) 3

(3) 2 (4) 0

130. The conic $8x^2 - 24xy + 15y^2 + 48x - 48y = 0$ represents a :

(1) Circle (2) Ellipse

(3) Parabola (4) Hyperbola

131. If $(a, b) = d$, then $\left(\frac{a}{d}, \frac{b}{d}\right)$ is equal to :

(1) 0 (2) 3

(3) 1 (4) None of these

132. The principal value of Log (–5) is :

(1) log 5 (2) log 5 + πi

(3) πi (4) 0

133. The integrating factor for the differential equation $x^2ydx-\left(x^3+y^3\right)dy=0$ to become exact is :

(1) $\frac{-1}{y^4}$ (2) $\frac{1}{y^4}$

(3) $\frac{2}{y^4}$ (4) $\frac{-2}{y^4}$

134. The particular integral for the differential equation $\frac{d^2y}{dx^2}-6\frac{dy}{dx}+9y=e^{3x}$ is given by :

(1) $\frac{x}{2}e^{3x}$ (2) xe^{3x}

(3) x^2e^{3x} (4) $\frac{x^2}{2}e^{3x}$

135. If $u=\sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then $x\frac{\partial u}{\partial y}+y\frac{\partial u}{\partial y}$ is equal to :

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

(3) $\tan u$ (4) $\cot u$

136. $\underset{x\to 0^+}{Lim}\left(\frac{1}{x}-\text{cosec}x\right)$ is given by :

(1) 0 (2) 1

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

137. The diameter of an empty set is :

(1) 2 (2) 0

(3) 1 (4) None of these

138. The improper integral $\int_0^1 \frac{dx}{x^2}$ is :

(1) Convergent

(2) Divergent

(3) 0

(4) None of these

139. Which one of the following is ***not*** a relational operator ?

(1) = =

(2) < =

(3) | |

(4) None of these

140. The order of convergence of Newton-Raphson iteration formula is :

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

141. ∇, Δ and E^{-1} are related as :

(1) $\Delta E^{-1} \equiv \nabla$

(2) $\Delta + E^{-1} \equiv \nabla$

(3) $-\Delta + E^{-1} \equiv \nabla$

(4) None of these

142. For a Poisson distribution, the recurrence formula is given by :

(1) $P(r+1) = \underline{|r}$

(2) $P(r+1) = \frac{m}{r+1} P(r)$

(3) $P(r+1) = mP(r)$

(4) None of these

143. Let T : U $\rightarrow$ V be a linear transformation. Then T is one-to-one, iff :

(1) $N(T) = \phi$

(2) $N(T) = \{\phi\}$

(3) $N(T) = \{0\}$

(4) None of these

144. The normalized vector corresponding to the vector (2, –3, 6) is :

(1) $\left(\frac{2}{-3}, \frac{-3}{6}, \frac{6}{2}\right)$ (2) $\left(\frac{6}{-3}, \frac{-3}{2}, \frac{2}{6}\right)$

(3) $\left(\frac{2}{7}, \frac{-3}{2}, \frac{6}{7}\right)$ (4) None of these

145. The only limit point of the set $S = \left\{\frac{1}{n}, n \in N\right\}$ is :

(1) 0 (2) 1

(3) ∞ (4) None of these

146. The series $\frac{\lfloor 1}{5} + \frac{\lfloor 2}{5^2} + \frac{\lfloor 3}{5^3} + \ldots\ldots$

(1) Doesn't exist (2) Is convergent

(3) Is divergent (4) None of these

147. The function $e^{\bar{z}}$ is :

(1) Analytic function

(2) Nowhere analytic

(3) Such that C-R conditions are satisfied

(4) None of these

148. If $f(x)$ is even function is (–L, L) and the Fourier Cosine series is $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \frac{\cos n\pi x}{L}$, then a_0 is given by :

(1) $\frac{2}{L}\int_0^L f(x)dx$ (2) $\int_0^L f(x)dx$ (3) $\int_0^{\infty} f(x)dx$ (4) $\int_0^{-L} f(x)dx$

149. Masses m_1 and m_2 are held at a distance 'd' apart. Distance of centre of mass from mass m_1 is :

(1) $\frac{m_1}{m_1+m_2}d$ (2) $\frac{m_2}{m_1+m_2}d$

(3) $\frac{m_1-m_2}{m_1+m_2}d$ (4) $\frac{m_2}{m_1}d$

150. Angular momentum of a particle rotating under a central force is constant due to :

(1) constant torque (2) constant force

(3) constant linear momentum (4) zero torque

151. The angle between the two vectors $-2\hat{i}+3\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}-4\hat{k}$ is :

(1) 0° (2) 90°

(3) 180° (4) None of these

152. The susceptibility of a diamagnetic substance :

(1) decreases with temperature

(2) does not vary with temperature

(3) increases with temperature

(4) first decreases and then increases

153. If S is stress and Y is Young's modulus of material of a wire, the energy stored per unit volume of wire is :

(1) $\frac{S}{2Y}$ (2) $\frac{2Y}{S^2}$

(3) $\frac{S^2}{2Y}$ (4) $2S^2Y$

154. At what temperature the molecules of nitrogen will have the same rms velocity as the molecules of oxygen at 127°C ?

(1) 77°C (2) 350°C

(3) 273°C (4) 457°C

155. The rest mass of an electron is m_0, when it moves with a velocity of 0.6 C, then its mass is :

(1) m_0 (2) $\frac{5}{4} m_0$ (3) $\frac{4}{5} m_0$ (4) $2 m_0$

156. The value of L, C and R in an LCR series circuit are 4mH, 40pF and 100Ω respectively. The quality factor of the circuit is :

(1) 10,000 (2) 100 (3) 1,000 (4) 10

157. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at $t = 0$. The time at which the energy is stored equally between the electric and magnetic fields is :

(1) $\frac{\pi}{4}\sqrt{LC}$ (2) $2\pi\sqrt{LC}$

(3) $\sqrt{LC}$ (4) $\pi\sqrt{LC}$

158. For detecting intensity of light we use :

(1) Photodiode in forward bias (2) Photodiode in reverse bias

(3) LED in forward bias (4) LED in reverse bias

159. When you make ice cubes, the entropy of water :

(1) does not change (2) increases

(3) decreases (4) first increases and then decreases

160. For a transformation that occurs in cooling, the Gibb's free energy per unit volume is :

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

161. In the study of co-axial system of lenses, the number of cardinal or Gauss point is :

(1) 6 (2) 5 (3) 4 (4) 3

162. In Young's double slit experiment, the seventh maximum with wavelength λ_1 is at distance d_1 and same maximum with wavelength λ_2 is at distance d_2. Then $\frac{d_1}{d_2}$ is :

(1) $\frac{\lambda_1}{\lambda_2}$ (2) $\frac{\lambda_2}{\lambda_1}$ (3) $\frac{\lambda_1^2}{\lambda_2^2}$ (4) $\frac{\lambda_2^2}{\lambda_1^2}$

163. The point in phase space is actually a cell whose minimum volume is of the order of :

(1) h (2) h^3 (3) h^2 (4) h^5

164. In Bose-Einstien statistics, the chemical potential is always :

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

165. If w is the thermodynamic probability of the state of the system then the entropy of the system is :

(1) kw
(2) k exp(w)
(3) k log (w)
(4) log (w/k)

166. A negative nuclear quadrupole moment indicates that nucleus is :

(1) prolate
(2) oblate
(3) spherical
(4) spheroidal

Total No. of Printed Pages : 29

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CPG-EE-2018 (Forensic Science)-(SET-X)

C

10363

Sr. No. .....

Time : **1½ Hours** Total Questions : **166** Max. Marks : **100**

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

Candidate's Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Exam : _____

_____ _____

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

SEAL

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

1. All questions of **Section-"A"** are ***compulsory***. Students are required to attempt either **Section "B"** or **Section "C"**. Students of *Medical Group* are required to attempt **Section "B"**. Students of *Non-Medical Group* are required to attempt **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/misbehaviour 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. 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.
4. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing ***within two hours*** after the test is over. No such complaint(s) will be entertained thereafter.
5. ***Use only blue or black ball point pen of good quality in the OMR Answer-Sheet.***
6. There will be ***negative*** marking. Each correct answer will be awarded ***one*** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
7. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after the start of examination.*

SECTION – A

1. The molecule which is IR inactive and Raman active is :

(1) Protein (2) HCl

(3) SO_2 (4) N_2

2. When 0.1 mole of glucose is dissolved in 10 mole of water, the vapour pressure of water is :

(1) Increased by 1% (2) Increased by 10%

(3) Decreased by 1% (4) Decreased by 10%

3. Fluorescence is an instantaneous process having the life time of :

(1) $10^{-2} s$ (2) $10^{-9} s$

(3) $100\ s$ (4) 1000 s

4. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

(1) 0.5 B (2) B

(3) 1.5 B (4) 2 B

(where B is rotational constant)

5. How many signals will be observed in the ^{1}HNMR spectrum of 1, 2, 2-tribromo-ethane and pure ethanol, respectively ?

(1) 2 and 2 (2) 3 and 3

(3) 3 and 2 (4) 2 and 3

6. CFSE for d^4 tetrahedral is :

(1) –4 Dq (2) –20 Dq (3) –8 Dq (4) –12 Dq

7. State the theory by which the reaction $6CaO + P_4O_{10} \rightarrow 2Ca_3(PO_4)_2$ is regarded as acid base reaction :

(1) Lewis Concept

(2) Bronsted Lowry Concept

(3) Lux-Flood Concept

(4) Is not a acid base reaction

8. Which symbiotic bacteria is capable of fixing N_2 ?

(1) Clostridium-pasteurianum

(2) Rhizobia

(3) Azobacter

(4) Nitrogenase

9. Mulliken symbol for spectroscopic term P in octahedral field is :

(1) A_{1g}

(2) T_{1g}

(3) T_{2g}

(4) E_g

10. The expected spin magnetic moment for Ni^{2+} ion is :

(1) 2.82 BM

(2) 1.73 BM

(3) 5.96 BM

(4) 3.87 BM

11. For the cell reaction $Fe(s)/Fe^{2+}(0.1\,M)||H^+(1M)|H_2(1\,atm)$, Pt. $E^\circ = 0.44\,V$. The cell emf is :

(1) 0.41 V

(2) 0.47 V

(3) 1.26 V

(4) 1.20 V

12. In an isothermal expansion of an ideal gas :

(1) $q = 0$

(2) $\Delta V = 0$

(3) $\Delta U = 0$

(4) $W = 0$

13. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

(1) $C-O$ (2) $C-N$

(3) $C-C$ (4) $C-H$

14. The end product in the following sequence is :

$$Phenol \xrightarrow{NaOH} A \xrightarrow[140°C]{CO_2} B \xrightarrow{H^+, H_2O} C \xrightarrow{(CH_3CO)_2O} D$$

(1) Aspirin (2) Salicylic acid

(3) Phenyl acetate (4) Salicyldehyde

15. The Cannizzaro's reaction is ***not*** given by :

(1) Trimethyl acetaldehyde (2) Acetaldehyde

(3) Benzaldehyde (4) Formaldehyde

16. The type of hybridization involved in the complex $[Ni(CN)_4]^{2-}$ is :

(1) d^2sp^2 (2) d^2sp^3

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

17. What will be the effect of adding KNH_2 to liquid NH_3 in respect of acidity ?

(1) Acidity will decrease (2) Acidity will increase

(3) Acidity will increase drastically (4) No effect on acidity

18. Which of the following is least basic ?

(1) $La(OH)_3$ (2) $Lu(OH)_3$

(3) $Ce(OH)_3$ (4) $Nd(OH)_3$

19. Which of the following will not give positive chromyl chloride test ?

(1) $CuCl_2$ (2) $ZnCl_2$

(3) $HgCl_2$ (4) $C_6H_5NH_3Cl$

20. The following data is known about the melting of a compound AB, $\Delta H = 9.2$ kJ mol^{-1}, $\Delta S = 0.008$ kJ K^{-1} mol^{-1}. Its melting point is :

(1) 736 K (2) 1050 K

(3) 1150 K (4) 1150°C

21. The critical temperature of water is higher than that of O_2 because the H_2O molecule has :

(1) fewer electrons than O_2 (2) two covalent bonds

(3) V-shape (4) dipole moment

22. The pH of blood is maintained by CO_2 and H_2CO_3 in the body and chemical constituents of blood. This phenomenon is called :

(1) Colloidal (2) Buffer action

(3) Acidity (4) Salt balance

23. What is the state of hybridization of carbon in Carbanion ?

(1) sp (2) sp^2

(3) sp^3 (4) sp^2d

24. Mesotartaric acid is optically inactive because of :

(1) Plane of symmetry (2) Two chiral or asymmetric carbon atoms

(3) External compensation (4) It is asymmetric

25. Chlorobenzene can be prepared by reacting aniline with :

(1) Zn and HCl

(2) Cuprous chloride

(3) Chlorine in presence of anhydrous $AlCl_3$

(4) Nitrous acid followed by heating with Cuprous chloride

26. Nineteenth electron of Cr-atom has which of the following sets of quantum numbers ?

(1) $n = 3, l = 0, m = 0, s = 1/2$ (2) $n = 3, l = 2, m = -2, s = 1/2$

(3) $n = 4, l = 0, m = 0, s = 1/2$ (4) $n = 4, l = 1, m = -1, s = 1/2$

27. Which of the following compound is expected to be coloured ?

(1) Ag_2SO_4 (2) CuF_2

(3) MgF_2 (4) $CuCl$

28. Which pair among the following is isostructural ?

(1) XeF_2, IF_2^- (2) NH_3, BF_3

(3) CO_3^{2-}, SO_3^{2-} (4) PCl_5, ICl_5

29. Which of the following ions does not contain S-S linkage ?

(1) $S_2O_3^{2-}$ (2) $S_2O_4^{2-}$ (3) $S_2O_6^{2-}$ (4) $S_2O_8^{2-}$

30. The term that accounts for intermolecular force in Vander Waal's equation for non ideal gas is :

(1) RT (2) $V - b$

(3) $\left(P + \frac{a}{V^2}\right)$ (4) $[RT]^{-1}$

31. Starch is composed of :

(1) Amylose and Glycogen

(2) Amylopectin and Glycogen

(3) Amylose and Amylopectin

(4) Glucose and Glycogen

32. Methyl lithium exists in the solid state as :

(1) Monomeric structure

(2) Dimeric structure

(3) Tetrameric structure

(4) Pentameric structure

33. Which of the following is ***not*** an α-amino acid ?

(1) Serine

(2) Aspartic acid

(3) Phenylalanine

(4) Thymine

34. Natural rubber is a polymer of :

(1) Isoprene

(2) Ethylene

(3) Acrylic acid

(4) 1, 4-butadiene

SECTION – B

35. Which of the following is involved in production of carboxy haemoglobin ?

(1) SO_2 (2) NO_2 (3) CO (4) NO_3

36. What is the minimum quantity of dissolved oxygen that should be present in the treated sewage ?

(1) 6ppm

(2) 4ppm

(3) 1ppm

(4) 10ppm

37. Which of the following indicates the correct order of the principal layers of the earth's atmosphere from top to bottom ?

(1) Troposphere - Stratosphere - Mesosphere - Thermosphere - Exosphere

(2) Thermosphere - Stratosphere - Troposphere - Mesosphere - Exosphere

(3) Exosphere - Thermosphere - Mesosphere - Stratosphere - Troposphere

(4) Exosphere - Mesosphere - Thermosphere - Stratosphere - Troposphere

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(1) Lartlet (2) Pai

(3) Mc Gregor (4) Fuhlrott

40. What term is used for a non-protein organic molecule that is required by some enzymes in order to catalyse a reaction on a substrate ?

(1) Cofactor (2) Prosthetic group

(3) Coenzyme (4) Modulator

41. Which pathway for aerobic cellular respiration is located in the cytoplasm of the cell ?

(1) Kreb cycle (2) Glycolysis

(3) Calvin cycle (4) Electron transport system

42. A segment of DNA that reads from the same forward and backward is called :

(1) Palindromic DNA (2) Plasmid DNA

(3) Complementary DNA (4) Copy DNA

43. RNaseH method and homopolymer tailing method generates blunt ended cDNA molecules. Which of the following can be used for attaching them to vector ?

(1) Blunt ended ligation

(2) Addition of linkers

(3) Using appropriate restriction enzymes

(4) All the methods can be used equivalently

44. If a gene is inactivated by gene targeting then it is called as :

(1) Knock-in gene

(2) Knock-out gene

(3) Gene disruption

(4) Insertional inactivation

45. In the growing oocyte, the nucleus enlarges in size due to an increase in :

(1) Proteins

(2) Nucleoplasm

(3) RNA

(4) DNA

46. During development of chick the fertilized egg is laid ..... hours after fertilization.

(1) 24

(2) 36

(3) 40

(4) 45

47. Superficial cleavage is found in :

(1) Amphibian

(2) Insects

(3) Mammals

(4) Protostomes showing spiral cleavage

48. Grey crescent is present in :

(1) Brain of rabbit

(2) Eye of frog

(3) Zygote of frog

(4) Retina of cockroach

49. What type of fruit is present in wheat ?

(1) Drupe
(2) Caryopsis
(3) Berries
(4) Catkin

50. The flax fibres are obtained from :

(1) *Linum usitatissimum*
(2) *Cocos nucifera*
(3) *Canabis sativa*
(4) *Crotalaria juncea*

51. To make transport fuel the bio ethanol is blended with ..... .

(1) Diesel
(2) Petrol
(3) Oil
(4) Kerosene

52. Which is the river basin with the largest catchment area ?

(1) Indus
(2) Godavari
(3) Krishna
(4) Ganga

53. Which of the following nutrients is ***not*** present in eggs ?

(1) Iron
(2) Riboflavin (vitamin B2)
(3) Vitamin C
(4) Vitamin A

54. Which of the following compounds is ***not*** an organic substance ?

(1) Pyrethrum
(2) Indane
(3) Rotenone
(4) Nicotine

55. An example of green algae occurring in colonial form is the organism :

(1) Oedogonium
(2) Volvox
(3) Chlamydomonas
(4) Spirogyra

56. The Phages that show lysogenic cycle are called :

(1) Temperate phages
(2) Lytic phases
(3) Virulent phages
(4) Quiescent phages

57. Which of the following belongs to Basidiomycetes ?

(1) *Fusarium*
(2) *Neurospora*
(3) *Agaricus*
(4) *Mucor*

58. Which of the following eukaryotic cell wall components are nitrogenous compounds ?

(1) Cellulose
(2) Chitin
(3) Lignin
(4) Glucans

59. Ribosomes are made up of :

(1) DNA and RNA
(2) DNA and protein
(3) RNA and protein
(4) Protein and lipid

60. Chromatin is made up of :

(1) DNA and protein
(2) RNA and DNA
(3) Protein and DNA
(4) DNA, RNA and Protein

61. Which of the following occurs in meiosis but not in mitosis ?

(1) Replication of DNA prior to the start of cell division

(2) Pairing of homologous chromosomes at the metaphase plate

(3) Attachment of spindle fibres to the kinetochore

(4) Separation of sister chromatids at anaphase

62. The most common chromosome abnormality in first trimester spontaneous miscarriages is :

(1) Monosomy (2) Trisomy (3) Tetrasomy (4) Triploidy

63. XY sex chromosome were discovered by :

(1) Nettil Stevans (2) M. J. D. White

(3) T. A. Brown (4) S. Sutton

64. Which of the following can cause mutations which contribute to development of cancers ?

(1) Chemicals in food (2) UV and ionising radiation

(3) Reactive oxygen species (4) All of these

65. Function of elaters is :

(1) To provide support (2) Spore dispersal

(3) Conduction of sap (4) Absorption of food

66. In Selaginella, an "organ suigeneris" is :

(1) Root (2) Rhizoid

(3) Rhizophore (4) Ligule

67. The Dihybrid test cross ratio is :

(1) 9 : 3 : 3 : 1 (2) 1 : 1 : 1 : 1

(3) 12 : 3 : 1 (4) 15 : 1

68. The gene which is suppressed from expressing its effect by the other gene is called :

(1) Complementary (2) Epistasis

(3) Hypostatic (4) Supplementary

69. The eukaryotic mRNA binding to the ribosomes is facilitated by :

(1) 7 -methyl guanosine cap
(2) T-RNA
(3) Poly-A tail
(4) Shine Dalgarno sequence

70. How many molecules of DNA are present in one chromosome ?

(1) One
(2) Two
(3) Four
(4) Multiple

71. Who discovered the blood group ?

(1) G. Mendel
(2) K. Landsteiner
(3) T. H. Morgan
(4) William Harvey

72. Which technique is used to detect gene expression ?

(1) DNA Foot printing
(2) DNA Fingerprinting
(3) Southern blotting
(4) Western blotting

73. *Entamoeba histolytica* causes :

(1) Typhoid
(2) Filiaria
(3) Dysentery
(4) None of the above

74. The excretory organs of earthworm are :

(1) Nephridia
(2) Green glands
(3) Solenocytes
(4) Kidneys

75. Endoskeleton of calcareous plates is found in :

(1) Cockroach
(2) Pila
(3) Starfish
(4) Earthworm

76. Which of the following is a good source of Sago starch ?

(1) *Cycas revoluta*
(2) *Cycas circinalis*
(3) *Ginkgo biloba*
(4) *Abies balsemea*

77. Angiosperms originated during :

(1) Lower Jurrassic
(2) Upper Cretaceous
(3) Carboniferous
(4) Mid Cretaceous

78. Which of the following Gymnosperm of Cycadeoidea was recovered from rajmahal hills by Prof. Birbal Sahni ?

(1) *Pentoxylon*
(2) *Williamsonia*
(3) *Genetum*
(4) *Heteroxylon*

79. The most important function of an inflorescence is to help in :

(1) Dispersal of seeds
(2) Release of pollen grains
(3) Attracting insects for cross pollination
(4) Forming large number of fruits

80. In Fabaceae stamens are :

(1) Monadelphous or Diadelphous
(2) Monadelphous
(3) Diadelphous
(4) Tetradynamous

81. The layer of meristematic cells at the tip of a plant root, which continually cuts off new cells to its outer edge is called :

(1) Tunica
(2) Procambium
(3) Calyptrogen
(4) Ground meristem

82. Identify the correct order of the components with reference to their arrangement from outer side to inner side in a woody dicot stem.

I. Secondary cortex
II. Autumn wood
III. Secondary phloem
IV. Phellem

The ***correct*** order is :

(1) III, IV, II, I
(2) IV, I, III, II
(3) II, III, I, IV
(4) I, II, IV, III

83. Which of the following pairs is suitable for critical study of secondary growth in plants ?

(1) Sugarcane and Sunflower
(2) Wheat and Maize
(3) Deodar and Fern
(4) Teak and Pine

84. Pneumatophores are a kind of modified root seen in mangroves and other plants seen in swampy environments. The main function of pneumatophores is :

(1) Respiration
(2) Photosynthesis
(3) Food storage
(4) No function

85. An embryo develop from a cell of an embryo sac other than egg is called :

(1) Parthenogenesis
(2) Parthenocarpy
(3) Apogamy
(4) Apospory

86. Which one of the following in birds indicates their reptilian ancestry ?

(1) Four-chambered heart
(2) Eggs with a calcareous shell
(3) Two special chambers crop and gizzard in their digestive tract
(4) Scales on their hind limbs

87. Skin of frog contains :

(1) Mucous gland
(2) Mucous and poison gland
(3) Poison gland
(4) Gland are absent

88. Poison glands of snakes are modified :

(1) Maxillary teeth
(2) Submaxillary teeth
(3) Sublingual glands
(4) Parotid glands

89. The largest mammalian order is :

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

90. In adult urochordate, the dorsal nerve cord of larva is changed into :

(1) Brain and spinal cord
(2) Ganglion
(3) Brain and nerve cord
(4) No change in nerve cord

91. Some of the enzymes, which are associated in converting fats into carbohydrates are present in :

(1) Golgi bodies
(2) Microsomes
(3) Liposomes
(4) Glyoxysomes

92. Which is phospholipid ?

(1) Sterol (2) Steroid (3) Lecithin (4) Cholesterol

93. Arthritis and osteoporosis are classified as :

(1) Disorders of vertebrae
(2) Disorders of bones
(3) Disorders of nervous system
(4) Disorders of cells

94. The walls of left ventricle are thicker than the walls of right ventricle because :

(1) It has to pump blood to the whole body

(2) Blood reaches this ventricle in huge amount

(3) It has to pump the blood to lungs

(4) Blood reaches this ventricle with extra pressure

95. Which of the following hormones is ***not*** released by the anterior pituitary ?

(1) Melanocyte-stimulating hormone (2) Growth hormone

(3) Gonadotropin-releasing hormone (4) Thyroid-stimulating hormone

96. Transpiration can be influenced by interfering with :

(1) Leaf epidermis (2) Atmospheric temperature

(3) Osmotic pressure (4) Guard cell

97. Favorable conditions for cyclic photophosphorylation are :

(1) Aerobic and optimum light (2) Aerobic condition only

(3) Aerobic and low light intensity (4) Anaerobic and low light intensity

98. Which of the following is natural cytokinin ?

(1) 6-aminopurine (2) 6-isopentenyl adenine

(3) Isopentenyl adenine (4) Zeatin

99. Which pigment detects the photoperiod and the presence of sunlight so as to regulate the life cycle and growth of a plant ?

(1) Chlorophyll (2) Phytochrome

(3) Xanthophyll (4) Carotenoids

100. Which of the following is pest of Sugarcane ?

(1) *Amrasca devastans*

(2) *Sitophilus oryzae*

(3) *Pyrilla perpusilla*

(4) *Tribolium castaneum*

SECTION – C

101. The value of L, C and R in an LCR series circuit are 4mH, 40pF and 100Ω respectively. The quality factor of the circuit is :

(1) 10,000

(2) 100

(3) 1,000

(4) 10

102. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at $t = 0$. The time at which the energy is stored equally between the electric and magnetic fields is :

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

103. For detecting intensity of light we use :

(1) Photodiode in forward bias

(2) Photodiode in reverse bias

(3) LED in forward bias

(4) LED in reverse bias

104. When you make ice cubes, the entropy of water :

(1) does not change

(2) increases

(3) decreases

(4) first increases and then decreases

105. For a transformation that occurs in cooling, the Gibb's free energy per unit volume is :

(1) positive

(2) negative

(3) zero

(4) infinite

106. In the study of co-axial system of lenses, the number of cardinal or Gauss point is :

(1) 6 (2) 5

(3) 4 (4) 3

107. In Young's double slit experiment, the seventh maximum with wavelength λ_1 is at distance d_1 and same maximum with wavelength λ_2 is at distance d_2. Then $\frac{d_1}{d_2}$ is :

(1) $\frac{\lambda_1}{\lambda_2}$ (2) $\frac{\lambda_2}{\lambda_1}$

(3) $\frac{\lambda_1^2}{\lambda_2^2}$ (4) $\frac{\lambda_2^2}{\lambda_1^2}$

108. The point in phase space is actually a cell whose minimum volume is of the order of :

(1) h (2) h^3

(3) h^2 (4) h^5

109. In Bose-Einstien statistics, the chemical potential is always :

(1) zero (2) positive

(3) infinite (4) negative

110. If w is the thermodynamic probability of the state of the system then the entropy of the system is :

(1) kw (2) k exp(w) (3) k log (w) (4) log (w/k)

111. In Fraunhoffer diffraction at a circular aperture, the condition for minimum intensity is that the path difference is equal to integral multiple of :

(1) λ (2) 2λ (3) $\frac{\lambda}{2}$ (4) $\frac{\lambda}{3}$

112. In Newton's rings, the radii of the rings vary as :

(1) square of natural numbers

(2) square root of natural numbers

(3) cube of natural numbers

(4) fourth power of natural numbers

113. An ink dot is marked on a piece of paper and a calcite crystal is placed over this dot on the paper. How many images will be observed ?

(1) Five

(2) Three

(3) Two

(4) Four

114. The atomic radius of bcc lattice is :

(1) $\frac{a}{2}$

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

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

(4) $\frac{a}{2\sqrt{2}}$

115. A crystallographic plane has the intercepts 1 along a, 2 along b and 3 along c. A parallel plane of this plane will have Miller indices :

(1) (1 2 3)

(2) (2 4 6)

(3) (3 2 1)

(4) (6 3 2)

116. If x-rays of wavelength 2Å are detected at an angle of 30° in the first order, then the spacing between the adjacent planes of the crystal would be :

(1) 2.0 Å

(2) 3.7 Å

(3) 4.3Å

(4) 4.9 Å

117. The packing factor of diamond cubic crystal structure is :

(1) 34%

(2) 54%

(3) 64%

(4) 74%

118. The group velocity of matter waves is :

(1) less than particle velocity

(2) greater than particle velocity

(3) equal to the particle velocity

(4) same as phase velocity

119. The operator associated with total energy is :

(1) $i\hbar\frac{\partial}{\partial t}$

(2) $-\frac{\hbar^2}{2m}\nabla^2 + U$

(3) Hamiltonian operator

(4) All of these

120. Heisenberg's uncertainty principle does not hold for the following pairs :

(1) energy and time

(2) position and linear momentum

(3) angular momentum and angle

(4) linear momentum and angle

121. A spectral line emitted by the excited atoms is split up into a doublet or triplet when the emitting atoms are placed in a magnetic field. The effect of the splitting of a spectral line under the action of magnetic field is known as :

(1) Raman effect

(2) Zeeman effect

(3) Spectra effect

(4) Compton effect

122. Which one of the series of hydrogen spectrum is in the visible region ?

(1) Lyman series

(2) Balmer series

(3) Paschen series

(4) Brackett series

123. The function of He atoms in the He-Ne laser is :

(1) to quench the neon atoms

(2) to provide energy to neon atoms

(3) to make neon atoms inactive

(4) none of the above

124. Two nuclei have their mass numbers in the ratio of 1 : 3. The ratio of their nuclear densities would be :

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

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

125. The energy released in a typical nuclear fusion reactor is approximately :

(1) 25 MeV (2) 200 MeV

(3) 800 MeV (4) 1025 MeV

126. The asymptotes of the curve $xy\left(x^2-y^2\right)+25y^2+8x^2-144=0$ are :

(1) $x=0, y=0, x=y, x=-y$ (2) $x=1, y=0, x=\frac{y}{2}, x=y$

(3) $x=-1, y=1, x=y, x=-y$ (4) None of these

127. $\int_0^{\pi/2} \sin^6\theta \, d\theta$ is equal to :

(1) $\frac{32}{35}$ (2) $\frac{35}{32}$ (3) $\frac{64}{35}$ (4) $\frac{35}{64}$

128. If $\vec{f}=z\hat{i}+x\hat{j}+y\hat{k}$, then curl curl $\vec{f}$ is equal to :

(1) $\vec{0}$ (2) $\hat{i}$ (3) $\hat{k}$ (4) $\hat{j}$

129. Particular Integral of the differential equation $\left(D^3-3D^2D'+4D'^3\right)z=e^{x+2y}$ is given by :

(1) $\frac{e^{x+2y}}{4}$ (2) $\frac{e^{x+2y}}{27}$

(3) $\frac{e^{x+2y}}{24}$ (4) $\frac{e^{x+2y}}{20}$

130. The partial differential equation r – 2s – 8t = 0 is :

(1) Parabolic

(2) Hyperbolic

(3) Elliptic

(4) None of these

131. Laplace transform of $e^{-at}\sinh bt$ is equal to :

(1) $\frac{b}{s}$

(2) $\frac{b+s}{s}$

(3) $\frac{b}{(s+a)^2}$

(4) None of these

132. Hermite polynomial $H_2(x)$ is given by :

(1) $2-4x^2$

(2) $\frac{x^2}{2}$

(3) $4x^2-2$

(4) 0

133. "If three coplanar forces acting at a point are in equilibrium, then each is proportional to the sine of the angle between the other two" is the statement of :

(1) Triangle Law

(2) Lami's theorem

(3) Parallelogram Law

(4) None of these

134. Kinetic energy of a particle of mass m moving with a velocity v is given by :

(1) $\frac{v^2}{2}$

(2) $\frac{2v^2}{m}$

(3) $\frac{m}{2v^2}$

(4) $\frac{1}{2}mv^2$

135. Time of flight of a projectile is given by :

(1) $\frac{2u\sin\alpha}{g}$ (2) $\frac{u}{2g\sin\alpha}$

(3) $\frac{g\sin\alpha}{2u}$ (4) $\frac{2gu}{\sin\alpha}$

136. If $a^2 = a$, a belongs to group (G, .), then :

(1) $a = -e$ (2) $a = \frac{e}{2}$

(3) $a = e$ (4) $a \neq \frac{e}{4}$

137. Let S be an ideal of a ring R, then S is said to be nilpotent if for some positive integer n :

(1) $S^n = \phi$ (2) $S^n = <0>$

(3) $S^n = <\phi>$ (4) None of these

138. The rank of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is :

(1) 0 (2) 3

(3) 1 (4) 2

139. If roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P. then one of the root is :

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

140. The conic $8x^2 - 24xy + 15y^2 + 48x - 48y = 0$ represents a :

(1) Circle (2) Ellipse

(3) Parabola (4) Hyperbola

141. If $(a, b) = d$, then $\left(\frac{a}{d}, \frac{b}{d}\right)$ is equal to :

(1) 0

(2) 3

(3) 1

(4) None of these

142. The principal value of Log (–5) is :

(1) log 5

(2) log 5 + πi

(3) πi

(4) 0

143. The integrating factor for the differential equation $x^2 y dx - \left(x^3 + y^3\right) dy = 0$ to become exact is :

(1) $\frac{-1}{y^4}$

(2) $\frac{1}{y^4}$

(3) $\frac{2}{y^4}$

(4) $\frac{-2}{y^4}$

144. The particular integral for the differential equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{3x}$ is given by :

(1) $\frac{x}{2}e^{3x}$

(2) xe^{3x}

(3) x^2e^{3x}

(4) $\frac{x^2}{2}e^{3x}$

145. If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, then $x\frac{\partial u}{\partial y} + y\frac{\partial u}{\partial y}$ is equal to :

(1) sin u

(2) cos u

(3) tan u

(4) cot u

146. $\lim_{x \to 0^+} \left(\frac{1}{x} - \text{cosec} x \right)$ is given by :

(1) 0 (2) 1 (3) $\frac{1}{2}$ (4) 2

147. The diameter of an empty set is :

(1) 2 (2) 0

(3) 1 (4) None of these

148. The improper integral $\int_0^1 \frac{dx}{x^2}$ is :

(1) Convergent (2) Divergent (3) 0 (4) None of these

149. Which one of the following is ***not*** a relational operator ?

(1) = = (2) < =

(3) | | (4) None of these

150. The order of convergence of Newton-Raphson iteration formula is :

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

151. ∇, Δ and E^{-1} are related as :

(1) $\Delta E^{-1} \equiv \nabla$ (2) $\Delta + E^{-1} \equiv \nabla$

(3) $-\Delta + E^{-1} \equiv \nabla$ (4) None of these

152. For a Poisson distribution, the recurrence formula is given by :

(1) $P(r+1) = \lfloor r$ (2) $P(r+1) = \frac{m}{r+1} P(r)$

(3) $P(r+1) = mP(r)$ (4) None of these

153. Let T : U → V be a linear transformation. Then T is one-to-one, iff :

(1) $N(T) = \phi$

(2) $N(T) = \{\phi\}$

(3) $N(T) = \{0\}$

(4) None of these

154. The normalized vector corresponding to the vector (2, –3, 6) is :

(1) $\left(\frac{2}{-3}, \frac{-3}{6}, \frac{6}{2}\right)$

(2) $\left(\frac{6}{-3}, \frac{-3}{2}, \frac{2}{6}\right)$

(3) $\left(\frac{2}{7}, \frac{-3}{2}, \frac{6}{7}\right)$

(4) None of these

155. The only limit point of the set $S = \left\{\frac{1}{n}, n \in N\right\}$ is :

(1) 0

(2) 1

(3) ∞

(4) None of these

156. The series $\frac{\lfloor 1}{5} + \frac{\lfloor 2}{5^2} + \frac{\lfloor 3}{5^3} + \ldots\ldots$

(1) Doesn't exist

(2) Is convergent

(3) Is divergent

(4) None of these

157. The function $e^{\bar{z}}$ is :

(1) Analytic function

(2) Nowhere analytic

(3) Such that C-R conditions are satisfied

(4) None of these

158. If $f(x)$ is even function is (–L, L) and the Fourier Cosine series is $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \frac{\cos n\pi x}{L}$, then a_0 is given by :

(1) $\frac{2}{L}\int_0^L f(x)dx$ (2) $\int_0^L f(x)dx$ (3) $\int_0^{\infty} f(x)dx$ (4) $\int_0^{-L} f(x)dx$

159. Masses m_1 and m_2 are held at a distance 'd' apart. Distance of centre of mass from mass m_1 is :

(1) $\frac{m_1}{m_1+m_2}d$ (2) $\frac{m_2}{m_1+m_2}d$

(3) $\frac{m_1-m_2}{m_1+m_2}d$ (4) $\frac{m_2}{m_1}d$

160. Angular momentum of a particle rotating under a central force is constant due to :

(1) constant torque (2) constant force

(3) constant linear momentum (4) zero torque

161. The angle between the two vectors $-2\hat{i}+3\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}-4\hat{k}$ is :

(1) 0° (2) 90°

(3) 180° (4) None of these

162. The susceptibility of a diamagnetic substance :

(1) decreases with temperature

(2) does not vary with temperature

(3) increases with temperature

(4) first decreases and then increases

163. If S is stress and Y is Young's modulus of material of a wire, the energy stored per unit volume of wire is :

(1) $\frac{S}{2Y}$ (2) $\frac{2Y}{S^2}$

(3) $\frac{S^2}{2Y}$ (4) $2S^2Y$

164. At what temperature the molecules of nitrogen will have the same rms velocity as the molecules of oxygen at 127°C ?

(1) 77°C (2) 350°C

(3) 273°C (4) 457°C

165. The rest mass of an electron is m_0, when it moves with a velocity of 0.6 C, then its mass is :

(1) m_0 (2) $\frac{5}{4} m_0$

(3) $\frac{4}{5} m_0$ (4) $2 m_0$

166. A negative nuclear quadrupole moment indicates that nucleus is :

(1) prolate (2) oblate

(3) spherical (4) spheroidal

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CPG-EE-2018 (Forensic Science)-(SET-X)

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10376

Sr. No. .....

Time : **1½ Hours** Total Questions : **166** Max. Marks : **100**

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4. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing ***within two hours*** after the test is over. No such complaint(s) will be entertained thereafter.
5. ***Use only blue or black ball point pen of good quality in the OMR Answer-Sheet.***
6. There will be ***negative*** marking. Each correct answer will be awarded ***one*** full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
7. *Before answering the questions, the candidates should ensure that they have been supplied correct & complete question booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after the start of examination.*

SECTION – A

1. CFSE for d^4 tetrahedral is :

   (1) –4 Dq (2) –20 Dq

   (3) –8 Dq (4) –12 Dq

2. State the theory by which the reaction $6CaO + P_4O_{10} \rightarrow 2Ca_3(PO_4)_2$ is regarded as acid base reaction :

   (1) Lewis Concept (2) Bronsted Lowry Concept

   (3) Lux-Flood Concept (4) Is not a acid base reaction

3. Which symbiotic bacteria is capable of fixing N_2 ?

   (1) Clostridium-pasteurianum (2) Rhizobia

   (3) Azobacter (4) Nitrogenase

4. Mulliken symbol for spectroscopic term P in octahedral field is :

   (1) A_{1g} (2) T_{1g}

   (3) T_{2g} (4) E_g

5. The expected spin magnetic moment for Ni^{2+} ion is :

   (1) 2.82 BM (2) 1.73 BM

   (3) 5.96 BM (4) 3.87 BM

6. Nineteenth electron of Cr-atom has which of the following sets of quantum numbers ?

   (1) $n = 3, l = 0, m = 0, s = 1/2$ (2) $n = 3, l = 2, m = -2, s = 1/2$

   (3) $n = 4, l = 0, m = 0, s = 1/2$ (4) $n = 4, l = 1, m = -1, s = 1/2$

7. Which of the following compound is expected to be coloured ?

(1) Ag_2SO_4 (2) CuF_2

(3) MgF_2 (4) $CuCl$

8. Which pair among the following is isostructural ?

(1) XeF_2, IF_2^- (2) NH_3, BF_3

(3) CO_3^{2-}, SO_3^{2-} (4) PCl_5, ICl_5

9. Which of the following ions does not contain S-S linkage ?

(1) $S_2O_3^{2-}$ (2) $S_2O_4^{2-}$ (3) $S_2O_6^{2-}$ (4) $S_2O_8^{2-}$

10. The term that accounts for intermolecular force in Vander Waal's equation for non ideal gas is :

(1) RT (2) $V - b$

(3) $\left(P + \frac{a}{V^2}\right)$ (4) $[RT]^{-1}$

11. The critical temperature of water is higher than that of O_2 because the H_2O molecule has :

(1) fewer electrons than O_2 (2) two covalent bonds

(3) V-shape (4) dipole moment

12. The pH of blood is maintained by CO_2 and H_2CO_3 in the body and chemical constituents of blood. This phenomenon is called :

(1) Colloidal (2) Buffer action

(3) Acidity (4) Salt balance

13. What is the state of hybridization of carbon in Carbanion ?

(1) sp (2) sp^2

(3) sp^3 (4) sp^2d

14. Mesotartaric acid is optically inactive because of :

(1) Plane of symmetry (2) Two chiral or asymmetric carbon atoms

(3) External compensation (4) It is asymmetric

15. Chlorobenzene can be prepared by reacting aniline with :

(1) Zn and HCl

(2) Cuprous chloride

(3) Chlorine in presence of anhydrous $AlCl_3$

(4) Nitrous acid followed by heating with Cuprous chloride

16. The molecule which is IR inactive and Raman active is :

(1) Protein (2) HCl

(3) SO_2 (4) N_2

17. When 0.1 mole of glucose is dissolved in 10 mole of water, the vapour pressure of water is :

(1) Increased by 1% (2) Increased by 10%

(3) Decreased by 1% (4) Decreased by 10%

18. Fluorescence is an instantaneous process having the life time of :

(1) $10^{-2}s$ (2) $10^{-9}s$

(3) $100\ s$ (4) 1000 s

19. The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to :

(1) 0.5 B (2) B

(3) 1.5 B (4) 2 B

(where B is rotational constant)

20. How many signals will be observed in the ^{1}HNMR spectrum of 1, 2, 2-tribromo-ethane and pure ethanol, respectively ?

(1) 2 and 2 (2) 3 and 3

(3) 3 and 2 (4) 2 and 3

21. For the cell reaction $Fe(s)/Fe^{2+}(0.1\,M)||H^+(1M)|H_2(1\,atm)$, Pt. $E^\circ = 0.44\,V$. The cell emf is :

(1) 0.41 V (2) 0.47 V (3) 1.26 V (4) 1.20 V

22. In an isothermal expansion of an ideal gas :

(1) $q = 0$ (2) $\Delta V = 0$ (3) $\Delta U = 0$ (4) $W = 0$

23. Which of the following bond in a molecule will have relatively more stretching frequency in IR spectrum ?

(1) $C-O$ (2) $C-N$ (3) $C-C$ (4) $C-H$

24. The end product in the following sequence is :

$$Phenol \xrightarrow{NaOH} A \xrightarrow[140^\circ C]{CO_2} B \xrightarrow{H^+, H_2O} C \xrightarrow{(CH_3CO)_2O} D$$

(1) Aspirin (2) Salicylic acid

(3) Phenyl acetate (4) Salicyldehyde

25. The Cannizzaro's reaction is ***not*** given by :

(1) Trimethyl acetaldehyde (2) Acetaldehyde

(3) Benzaldehyde (4) Formaldehyde

26. The type of hybridization involved in the complex $[Ni(CN)_4]^{2-}$ is :

(1) d^2sp^2 (2) d^2sp^3

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

27. What will be the effect of adding KNH_2 to liquid NH_3 in respect of acidity ?

(1) Acidity will decrease (2) Acidity will increase

(3) Acidity will increase drastically (4) No effect on acidity

28. Which of the following is least basic ?

(1) $La(OH)_3$ (2) $Lu(OH)_3$

(3) $Ce(OH)_3$ (4) $Nd(OH)_3$

29. Which of the following will not give positive chromyl chloride test ?

(1) $CuCl_2$ (2) $ZnCl_2$

(3) $HgCl_2$ (4) $C_6H_5NH_3Cl$

30. The following data is known about the melting of a compound AB, $\Delta H = 9.2$ kJ mol^{-1}, $\Delta S = 0.008$ kJ K^{-1} mol^{-1}. Its melting point is :

(1) 736 K (2) 1050 K (3) 1150 K (4) 1150°C

31. Starch is composed of :

(1) Amylose and Glycogen (2) Amylopectin and Glycogen

(3) Amylose and Amylopectin (4) Glucose and Glycogen

32. Methyl lithium exists in the solid state as :

(1) Monomeric structure
(2) Dimeric structure
(3) Tetrameric structure
(4) Pentameric structure

33. Which of the following is ***not*** an α-amino acid ?

(1) Serine
(2) Aspartic acid
(3) Phenylalanine
(4) Thymine

34. Natural rubber is a polymer of :

(1) Isoprene
(2) Ethylene
(3) Acrylic acid
(4) 1, 4-butadiene

SECTION – B

35. In adult urochordate, the dorsal nerve cord of larva is changed into :

(1) Brain and spinal cord
(2) Ganglion
(3) Brain and nerve cord
(4) No change in nerve cord

36. Some of the enzymes, which are associated in converting fats into carbohydrates are present in :

(1) Golgi bodies
(2) Microsomes
(3) Liposomes
(4) Glyoxysomes

37. Which is phospholipid ?

(1) Sterol
(2) Steroid
(3) Lecithin
(4) Cholesterol

38. Arthritis and osteoporosis are classified as :

(1) Disorders of vertebrae
(2) Disorders of bones
(3) Disorders of nervous system
(4) Disorders of cells

39. The walls of left ventricle are thicker than the walls of right ventricle because :

(1) It has to pump blood to the whole body
(2) Blood reaches this ventricle in huge amount
(3) It has to pump the blood to lungs
(4) Blood reaches this ventricle with extra pressure

40. Which of the following hormones is ***not*** released by the anterior pituitary ?

(1) Melanocyte-stimulating hormone
(2) Growth hormone
(3) Gonadotropin-releasing hormone
(4) Thyroid-stimulating hormone

41. Transpiration can be influenced by interfering with :

(1) Leaf epidermis
(2) Atmospheric temperature
(3) Osmotic pressure
(4) Guard cell

42. Favorable conditions for cyclic photophosphorylation are :

(1) Aerobic and optimum light
(2) Aerobic condition only
(3) Aerobic and low light intensity
(4) Anaerobic and low light intensity

43. Which of the following is natural cytokinin ?

(1) 6-aminopurine
(2) 6-isopentenyl adenine
(3) Isopentenyl adenine
(4) Zeatin

44. Which pigment detects the photoperiod and the presence of sunlight so as to regulate the life cycle and growth of a plant ?

(1) Chlorophyll
(2) Phytochrome
(3) Xanthophyll
(4) Carotenoids

45. Which of the following is involved in production of carboxy haemoglobin ?

(1) SO_2 (2) NO_2 (3) CO (4) NO_3

46. What is the minimum quantity of dissolved oxygen that should be present in the treated sewage ?

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

47. Which of the following indicates the correct order of the principal layers of the earth's atmosphere from top to bottom ?

(1) Troposphere - Stratosphere - Mesosphere - Thermosphere - Exosphere
(2) Thermosphere - Stratosphere - Troposphere - Mesosphere - Exosphere
(3) Exosphere - Thermosphere - Mesosphere - Stratosphere - Troposphere
(4) Exosphere - Mesosphere - Thermosphere - Stratosphere - Troposphere

48. The evolution of a species is based upon sum total of adaptive changes preserved by :

(1) Natural selection
(2) Isolation
(3) Speciation
(4) Human conservation

49. Fossil of neanderthal man was discovered by :

(1) Lartlet
(2) Pai
(3) Mc Gregor
(4) Fuhlrott

50. What term is used for a non-protein organic molecule that is required by some enzymes in order to catalyse a reaction on a substrate ?

(1) Cofactor
(2) Prosthetic group
(3) Coenzyme
(4) Modulator

51. Which pathway for aerobic cellular respiration is located in the cytoplasm of the cell ?

(1) Kreb cycle
(2) Glycolysis
(3) Calvin cycle
(4) Electron transport system

52. A segment of DNA that reads from the same forward and backward is called :

(1) Palindromic DNA
(2) Plasmid DNA
(3) Complementary DNA
(4) Copy DNA

53. RNaseH method and homopolymer tailing method generates blunt ended cDNA molecules. Which of the following can be used for attaching them to vector ?

(1) Blunt ended ligation
(2) Addition of linkers
(3) Using appropriate restriction enzymes
(4) All the methods can be used equivalently

54. If a gene is inactivated by gene targeting then it is called as :

(1) Knock-in gene
(2) Knock-out gene
(3) Gene disruption
(4) Insertional inactivation

55. In the growing oocyte, the nucleus enlarges in size due to an increase in :

(1) Proteins
(2) Nucleoplasm
(3) RNA
(4) DNA

56. During development of chick the fertilized egg is laid ..... hours after fertilization.

(1) 24
(2) 36
(3) 40
(4) 45

57. Superficial cleavage is found in :

(1) Amphibian
(2) Insects
(3) Mammals
(4) Protostomes showing spiral cleavage

58. Grey crescent is present in :

(1) Brain of rabbit
(2) Eye of frog
(3) Zygote of frog
(4) Retina of cockroach

59. What type of fruit is present in wheat ?

(1) Drupe
(2) Caryopsis
(3) Berries
(4) Catkin

60. The flax fibres are obtained from :

(1) *Linum usitatissimum*
(2) *Cocos nucifera*
(3) *Canabis sativa*
(4) *Crotalaria juncea*

61. To make transport fuel the bio ethanol is blended with ..... .

(1) Diesel
(2) Petrol
(3) Oil
(4) Kerosene

62. Which is the river basin with the largest catchment area ?

(1) Indus
(2) Godavari
(3) Krishna
(4) Ganga

63. Which of the following nutrients is ***not*** present in eggs ?

(1) Iron
(2) Riboflavin (vitamin B2)
(3) Vitamin C
(4) Vitamin A

64. Which of the following compounds is ***not*** an organic substance ?

(1) Pyrethrum
(2) Indane
(3) Rotenone
(4) Nicotine

65. An example of green algae occurring in colonial form is the organism :

(1) Oedogonium
(2) Volvox
(3) Chlamydomonas
(4) Spirogyra

66. The Phages that show lysogenic cycle are called :

(1) Temperate phages
(2) Lytic phases
(3) Virulent phages
(4) Quiescent phages

67. Which of the following belongs to Basidiomycetes ?

(1) *Fusarium*
(2) *Neurospora*
(3) *Agaricus*
(4) *Mucor*

68. Which of the following eukaryotic cell wall components are nitrogenous compounds ?

(1) Cellulose
(2) Chitin
(3) Lignin
(4) Glucans

69. Ribosomes are made up of :

(1) DNA and RNA
(2) DNA and protein
(3) RNA and protein
(4) Protein and lipid

70. Chromatin is made up of :

(1) DNA and protein

(2) RNA and DNA

(3) Protein and DNA

(4) DNA, RNA and Protein

71. Which of the following occurs in meiosis but not in mitosis ?

(1) Replication of DNA prior to the start of cell division

(2) Pairing of homologous chromosomes at the metaphase plate

(3) Attachment of spindle fibres to the kinetochore

(4) Separation of sister chromatids at anaphase

72. The most common chromosome abnormality in first trimester spontaneous miscarriages is :

(1) Monosomy

(2) Trisomy

(3) Tetrasomy

(4) Triploidy

73. XY sex chromosome were discovered by :

(1) Nettil Stevans

(2) M. J. D. White

(3) T. A. Brown

(4) S. Sutton

74. Which of the following can cause mutations which contribute to development of cancers ?

(1) Chemicals in food

(2) UV and ionising radiation

(3) Reactive oxygen species

(4) All of these

75. Function of elaters is :

(1) To provide support

(2) Spore dispersal

(3) Conduction of sap

(4) Absorption of food

76. In Selaginella, an "organ suigeneris" is :

(1) Root
(2) Rhizoid
(3) Rhizophore
(4) Ligule

77. The Dihybrid test cross ratio is :

(1) 9 : 3 : 3 : 1
(2) 1 : 1 : 1 : 1
(3) 12 : 3 : 1
(4) 15 : 1

78. The gene which is suppressed from expressing its effect by the other gene is called :

(1) Complementary
(2) Epistasis
(3) Hypostatic
(4) Supplementary

79. The eukaryotic mRNA binding to the ribosomes is facilitated by :

(1) 7 -methyl guanosine cap
(2) T-RNA
(3) Poly-A tail
(4) Shine Dalgarno sequence

80. How many molecules of DNA are present in one chromosome ?

(1) One
(2) Two
(3) Four
(4) Multiple

81. Who discovered the blood group ?

(1) G. Mendel
(2) K. Landsteiner
(3) T. H. Morgan
(4) William Harvey

82. Which technique is used to detect gene expression ?

(1) DNA Foot printing
(2) DNA Fingerprinting
(3) Southern blotting
(4) Western blotting

83. *Entamoeba histolytica* causes :

(1) Typhoid (2) Filiaria (3) Dysentery (4) None of the above

84. The excretory organs of earthworm are :

(1) Nephridia (2) Green glands

(3) Solenocytes (4) Kidneys

85. Endoskeleton of calcareous plates is found in :

(1) Cockroach (2) Pila

(3) Starfish (4) Earthworm

86. Which of the following is a good source of Sago starch ?

(1) *Cycas revoluta* (2) *Cycas circinalis*

(3) *Ginkgo biloba* (4) *Abies balsemea*

87. Angiosperms originated during :

(1) Lower Jurrassic (2) Upper Cretaceous

(3) Carboniferous (4) Mid Cretaceous

88. Which of the following Gymnosperm of Cycadeoidea was recovered from rajmahal hills by Prof. Birbal Sahni ?

(1) *Pentoxylon* (2) *Williamsonia* (3) *Genetum* (4) *Heteroxylon*

89. The most important function of an inflorescence is to help in :

(1) Dispersal of seeds

(2) Release of pollen grains

(3) Attracting insects for cross pollination

(4) Forming large number of fruits

90. In Fabaceae stamens are :

(1) Monadelphous or Diadelphous (2) Monadelphous

(3) Diadelphous (4) Tetradynamous

91. The layer of meristematic cells at the tip of a plant root, which continually cuts off new cells to its outer edge is called :

(1) Tunica (2) Procambium

(3) Calyptrogen (4) Ground meristem

92. Identify the correct order of the components with reference to their arrangement from outer side to inner side in a woody dicot stem.

I. Secondary cortex II. Autumn wood

III. Secondary phloem IV. Phellem

The ***correct*** order is :

(1) III, IV, II, I (2) IV, I, III, II

(3) II, III, I, IV (4) I, II, IV, III

93. Which of the following pairs is suitable for critical study of secondary growth in plants ?

(1) Sugarcane and Sunflower (2) Wheat and Maize

(3) Deodar and Fern (4) Teak and Pine

94. Pneumatophores are a kind of modified root seen in mangroves and other plants seen in swampy environments. The main function of pneumatophores is :

(1) Respiration (2) Photosynthesis

(3) Food storage (4) No function

95. An embryo develop from a cell of an embryo sac other than egg is called :

(1) Parthenogenesis

(2) Parthenocarpy

(3) Apogamy

(4) Apospory

96. Which one of the following in birds indicates their reptilian ancestry ?

(1) Four-chambered heart

(2) Eggs with a calcareous shell

(3) Two special chambers crop and gizzard in their digestive tract

(4) Scales on their hind limbs

97. Skin of frog contains :

(1) Mucous gland

(2) Mucous and poison gland

(3) Poison gland

(4) Gland are absent

98. Poison glands of snakes are modified :

(1) Maxillary teeth

(2) Submaxillary teeth

(3) Sublingual glands

(4) Parotid glands

99. The largest mammalian order is :

(1) Rodentia

(2) Carnivora

(3) Chiroptera

(4) Primates

100. Which of the following is pest of Sugarcane ?

(1) *Amrasca devastans*

(2) *Sitophilus oryzae*

(3) *Pyrilla perpusilla*

(4) *Tribolium castaneum*

SECTION – C

101. The series $\frac{\lfloor 1}{5}+\frac{\lfloor 2}{5^2}+\frac{\lfloor 3}{5^3}+\ldots\ldots$

(1) Doesn't exist
(2) Is convergent
(3) Is divergent
(4) None of these

102. The function $e^{\bar{z}}$ is :

(1) Analytic function
(2) Nowhere analytic
(3) Such that C-R conditions are satisfied
(4) None of these

103. If $f(x)$ is even function is (–L, L) and the Fourier Cosine series is $f(x)=\frac{a_0}{2}+\sum_{n=1}^{\infty}a_n\frac{\cos n\pi x}{L}$, then a_0 is given by :

(1) $\frac{2}{L}\int_0^L f(x)dx$ (2) $\int_0^L f(x)dx$ (3) $\int_0^{\infty} f(x)dx$ (4) $\int_0^{-L} f(x)dx$

104. Masses m_1 and m_2 are held at a distance 'd' apart. Distance of centre of mass from mass m_1 is :

(1) $\frac{m_1}{m_1+m_2}d$ (2) $\frac{m_2}{m_1+m_2}d$ (3) $\frac{m_1-m_2}{m_1+m_2}d$ (4) $\frac{m_2}{m_1}d$

105. Angular momentum of a particle rotating under a central force is constant due to :

(1) constant torque
(2) constant force
(3) constant linear momentum
(4) zero torque

106. The angle between the two vectors $-2\hat{i}+3\hat{j}+\hat{k}$ and $\hat{i}+2\hat{j}-4\hat{k}$ is :

(1) 0°

(2) 90°

(3) 180°

(4) None of these

107. The susceptibility of a diamagnetic substance :

(1) decreases with temperature

(2) does not vary with temperature

(3) increases with temperature

(4) first decreases and then increases

108. If S is stress and Y is Young's modulus of material of a wire, the energy stored per unit volume of wire is :

(1) $\frac{S}{2Y}$

(2) $\frac{2Y}{S^2}$

(3) $\frac{S^2}{2Y}$

(4) $2S^2Y$

109. At what temperature the molecules of nitrogen will have the same rms velocity as the molecules of oxygen at 127°C ?

(1) 77°C

(2) 350°C

(3) 273°C

(4) 457°C

110. The rest mass of an electron is m_0, when it moves with a velocity of 0.6 C, then its mass is :

(1) m_0

(2) $\frac{5}{4}m_0$

(3) $\frac{4}{5}m_0$

(4) $2m_0$

111. The value of L, C and R in an LCR series circuit are 4mH, 40pF and 100Ω respectively. The quality factor of the circuit is :

(1) 10,000 (2) 100

(3) 1,000 (4) 10

112. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at $t = 0$. The time at which the energy is stored equally between the electric and magnetic fields is :

(1) $\frac{\pi}{4}\sqrt{LC}$ (2) $2\pi\sqrt{LC}$

(3) $\sqrt{LC}$ (4) $\pi\sqrt{LC}$

113. For detecting intensity of light we use :

(1) Photodiode in forward bias (2) Photodiode in reverse bias

(3) LED in forward bias (4) LED in reverse bias

114. When you make ice cubes, the entropy of water :

(1) does not change (2) increases

(3) decreases (4) first increases and then decreases

115. For a transformation that occurs in cooling, the Gibb's free energy per unit volume is :

(1) positive (2) negative

(3) zero (4) infinite

116. In the study of co-axial system of lenses, the number of cardinal or Gauss point is :

(1) 6 (2) 5

(3) 4 (4) 3

117. In Young's double slit experiment, the seventh maximum with wavelength λ_1 is at distance d_1 and same maximum with wavelength λ_2 is at distance d_2. Then $\frac{d_1}{d_2}$ is :

(1) $\frac{\lambda_1}{\lambda_2}$ (2) $\frac{\lambda_2}{\lambda_1}$

(3) $\frac{\lambda_1^2}{\lambda_2^2}$ (4) $\frac{\lambda_2^2}{\lambda_1^2}$

118. The point in phase space is actually a cell whose minimum volume is of the order of :

(1) h (2) h^3 (3) h^2 (4) h^5

119. In Bose-Einstien statistics, the chemical potential is always :

(1) zero (2) positive

(3) infinite (4) negative

120. If w is the thermodynamic probability of the state of the system then the entropy of the system is :

(1) kw (2) k exp(w)

(3) k log (w) (4) log (w/k)

121. In Fraunhoffer diffraction at a circular aperture, the condition for minimum intensity is that the path difference is equal to integral multiple of :

(1) λ (2) 2λ (3) $\frac{\lambda}{2}$ (4) $\frac{\lambda}{3}$

122. In Newton's rings, the radii of the rings vary as :

(1) square of natural numbers (2) square root of natural numbers

(3) cube of natural numbers (4) fourth power of natural numbers

123. An ink dot is marked on a piece of paper and a calcite crystal is placed over this dot on the paper. How many images will be observed ?

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

124. The atomic radius of bcc lattice is :

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

125. A crystallographic plane has the intercepts 1 along a, 2 along b and 3 along c. A parallel plane of this plane will have Miller indices :

(1) (1 2 3)
(2) (2 4 6)
(3) (3 2 1)
(4) (6 3 2)

126. If x-rays of wavelength 2Å are detected at an angle of 30° in the first order, then the spacing between the adjacent planes of the crystal would be :

(1) 2.0 Å
(2) 3.7 Å
(3) 4.3Å
(4) 4.9 Å

127. The packing factor of diamond cubic crystal structure is :

(1) 34%
(2) 54%
(3) 64%
(4) 74%

128. The group velocity of matter waves is :

(1) less than particle velocity
(2) greater than particle velocity
(3) equal to the particle velocity
(4) same as phase velocity

129. The operator associated with total energy is :

(1) $i\hbar\frac{\partial}{\partial t}$

(2) $-\frac{\hbar^2}{2m}\nabla^2 + U$

(3) Hamiltonian operator

(4) All of these

130. Heisenberg's uncertainty principle does not hold for the following pairs :

(1) energy and time

(2) position and linear momentum

(3) angular momentum and angle

(4) linear momentum and angle

131. A spectral line emitted by the excited atoms is split up into a doublet or triplet when the emitting atoms are placed in a magnetic field. The effect of the splitting of a spectral line under the action of magnetic field is known as :

(1) Raman effect

(2) Zeeman effect

(3) Spectra effect

(4) Compton effect

132. Which one of the series of hydrogen spectrum is in the visible region ?

(1) Lyman series

(2) Balmer series

(3) Paschen series

(4) Brackett series

133. The function of He atoms in the He-Ne laser is :

(1) to quench the neon atoms

(2) to provide energy to neon atoms

(3) to make neon atoms inactive

(4) none of the above

134. Two nuclei have their mass numbers in the ratio of 1 : 3. The ratio of their nuclear densities would be :

(1) 1 : 1

(2) 1 : 3

(3) 3 : 1

(4) 1 : 9

135. The energy released in a typical nuclear fusion reactor is approximately :

(1) 25 MeV (2) 200 MeV

(3) 800 MeV (4) 1025 MeV

136. The asymptotes of the curve $xy(x^2 - y^2) + 25y^2 + 8x^2 - 144 = 0$ are :

(1) $x = 0, y = 0, x = y, x = -y$ (2) $x = 1, y = 0, x = \frac{y}{2}, x = y$

(3) $x = -1, y = 1, x = y, x = -y$ (4) None of these

137. $\int_0^{\pi/2} \sin^6 \theta \, d\theta$ is equal to :

(1) $\frac{32}{35}$ (2) $\frac{35}{32}$ (3) $\frac{64}{35}$ (4) $\frac{35}{64}$

138. If $\vec{f} = z\hat{i} + x\hat{j} + y\hat{k}$, then curl curl $\vec{f}$ is equal to :

(1) $\vec{0}$ (2) $\hat{i}$ (3) $\hat{k}$ (4) $\hat{j}$

139. Particular Integral of the differential equation $(D^3 - 3D^2D' + 4D'^3)z = e^{x+2y}$ is given by :

(1) $\frac{e^{x+2y}}{4}$ (2) $\frac{e^{x+2y}}{27}$ (3) $\frac{e^{x+2y}}{24}$ (4) $\frac{e^{x+2y}}{20}$

140. The partial differential equation r – 2s – 8t = 0 is :

(1) Parabolic (2) Hyperbolic

(3) Elliptic (4) None of these

141. Laplace transform of $e^{-at}\sinh bt$ is equal to :

(1) $\frac{b}{s}$

(2) $\frac{b+s}{s}$

(3) $\frac{b}{(s+a)^2}$

(4) None of these

142. Hermite polynomial $H_2(x)$ is given by :

(1) $2-4x^2$

(2) $\frac{x^2}{2}$

(3) $4x^2-2$

(4) 0

143. "If three coplanar forces acting at a point are in equilibrium, then each is proportional to the sine of the angle between the other two" is the statement of :

(1) Triangle Law

(2) Lami's theorem

(3) Parallelogram Law

(4) None of these

144. Kinetic energy of a particle of mass m moving with a velocity v is given by :

(1) $\frac{v^2}{2}$

(2) $\frac{2v^2}{m}$

(3) $\frac{m}{2v^2}$

(4) $\frac{1}{2}mv^2$

145. Time of flight of a projectile is given by :

(1) $\frac{2u\sin\alpha}{g}$

(2) $\frac{u}{2g\sin\alpha}$

(3) $\frac{g\sin\alpha}{2u}$

(4) $\frac{2gu}{\sin\alpha}$

146. If $a^2 = a$, a belongs to group (G, .), then :

(1) $a = -e$ (2) $a = \frac{e}{2}$

(3) $a = e$ (4) $a \neq \frac{e}{4}$

147. Let S be an ideal of a ring R, then S is said to be nilpotent if for some positive integer n :

(1) $S^n = \phi$ (2) $S^n = <0>$

(3) $S^n = <\phi>$ (4) None of these

148. The rank of matrix $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ is :

(1) 0 (2) 3

(3) 1 (4) 2

149. If roots of the equation $x^3 - 12x^2 + 39x - 28 = 0$ are in A. P. then one of the root is :

(1) 4 (2) 3

(3) 2 (4) 0

150. The conic $8x^2 - 24xy + 15y^2 + 48x - 48y = 0$ represents a :

(1) Circle (2) Ellipse

(3) Parabola (4) Hyperbola

151. If $(a, b) = d$, then $\left(\frac{a}{d}, \frac{b}{d}\right)$ is equal to :

(1) 0 (2) 3

(3) 1 (4) None of these

152. The principal value of Log (–5) is :

(1) $\log 5$

(2) $\log 5 + \pi i$

(3) πi

(4) 0

153. The integrating factor for the differential equation $x^2 y dx - \left(x^3 + y^3\right) dy = 0$ to become exact is :

(1) $\frac{-1}{y^4}$

(2) $\frac{1}{y^4}$

(3) $\frac{2}{y^4}$

(4) $\frac{-2}{y^4}$

154. The particular integral for the differential equation $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = e^{3x}$ is given by :

(1) $\frac{x}{2}e^{3x}$

(2) xe^{3x}

(3) x^2e^{3x}

(4) $\frac{x^2}{2}e^{3x}$

155. If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, then $x\frac{\partial u}{\partial y} + y\frac{\partial u}{\partial y}$ is equal to :

(1) $\sin u$

(2) $\cos u$

(3) $\tan u$

(4) $\cot u$

156. $\underset{x \to 0^+}{Lim}\left(\frac{1}{x} - \text{cosec}x\right)$ is given by :

(1) 0

(2) 1

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

(4) 2

157. The diameter of an empty set is :

(1) 2 (2) 0

(3) 1 (4) None of these

158. The improper integral $\int_0^1 \frac{dx}{x^2}$ is :

(1) Convergent (2) Divergent

(3) 0 (4) None of these

159. Which one of the following is ***not*** a relational operator ?

(1) = = (2) < = (3) | | (4)None of these

160. The order of convergence of Newton-Raphson iteration formula is :

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

161. ∇, Δ and E^{-1} are related as :

(1) $\Delta E^{-1} \equiv \nabla$ (2) $\Delta + E^{-1} \equiv \nabla$

(3) $-\Delta + E^{-1} \equiv \nabla$ (4) None of these

162. For a Poisson distribution, the recurrence formula is given by :

(1) $P(r+1) = \lfloor r$ (2) $P(r+1) = \frac{m}{r+1} P(r)$

(3) $P(r+1) = mP(r)$ (4) None of these

163. Let T : U $\rightarrow$ V be a linear transformation. Then T is one-to-one, iff :

(1) $N(T) = \phi$ (2) $N(T) = \{\phi\}$

(3) $N(T) = \{0\}$ (4) None of these

164. The normalized vector corresponding to the vector (2, –3, 6) is :

(1) $\left(\frac{2}{-3}, \frac{-3}{6}, \frac{6}{2}\right)$

(2) $\left(\frac{6}{-3}, \frac{-3}{2}, \frac{2}{6}\right)$

(3) $\left(\frac{2}{7}, \frac{-3}{2}, \frac{6}{7}\right)$

(4) None of these

165. The only limit point of the set $S = \left\{\frac{1}{n}, n \in N\right\}$ is :

(1) 0

(2) 1

(3) ∞

(4) None of these

166. A negative nuclear quadrupole moment indicates that nucleus is :

(1) prolate

(2) oblate

(3) spherical

(4) spheroidal

ANSWER KEY OF FORENSIC SCIENCE MDUCEE ENTRANCE TEST 2018

SR NO.	A	B	C	D
1	3	2	4	1
2	2	3	3	3
3	1	4	2	2
4	4	1	4	2
5	3	2	2	1
6	4		1	3
7	2	3	3	2
8	3	2	2	1
9	1	4	2	4
10	4	2	1	3
11	4	3	2	4
12	1	2	3	2
13	2	1	4	3
14	3	4	1	1
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18	4	3	2	2
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35	2	3	3	2
36	1	1	2	4
37	3	2	3	3
38	2	3	2	2
39	3	2	4	1
40	4	1	3	3
41	2	2	2	2
42	2	4	1	1
43	1	3	4	4
44	4	2	2	2

ANSWER KEY OF FORENSIC SCIENCE MDUCEE ENTRANCE TEST 2018

SR NO.	A	B	C	D
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84	4	1	1	1
85	3	3	3	3
86	2	2	4	1
87	1	1	2	4
88	4	4	4	2

ANSWER KEY OF FORENSIC SCIENCE MDUCEE ENTRANCE TEST 2018

SR NO.	A	B	C	D
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93	3	2	2	4
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123	2	2	2	3
124	3	4	1	2
125	4	1	1	4
126	1	3	1	1
127	2	2	3	1
128	3	4	1	3
129	4	1	2	4
130	1	4	2	4
131	3	3	4	2
132	2	2	3	2

ANSWER KEY OF FORENSIC SCIENCE MDUCEE ENTRANCE TEST 2018

SR NO.	A	B	C	D
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136	2	1	3	1
137	2	2	2	3
138	3	2	4	1
139	1	3	1	2
140	2	4	4	2
141	2	1	3	4
142	1	2	2	3
143	2	3	1	2
144	3	4	4	4
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147	1	2	2	2
148	2	1	2	4
149	4	2	3	1
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160	4	2	4	4
161	2	1	2	1
162	2	1	2	2
163	2	2	3	3
164	1	4	1	4
165	1	3	2	1
166	4	4	4	4