Total No. of Printed Pages : 29

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

A

SET-X

PG-EE-2021

SUBJECT : Forensic Science

Sr. No. 10005

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **166**

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

Name_____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

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

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

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

SECTION – A

1. The effective nuclear chage for 35 electron in sulphur is :
   (1) 5.25 (2) 5.45
   (3) 5.15 (4) 5.55

2. In the Compton effect, the Compton wavelength is the value corresponding to the scattering angle equal to :
   (1) 90° (2) 0°
   (3) 180° (4) 270°

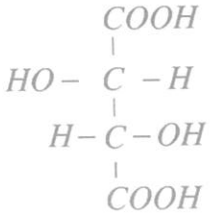
3. Structure of B_2H_6 is depicted as :
   (1) Octahedral structure
   (2) Two BH_3 units joined together
   (3) Two BH_2 units joined by two B-H-B
   (4) Two BH_3 units joined by two B-H-B

4. The magnetic moment value in lanthanide series is maximum with :
   (1) Cerium (2) Neodymium
   (3) Gadolinium (4) Holmium

5. Following pair of compounds are

   (1) Enantiomers (2) Homomers
   (3) Diastereomers (4) Geometrical isomers

6. Absolute configuration of



   is :
   (1) 2R, 3R (2) 2S, 3S
   (3) 2S, 3R (4) 2R, 3S

7. The product in the following reaction :

$$CH_3 - CN \xrightarrow[\text{(ii)} \quad H_2O]{\text{(i)} \quad CH_3MgBr} ?$$

is :

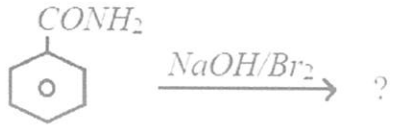
(1) $H_3C - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$

(2) CH_3COCH_3

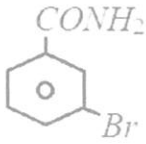
(3) $H_3C - \underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}} - OH$

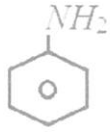
(4) $H_3C - \overset{\displaystyle O}{\overset{||}{C}} - NH_2$

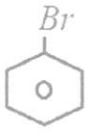
8. The product in the given reaction is :



(1) 

(2) 

(3) 

(4) 

9. Which of the following ligands functions as σ-donor-π-acceptor ?

(1) CO (2) C_2H_2

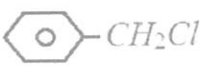
(3) C_2H_4 (4) C_2H_6

10. The name of the transition metal ion that activates insulin is :

(1) Copper (2) Iron

(3) Manganese (4) Chromium

11. Arrange the following compounds in order of their decreasing reactivity towards SN_1 reaction :


(A)


(B)


(C)

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

12. Which of the following carbonyl does not obey EAN rule ?

(1) $V(CO)_6$
(2) $Fe(CO)_5$
(3) $Ni(CO)_4$
(4) $Cr(CO)_6$

13. The spectroscopic state for d^3 system is :

(1) $4D_{3/2}$
(2) $4F_2$
(3) $4F_{3/2}$
(4) $3F_{3/2}$

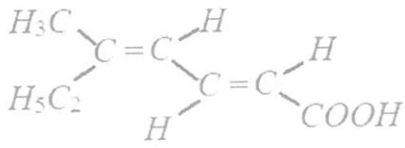
14. Mercury is the only metal which is liquid at 0°C. This is due to :

(1) High vapour pressure
(2) High atomic weight
(3) Low ionization potential
(4) High ionization energy and weak metallic bond

15. Acid present in tomatoes is :

(1) Boric acid
(2) Citric acid
(3) Tartaric acid
(4) Oxalic acid

16. The configuration of the given compound is :



(1) 2Z, 4Z
(2) 2E, 4Z
(3) 2E, 4E
(4) 2Z, 4E

17. Lewis acid strength of BCl_3, BF_3 and BBr_3 varies in the order :

(1) $BF_3 > BCl_3 > BBr_3$ (2) $BF_3 > BCl_3 \approx BBr_3$

(3) $BF_3 > BBr_3 > BCl_3$ (4) $BCl_3 > BBr_3 > BF_3$

18. Which is of the following is ***not*** a hard base ?

(1) NH_3 (2) H_2O

(3) Cl^- (4) CN^-

19. The bond order in super oxide (O_2^-) ion is :

(1) 2 (2) 2.5

(3) 1.5 (4) 3

20. For an isentropic change of state :

(1) ds =1 (2) ds = 0

(3) dH = 0 (4) dE = 0

21. Spotting electrolyte is used to eliminate :

(1) Migration current (2) Diffusion current

(3) Limiting current (4) Condenser current

22. In the lead acid battery during charging the cathode reaction is :

(1) Formation of $PbSO_4$ (2) Reduction of Pb^{2+} to Pb

(3) Formation of PbO_2 (4) None of these

23. The temperature at which second virial coefficient of a real gas is zero, is called :

(1) Critical temperature (2) Boiling point

(3) Eutectic point (4) Boyle temperature

24. The degeneracy of the rotational energy level with J = 4 for a heteronuclear diatomic molecule is :

(1) 4 (2) 2

(3) 9 (4) 1

25. If $\left(\frac{\partial P}{\partial T}\right)_V = \frac{\alpha}{\beta}$; then which of the following relation is correct (Maxwell relation) :

(1) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\beta}{\alpha}$

(2) $\left(\frac{\partial S}{\partial V}\right)_T = -\frac{\alpha}{\beta}$

(3) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\alpha}{\beta}$

(4) $\left(\frac{\partial S}{\partial V}\right)_T = \alpha \times \beta$

26. The average of any observable quantity, x can be estimated using quantum mechanics by relation :

(1) $< x > = \frac{\int x\psi\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$

(2) $< x > = \frac{\int \psi\psi^{\oplus} x d\tau}{\int \psi\psi^{\oplus} d\tau}$

(3) $< x > = \frac{\int \psi x\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$

(4) None of these

27. Evaluation of commutator $\left[x, \frac{d}{dx}\right]$ yields value :

(1) Zero

(2) 1

(3) –1

(4) None of these

28. In the limit $T \to 0$, Entropy of a crystal at temperature, T (S_T) is given by :

(1) $S_T = C_{P/3}$

(2) $S_T = C_{P/4}$

(3) $S_T = C_P$

(4) $S_T = C_{P/2}$

29. Isotonic solutions have :

(1) same vapour pressure

(2) same viscosity

(3) same surface tension

(4) same osmotic pressure

30. The Clapeyron-Clausius equation for the transition equilibrium may be expressed as :

(1) $\frac{dT}{dP} = \frac{T(V_B - V_A)}{\Delta H_t}$; where all the symbols have their usual meaning

(2) $\frac{dT}{dP} = T(V_B - V_A)\Delta H_t$

(3) $\frac{dP}{dT} = T(V_B - V_A)\Delta H_t$

(4) $\frac{dT}{dP} = \frac{T^2 \Delta H_t}{V_B - V_A}$

31. The Miller indices of crystal planes which cut through the crystal axes at ($2a$, $3b$, c) are :

(1) (122) (2) (111)

(3) (326) (4) $(1\bar{1}\bar{1})$

32. If activation energy of a reaction is zero, then rate constant, K is equal to :

(1) A^{-1} (2) A

(3) Infinity (4) Zero

Where 'A' is the frequency factor.

33. According to Debye-Huckel theory of strong electrolytes, increase in conductivity on dilution is due to :

(1) Decrease in viscosity of the solution

(2) Increase in volume of the solution

(3) Increase in number of ions

(4) Increase in mobility of ions

34. In phase diagram for lead-silver system at eutectic point, the number of degree of freedom is :

(1) Zero (2) One

(3) Two (4) Three

SECTION – B

35. Which of this bacterium is resistant to penicillin as it lacks a cell wall ?

(1) Spirochetes
(2) Cyanobacteria
(3) Mycoplasmas
(4) Bdellovibrios

36. Which of these is exposed on the outer surface of a gram-negative bacterium ?

(1) Braun lipoprotein
(2) O-antigen of lipopolysaccharide (LPS)
(3) Polysaccharide portion of lipoteichoic acid (LTA)
(4) Electron transport system components

37. The electron acceptor in the anaerobic condition in prokaryotes is :

(1) SO_4^{2-}
(2) Antioxidants such as vitamin K
(3) Fatty acids
(4) Glucose, fructose, maltose

38. Which of the following membrane lipid constituents can be considered as the lipid marker of inner mitochondrial membrane ?

(1) Lecithin
(2) Cardiolipin
(3) Ceramide
(4) Sphingoceramide

39. Which is the most variable stage of cell cycle ?

(1) G1 phase
(2) S phase
(3) G2 phase
(4) M phase

40. Which of the following is microtubule associated protein (MAPS) ?

(1) tus protein
(2) tau protein
(3) rho protein
(4) G protein

41. Which of the following is the most heterogenous protein of cytoskeletal filaments ?

(1) Microtubule (2) Microfilament

(3) Intermediate filaments (4) None of above

42. Which of the following organelle involved in xenobiotic detoxification ?

(1) Golgi (2) Lysosomes

(3) RER (4) SER

43. Which of the following chromosomal alterations would you expect to have the most drastic consequences ?

(1) Inversion (2) duplication

(3) translocation (4) deletion

44. Archesporium is :

(1) A diploid tissue responsible for the formation of sporogenous tissue

(2) A part of archegonia

(3) A haploid tissue responsible for the formation of gametophytic cells

(4) None of the above

45. Club mosses are :

(1) Lycopsida (2) Psilopsida

(3) Pteropsida (4) Sphenopsida

46. Z-DNA have a :

(1) Double helical nature (2) Zig-Zag appearance

(3) Uracil base (4) Single stranded nature

47. Which of the following chemical is a DNA intercalator ?

(1) 5-bromouracil (2) Ethyl methane sulfonate

(3) Acridine orange (4) UV

48. In eukaryotes replication, helicase loading occur at all replicators during :

(1) G0 phase
(2) G1 phase
(3) S phase
(4) G2 phase

49. Error free repair of double strand break in DNA is accomplished by :

(1) Non-homologous end joining
(2) Base excision repair
(3) Homologous recombination
(4) Mismatch repair

50. Which of the following enzyme joints the okazaki fragments ?

(1) DNA polymerase
(2) DNA ligase
(3) Helicase
(4) Restriction endonuclease

51. The following set of RNA is required in the translation process except one, choose the ***incorrect*** ?

(1) Si RNA
(2) rRNA
(3) mRNA
(4) tRNA

52. In sponge the whole inner surface of the asconoid is lined by :

(1) Choanocytes
(2) Porocytes
(3) Pnacocytes
(4) Amoebocytes

53. Metamerism is characteristic of :

(1) Platyhelminthes
(2) Mollusca
(3) Porifera
(4) Annelida

54. A deuterostomic animal is :

(1) Sea anemone
(2) Star fish
(3) Pearl oyster
(4) Cabbage butterfly

55. Saccus' term is used for :

(1) exine of pollen grains of Pinus
(2) intine of pollen grains of Pinus
(3) Wings of pollen grains of Pinus
(4) Wings of seeds of Pinus

56. Pick the pair that is ***incorrectly*** matched :

(1) Cycas – coralloid roots
(2) Abies – wood tar, wood gas
(3) Pinus – Mycorrhizal roots
(4) Sequoia – Redwood tree

57. Cedrus have :

(1) leaves with large surface area
(2) branched stem
(3) simple leaves
(4) taproot system

58. Which of the following families is characterised by trimerous flowers, superior and trilocular ovary with axile placentation ?

(1) Cucurbitaceae
(2) Solanaceae
(3) Liliaceae
(4) Compositae

59. The appearance of branched mass like corals on the soil is :

(1) Glittery roots
(2) Coralloid roots
(3) Massy roots
(4) Lancy roots

60. Which gives rise to the cork tissue ?

(1) Periblem
(2) Phellogen
(3) Phelloderm
(4) Periderm

61. Where in epiphytes are velamen cells located ?

(1) Below the endodermis
(2) Below the epidermis
(3) Just outside the cortex
(4) Just outside the exodermis

62. Tissue loosely held and stored food in plant is :

(1) Parenchyma
(2) Meristematic
(3) Permeant tissue
(4) None of above

63. In monocot stem, vascular bundles are :

(1) Arranged in ring
(2) Arranged alternatively
(3) Present inside endodermis
(4) Scattered in ground tissue

64. Root cap is formed by :

(1) Dermatogen
(2) Calyptrogen
(3) Vascular cambium
(4) Wood cambium

65. The adult body of subphylum Urochordata is covered by :

(1) Calcium
(2) Tunic
(3) Epithelium
(4) Endoderm

66. The embryonic notochord is replaced by ..... in most of the vertebrates.

(1) Ventral heart (2) Gills

(3) Wings (4) Vertebral column

67. Which of the following is ***not*** the characteristic feather of phylum Chordata ?

(1) Pharyngeal gills (2) Amniotic egg

(3) Postanal tail (4) Notochord

68. The study of migration of birds is known as :

(1) Ecology (2) Nidology

(3) Phenology (4) Phrenology

69. Balanoglossus belongs to :

(1) Hemichordate (2) Cephalochordate

(3) Urochordata (4) Cyclostomes

70. An Essential for the Conversion of Glucose to Glycogen in Liver is :

(1) UTP (2) GTP

(3) Pyruvate kinase (4) Guanosine

71. Which of the following hormone is ***not*** used in the hydrolysis of triacylglycerol into the fatty acids in adipose tissues ?

(1) Epinephrine (2) Norepinephrine

(3) Glucagon (4) Insulin

72. Accepts hydrogen from malate :

(1) FAD (2) NAD

(3) NADP (4) FMN

73. Which one of the following statements is ***false*** about the trachea ?

(1) Has C-shaped rings

(2) It is covered by epiglottis

(3) It splits into the right and left lungs

(4) None of the above

74. Intercostal muscle regulates the movement of :

(1) Ribs (2) Trachea

(3) Pharynx (4) Diaphragm

75. In a plant cell, the dark reactions take place in the :

(1) Cytosol (2) Endoplasmic reticulum

(3) Leucoplasts (4) Chloroplasts

76. Which of these in ***not*** a function of auxin ?

(1) inducing callus formation

(2) inducing dormancy

(3) enhancing cell division

(4) maintaining apical dominance

77. The change over from vegetative to reproductive phase in plants takes place in response to ..... .

(1) Length of the day

(2) severity of temperature

(3) Oxygen content in the air

(4) Mainly the food material available in the soil

78. Which of the following is involved in the activation of RuBisCO ?

(1) K^{+} (2) Zn^{2+}

(3) Mg^{2+} (4) Ca^{2+}

79. Among the following which is the best indicator of water pollution due to mixing of human faeces :

(1) Paramecium (2) Bacillus

(3) Trypanasoma (4) E. coli

80. Phytoplankton spends very little energy on developing protective structure against predators, this suggests that :

(1) Food chain is small

(2) Less competition

(3) Productivity of aquatic ecosystem is low

(4) Assimilation efficiency is high in aquatic ecosystem

81. Insectivorous plant generally grows in soil which is deficient in :

(1) Water (2) Nitrogen

(3) Potassium (4) Calcium

82. Compound responsible for pollution which caused the ill-famed Bhopal gas tragedy was :

(1) NH_4OH (2) CH_3NCO

(3) CH_3NH_2O (4) $CHCl_3$

83. Micro consumers are popularly known as :

(1) Primary consumer (2) Secondary consumer

(3) Tertiary consumer (4) Decomposers

84. Among the ecosystem mentioned below, where can one find maximum biodiversity ?

(1) Alpine meadows (2) Mangroves

(3) Desert (4) Corals

85. Which technique is used to introduce genes into dicots ?

(1) Electroporation (2) Particle acceleration

(3) Microinjection (4) Ti plasmid infection

86. In competitive inhibition, inhibitors bear a close structural similarity with the :

(1) Co-enzyme (2) Co- factor

(3) Prosthetic group (4) Substrate

87. Which of the following pathway is ***not*** used for triacylglycerol synthesis ?

(1) Glycerol 3-phosphate pathway

(2) Glyoxylate pathway

(3) Monoacylglycerol pathway

(4) Kennedy pathway

88. Ubiquinone transfers its electrons to :

(1) Complex I
(2) Complex II
(3) Matrix
(4) CytC I

89. Which antibiotic resistance is present in pBR322 ?

(1) Ampicillin
(2) Kanamycin
(3) Lactase
(4) Gentamycin

90. The initial dorsal-ventral axis in amphibian embryos is determined by :

(1) The point of sperm entry
(2) Gravity
(3) The point of contact with the uterus
(4) Genetic differences in the cells

91. The central fluid filled cavity of the blastula is known as :

(1) Archenteron
(2) Blastocoel
(3) Blastocyst
(4) Morula

92. The cells which secrete male sex hormone testosterone are :

(1) Isthmus
(2) Crypt cells
(3) Lieberkuhn
(4) Leydig's cells

93. In human beings, the eggs are :

(1) Microlecithal
(2) Macrolecithal
(3) Mesolecithal
(4) Alecithal

94. Which of the following plant growth hormone increases the yield of sugar by increasing the length of stem in sugarcane ?

(1) Cytokinin (2) Ethylene

(3) Gibberellic acid (4) Auxin

95. Botanical name of tea is :

(1) Coffea arabica (2) Sinensis thea

(3) Camellia sinensis (4) None of above

96. The aromatic volatile components of spices are :

(1) Spice oil (2) Spice fat

(3) Spice gel (4) Spice paste

97. Which of the component is reduced when pulses are soaked ?

(1) Phytic acid (2) Nitric acid

(3) Potassium oxide (4) Nitrous oxide

98. Osphradium acts as ..... organ.

(1) Sense (2) Defense

(3) Reproductive (4) Respiratory

99. National Bureau of Fish Genetic Resources is located at... ?

(1) Jabalpur, Madhya Pradesh

(2) Lucknow, Uttar Pradesh

(3) Hyderabad, Andhra Pradesh

(4) Patna, Bihar

100. Ichthyoplankton is/are :

(1) Eggs of the fish (2) Larvae of the fish

(3) Both (1) and (2) (4) None of the above

SECTION – C

101. The rank of the matrix :

$$\begin{bmatrix} 3 & 4 & 1 & 2 \\ 7 & 2 & 1 & 4 \\ 5 & 6 & 2 & 4 \end{bmatrix}$$

(1) 4 (2) 3

(3) 2 (4) 1

102. The equation whose one root is $2 + 3i$, is given by :

(1) $x^2 + 4x + 13 = 0$ (2) $x^2 + 4x - 13 = 0$

(3) $x^2 - 4x + 13 = 0$ (4) $-x^2 + 4x + 13 = 0$

103. Which of the following is ***not*** a asymptote of the equation :

$$xy(x^2 - y^2) + 20y^2 + 8x^2 - 144 = 0$$

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

(3) $x + y = 0$ (4) $\frac{x}{20} + \frac{y}{8} = 0$

104. $\int_0^{2\pi} \sin^7 \frac{t}{4} dt$ is equal to :

(1) $\frac{64}{35}$ (2) $\frac{35}{64}$

(3) $\frac{7}{4}$ (4) $\frac{4}{7}$

105. The equation $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ represents a :

(1) Hyperbola (2) Parabola

(3) Ellipse (4) None of these

106. If $(a, b) = 1$, then g.c.d. of $a + b$ and $a - b$ is :

(1) 0 (2) 1

(3) 2 (4) 1 or 2

107. If $x = \cos\theta + i\sin\theta$, then $x - \frac{1}{x}$ is equal to :

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

(3) $2\cos\theta$ (4) $2i\sin\theta$

108. If $\vec{r} = \sin t\,\hat{i} + \cos t\,\hat{j} + t\hat{k}$, then $\left|\frac{d\vec{r}}{dt}\right|$ is equal to :

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

(3) $\sqrt{2}$ (4) None of these

109. $\lim\limits_{x\to b} \frac{x^b - b^x}{x^x - b^b}$ is equal to :

(1) $\frac{1-\log b}{1+\log b}$ (2) $\frac{1+\log b}{1-\log b}$

(3) $\frac{1-\log b}{1-\log b}$ (4) $\frac{1+\log b}{b}$

110. The normal which is perpendicular to the osulating plane at a point is called :

(1) Principal Normal (2) Bi-normal

(3) Principal Tangent (4) None of these

111. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

(1) $\frac{e^{x+2y}}{9}$ (2) $\frac{e^{x+2y}}{18}$

(3) $\frac{e^{x+2y}}{27}$ (4) $\frac{e^{x+2y}}{54}$

112. The differential equation $2\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + 5\frac{\partial^2 z}{\partial y^2} = 0$ is :

(1) Elliptic (2) Parabolic

(3) Hyperbolic (4) None of these

113. If F is the limiting friction, R is the normal reaction, then coefficient of friction μ is given by :

(1) $F+R$ (2) $\frac{F}{R}$

(3) $F.R$ (4) $F-R$

114. The limit point of the set $\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \ldots\ldots\ldots\right\}$ is :

(1) 1 (2) ∞

(3) 0 (4) None of these

115. The geometrical series $a+ar+ar^2+\ldots\ldots\ldots+\infty$ oscillates finitely, if.

(1) $|r|<1$ (2) $r<-1$

(3) $r\geq 1$ (4) $r=-1$

116. The integrating factor of the differential equation $x^2ydx-(x^3+y^3)dy=0$ is :

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

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

117. For the differential equation $\frac{d^2y}{dx^2}+6\frac{dy}{dx}+25y=10e^{3x}$, particular integral is :

(1) $\frac{5}{26}e^{3x}$ (2) $\frac{26}{5}e^{3x}$

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

118. $L(e^{at})$ is equal to :

(1) $\frac{1}{s+a}$ (2) $\frac{1}{s-a}$

(3) $\frac{2}{s+a}$ (4) $\frac{2}{s-a}$

119. The equation $(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+n(n+1)y=0$, where n is a parameter real or complex is :

(1) Bessel's equation

(2) Hermite's equation

(3) Legendre's equation

(4) None of these

120. Which of the following is ***not*** a Logical operator ?

(1) ! =

(2) ||

(3) !

(4) None of these

121. If a function f is defined by $f(x) = x + 1$, $x \in [1, 3]$ and partition $P = \{1, 2, 3\}$, then $L(f, P)$ is equal to :

(1) 2

(2) 3

(3) 4

(4) 5

122. Let (R, d) be the usual metric space. Then the derived set of $A=\left\{\frac{1}{n};n\in N\right\}$ is :

(1) ϕ

(2) $\{0\}$

(3) $\{0, 1\}$

(4) None of these

123. If $G=\{1,\omega,\omega^2\}$ is the group of cube roots of unity, then order of the element ω under the binary operation multiplication is :

(1) 3

(2) 4

(3) 2

(4) 1

124. A ring $R \neq \{0\}$ is called a simple ring, if :

(1) R has no ideals

(2) R has only one ideal

(3) R has no ideals except R and $\{0\}$

(4) R has at least one ideal other than R and $\{0\}$

125. If n denotes the frequency and T the periodic time, then :

(1) $nT = 1$ (2) $\frac{n}{T} = 1$

(3) $\frac{T}{n} = 1$ (4) None of these

126. The time of flight of a projectile is given by :

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

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

127. $\Gamma\left(\frac{1}{2}\right)$ is equal to :

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

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

128. If $f(x) = x \sin x$ is expanded by Fourier series in $(0, 2\pi)$, then a_0 is equal to :

(1) 2 (2) 2π

(3) $\frac{\pi}{2}$ (4) -2

129. The dimension of vector space $Q(\sqrt{2})$ over Q is :

(1) 4 (2) 3

(3) 2 (4) 1

130. In an inner product space, if $\| u + v \| = \| u \| + \| v \|$, then the vectors u, v are :

(1) linearly dependent

(2) linearly independent

(3) always orthogonal

(4) None of these

131. If the equation $x^5 - 5x + 2 = 0$ has three real roots, then the interval in which no real root lies is :

(1) (–2, –1)
(2) (0, 1)
(3) (–3, –2)
(4) (1, 2)

132. If $f(0) = 8, f(1) = 68$ and $f(5) = 123$, then $\Delta f(x)$ are :

(1) 50, 12.75
(2) 60, 12.75
(3) 50, 13.75
(4) 60, 13.75

133. $\int_{x_0}^{x_0+nh} f(x)dx = \frac{h}{2}$

[(Sum of first and last ordinates) + 2(sum of all the intermediate ordinates)]

is called :

(1) Simpson's one-third rule
(2) Simpson's three-eights rule
(3) Trapezoidal rule
(4) None of these

134. If momentum of a certain body be increased by 50%, its kinetic energy will increase by :

(1) 25%
(2) 50%
(3) 100%
(4) 125%

135. A ring is rolling on a surface without slipping. The ratio of it; translation to rotational kinetic energie is :

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

136. A force $\vec{F} = -\vec{\nabla}u$ is said to be conservative if :

(1) grad F = zero
(2) div F = zero
(3) curl F = zero
(4) none of the above

137. The susceptibility of a diamagnetic substance :

(1) decrease with temperature

(2) does not vary with temperature

(3) first decrease and then increase with temperature

(4) increase with temperature

138. The Bulk modulus of a perfectly rigid body is equal to :

(1) Zero

(2) Unit

(3) Infinity

(4) may have any finite non-zero value

139. What will be the temperature when the r.m.s. velocity of a gas is double then that at 27°C ?

(1) 300 K (2) 600 K

(3) 900 K (4) 1200 K

140. If the speed of a particle moving at a relativistic speed is doubled, it's linear momentum will :

(1) become double (2) become more than double

(3) become less than double (4) No effect

141. Choke used to limit high frequency A. C. has :

(1) air core (2) iron core

(3) paramagnetic core (4) diamagnetic core

142. 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

143. An oscillator is nothing but an amplifier with :

(1) large gain
(2) negative feedback
(3) positive feedback
(4) no feedback

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

(1) remains constant
(2) decreases
(3) increases
(4) may either increase or decrease depending on the process used

145. A Carnot engine absorbs 100 calories of heat from a source at 400 K and give 80 calories to sink. The temperature of sink is :

(1) 20 K
(2) 300 K
(3) 320 K
(4) 500 K

146. Which law of thermodynamics states that entropy of a system vanishes at absolute zero ?

(1) Zeroth law
(2) First law
(3) Second law
(4) Third law

147. When a thin convex lens is put in contact with a thin concave lens of the same focal length f, the resultant combination has a focal length equal to :

(1) $f/2$
(2) $2f$
(3) zero
(4) infinity

148. Chromatic aberration in the formation of images by a lens arises because :

(1) of non-paraxial rays
(2) the radii of curvature of the two sides are not same
(3) of the defect in grinding
(4) the focal length varies with wavelength

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

(1) zero (2) positive

(3) infinity (4) negative

150. The probability that in tossing a coin 10 times, we get 5 heads, 5 tails is :

(1) 1/1024 (2) 120/1024

(3) 255/1024 (4) 180/1024

151. In Newton', ring experiment the diameters of the bright rings are proportional to the square root of :

(1) natural numebrs

(2) odd natural numebrs

(3) even natural numebrs

(4) half integral multiple of natural numbers

152. A zone plate behaves like a convex lens of focal length 50 cm for a light of wavelength 5000 Å. The radius of the first half period zone is :

(1) 5 mm (2) 0.5 mm

(3) 1 mm (4) 1.5 mm

153. Two Nicol prisms are first crossed and then one of them is rotated through 60°. The percentage of incident light transmitted is :

(1) 12.5 (2) 25.0

(3) 37.5 (4) 50.0

154. The coordination number in the case of simple cubic crystal structure is :

(1) 12 (2) 6

(3) 2 (4) 1

155. The reciprocal lattice of monoclinic is :

(1) monoclinic (2) hexagonal

(3) triclinic (4) cubic

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

(1) 34% (2) 54%

(3) 64% (4) 74%

157. The volume of the primitive unit cell of a fcc structure with lattice constant a is :

(1) a^3 (2) $a^3/2$

(3) $a^3/4$ (4) $a^3/8$

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 spacing between n^{th} energy level and the next higher level in a one dimensional potential box increase by :

(1) $2n - 1$ (2) $2n + 1$

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

160. Heisenberg uncertainity principle does not hold for the following pairs :

(1) energy and time

(2) position and momentum

(3) angular momentum and angle

(4) linear momentum and angle

161. Russel-Saunder's coupling is also called as :

(1) LS coupling (2) LJ coupling

(3) JJ coupling (4) SJ coupling

162. A laser beam is highly coherent,so it can be used in :

(1) interference (2) diffraction

(3) polarization (4) optical pumping

163. The population inversion in helium-neon laser is produced by :

(1) photon excitation (2) chemical excitation

(3) inelastic atomic collisions (4) chemical reaction

164. For nuclear fission to take place neutrons must have :

(1) very very low energy (2) thermal energy

(3) very high energy (4) no kinetic energy

165. Primary cosmic rays are composed of very energetic :

(1) electrons (2) mesons

(3) protons (4) neutrons

166. Which of the following is a good nuclear fuel ?

(1) Neptunium – 239 (2) Plutorium – 239

(3) Thorium – 236 (4) Uranium – 236

Total No. of Printed Pages : 29

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SET-X

B

PG-EE-2021

SUBJECT : Forensic Science

10018

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **166**

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

Name_____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

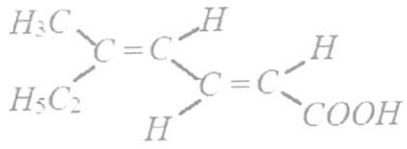
(Signature of the Candidate) (Signature of the Invigilator)

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

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

SECTION – A

1. The configuration of the given compound is :



(1) 2Z, 4Z
(2) 2E, 4Z
(3) 2E, 4E
(4) 2Z, 4E

2. Lewis acid strength of BCl_3, BF_3 and BBr_3 varies in the order :

(1) $BF_3 > BCl_3 > BBr_3$
(2) $BF_3 > BCl_3 \approx BBr_3$
(3) $BF_3 > BBr_3 > BCl_3$
(4) $BCl_3 > BBr_3 > BF_3$

3. Which is of the following is ***not*** a hard base ?

(1) NH_3
(2) H_2O
(3) Cl^-
(4) CN^-

4. The bond order in super oxide (O_2^-) ion is :

(1) 2
(2) 2.5
(3) 1.5
(4) 3

5. For an isentropic change of state :

(1) ds =1
(2) ds = 0
(3) dH = 0
(4) dE = 0

6. The average of any observable quantity, x can be estimated using quantum mechanics by relation :

(1) $< x > = \dfrac{\int x\psi\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$
(2) $< x > = \dfrac{\int \psi\psi^{\oplus} x d\tau}{\int \psi\psi^{\oplus} d\tau}$
(3) $< x > = \dfrac{\int \psi x\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$
(4) None of these

7. Evaluation of commutator $\left[x, \frac{d}{dx}\right]$ yields value :

(1) Zero (2) 1

(3) –1 (4) None of these

8. In the limit $T \to 0$, Entropy of a crystal at temperature, T (S_T) is given by :

(1) $S_T = C_{P/3}$ (2) $S_T = C_{P/4}$

(3) $S_T = C_P$ (4) $S_T = C_{P/2}$

9. Isotonic solutions have :

(1) same vapour pressure

(2) same viscosity

(3) same surface tension

(4) same osmotic pressure

10. The Clapeyron-Clausius equation for the transition equilibrium may be expressed as :

(1) $\frac{dT}{dP} = \frac{T(V_B - V_A)}{\Delta H_t}$; where all the symbols have their usual meaning

(2) $\frac{dT}{dP} = T(V_B - V_A)\Delta H_t$

(3) $\frac{dP}{dT} = T(V_B - V_A)\Delta H_t$

(4) $\frac{dT}{dP} = \frac{T^2 \Delta H_t}{V_B - V_A}$

11. The effective nuclear chage for 35 electron in sulphur is :

(1) 5.25 (2) 5.45

(3) 5.15 (4) 5.55

12. In the Compton effect, the Compton wavelength is the value corresponding to the scattering angle equal to :

(1) 90° (2) 0°

(3) 180° (4) 270°

13. Structure of B_2H_6 is depicted as :

(1) Octahedral structure

(2) Two BH_3 units joined together

(3) Two BH_2 units joined by two B-H-B

(4) Two BH_3 units joined by two B-H-B

14. The magnetic moment value in lanthanide series is maximum with :

(1) Cerium (2) Neodymium

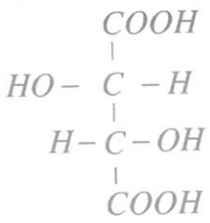
(3) Gadolinium (4) Holmium

15. Following pair of compounds are

(1) Enantiomers (2) Homomers

(3) Diastereomers (4) Geometrical isomers

16. Absolute configuration of



is :

(1) 2R, 3R (2) 2S, 3S (3) 2S, 3R (4) 2R, 3S

17. The product in the following reaction :

$$CH_3-CN \xrightarrow[\text{(ii)}\quad H_2O]{\text{(i)}\quad CH_3MgBr} ?$$

is :

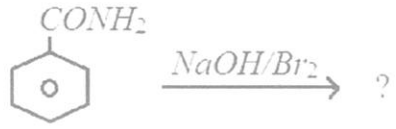
(1) $H_3C-\underset{\displaystyle OH}{\underset{|}{CH}}-CH_3$

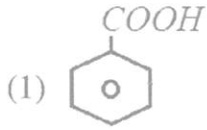
(2) CH_3COCH_3

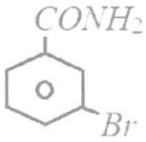
(3) $H_3C-\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}-OH$

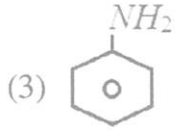
(4) $H_3C-\overset{\displaystyle O}{\overset{||}{C}}-NH_2$

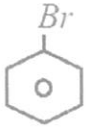
18. The product in the given reaction is :



(1) 

(2) 

(3) 

(4) 

19. Which of the following ligands functions as σ-donor-π-acceptor ?

(1) CO (2) C_2H_2

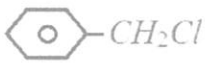
(3) C_2H_4 (4) C_2H_6

20. The name of the transition metal ion that activates insulin is :

(1) Copper (2) Iron

(3) Manganese (4) Chromium

21. Arrange the following compounds in order of their decreasing reactivity towards SN_1 reaction :


(A)


(B)


(C)

(1) A > B > C (2) B > A > C

(3) C > B > A (4) B > C > A

22. Which of the following carbonyl does not obey EAN rule ?

(1) $V(CO)_6$ (2) $Fe(CO)_5$

(3) $Ni(CO)_4$ (4) $Cr(CO)_6$

23. The spectroscopic state for d^3 system is :

(1) $4D_{3/2}$ (2) $4F_2$

(3) $4F_{3/2}$ (4) $3F_{3/2}$

24. Mercury is the only metal which is liquid at 0°C. This is due to :

(1) High vapour pressure

(2) High atomic weight

(3) Low ionization potential

(4) High ionization energy and weak metallic bond

25. Acid present in tomatoes is :

(1) Boric acid

(2) Citric acid

(3) Tartaric acid

(4) Oxalic acid

26. Spotting electrolyte is used to eliminate :

(1) Migration current

(2) Diffusion current

(3) Limiting current

(4) Condenser current

27. In the lead acid battery during charging the cathode reaction is :

(1) Formation of $PbSO_4$

(2) Reduction of Pb^{2+} to Pb

(3) Formation of PbO_2

(4) None of these

28. The temperature at which second virial coefficient of a real gas is zero, is called :

(1) Critical temperature

(2) Boiling point

(3) Eutectic point

(4) Boyle temperature

29. The degeneracy of the rotational energy level with J = 4 for a heteronuclear diatomic molecule is :

(1) 4

(2) 2

(3) 9

(4) 1

30. If $\left(\frac{\partial P}{\partial T}\right)_V = \frac{\alpha}{\beta}$; then which of the following relation is correct (Maxwell relation) :

(1) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\beta}{\alpha}$ (2) $\left(\frac{\partial S}{\partial V}\right)_T = -\frac{\alpha}{\beta}$

(3) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\alpha}{\beta}$ (4) $\left(\frac{\partial S}{\partial V}\right)_T = \alpha \times \beta$

31. The Miller indices of crystal planes which cut through the crystal axes at ($2a$, $3b$, c) are :

(1) (122) (2) (111)

(3) (326) (4) $(1\bar{1}\bar{1})$

32. If activation energy of a reaction is zero, then rate constant, K is equal to :

(1) A^{-1} (2) A

(3) Infinity (4) Zero

Where 'A' is the frequency factor.

33. According to Debye-Huckel theory of strong electrolytes, increase in conductivity on dilution is due to :

(1) Decrease in viscosity of the solution

(2) Increase in volume of the solution

(3) Increase in number of ions

(4) Increase in mobility of ions

34. In phase diagram for lead-silver system at eutectic point, the number of degree of freedom is :

(1) Zero (2) One

(3) Two (4) Three

SECTION – B

35. The initial dorsal-ventral axis in amphibian embryos is determined by :

(1) The point of sperm entry

(2) Gravity

(3) The point of contact with the uterus

(4) Genetic differences in the cells

36. The central fluid filled cavity of the blastula is known as :

(1) Archenteron (2) Blastocoel

(3) Blastocyst (4) Morula

37. The cells which secrete male sex hormone testosterone are :

(1) Isthmus (2) Crypt cells

(3) Lieberkuhn (4) Leydig's cells

38. In human beings, the eggs are :

(1) Microlecithal (2) Macrolecithal

(3) Mesolecithal (4) Alecithal

39. Which of the following plant growth hormone increases the yield of sugar by increasing the length of stem in sugarcane ?

(1) Cytokinin (2) Ethylene

(3) Gibberellic acid (4) Auxin

40. Botanical name of tea is :

(1) Coffea arabica (2) Sinensis thea

(3) Camellia sinensis (4) None of above

41. The aromatic volatile components of spices are :
(1) Spice oil (2) Spice fat
(3) Spice gel (4) Spice paste

42. Which of the component is reduced when pulses are soaked ?
(1) Phytic acid (2) Nitric acid
(3) Potassium oxide (4) Nitrous oxide

43. Osphradium acts as ..... organ.
(1) Sense (2) Defense
(3) Reproductive (4) Respiratory

44. National Bureau of Fish Genetic Resources is located at... ?
(1) Jabalpur, Madhya Pradesh
(2) Lucknow, Uttar Pradesh
(3) Hyderabad, Andhra Pradesh
(4) Patna, Bihar

45. Which of this bacterium is resistant to penicillin as it lacks a cell wall ?
(1) Spirochetes (2) Cyanobacteria
(3) Mycoplasmas (4) Bdellovibrios

46. Which of these is exposed on the outer surface of a gram-negative bacterium ?
(1) Braun lipoprotein
(2) O-antigen of lipopolysaccharide (LPS)
(3) Polysaccharide portion of lipoteichoic acid (LTA)
(4) Electron transport system components

47. The electron acceptor in the anaerobic condition in prokaryotes is :
(1) SO_4^{2-}
(2) Antioxidants such as vitamin K
(3) Fatty acids
(4) Glucose, fructose, maltose

48. Which of the following membrane lipid constituents can be considered as the lipid marker of inner mitochondrial membrane ?

(1) Lecithin
(2) Cardiolipin
(3) Ceramide
(4) Sphingoceramide

49. Which is the most variable stage of cell cycle ?

(1) G1 phase
(2) S phase
(3) G2 phase
(4) M phase

50. Which of the following is microtubule associated protein (MAPS) ?

(1) tus protein
(2) tau protein
(3) rho protein
(4) G protein

51. Which of the following is the most heterogenous protein of cytoskeletal filaments ?

(1) Microtubule
(2) Microfilament
(3) Intermediate filaments
(4) None of above

52. Which of the following organelle involved in xenobiotic detoxification ?

(1) Golgi
(2) Lysosomes
(3) RER
(4) SER

53. Which of the following chromosomal alterations would you expect to have the most drastic consequences ?

(1) Inversion
(2) duplication
(3) translocation
(4) deletion

54. Archesporium is :

(1) A diploid tissue responsible for the formation of sporogenous tissue
(2) A part of archegonia
(3) A haploid tissue responsible for the formation of gametophytic cells
(4) None of the above

55. Club mosses are :

(1) Lycopsida (2) Psilopsida

(3) Pteropsida (4) Sphenopsida

56. Z-DNA have a :

(1) Double helical nature (2) Zig-Zag appearance

(3) Uracil base (4) Single stranded nature

57. Which of the following chemical is a DNA intercalator ?

(1) 5-bromouracil (2) Ethyl methane sulfonate

(3) Acridine orange (4) UV

58. In eukaryotes replication, helicase loading occur at all replicators during :

(1) G0 phase (2) G1 phase

(3) S phase (4) G2 phase

59. Error free repair of double strand break in DNA is accomplished by :

(1) Non-homologous end joining

(2) Base excision repair

(3) Homologous recombination

(4) Mismatch repair

60. Which of the following enzyme joints the okazaki fragments ?

(1) DNA polymerase

(2) DNA ligase

(3) Helicase

(4) Restriction endonuclease

61. The following set of RNA is required in the translation process except one, choose the ***incorrect*** ?

(1) Si RNA
(2) rRNA
(3) mRNA
(4) tRNA

62. In sponge the whole inner surface of the asconoid is lined by :

(1) Choanocytes
(2) Porocytes
(3) Pnacocytes
(4) Amoebocytes

63. Metamerism is characteristic of :

(1) Platyhelminthes
(2) Mollusca
(3) Porifera
(4) Annelida

64. A deuterostomic animal is :

(1) Sea anemone
(2) Star fish
(3) Pearl oyster
(4) Cabbage butterfly

65. Saccus' term is used for :

(1) exine of pollen grains of Pinus
(2) intine of pollen grains of Pinus
(3) Wings of pollen grains of Pinus
(4) Wings of seeds of Pinus

66. Pick the pair that is ***incorrectly*** matched :

(1) Cycas – coralloid roots
(2) Abies – wood tar, wood gas
(3) Pinus – Mycorrhizal roots
(4) Sequoia – Redwood tree

67. Cedrus have :

(1) leaves with large surface area

(2) branched stem

(3) simple leaves

(4) taproot system

68. Which of the following families is characterised by trimerous flowers, superior and trilocular ovary with axile placentation ?

(1) Cucurbitaceae (2) Solanaceae

(3) Liliaceae (4) Compositae

69. The appearance of branched mass like corals on the soil is :

(1) Glittery roots (2) Coralloid roots

(3) Massy roots (4) Lancy roots

70. Which gives rise to the cork tissue ?

(1) Periblem (2) Phellogen

(3) Phelloderm (4) Periderm

71. Where in epiphytes are velamen cells located ?

(1) Below the endodermis

(2) Below the epidermis

(3) Just outside the cortex

(4) Just outside the exodermis

72. Tissue loosely held and stored food in plant is :

(1) Parenchyma (2) Meristematic

(3) Permeant tissue (4) None of above

73. In monocot stem, vascular bundles are :

(1) Arranged in ring

(2) Arranged alternatively

(3) Present inside endodermis

(4) Scattered in ground tissue

74. Root cap is formed by :

(1) Dermatogen

(2) Calyptrogen

(3) Vascular cambium

(4) Wood cambium

75. The adult body of subphylum Urochordata is covered by :

(1) Calcium

(2) Tunic

(3) Epithelium

(4) Endoderm

76. The embryonic notochord is replaced by ..... in most of the vertebrates.

(1) Ventral heart

(2) Gills

(3) Wings

(4) Vertebral column

77. Which of the following is ***not*** the characteristic feather of phylum Chordata ?

(1) Pharyngeal gills

(2) Amniotic egg

(3) Postanal tail

(4) Notochord

78. The study of migration of birds is known as :

(1) Ecology

(2) Nidology

(3) Phenology

(4) Phrenology

79. Balanoglossus belongs to :

(1) Hemichordate (2) Cephalochordate

(3) Urochordata (4) Cyclostomes

80. An Essential for the Conversion of Glucose to Glycogen in Liver is :

(1) UTP (2) GTP

(3) Pyruvate kinase (4) Guanosine

81. Which of the following hormone is ***not*** used in the hydrolysis of triacylglycerol into the fatty acids in adipose tissues ?

(1) Epinephrine (2) Norepinephrine

(3) Glucagon (4) Insulin

82. Accepts hydrogen from malate :

(1) FAD (2) NAD

(3) NADP (4) FMN

83. Which one of the following statements is ***false*** about the trachea ?

(1) Has C-shaped rings

(2) It is covered by epiglottis

(3) It splits into the right and left lungs

(4) None of the above

84. Intercostal muscle regulates the movement of :

(1) Ribs

(2) Trachea

(3) Pharynx

(4) Diaphragm

85. In a plant cell, the dark reactions take place in the :

(1) Cytosol

(2) Endoplasmic reticulum

(3) Leucoplasts

(4) Chloroplasts

86. Which of these in ***not*** a function of auxin ?

(1) inducing callus formation

(2) inducing dormancy

(3) enhancing cell division

(4) maintaining apical dominance

87. The change over from vegetative to reproductive phase in plants takes place in response to ..... .

(1) Length of the day

(2) severity of temperature

(3) Oxygen content in the air

(4) Mainly the food material available in the soil

88. Which of the following is involved in the activation of RuBisCO ?

(1) K^{+}

(2) Zn^{2+}

(3) Mg^{2+}

(4) Ca^{2+}

89. Among the following which is the best indicator of water pollution due to mixing of human faeces :

(1) Paramecium (2) Bacillus

(3) Trypanasoma (4) E. coli

90. Phytoplankton spends very little energy on developing protective structure against predators, this suggests that :

(1) Food chain is small

(2) Less competition

(3) Productivity of aquatic ecosystem is low

(4) Assimilation efficiency is high in aquatic ecosystem

91. Insectivorous plant generally grows in soil which is deficient in :

(1) Water (2) Nitrogen

(3) Potassium (4) Calcium

92. Compound responsible for pollution which caused the ill-famed Bhopal gas tragedy was :

(1) NH_4OH (2) CH_3NCO

(3) CH_3NH_2O (4) $CHCl_3$

93. Micro consumers are popularly known as :

(1) Primary consumer (2) Secondary consumer

(3) Tertiary consumer (4) Decomposers

94. Among the ecosystem mentioned below, where can one find maximum biodiversity ?

(1) Alpine meadows (2) Mangroves

(3) Desert (4) Corals

95. Which technique is used to introduce genes into dicots ?

(1) Electroporation
(2) Particle acceleration
(3) Microinjection
(4) Ti plasmid infection

96. In competitive inhibition, inhibitors bear a close structural similarity with the :

(1) Co-enzyme
(2) Co- factor
(3) Prosthetic group
(4) Substrate

97. Which of the following pathway is ***not*** used for triacylglycerol synthesis ?

(1) Glycerol 3-phosphate pathway
(2) Glyoxylate pathway
(3) Monoacylglycerol pathway
(4) Kennedy pathway

98. Ubiquinone transfers its electrons to :

(1) Complex I
(2) Complex II
(3) Matrix
(4) CytC I

99. Which antibiotic resistance is present in pBR322 ?

(1) Ampicillin
(2) Kanamycin
(3) Lactase
(4) Gentamycin

100. Ichthyoplankton is/are :

(1) Eggs of the fish
(2) Larvae of the fish
(3) Both (1) and (2)
(4) None of the above

SECTION – C

101. In Newton', ring experiment the diameters of the bright rings are proportional to the square root of :

(1) natural numebrs

(2) odd natural numebrs

(3) even natural numebrs

(4) half integral multiple of natural numbers

102. A zone plate behaves like a convex lens of focal length 50 cm for a light of wavelength 5000 Å. The radius of the first half period zone is :

(1) 5 mm (2) 0.5 mm

(3) 1 mm (4) 1.5 mm

103. Two Nicol prisms are first crossed and then one of them is rotated through 60°. The percentage of incident light transmitted is :

(1) 12.5 (2) 25.0

(3) 37.5 (4) 50.0

104. The coordination number in the case of simple cubic crystal structure is :

(1) 12 (2) 6

(3) 2 (4) 1

105. The reciprocal lattice of monoclinic is :

(1) monoclinic (2) hexagonal

(3) triclinic (4) cubic

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

(1) 34% (2) 54%

(3) 64% (4) 74%

107. The volume of the primitive unit cell of a fcc structure with lattice constant a is :

(1) a^3 (2) $a^3/2$

(3) $a^3/4$ (4) $a^3/8$

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 spacing between n^{th} energy level and the next higher level in a one dimensional potential box increase by :

(1) $2n - 1$ (2) $2n + 1$

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

110. Heisenberg uncertainity principle does not hold for the following pairs :

(1) energy and time

(2) position and momentum

(3) angular momentum and angle

(4) linear momentum and angle

111. Russel-Saunder's coupling is also called as :

(1) LS coupling (2) LJ coupling

(3) JJ coupling (4) SJ coupling

112. A laser beam is highly coherent,so it can be used in :

(1) interference (2) diffraction

(3) polarization (4) optical pumping

113. The population inversion in helium-neon laser is produced by :

(1) photon excitation (2) chemical excitation

(3) inelastic atomic collisions (4) chemical reaction

114. For nuclear fission to take place neutrons must have :

(1) very very low energy (2) thermal energy

(3) very high energy (4) no kinetic energy

115. Primary cosmic rays are composed of very energetic :

(1) electrons (2) mesons

(3) protons (4) neutrons

116. The rank of the matrix :

$$\begin{bmatrix} 3 & 4 & 1 & 2 \\ 7 & 2 & 1 & 4 \\ 5 & 6 & 2 & 4 \end{bmatrix}$$

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

117. The equation whose one root is $2 + 3i$, is given by :

(1) $x^2 + 4x + 13 = 0$ (2) $x^2 + 4x - 13 = 0$

(3) $x^2 - 4x + 13 = 0$ (4) $-x^2 + 4x + 13 = 0$

118. Which of the following is ***not*** a asymptote of the equation :

$$xy(x^2 - y^2) + 20y^2 + 8x^2 - 144 = 0$$

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

(3) $x + y = 0$ (4) $\frac{x}{20} + \frac{y}{8} = 0$

119. $\int_0^{2\pi} \sin^7 \frac{t}{4} dt$ is equal to :

(1) $\frac{64}{35}$ (2) $\frac{35}{64}$ (3) $\frac{7}{4}$ (4) $\frac{4}{7}$

120. The equation $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ represents a :

(1) Hyperbola

(2) Parabola

(3) Ellipse

(4) None of these

121. If $(a, b) = 1$, then g.c.d. of $a + b$ and $a - b$ is :

(1) 0

(2) 1

(3) 2

(4) 1 or 2

122. If $x = \cos\theta + i \sin\theta$, then $x - \frac{1}{x}$ is equal to :

(1) $\cos\theta$

(2) $\sin\theta$

(3) $2\cos\theta$

(4) $2i \sin\theta$

123. If $\vec{r} = \sin t\,\hat{i} + \cos t\,\hat{j} + t\hat{k}$, then $\left|\frac{d\vec{r}}{dt}\right|$ is equal to :

(1) 2

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

(3) $\sqrt{2}$

(4) None of these

124. $\lim\limits_{x \to b} \frac{x^b - b^x}{x^x - b^b}$ is equal to :

(1) $\frac{1 - \log b}{1 + \log b}$

(2) $\frac{1 + \log b}{1 - \log b}$

(3) $\frac{1 - \log b}{1 - \log b}$

(4) $\frac{1 + \log b}{b}$

125. The normal which is perpendicular to the osulating plane at a point is called :

(1) Principal Normal

(2) Bi-normal

(3) Principal Tangent

(4) None of these

126. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

(1) $\frac{e^{x+2y}}{9}$ (2) $\frac{e^{x+2y}}{18}$

(3) $\frac{e^{x+2y}}{27}$ (4) $\frac{e^{x+2y}}{54}$

127. The differential equation $2\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + 5\frac{\partial^2 z}{\partial y^2} = 0$ is :

(1) Elliptic (2) Parabolic

(3) Hyperbolic (4) None of these

128. If F is the limiting friction, R is the normal reaction, then coefficient of friction μ is given by :

(1) $F + R$ (2) $\frac{F}{R}$

(3) $F.R$ (4) $F - R$

129. The limit point of the set $\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \ldots\ldots\ldots\right\}$ is :

(1) 1 (2) ∞

(3) 0 (4) None of these

130. The geometrical series $a + ar + ar^2 + \ldots\ldots\ldots + \infty$ oscillates finitely, if.

(1) $|r| < 1$ (2) $r < -1$

(3) $r \geq 1$ (4) $r = -1$

131. The integrating factor of the differential equation $x^2 y dx - (x^3 + y^3) dy = 0$ is :

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

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

132. For the differential equation $\frac{d^2y}{dx^2}+6\frac{dy}{dx}+25y=10e^{3x}$, particular integral is :

(1) $\frac{5}{26}e^{3x}$ (2) $\frac{26}{5}e^{3x}$

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

133. $L(e^{at})$ is equal to :

(1) $\frac{1}{s+a}$ (2) $\frac{1}{s-a}$

(3) $\frac{2}{s+a}$ (4) $\frac{2}{s-a}$

134. The equation $(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+n(n+1)y=0$, where n is a parameter real or complex is :

(1) Bessel's equation

(2) Hermite's equation

(3) Legendre's equation

(4) None of these

135. Which of the following is ***not*** a Logical operator ?

(1) ! = (2) ||

(3) ! (4) None of these

136. If a function f is defined by $f(x) = x + 1$, $x \in [1, 3]$ and partition $P = \{1, 2, 3\}$, then $L(f, P)$ is equal to :

(1) 2 (2) 3

(3) 4 (4) 5

137. Let (R, d) be the usual metric space. Then the derived set of $A=\left\{\frac{1}{n};n\in N\right\}$ is :

(1) ϕ (2) $\{0\}$

(3) $\{0, 1\}$ (4) None of these

138. If $G = \{1, \omega, \omega^2\}$ is the group of cube roots of unity, then order of the element ω under the binary operation multiplication is :

(1) 3 (2) 4

(3) 2 (4) 1

139. A ring $R \neq \{0\}$ is called a simple ring, if :

(1) R has no ideals

(2) R has only one ideal

(3) R has no ideals except R and $\{0\}$

(4) R has at least one ideal other than R and $\{0\}$

140. If n denotes the frequency and T the periodic time, then :

(1) $nT = 1$ (2) $\frac{n}{T} = 1$

(3) $\frac{T}{n} = 1$ (4) None of these

141. The time of flight of a projectile is given by :

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

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

142. $\Gamma\left(\frac{1}{2}\right)$ is equal to :

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

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

143. If $f(x) = x \sin x$ is expanded by Fourier series in $(0, 2\pi)$, then a_0 is equal to :

(1) 2 (2) 2π

(3) $\frac{\pi}{2}$ (4) -2

144. The dimension of vector space $Q(\sqrt{2})$ over Q is :

(1) 4 (2) 3

(3) 2 (4) 1

145. In an inner product space, if $\| u+v \| = \| u \| + \| v \|$, then the vectors u, v are :

(1) linearly dependent (2) linearly independent

(3) always orthogonal (4) None of these

146. If the equation $x^5 - 5x + 2 = 0$ has three real roots, then the interval in which no real root lies is :

(1) $(-2, -1)$ (2) $(0, 1)$

(3) $(-3, -2)$ (4) $(1, 2)$

147. If $f(0) = 8, f(1) = 68$ and $f(5) = 123$, then $\Delta f(x)$ are :

(1) 50, 12.75 (2) 60, 12.75

(3) 50, 13.75 (4) 60, 13.75

148. $\int_{x_0}^{x_0+nh} f(x)dx = \frac{h}{2}$

[(Sum of first and last ordinates) + 2(sum of all the intermediate ordinates)]

is called :

(1) Simpson's one-third rule

(2) Simpson's three-eights rule

(3) Trapezoidal rule

(4) None of these

149. If momentum of a certain body be increased by 50%, its kinetic energy will increase by :

(1) 25% (2) 50%

(3) 100% (4) 125%

150. A ring is rolling on a surface without slipping. The ratio of it; translation to rotational kinetic energie is :

(1) 5 : 7 (2) 2 : 5

(3) 2 : 7 (4) 1 : 1

151. A force $\vec{F} = -\vec{\nabla}u$ is said to be conservative if :

(1) grad F = zero (2) div F = zero

(3) curl F = zero (4) none of the above

152. The susceptibility of a diamagnetic substance :

(1) decrease with temperature

(2) does not vary with temperature

(3) first decrease and then increase with temperature

(4) increase with temperature

153. The Bulk modulus of a perfectly rigid body is equal to :

(1) Zero

(2) Unit

(3) Infinity

(4) may have any finite non-zero value

154. What will be the temperature when the r.m.s. velocity of a gas is double then that at 27°C ?

(1) 300 K (2) 600 K

(3) 900 K (4) 1200 K

155. If the speed of a particle moving at a relativistic speed is doubled, it's linear momentum will :

(1) become double
(2) become more than double
(3) become less than double
(4) No effect

156. Choke used to limit high frequency A. C. has :

(1) air core
(2) iron core
(3) paramagnetic core
(4) diamagnetic core

157. 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

158. An oscillator is nothing but an amplifier with :

(1) large gain
(2) negative feedback
(3) positive feedback
(4) no feedback

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

(1) remains constant
(2) decreases
(3) increases
(4) may either increase or decrease depending on the process used

160. A Carnot engine absorbs 100 calories of heat from a source at 400 K and give 80 calories to sink. The temperature of sink is :

(1) 20 K
(2) 300 K
(3) 320 K
(4) 500 K

161. Which law of thermodynamics states that entropy of a system vanishes at absolute zero ?

(1) Zeroth law (2) First law

(3) Second law (4) Third law

162. When a thin convex lens is put in contact with a thin concave lens of the same focal length f, the resultant combination has a focal length equal to :

(1) $f/2$ (2) $2f$

(3) zero (4) infinity

163. Chromatic aberration in the formation of images by a lens arises because :

(1) of non-paraxial rays

(2) the radii of curvature of the two sides are not same

(3) of the defect in grinding

(4) the focal length varies with wavelength

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

(1) zero (2) positive

(3) infinity (4) negative

165. The probability that in tossing a coin 10 times, we get 5 heads, 5 tails is :

(1) 1/1024 (2) 120/1024

(3) 255/1024 (4) 180/1024

166. Which of the following is a good nuclear fuel ?

(1) Neptunium – 239 (2) Plutorium – 239

(3) Thorium – 236 (4) Uranium – 236

Total No. of Printed Pages : 29

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C

SET-X

PG-EE-2021

SUBJECT : Forensic Science

10027

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **166**

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

Name_____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

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

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SECTION – A

1. The average of any observable quantity, x can be estimated using quantum mechanics by relation :

(1) $< x > = \dfrac{\int x\psi\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$

(2) $< x > = \dfrac{\int \psi\psi^{\oplus} x d\tau}{\int \psi\psi^{\oplus} d\tau}$

(3) $< x > = \dfrac{\int \psi x\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$

(4) None of these

2. Evaluation of commutator $\left[x, \dfrac{d}{dx} \right]$ yields value :

(1) Zero

(2) 1

(3) –1

(4) None of these

3. In the limit $T \to 0$, Entropy of a crystal at temperature, T (S_T) is given by :

(1) $S_T = C_{P/3}$

(2) $S_T = C_{P/4}$

(3) $S_T = C_P$

(4) $S_T = C_{P/2}$

4. Isotonic solutions have :

(1) same vapour pressure

(2) same viscosity

(3) same surface tension

(4) same osmotic pressure

5. The Clapeyron-Clausius equation for the transition equilibrium may be expressed as :

(1) $\dfrac{dT}{dP} = \dfrac{T(V_B - V_A)}{\Delta H_t}$; where all the symbols have their usual meaning

(2) $\dfrac{dT}{dP} = T(V_B - V_A)\Delta H_t$

(3) $\dfrac{dP}{dT} = T(V_B - V_A)\Delta H_t$

(4) $\dfrac{dT}{dP} = \dfrac{T^2 \Delta H_t}{V_B - V_A}$

6. Spotting electrolyte is used to eliminate :

(1) Migration current (2) Diffusion current

(3) Limiting current (4) Condenser current

7. In the lead acid battery during charging the cathode reaction is :

(1) Formation of $PbSO_4$ (2) Reduction of Pb^{2+} to Pb

(3) Formation of PbO_2 (4) None of these

8. The temperature at which second virial coefficient of a real gas is zero, is called :

(1) Critical temperature (2) Boiling point

(3) Eutectic point (4) Boyle temperature

9. The degeneracy of the rotational energy level with J = 4 for a heteronuclear diatomic molecule is :

(1) 4 (2) 2

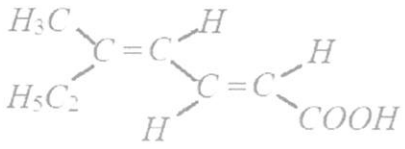
(3) 9 (4) 1

10. If $\left(\frac{\partial P}{\partial T}\right)_V = \frac{\alpha}{\beta}$; then which of the following relation is correct (Maxwell relation) :

(1) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\beta}{\alpha}$ (2) $\left(\frac{\partial S}{\partial V}\right)_T = -\frac{\alpha}{\beta}$

(3) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\alpha}{\beta}$ (4) $\left(\frac{\partial S}{\partial V}\right)_T = \alpha \times \beta$

11. The configuration of the given compound is :



(1) 2*Z*, 4*Z* (2) 2*E*, 4*Z*

(3) 2*E*, 4*E* (4) 2*Z*, 4*E*

12. Lewis acid strength of BCl_3, BF_3 and BBr_3 varies in the order :

(1) $BF_3 > BCl_3 > BBr_3$ (2) $BF_3 > BCl_3 \approx BBr_3$

(3) $BF_3 > BBr_3 > BCl_3$ (4) $BCl_3 > BBr_3 > BF_3$

13. Which is of the following is ***not*** a hard base ?

(1) NH_3 (2) H_2O

(3) Cl^- (4) CN^-

14. The bond order in super oxide (O_2^-) ion is :

(1) 2 (2) 2.5

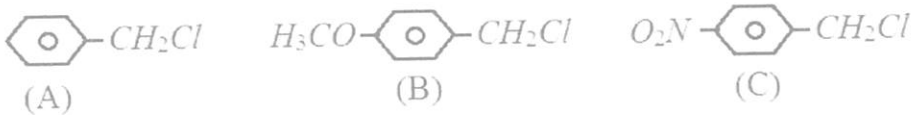
(3) 1.5 (4) 3

15. For an isentropic change of state :

(1) ds =1 (2) ds = 0

(3) dH = 0 (4) dE = 0

16. Arrange the following compounds in order of their decreasing reactivity towards SN_1 reaction :



(A) (B) (C)

(1) A > B > C (2) B > A > C

(3) C > B > A (4) B > C > A

17. Which of the following carbonyl does not obey EAN rule ?

(1) $V(CO)_6$ (2) $Fe(CO)_5$

(3) $Ni(CO)_4$ (4) $Cr(CO)_6$

18. The spectroscopic state for d^3 system is :

(1) $4D_{3/2}$ (2) $4F_2$

(3) $4F_{3/2}$ (4) $3F_{3/2}$

19. Mercury is the only metal which is liquid at 0°C. This is due to :

(1) High vapour pressure

(2) High atomic weight

(3) Low ionization potential

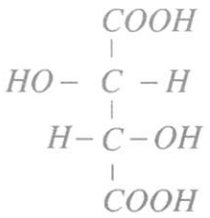
(4) High ionization energy and weak metallic bond

20. Acid present in tomatoes is :

(1) Boric acid (2) Citric acid

(3) Tartaric acid (4) Oxalic acid

21. Absolute configuration of



is :

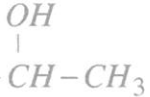
(1) 2R, 3R (2) 2S, 3S

(3) 2S, 3R (4) 2R, 3S

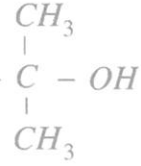
22. The product in the following reaction :

$$CH_3 - CN \xrightarrow[\text{(ii)}\quad H_2O]{\text{(i)}\quad CH_3MgBr} ?$$

is :

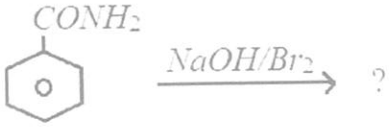
(1) 

(2) CH_3COCH_3

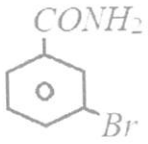
(3) 

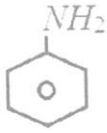
(4) 

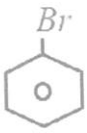
23. The product in the given reaction is :



(1) 

(2) 

(3) 

(4) 

24. Which of the following ligands functions as σ-donor-π-acceptor ?

(1) CO (2) C_2H_2

(3) C_2H_4 (4) C_2H_6

25. The name of the transition metal ion that activates insulin is :

(1) Copper (2) Iron

(3) Manganese (4) Chromium

26. The effective nuclear chage for 35 electron in sulphur is :

(1) 5.25 (2) 5.45

(3) 5.15 (4) 5.55

27. In the Compton effect, the Compton wavelength is the value corresponding to the scattering angle equal to :

(1) 90° (2) 0°

(3) 180° (4) 270°

28. Structure of B_2H_6 is depicted as :

(1) Octahedral structure

(2) Two BH_3 units joined together

(3) Two BH_2 units joined by two B-H-B

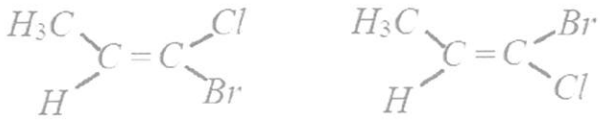
(4) Two BH_3 units joined by two B-H-B

29. The magnetic moment value in lanthanide series is maximum with :

(1) Cerium (2) Neodymium

(3) Gadolinium (4) Holmium

30. Following pair of compounds are



(1) Enantiomers (2) Homomers

(3) Diastereomers (4) Geometrical isomers

31. The Miller indices of crystal planes which cut through the crystal axes at $(2a, 3b, c)$ are :

(1) (122) (2) (111)

(3) (326) (4) $(1\bar{1}\bar{1})$

32. If activation energy of a reaction is zero, then rate constant, K is equal to :

(1) A^{-1} (2) A

(3) Infinity (4) Zero

Where 'A' is the frequency factor.

33. According to Debye-Huckel theory of strong electrolytes, increase in conductivity on dilution is due to :

(1) Decrease in viscosity of the solution

(2) Increase in volume of the solution

(3) Increase in number of ions

(4) Increase in mobility of ions

34. In phase diagram for lead-silver system at eutectic point, the number of degree of freedom is :

(1) Zero (2) One

(3) Two (4) Three

SECTION – B

35. Phytoplankton spends very little energy on developing protective structure against predators, this suggests that :

(1) Food chain is small

(2) Less competition

(3) Productivity of aquatic ecosystem is low

(4) Assimilation efficiency is high in aquatic ecosystem

36. Insectivorous plant generally grows in soil which is deficient in :

(1) Water (2) Nitrogen

(3) Potassium (4) Calcium

37. Compound responsible for pollution which caused the ill-famed Bhopal gas tragedy was :

(1) NH_4OH (2) CH_3NCO

(3) CH_3NH_2O (4) $CHCl_3$

38. Micro consumers are popularly known as :

(1) Primary consumer (2) Secondary consumer

(3) Tertiary consumer (4) Decomposers

39. Among the ecosystem mentioned below, where can one find maximum biodiversity ?

(1) Alpine meadows (2) Mangroves

(3) Desert (4) Corals

40. Which technique is used to introduce genes into dicots ?

(1) Electroporation (2) Particle acceleration

(3) Microinjection (4) Ti plasmid infection

41. In competitive inhibition, inhibitors bear a close structural similarity with the :

(1) Co-enzyme (2) Co- factor

(3) Prosthetic group (4) Substrate

42. Which of the following pathway is ***not*** used for triacylglycerol synthesis ?

(1) Glycerol 3-phosphate pathway (2) Glyoxylate pathway

(3) Monoacylglycerol pathway (4) Kennedy pathway

43. Ubiquinone transfers its electrons to :

(1) Complex I (2) Complex II

(3) Matrix (4) CytC I

44. Which antibiotic resistance is present in pBR322 ?

(1) Ampicillin (2) Kanamycin

(3) Lactase (4) Gentamycin

45. The initial dorsal-ventral axis in amphibian embryos is determined by :

(1) The point of sperm entry

(2) Gravity

(3) The point of contact with the uterus

(4) Genetic differences in the cells

46. The central fluid filled cavity of the blastula is known as :

(1) Archenteron (2) Blastocoel

(3) Blastocyst (4) Morula

47. The cells which secrete male sex hormone testosterone are :

(1) Isthmus (2) Crypt cells

(3) Lieberkuhn (4) Leydig's cells

48. In human beings, the eggs are :

(1) Microlecithal (2) Macrolecithal

(3) Mesolecithal (4) Alecithal

49. Which of the following plant growth hormone increases the yield of sugar by increasing the length of stem in sugarcane ?

(1) Cytokinin (2) Ethylene

(3) Gibberellic acid (4) Auxin

50. Botanical name of tea is :

(1) Coffea arabica (2) Sinensis thea

(3) Camellia sinensis (4) None of above

51. The aromatic volatile components of spices are :

(1) Spice oil (2) Spice fat

(3) Spice gel (4) Spice paste

52. Which of the component is reduced when pulses are soaked ?

(1) Phytic acid (2) Nitric acid

(3) Potassium oxide (4) Nitrous oxide

53. Osphradium acts as ..... organ.

(1) Sense (2) Defense

(3) Reproductive (4) Respiratory

54. National Bureau of Fish Genetic Resources is located at... ?

(1) Jabalpur, Madhya Pradesh

(2) Lucknow, Uttar Pradesh

(3) Hyderabad, Andhra Pradesh

(4) Patna, Bihar

55. Which of this bacterium is resistant to penicillin as it lacks a cell wall ?

(1) Spirochetes (2) Cyanobacteria

(3) Mycoplasmas (4) Bdellovibrios

56. Which of these is exposed on the outer surface of a gram-negative bacterium ?

(1) Braun lipoprotein

(2) O-antigen of lipopolysaccharide (LPS)

(3) Polysaccharide portion of lipoteichoic acid (LTA)

(4) Electron transport system components

57. The electron acceptor in the anaerobic condition in prokaryotes is :

(1) SO_4^{2-}

(2) Antioxidants such as vitamin K

(3) Fatty acids

(4) Glucose, fructose, maltose

58. Which of the following membrane lipid constituents can be considered as the lipid marker of inner mitochondrial membrane ?

(1) Lecithin (2) Cardiolipin

(3) Ceramide (4) Sphingoceramide

59. Which is the most variable stage of cell cycle ?

(1) G1 phase (2) S phase

(3) G2 phase (4) M phase

60. Which of the following is microtubule associated protein (MAPS) ?

(1) tus protein (2) tau protein

(3) rho protein (4) G protein

61. Which of the following is the most heterogenous protein of cytoskeletal filaments ?

(1) Microtubule (2) Microfilament

(3) Intermediate filaments (4) None of above

62. Which of the following organelle involved in xenobiotic detoxification ?

(1) Golgi (2) Lysosomes

(3) RER (4) SER

63. Which of the following chromosomal alterations would you expect to have the most drastic consequences ?

(1) Inversion (2) duplication

(3) translocation (4) deletion

64. Archesporium is :

(1) A diploid tissue responsible for the formation of sporogenous tissue

(2) A part of archegonia

(3) A haploid tissue responsible for the formation of gametophytic cells

(4) None of the above

65. Club mosses are :

(1) Lycopsida (2) Psilopsida

(3) Pteropsida (4) Sphenopsida

66. Z-DNA have a :

(1) Double helical nature (2) Zig-Zag appearance

(3) Uracil base (4) Single stranded nature

67. Which of the following chemical is a DNA intercalator ?

(1) 5-bromouracil (2) Ethyl methane sulfonate

(3) Acridine orange (4) UV

68. In eukaryotes replication, helicase loading occur at all replicators during :

(1) G0 phase (2) G1 phase

(3) S phase (4) G2 phase

69. Error free repair of double strand break in DNA is accomplished by :

(1) Non-homologous end joining

(2) Base excision repair

(3) Homologous recombination

(4) Mismatch repair

70. Which of the following enzyme joints the okazaki fragments ?

(1) DNA polymerase

(2) DNA ligase

(3) Helicase

(4) Restriction endonuclease

71. The following set of RNA is required in the translation process except one, choose the ***incorrect*** ?

(1) Si RNA (2) rRNA

(3) mRNA (4) tRNA

72. In sponge the whole inner surface of the asconoid is lined by :

(1) Choanocytes
(2) Porocytes
(3) Pnacocytes
(4) Amoebocytes

73. Metamerism is characteristic of :

(1) Platyhelminthes
(2) Mollusca
(3) Porifera
(4) Annelida

74. A deuterostomic animal is :

(1) Sea anemone
(2) Star fish
(3) Pearl oyster
(4) Cabbage butterfly

75. Saccus' term is used for :

(1) exine of pollen grains of Pinus
(2) intine of pollen grains of Pinus
(3) Wings of pollen grains of Pinus
(4) Wings of seeds of Pinus

76. Pick the pair that is ***incorrectly*** matched :

(1) Cycas – coralloid roots
(2) Abies – wood tar, wood gas
(3) Pinus – Mycorrhizal roots
(4) Sequoia – Redwood tree

77. Cedrus have :

(1) leaves with large surface area
(2) branched stem
(3) simple leaves
(4) taproot system

78. Which of the following families is characterised by trimerous flowers, superior and trilocular ovary with axile placentation ?

(1) Cucurbitaceae (2) Solanaceae

(3) Liliaceae (4) Compositae

79. The appearance of branched mass like corals on the soil is :

(1) Glittery roots (2) Coralloid roots

(3) Massy roots (4) Lancy roots

80. Which gives rise to the cork tissue ?

(1) Periblem (2) Phellogen

(3) Phelloderm (4) Periderm

81. Where in epiphytes are velamen cells located ?

(1) Below the endodermis

(2) Below the epidermis

(3) Just outside the cortex

(4) Just outside the exodermis

82. Tissue loosely held and stored food in plant is :

(1) Parenchyma (2) Meristematic

(3) Permeant tissue (4) None of above

83. In monocot stem, vascular bundles are :

(1) Arranged in ring

(2) Arranged alternatively

(3) Present inside endodermis

(4) Scattered in ground tissue

84. Root cap is formed by :

(1) Dermatogen
(2) Calyptrogen
(3) Vascular cambium
(4) Wood cambium

85. The adult body of subphylum Urochordata is covered by :

(1) Calcium
(2) Tunic
(3) Epithelium
(4) Endoderm

86. The embryonic notochord is replaced by ..... in most of the vertebrates.

(1) Ventral heart
(2) Gills
(3) Wings
(4) Vertebral column

87. Which of the following is ***not*** the characteristic feather of phylum Chordata ?

(1) Pharyngeal gills
(2) Amniotic egg
(3) Postanal tail
(4) Notochord

88. The study of migration of birds is known as :

(1) Ecology
(2) Nidology
(3) Phenology
(4) Phrenology

89. Balanoglossus belongs to :

(1) Hemichordate
(2) Cephalochordate
(3) Urochordata
(4) Cyclostomes

90. An Essential for the Conversion of Glucose to Glycogen in Liver is :

(1) UTP
(2) GTP
(3) Pyruvate kinase
(4) Guanosine

91. Which of the following hormone is ***not*** used in the hydrolysis of triacylglycerol into the fatty acids in adipose tissues ?

(1) Epinephrine (2) Norepinephrine

(3) Glucagon (4) Insulin

92. Accepts hydrogen from malate :

(1) FAD (2) NAD

(3) NADP (4) FMN

93. Which one of the following statements is ***false*** about the trachea ?

(1) Has C-shaped rings

(2) It is covered by epiglottis

(3) It splits into the right and left lungs

(4) None of the above

94. Intercostal muscle regulates the movement of :

(1) Ribs (2) Trachea

(3) Pharynx (4) Diaphragm

95. In a plant cell, the dark reactions take place in the :

(1) Cytosol (2) Endoplasmic reticulum

(3) Leucoplasts (4) Chloroplasts

96. Which of these in ***not*** a function of auxin ?

(1) inducing callus formation

(2) inducing dormancy

(3) enhancing cell division

(4) maintaining apical dominance

97. The change over from vegetative to reproductive phase in plants takes place in response to ..... .

(1) Length of the day

(2) severity of temperature

(3) Oxygen content in the air

(4) Mainly the food material available in the soil

98. Which of the following is involved in the activation of RuBisCO ?

(1) K^+ (2) Zn^{2+}

(3) Mg^{2+} (4) Ca^{2+}

99. Among the following which is the best indicator of water pollution due to mixing of human faeces :

(1) Paramecium (2) Bacillus

(3) Trypanasoma (4) E. coli

100. Ichthyoplankton is/are :

(1) Eggs of the fish (2) Larvae of the fish

(3) Both (1) and (2) (4) None of the above

SECTION – C

101. Choke used to limit high frequency A. C. has :

(1) air core (2) iron core

(3) paramagnetic core (4) diamagnetic core

102. 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

103. An oscillator is nothing but an amplifier with :

(1) large gain (2) negative feedback

(3) positive feedback (4) no feedback

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

(1) remains constant

(2) decreases

(3) increases

(4) may either increase or decrease depending on the process used

105. A Carnot engine absorbs 100 calories of heat from a source at 400 K and give 80 calories to sink. The temperature of sink is :

(1) 20 K (2) 300 K

(3) 320 K (4) 500 K

106. Which law of thermodynamics states that entropy of a system vanishes at absolute zero ?

(1) Zeroth law (2) First law

(3) Second law (4) Third law

107. When a thin convex lens is put in contact with a thin concave lens of the same focal length f, the resultant combination has a focal length equal to :

(1) $f/2$ (2) $2f$

(3) zero (4) infinity

108. Chromatic aberration in the formation of images by a lens arises because :

(1) of non-paraxial rays

(2) the radii of curvature of the two sides are not same

(3) of the defect in grinding

(4) the focal length varies with wavelength

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

(1) zero (2) positive

(3) infinity (4) negative

110. The probability that in tossing a coin 10 times, we get 5 heads, 5 tails is :

(1) 1/1024 (2) 120/1024

(3) 255/1024 (4) 180/1024

111. In Newton', ring experiment the diameters of the bright rings are proportional to the square root of :

(1) natural numebrs

(2) odd natural numebrs

(3) even natural numebrs

(4) half integral multiple of natural numbers

112. A zone plate behaves like a convex lens of focal length 50 cm for a light of wavelength 5000 Å. The radius of the first half period zone is :

(1) 5 mm (2) 0.5 mm

(3) 1 mm (4) 1.5 mm

113. Two Nicol prisms are first crossed and then one of them is rotated through 60°. The percentage of incident light transmitted is :

(1) 12.5 (2) 25.0

(3) 37.5 (4) 50.0

114. The coordination number in the case of simple cubic crystal structure is :

(1) 12 (2) 6

(3) 2 (4) 1

115. The reciprocal lattice of monoclinic is :

(1) monoclinic (2) hexagonal

(3) triclinic (4) cubic

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

(1) 34% (2) 54%

(3) 64% (4) 74%

117. The volume of the primitive unit cell of a fcc structure with lattice constant a is :

(1) a^3 (2) $a^3/2$

(3) $a^3/4$ (4) $a^3/8$

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 spacing between n^{th} energy level and the next higher level in a one dimensional potential box increase by :

(1) $2n - 1$ (2) $2n + 1$

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

120. Heisenberg uncertainity principle does not hold for the following pairs :

(1) energy and time

(2) position and momentum

(3) angular momentum and angle

(4) linear momentum and angle

121. Russel-Saunder's coupling is also called as :

(1) LS coupling (2) LJ coupling

(3) JJ coupling (4) SJ coupling

122. A laser beam is highly coherent,so it can be used in :

(1) interference (2) diffraction

(3) polarization (4) optical pumping

123. The population inversion in helium-neon laser is produced by :

(1) photon excitation (2) chemical excitation

(3) inelastic atomic collisions (4) chemical reaction

124. For nuclear fission to take place neutrons must have :

(1) very very low energy (2) thermal energy

(3) very high energy (4) no kinetic energy

125. Primary cosmic rays are composed of very energetic :

(1) electrons (2) mesons

(3) protons (4) neutrons

126. The rank of the matrix :

$$\begin{bmatrix} 3 & 4 & 1 & 2 \\ 7 & 2 & 1 & 4 \\ 5 & 6 & 2 & 4 \end{bmatrix}$$

(1) 4 (2) 3

(3) 2 (4) 1

127. The equation whose one root is $2 + 3i$, is given by :

(1) $x^2 + 4x + 13 = 0$ (2) $x^2 + 4x - 13 = 0$

(3) $x^2 - 4x + 13 = 0$ (4) $-x^2 + 4x + 13 = 0$

128. Which of the following is ***not*** a asymptote of the equation :

$$xy(x^2 - y^2) + 20y^2 + 8x^2 - 144 = 0$$

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

(3) $x + y = 0$ (4) $\frac{x}{20} + \frac{y}{8} = 0$

129. $\int_0^{2\pi} \sin^7 \frac{t}{4} dt$ is equal to :

(1) $\frac{64}{35}$ (2) $\frac{35}{64}$

(3) $\frac{7}{4}$ (4) $\frac{4}{7}$

130. The equation $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ represents a :

(1) Hyperbola (2) Parabola

(3) Ellipse (4) None of these

131. If $(a, b) = 1$, then g.c.d. of $a + b$ and $a - b$ is :

(1) 0 (2) 1

(3) 2 (4) 1 or 2

132. If $x = \cos\theta + i\sin\theta$, then $x - \frac{1}{x}$ is equal to :

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

(3) $2\cos\theta$ (4) $2i\sin\theta$

133. If $\vec{r} = \sin t\,\hat{i} + \cos t\,\hat{j} + t\hat{k}$, then $\left|\frac{d\vec{r}}{dt}\right|$ is equal to :

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

(3) $\sqrt{2}$ (4) None of these

134. $\lim_{x\to b} \frac{x^b - b^x}{x^x - b^b}$ is equal to :

(1) $\frac{1-\log b}{1+\log b}$ (2) $\frac{1+\log b}{1-\log b}$

(3) $\frac{1-\log b}{1-\log b}$ (4) $\frac{1+\log b}{b}$

135. The normal which is perpendicular to the osulating plane at a point is called :

(1) Principal Normal (2) Bi-normal

(3) Principal Tangent (4) None of these

136. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

(1) $\frac{e^{x+2y}}{9}$ (2) $\frac{e^{x+2y}}{18}$

(3) $\frac{e^{x+2y}}{27}$ (4) $\frac{e^{x+2y}}{54}$

137. The differential equation $2\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + 5\frac{\partial^2 z}{\partial y^2} = 0$ is :

(1) Elliptic (2) Parabolic

(3) Hyperbolic (4) None of these

138. If F is the limiting friction, R is the normal reaction, then coefficient of friction μ is given by :

(1) $F+R$ (2) $\frac{F}{R}$

(3) $F.R$ (4) $F-R$

139. The limit point of the set $\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \ldots\ldots\ldots\right\}$ is :

(1) 1 (2) ∞

(3) 0 (4) None of these

140. The geometrical series $a+ar+ar^2+\ldots\ldots\ldots+\infty$ oscillates finitely, if.

(1) $|r|<1$ (2) $r<-1$

(3) $r\geq 1$ (4) $r=-1$

141. The integrating factor of the differential equation $x^2ydx-(x^3+y^3)dy=0$ is :

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

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

142. For the differential equation $\frac{d^2y}{dx^2}+6\frac{dy}{dx}+25y=10e^{3x}$, particular integral is :

(1) $\frac{5}{26}e^{3x}$ (2) $\frac{26}{5}e^{3x}$

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

143. $L(e^{at})$ is equal to :

(1) $\frac{1}{s+a}$ (2) $\frac{1}{s-a}$

(3) $\frac{2}{s+a}$ (4) $\frac{2}{s-a}$

144. The equation $(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+n(n+1)y=0$, where n is a parameter real or complex is :

(1) Bessel's equation

(2) Hermite's equation

(3) Legendre's equation

(4) None of these

145. Which of the following is ***not*** a Logical operator ?

(1) ! =

(2) ||

(3) !

(4) None of these

146. If a function f is defined by $f(x) = x + 1$, $x \in [1, 3]$ and partition $P = \{1, 2, 3\}$, then $L(f, P)$ is equal to :

(1) 2

(2) 3

(3) 4

(4) 5

147. Let (R, d) be the usual metric space. Then the derived set of $A=\left\{\frac{1}{n}; n\in N\right\}$ is :

(1) ϕ

(2) $\{0\}$

(3) $\{0, 1\}$

(4) None of these

148. If $G=\{1,\omega,\omega^2\}$ is the group of cube roots of unity, then order of the element ω under the binary operation multiplication is :

(1) 3

(2) 4

(3) 2

(4) 1

149. A ring $R \neq \{0\}$ is called a simple ring, if :

(1) R has no ideals

(2) R has only one ideal

(3) R has no ideals except R and $\{0\}$

(4) R has at least one ideal other than R and $\{0\}$

150. If n denotes the frequency and T the periodic time, then :

(1) $nT = 1$ (2) $\frac{n}{T} = 1$

(3) $\frac{T}{n} = 1$ (4) None of these

151. The time of flight of a projectile is given by :

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

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

152. $\Gamma\left(\frac{1}{2}\right)$ is equal to :

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

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

153. If $f(x) = x \sin x$ is expanded by Fourier series in $(0, 2\pi)$, then a_0 is equal to :

(1) 2 (2) 2π

(3) $\frac{\pi}{2}$ (4) -2

154. The dimension of vector space $Q(\sqrt{2})$ over Q is :

(1) 4 (2) 3

(3) 2 (4) 1

155. In an inner product space, if $\| u + v \| = \| u \| + \| v \|$, then the vectors u, v are :

(1) linearly dependent

(2) linearly independent

(3) always orthogonal

(4) None of these

156. If the equation $x^5 - 5x + 2 = 0$ has three real roots, then the interval in which no real root lies is :

(1) (–2, –1) (2) (0, 1)

(3) (–3, –2) (4) (1, 2)

157. If $f(0) = 8, f(1) = 68$ and $f(5) = 123$, then $\Delta f(x)$ are :

(1) 50, 12.75 (2) 60, 12.75

(3) 50, 13.75 (4) 60, 13.75

158. $\int_{x_0}^{x_0+nh} f(x)dx = \frac{h}{2}$

[(Sum of first and last ordinates) + 2(sum of all the intermediate ordinates)] is called :

(1) Simpson's one-third rule

(2) Simpson's three-eights rule

(3) Trapezoidal rule

(4) None of these

159. If momentum of a certain body be increased by 50%, its kinetic energy will increase by :

(1) 25% (2) 50%

(3) 100% (4) 125%

160. A ring is rolling on a surface without slipping. The ratio of it; translation to rotational kinetic energie is :

(1) 5 : 7 (2) 2 : 5

(3) 2 : 7 (4) 1 : 1

161. A force $\vec{F} = -\vec{\nabla}u$ is said to be conservative if :

(1) grad F = zero (2) div F = zero

(3) curl F = zero (4) none of the above

162. The susceptibility of a diamagnetic substance :

(1) decrease with temperature

(2) does not vary with temperature

(3) first decrease and then increase with temperature

(4) increase with temperature

163. The Bulk modulus of a perfectly rigid body is equal to :

(1) Zero

(2) Unit

(3) Infinity

(4) may have any finite non-zero value

164. What will be the temperature when the r.m.s. velocity of a gas is double then that at 27°C ?

(1) 300 K (2) 600 K

(3) 900 K (4) 1200 K

165. If the speed of a particle moving at a relativistic speed is doubled, it's linear momentum will :

(1) become double (2) become more than double

(3) become less than double (4) No effect

166. Which of the following is a good nuclear fuel ?

(1) Neptunium – 239 (2) Plutorium – 239

(3) Thorium – 236 (4) Uranium – 236

Total No. of Printed Pages : 29

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D

SET-X

PG-EE-2021

SUBJECT : Forensic Science

10032

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **166**

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

Name_____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

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

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

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

SECTION – A

1. Spotting electrolyte is used to eliminate :

(1) Migration current (2) Diffusion current

(3) Limiting current (4) Condenser current

2. In the lead acid battery during charging the cathode reaction is :

(1) Formation of $PbSO_4$ (2) Reduction of Pb^{2+} to Pb

(3) Formation of PbO_2 (4) None of these

3. The temperature at which second virial coefficient of a real gas is zero, is called :

(1) Critical temperature (2) Boiling point

(3) Eutectic point (4) Boyle temperature

4. The degeneracy of the rotational energy level with J = 4 for a heteronuclear diatomic molecule is :

(1) 4 (2) 2

(3) 9 (4) 1

5. If $\left(\frac{\partial P}{\partial T}\right)_V = \frac{\alpha}{\beta}$; then which of the following relation is correct (Maxwell relation) :

(1) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\beta}{\alpha}$ (2) $\left(\frac{\partial S}{\partial V}\right)_T = -\frac{\alpha}{\beta}$

(3) $\left(\frac{\partial S}{\partial V}\right)_T = \frac{\alpha}{\beta}$ (4) $\left(\frac{\partial S}{\partial V}\right)_T = \alpha \times \beta$

6. The effective nuclear chage for 35 electron in sulphur is :

(1) 5.25 (2) 5.45

(3) 5.15 (4) 5.55

7. In the Compton effect, the Compton wavelength is the value corresponding to the scattering angle equal to :

(1) 90° (2) 0°

(3) 180° (4) 270°

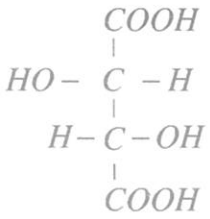
8. Structure of B_2H_6 is depicted as :
   (1) Octahedral structure
   (2) Two BH_3 units joined together
   (3) Two BH_2 units joined by two B-H-B
   (4) Two BH_3 units joined by two B-H-B

9. The magnetic moment value in lanthanide series is maximum with :
   (1) Cerium (2) Neodymium
   (3) Gadolinium (4) Holmium

10. Following pair of compounds are

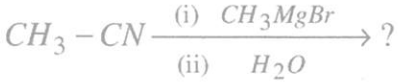
   (1) Enantiomers (2) Homomers
   (3) Diastereomers (4) Geometrical isomers

11. Absolute configuration of

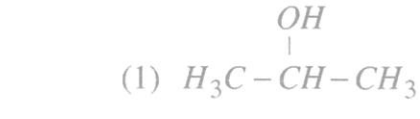


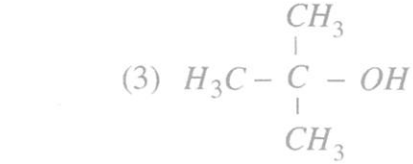
is :
   (1) 2R, 3R (2) 2S, 3S (3) 2S, 3R (4) 2R, 3S

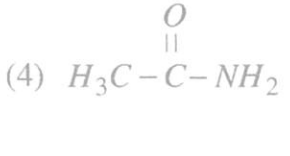
12. The product in the following reaction :



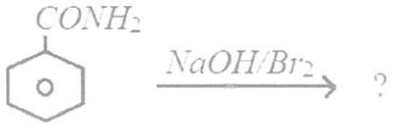
is :



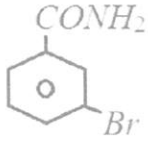


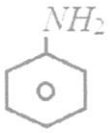


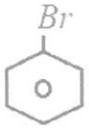
13. The product in the given reaction is :



(1) 

(2) 

(3) 

(4) 

14. Which of the following ligands functions as σ-donor-π-acceptor ?

(1) CO (2) C_2H_2

(3) C_2H_4 (4) C_2H_6

15. The name of the transition metal ion that activates insulin is :

(1) Copper (2) Iron

(3) Manganese (4) Chromium

16. The average of any observable quantity, x can be estimated using quantum mechanics by relation :

(1) $< x > = \dfrac{\int x\psi\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$

(2) $< x > = \dfrac{\int \psi\psi^{\oplus} x d\tau}{\int \psi\psi^{\oplus} d\tau}$

(3) $< x > = \dfrac{\int \psi x\psi^{\oplus} d\tau}{\int \psi\psi^{\oplus} d\tau}$

(4) None of these

17. Evaluation of commutator $\left[x, \frac{d}{dx}\right]$ yields value :

(1) Zero (2) 1

(3) -1 (4) None of these

18. In the limit $T \to 0$, Entropy of a crystal at temperature, T (S_T) is given by :

(1) $S_T = C_{P/3}$ (2) $S_T = C_{P/4}$

(3) $S_T = C_P$ (4) $S_T = C_{P/2}$

19. Isotonic solutions have :

(1) same vapour pressure

(2) same viscosity

(3) same surface tension

(4) same osmotic pressure

20. The Clapeyron-Clausius equation for the transition equilibrium may be expressed as :

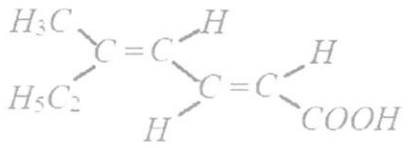
(1) $\frac{dT}{dP} = \frac{T(V_B - V_A)}{\Delta H_t}$; where all the symbols have their usual meaning

(2) $\frac{dT}{dP} = T(V_B - V_A)\Delta H_t$

(3) $\frac{dP}{dT} = T(V_B - V_A)\Delta H_t$

(4) $\frac{dT}{dP} = \frac{T^2 \Delta H_t}{V_B - V_A}$

21. The configuration of the given compound is :



(1) 2Z, 4Z (2) 2E, 4Z

(3) 2E, 4E (4) 2Z, 4E

22. Lewis acid strength of BCl_3, BF_3 and BBr_3 varies in the order :

(1) $BF_3 > BCl_3 > BBr_3$ (2) $BF_3 > BCl_3 \approx BBr_3$

(3) $BF_3 > BBr_3 > BCl_3$ (4) $BCl_3 > BBr_3 > BF_3$

23. Which is of the following is ***not*** a hard base ?

(1) NH_3 (2) H_2O

(3) Cl^- (4) CN^-

24. The bond order in super oxide (O_2^-) ion is :

(1) 2 (2) 2.5

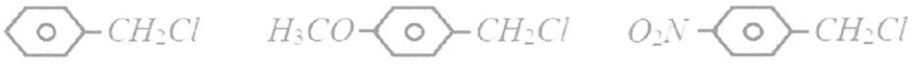
(3) 1.5 (4) 3

25. For an isentropic change of state :

(1) ds =1 (2) ds = 0

(3) dH = 0 (4) dE = 0

26. Arrange the following compounds in order of their decreasing reactivity towards SN_1 reaction :



(A) (B) (C)

(1) A > B > C (2) B > A > C

(3) C > B > A (4) B > C > A

27. Which of the following carbonyl does not obey EAN rule ?

(1) $V(CO)_6$ (2) $Fe(CO)_5$

(3) $Ni(CO)_4$ (4) $Cr(CO)_6$

28. The spectroscopic state for d^3 system is :

(1) $4D_{3/2}$ (2) $4F_2$

(3) $4F_{3/2}$ (4) $3F_{3/2}$

29. Mercury is the only metal which is liquid at 0°C. This is due to :

(1) High vapour pressure

(2) High atomic weight

(3) Low ionization potential

(4) High ionization energy and weak metallic bond

30. Acid present in tomatoes is :

(1) Boric acid (2) Citric acid

(3) Tartaric acid (4) Oxalic acid

31. The Miller indices of crystal planes which cut through the crystal axes at $(2a, 3b, c)$ are :

(1) (122) (2) (111)

(3) (326) (4) $(1\bar{1}\bar{1})$

32. If activation energy of a reaction is zero, then rate constant, K is equal to :

(1) A^{-1} (2) A

(3) Infinity (4) Zero

Where 'A' is the frequency factor.

33. According to Debye-Huckel theory of strong electrolytes, increase in conductivity on dilution is due to :

(1) Decrease in viscosity of the solution

(2) Increase in volume of the solution

(3) Increase in number of ions

(4) Increase in mobility of ions

34. In phase diagram for lead-silver system at eutectic point, the number of degree of freedom is :

(1) Zero (2) One

(3) Two (4) Three

SECTION – B

35. An Essential for the Conversion of Glucose to Glycogen in Liver is :

(1) UTP (2) GTP

(3) Pyruvate kinase (4) Guanosine

36. Which of the following hormone is ***not*** used in the hydrolysis of triacylglycerol into the fatty acids in adipose tissues ?

(1) Epinephrine (2) Norepinephrine

(3) Glucagon (4) Insulin

37. Accepts hydrogen from malate :

(1) FAD (2) NAD

(3) NADP (4) FMN

38. Which one of the following statements is ***false*** about the trachea ?

(1) Has C-shaped rings

(2) It is covered by epiglottis

(3) It splits into the right and left lungs

(4) None of the above

39. Intercostal muscle regulates the movement of :

(1) Ribs (2) Trachea

(3) Pharynx (4) Diaphragm

40. In a plant cell, the dark reactions take place in the :

(1) Cytosol (2) Endoplasmic reticulum

(3) Leucoplasts (4) Chloroplasts

41. Which of these in ***not*** a function of auxin ?

(1) inducing callus formation

(2) inducing dormancy

(3) enhancing cell division

(4) maintaining apical dominance

42. The change over from vegetative to reproductive phase in plants takes place in response to ..... .

(1) Length of the day

(2) severity of temperature

(3) Oxygen content in the air

(4) Mainly the food material available in the soil

43. Which of the following is involved in the activation of RuBisCO ?

(1) K^+ (2) Zn^{2+}

(3) Mg^{2+} (4) Ca^{2+}

44. Among the following which is the best indicator of water pollution due to mixing of human faeces :

(1) Paramecium (2) Bacillus

(3) Trypanasoma (4) E. coli

45. Phytoplankton spends very little energy on developing protective structure against predators, this suggests that :

(1) Food chain is small

(2) Less competition

(3) Productivity of aquatic ecosystem is low

(4) Assimilation efficiency is high in aquatic ecosystem

46. Insectivorous plant generally grows in soil which is deficient in :

(1) Water (2) Nitrogen

(3) Potassium (4) Calcium

47. Compound responsible for pollution which caused the ill-famed Bhopal gas tragedy was :

(1) NH_4OH (2) CH_3NCO

(3) CH_3NH_2O (4) $CHCl_3$

48. Micro consumers are popularly known as :

(1) Primary consumer (2) Secondary consumer

(3) Tertiary consumer (4) Decomposers

49. Among the ecosystem mentioned below, where can one find maximum biodiversity ?

(1) Alpine meadows (2) Mangroves

(3) Desert (4) Corals

50. Which technique is used to introduce genes into dicots ?

(1) Electroporation (2) Particle acceleration

(3) Microinjection (4) Ti plasmid infection

51. In competitive inhibition, inhibitors bear a close structural similarity with the :

(1) Co-enzyme (2) Co- factor

(3) Prosthetic group (4) Substrate

52. Which of the following pathway is ***not*** used for triacylglycerol synthesis ?

(1) Glycerol 3-phosphate pathway

(2) Glyoxylate pathway

(3) Monoacylglycerol pathway

(4) Kennedy pathway

53. Ubiquinone transfers its electrons to :

(1) Complex I (2) Complex II

(3) Matrix (4) CytC I

54. Which antibiotic resistance is present in pBR322 ?

(1) Ampicillin (2) Kanamycin

(3) Lactase (4) Gentamycin

55. The initial dorsal-ventral axis in amphibian embryos is determined by :

(1) The point of sperm entry

(2) Gravity

(3) The point of contact with the uterus

(4) Genetic differences in the cells

56. The central fluid filled cavity of the blastula is known as :

(1) Archenteron (2) Blastocoel

(3) Blastocyst (4) Morula

57. The cells which secrete male sex hormone testosterone are :

(1) Isthmus (2) Crypt cells

(3) Lieberkuhn (4) Leydig's cells

58. In human beings, the eggs are :

(1) Microlecithal (2) Macrolecithal

(3) Mesolecithal (4) Alecithal

59. Which of the following plant growth hormone increases the yield of sugar by increasing the length of stem in sugarcane ?

(1) Cytokinin (2) Ethylene

(3) Gibberellic acid (4) Auxin

60. Botanical name of tea is :

(1) Coffea arabica (2) Sinensis thea

(3) Camellia sinensis (4) None of above

61. The aromatic volatile components of spices are :

(1) Spice oil (2) Spice fat

(3) Spice gel (4) Spice paste

62. Which of the component is reduced when pulses are soaked ?

(1) Phytic acid (2) Nitric acid

(3) Potassium oxide (4) Nitrous oxide

63. Osphradium acts as ..... organ.

(1) Sense (2) Defense

(3) Reproductive (4) Respiratory

64. National Bureau of Fish Genetic Resources is located at... ?

(1) Jabalpur, Madhya Pradesh

(2) Lucknow, Uttar Pradesh

(3) Hyderabad, Andhra Pradesh

(4) Patna, Bihar

65. Which of this bacterium is resistant to penicillin as it lacks a cell wall ?

(1) Spirochetes (2) Cyanobacteria

(3) Mycoplasmas (4) Bdellovibrios

66. Which of these is exposed on the outer surface of a gram-negative bacterium ?

(1) Braun lipoprotein

(2) O-antigen of lipopolysaccharide (LPS)

(3) Polysaccharide portion of lipoteichoic acid (LTA)

(4) Electron transport system components

67. The electron acceptor in the anaerobic condition in prokaryotes is :

(1) SO_4^{2-}

(2) Antioxidants such as vitamin K

(3) Fatty acids

(4) Glucose, fructose, maltose

68. Which of the following membrane lipid constituents can be considered as the lipid marker of inner mitochondrial membrane ?

(1) Lecithin (2) Cardiolipin

(3) Ceramide (4) Sphingoceramide

69. Which is the most variable stage of cell cycle ?

(1) G1 phase (2) S phase

(3) G2 phase (4) M phase

70. Which of the following is microtubule associated protein (MAPS) ?

(1) tus protein (2) tau protein

(3) rho protein (4) G protein

71. Which of the following is the most heterogenous protein of cytoskeletal filaments ?

(1) Microtubule (2) Microfilament

(3) Intermediate filaments (4) None of above

72. Which of the following organelle involved in xenobiotic detoxification ?

(1) Golgi (2) Lysosomes

(3) RER (4) SER

73. Which of the following chromosomal alterations would you expect to have the most drastic consequences ?

(1) Inversion (2) duplication

(3) translocation (4) deletion

74. Archesporium is :

(1) A diploid tissue responsible for the formation of sporogenous tissue

(2) A part of archegonia

(3) A haploid tissue responsible for the formation of gametophytic cells

(4) None of the above

75. Club mosses are :

(1) Lycopsida (2) Psilopsida

(3) Pteropsida (4) Sphenopsida

76. Z-DNA have a :

(1) Double helical nature (2) Zig-Zag appearance

(3) Uracil base (4) Single stranded nature

77. Which of the following chemical is a DNA intercalator ?

(1) 5-bromouracil (2) Ethyl methane sulfonate

(3) Acridine orange (4) UV

78. In eukaryotes replication, helicase loading occur at all replicators during :

(1) G0 phase (2) G1 phase

(3) S phase (4) G2 phase

79. Error free repair of double strand break in DNA is accomplished by :

(1) Non-homologous end joining

(2) Base excision repair

(3) Homologous recombination

(4) Mismatch repair

80. Which of the following enzyme joints the okazaki fragments ?

(1) DNA polymerase

(2) DNA ligase

(3) Helicase

(4) Restriction endonuclease

81. The following set of RNA is required in the translation process except one, choose the ***incorrect*** ?

(1) Si RNA (2) rRNA

(3) mRNA (4) tRNA

82. In sponge the whole inner surface of the asconoid is lined by :

(1) Choanocytes (2) Porocytes

(3) Pnacocytes (4) Amoebocytes

83. Metamerism is characteristic of :

(1) Platyhelminthes (2) Mollusca

(3) Porifera (4) Annelida

84. A deuterostomic animal is :

(1) Sea anemone (2) Star fish

(3) Pearl oyster (4) Cabbage butterfly

85. Saccus' term is used for :

(1) exine of pollen grains of Pinus

(2) intine of pollen grains of Pinus

(3) Wings of pollen grains of Pinus

(4) Wings of seeds of Pinus

86. Pick the pair that is ***incorrectly*** matched :

(1) Cycas – coralloid roots

(2) Abies – wood tar, wood gas

(3) Pinus – Mycorrhizal roots

(4) Sequoia – Redwood tree

87. Cedrus have :

(1) leaves with large surface area

(2) branched stem

(3) simple leaves

(4) taproot system

88. Which of the following families is characterised by trimerous flowers, superior and trilocular ovary with axile placentation ?

(1) Cucurbitaceae (2) Solanaceae

(3) Liliaceae (4) Compositae

89. The appearance of branched mass like corals on the soil is :

(1) Glittery roots (2) Coralloid roots

(3) Massy roots (4) Lancy roots

90. Which gives rise to the cork tissue ?

(1) Periblem (2) Phellogen

(3) Phelloderm (4) Periderm

91. Where in epiphytes are velamen cells located ?

(1) Below the endodermis

(2) Below the epidermis

(3) Just outside the cortex

(4) Just outside the exodermis

92. Tissue loosely held and stored food in plant is :

(1) Parenchyma (2) Meristematic

(3) Permeant tissue (4) None of above

93. In monocot stem, vascular bundles are :

(1) Arranged in ring

(2) Arranged alternatively

(3) Present inside endodermis

(4) Scattered in ground tissue

94. Root cap is formed by :

(1) Dermatogen (2) Calyptrogen

(3) Vascular cambium (4) Wood cambium

95. The adult body of subphylum Urochordata is covered by :

(1) Calcium (2) Tunic

(3) Epithelium (4) Endoderm

96. The embryonic notochord is replaced by ..... in most of the vertebrates.

(1) Ventral heart (2) Gills

(3) Wings (4) Vertebral column

97. Which of the following is ***not*** the characteristic feather of phylum Chordata ?

(1) Pharyngeal gills (2) Amniotic egg

(3) Postanal tail (4) Notochord

98. The study of migration of birds is known as :

(1) Ecology (2) Nidology

(3) Phenology (4) Phrenology

99. Balanoglossus belongs to :

(1) Hemichordate (2) Cephalochordate

(3) Urochordata (4) Cyclostomes

100. Ichthyoplankton is/are :

(1) Eggs of the fish (2) Larvae of the fish

(3) Both (1) and (2) (4) None of the above

SECTION – C

101. If the equation $x^5 - 5x + 2 = 0$ has three real roots, then the interval in which no real root lies is :

(1) (–2, –1) (2) (0, 1)

(3) (–3, –2) (4) (1, 2)

102. If $f(0) = 8, f(1) = 68$ and $f(5) = 123$, then $\Delta f(x)$ are :

(1) 50, 12.75 (2) 60, 12.75

(3) 50, 13.75 (4) 60, 13.75

103. $\int_{x_0}^{x_0+nh} f(x)dx = \frac{h}{2}$

[(Sum of first and last ordinates) + 2(sum of all the intermediate ordinates)] is called :

(1) Simpson's one-third rule

(2) Simpson's three-eights rule

(3) Trapezoidal rule

(4) None of these

104. If momentum of a certain body be increased by 50%, its kinetic energy will increase by :

(1) 25% (2) 50%

(3) 100% (4) 125%

105. A ring is rolling on a surface without slipping. The ratio of it; translation to rotational kinetic energie is :

(1) 5 : 7 (2) 2 : 5

(3) 2 : 7 (4) 1 : 1

106. A force $\vec{F} = -\vec{\nabla}u$ is said to be conservative if :

(1) grad F = zero (2) div F = zero

(3) curl F = zero (4) none of the above

107. The susceptibility of a diamagnetic substance :

(1) decrease with temperature

(2) does not vary with temperature

(3) first decrease and then increase with temperature

(4) increase with temperature

108. The Bulk modulus of a perfectly rigid body is equal to :

(1) Zero

(2) Unit

(3) Infinity

(4) may have any finite non-zero value

109. What will be the temperature when the r.m.s. velocity of a gas is double then that at 27°C ?

(1) 300 K (2) 600 K

(3) 900 K (4) 1200 K

110. If the speed of a particle moving at a relativistic speed is doubled, it's linear momentum will :

(1) become double (2) become more than double

(3) become less than double (4) No effect

111. Choke used to limit high frequency A. C. has :

(1) air core (2) iron core

(3) paramagnetic core (4) diamagnetic core

112. 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

113. An oscillator is nothing but an amplifier with :

(1) large gain (2) negative feedback

(3) positive feedback (4) no feedback

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

(1) remains constant

(2) decreases

(3) increases

(4) may either increase or decrease depending on the process used

115. A Carnot engine absorbs 100 calories of heat from a source at 400 K and give 80 calories to sink. The temperature of sink is :

(1) 20 K (2) 300 K

(3) 320 K (4) 500 K

116. Which law of thermodynamics states that entropy of a system vanishes at absolute zero ?

(1) Zeroth law (2) First law

(3) Second law (4) Third law

117. When a thin convex lens is put in contact with a thin concave lens of the same focal length f, the resultant combination has a focal length equal to :

(1) $f/2$ (2) $2f$

(3) zero (4) infinity

118. Chromatic aberration in the formation of images by a lens arises because :

(1) of non-paraxial rays

(2) the radii of curvature of the two sides are not same

(3) of the defect in grinding

(4) the focal length varies with wavelength

119. In Bose-Einstein statistics, the chemical potential is always :

(1) zero (2) positive

(3) infinity (4) negative

120. The probability that in tossing a coin 10 times, we get 5 heads, 5 tails is :

(1) 1/1024 (2) 120/1024

(3) 255/1024 (4) 180/1024

121. In Newton', ring experiment the diameters of the bright rings are proportional to the square root of :

(1) natural numebrs

(2) odd natural numebrs

(3) even natural numebrs

(4) half integral multiple of natural numbers

122. A zone plate behaves like a convex lens of focal length 50 cm for a light of wavelength 5000 Å. The radius of the first half period zone is :

(1) 5 mm (2) 0.5 mm

(3) 1 mm (4) 1.5 mm

123. Two Nicol prisms are first crossed and then one of them is rotated through 60°. The percentage of incident light transmitted is :

(1) 12.5 (2) 25.0

(3) 37.5 (4) 50.0

124. The coordination number in the case of simple cubic crystal structure is :

(1) 12 (2) 6

(3) 2 (4) 1

125. The reciprocal lattice of monoclinic is :

(1) monoclinic (2) hexagonal

(3) triclinic (4) cubic

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

(1) 34% (2) 54%

(3) 64% (4) 74%

127. The volume of the primitive unit cell of a fcc structure with lattice constant a is :

(1) a^3 (2) $a^3/2$

(3) $a^3/4$ (4) $a^3/8$

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 spacing between n^{th} energy level and the next higher level in a one dimensional potential box increase by :

(1) $2n - 1$ (2) $2n + 1$

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

130. Heisenberg uncertainity principle does not hold for the following pairs :

(1) energy and time

(2) position and momentum

(3) angular momentum and angle

(4) linear momentum and angle

131. Russel-Saunder's coupling is also called as :

(1) LS coupling (2) LJ coupling

(3) JJ coupling (4) SJ coupling

132. A laser beam is highly coherent,so it can be used in :

(1) interference (2) diffraction

(3) polarization (4) optical pumping

133. The population inversion in helium-neon laser is produced by :

(1) photon excitation (2) chemical excitation

(3) inelastic atomic collisions (4) chemical reaction

134. For nuclear fission to take place neutrons must have :

(1) very very low energy (2) thermal energy

(3) very high energy (4) no kinetic energy

135. Primary cosmic rays are composed of very energetic :

(1) electrons (2) mesons

(3) protons (4) neutrons

136. The rank of the matrix :

$$\begin{bmatrix} 3 & 4 & 1 & 2 \\ 7 & 2 & 1 & 4 \\ 5 & 6 & 2 & 4 \end{bmatrix}$$

(1) 4 (2) 3

(3) 2 (4) 1

137. The equation whose one root is $2 + 3i$, is given by :

(1) $x^2 + 4x + 13 = 0$ (2) $x^2 + 4x - 13 = 0$

(3) $x^2 - 4x + 13 = 0$ (4) $-x^2 + 4x + 13 = 0$

138. Which of the following is ***not*** a asymptote of the equation :

$$xy(x^2 - y^2) + 20y^2 + 8x^2 - 144 = 0$$

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

(3) $x + y = 0$ (4) $\frac{x}{20} + \frac{y}{8} = 0$

139. $\int_0^{2\pi} \sin^7 \frac{t}{4} dt$ is equal to :

(1) $\frac{64}{35}$ (2) $\frac{35}{64}$

(3) $\frac{7}{4}$ (4) $\frac{4}{7}$

140. The equation $16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$ represents a :

(1) Hyperbola (2) Parabola

(3) Ellipse (4) None of these

141. If $(a, b) = 1$, then g.c.d. of $a + b$ and $a - b$ is :

(1) 0 (2) 1

(3) 2 (4) 1 or 2

142. If $x = \cos\theta + i \sin\theta$, then $x - \frac{1}{x}$ is equal to :

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

(3) $2\cos\theta$ (4) $2i \sin\theta$

143. If $\vec{r} = \sin t\,\hat{i} + \cos t\,\hat{j} + t\hat{k}$, then $\left|\frac{d\vec{r}}{dt}\right|$ is equal to :

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

(3) $\sqrt{2}$ (4) None of these

144. $\lim_{x \to b} \frac{x^b - b^x}{x^x - b^b}$ is equal to :

(1) $\frac{1-\log b}{1+\log b}$ (2) $\frac{1+\log b}{1-\log b}$

(3) $\frac{1-\log b}{1-\log b}$ (4) $\frac{1+\log b}{b}$

145. The normal which is perpendicular to the osulating plane at a point is called :

(1) Principal Normal (2) Bi-normal

(3) Principal Tangent (4) None of these

146. The particular integral of the differential equation $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x+2y}$ is :

(1) $\frac{e^{x+2y}}{9}$ (2) $\frac{e^{x+2y}}{18}$

(3) $\frac{e^{x+2y}}{27}$ (4) $\frac{e^{x+2y}}{54}$

147. The differential equation $2\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} + 5\frac{\partial^2 z}{\partial y^2} = 0$ is :

(1) Elliptic (2) Parabolic

(3) Hyperbolic (4) None of these

148. If F is the limiting friction, R is the normal reaction, then coefficient of friction μ is given by :

(1) $F + R$ (2) $\frac{F}{R}$

(3) $F.R$ (4) $F - R$

149. The limit point of the set $\left\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \ldots\ldots\right\}$ is :

(1) 1 (2) ∞

(3) 0 (4) None of these

150. The geometrical series $a+ar+ar^2+.....+\infty$ oscillates finitely, if.

(1) $|r|<1$ (2) $r<-1$

(3) $r\geq 1$ (4) $r=-1$

151. The integrating factor of the differential equation $x^2ydx-(x^3+y^3)dy=0$ is :

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

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

152. For the differential equation $\frac{d^2y}{dx^2}+6\frac{dy}{dx}+25y=10e^{3x}$, particular integral is :

(1) $\frac{5}{26}e^{3x}$ (2) $\frac{26}{5}e^{3x}$

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

153. $L(e^{at})$ is equal to :

(1) $\frac{1}{s+a}$ (2) $\frac{1}{s-a}$

(3) $\frac{2}{s+a}$ (4) $\frac{2}{s-a}$

154. The equation $(1-x^2)\frac{d^2y}{dx^2}-2x\frac{dy}{dx}+n(n+1)y=0$, where n is a parameter real or complex is :

(1) Bessel's equation

(2) Hermite's equation

(3) Legendre's equation

(4) None of these

155. Which of the following is ***not*** a Logical operator ?

(1) ! =
(2) ||
(3) !
(4) None of these

156. If a function f is defined by $f(x) = x + 1$, $x \in [1, 3]$ and partition $P = \{1, 2, 3\}$, then $L(f, P)$ is equal to :

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

157. Let (R, d) be the usual metric space. Then the derived set of $A = \left\{\frac{1}{n}; n \in N\right\}$ is :

(1) ϕ
(2) $\{0\}$
(3) $\{0, 1\}$
(4) None of these

158. If $G = \{1, \omega, \omega^2\}$ is the group of cube roots of unity, then order of the element ω under the binary operation multiplication is :

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

159. A ring $R \neq \{0\}$ is called a simple ring, if :

(1) R has no ideals
(2) R has only one ideal
(3) R has no ideals except R and $\{0\}$
(4) R has at least one ideal other than R and $\{0\}$

160. If n denotes the frequency and T the periodic time, then :

(1) $nT = 1$
(2) $\frac{n}{T} = 1$
(3) $\frac{T}{n} = 1$
(4) None of these

161. The time of flight of a projectile is given by :

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

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

162. $\Gamma\left(\frac{1}{2}\right)$ is equal to :

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

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

163. If $f(x) = x \sin x$ is expanded by Fourier series in $(0, 2\pi)$, then a_0 is equal to :

(1) 2 (2) 2π

(3) $\frac{\pi}{2}$ (4) -2

164. The dimension of vector space $Q(\sqrt{2})$ over Q is :

(1) 4 (2) 3

(3) 2 (4) 1

165. In an inner product space, if $\| u + v \| = \| u \| + \| v \|$, then the vectors u, v are :

(1) linearly dependent

(2) linearly independent

(3) always orthogonal

(4) None of these

166. Which of the following is a good nuclear fuel ?

(1) Neptunium – 239 (2) Plutorium – 239

(3) Thorium – 236 (4) Uranium – 236

Answer Key of Forensic Science Entrance Exam held on 21.09.2021 at 03:00 PM

Question No.	Code A	Code B	Code C	Code D
1	2	2	3	1
2	1	1	3	2
3	3	4	1	4
4	4	3	4	3
5	4	2	1	3
6	1	3	1	2
7	2	3	2	1
8	3	1	4	3
9	1	4	3	4
10	4	1	3	4
11	2	2	2	1
12	1	1	1	2
13	3	3	4	3
14	4	4	3	1
15	2	4	2	4
16	2	1	2	3
17	1	2	1	3
18	4	3	3	1
19	3	1	4	4
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22	2	1	2	1
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26	3	1	2	2
27	3	2	1	1
28	1	4	3	3
29	4	3	4	4
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31	3	3	3	3
32	2	2	2	2
33	4	4	4	4
34	1	1	1	1
35	3	1	2	1
36	2	1	2	4
37	1	4	2	2
38	2	4	4	2
39	1	3	4	1

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40	2	3	4	4
41	3	1	4	2
42	3	1	2	1
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79	4	1	2	3
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81	2	4	4	1
82	2	2	3	1
83	4	2	4	4
84	4	1	2	2
85	4	4	2	3
86	4	2	4	3

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87	2	1	2	2
88	4	3	3	3
89	1	4	1	2
90	1	2	1	2
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128	4	2	4	3
129	3	3	1	2
130	1	4	2	4
131	3	2	4	1
132	4	1	4	1
133	3	2	3	3

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134	4	3	1	2
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137	2	2	1	3
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163	3	4	3	4
164	2	4	4	3
165	3	3	2	1
166	2	2	2	2