AJMAL SUPER 40

PHASE - 1

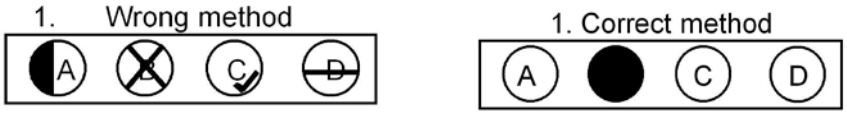
ADMISSION CUM SCHOLARSHIP TEST : 2022

FOR 12th PASSED/APPEARING [CHALLENGERS]

Conducted by : **AJMAL FOUNDATION, Hojai**

INSTRUCTIONS TO THE CANDIDATES

1. Candidates are to use the Answer Sheet provided.
2. Ensure that you fill in your **Registration No.** correctly in the space provided in the OMR sheet as shown in the example there.
3. Candidates are required to mark the correct answer choice by **shading** the circle completely with blue or black ball point pen. (Pen of any other colour or pencil is not allowed). For example, if the correct answer to question no 1. is 'B' then the marking should be:



4. Write your details in the OMR sheet which are asked for.
5. Only one circle, i.e. the correct one should be shaded. Shading more than one circle will render the answer invalid.
6. A candidate having completed his/her **ANSWER SHEET** must hand it over, even if blank, to the invigilator.
7. An examinee must not bring any loose paper, book, etc. to the Examination Hall. Any examinee found in possession of even loose papers will be EXPELLED.
8. An examinee must not talk to, disturb or seek help from a fellow examinee during the examination.
9. Any mechanical or digital calculating device (calculator etc.) shall not be used by the examinee during the examination.
10. No candidate will be allowed to leave the Examination Hall during the first hour of the examination.
11. For each correct answer 1 marks will be awarded and no negative mark will be there for incorrect answer
12. Duration of the exam is 03 hours from 11:00 AM to 02:00 PM.
13. XII passed / appearing students will attempt the Question as follows :

For Medical			For Engineering		
Subject	Questions	Marks	Subject	Questions	Marks
Physics	40	40	Physics	40	40
Chemistry	40	40	Chemistry	40	40
Biology	70	70	Mathematics	50	50
Total	**150**	**150**	**Total**	**130**	**130**

14. Contravention of any of the instruction mentioned above shall render a candidate liable for disciplinary action as per rule.

DATE OF RESULT DECLARATION - 15th APRIL - 2022 (www.ajmalsuper40.in)

Full name of the Student:

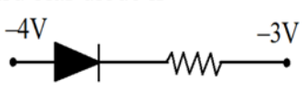
Your Application Number	Invigilator's Signature:

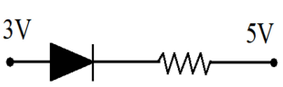
Address: Bordoloi Colony, AJMAL Super 40 Campus, Hojai, Assam Pin: 782435 Phone: 03674-254004

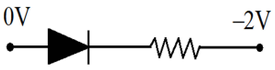
ADMISSION CUM SCHOLARSHIP TEST – 2022

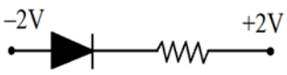
FOR 12TH PASSED / APPEARING [CHALLENGERS]

PHYSICS

1. The energy of the ground electronic state of hydrogen atom is –13.6 eV. The energy of the first excited state will be
   (1) –52.4 eV (2) –27.2 eV
   (3) –68 eV (4) –3.4 eV
2. The binding energy per nucleon is maximum in the case of
   (1) $^{4}_{2}He$ (2) $^{56}_{26}Fe$
   (3) $^{141}_{56}Ba$ (4) $^{235}_{92}U$
3. The probability of survivial of a radioactive nucleus for one mean-life is
   (1) $\frac{1}{e}$ (2) $1-\frac{1}{e}$
   (3) $\frac{\ln 2}{e}$ (4) $1-\frac{\ln 2}{e}$
4. A radioactive nucleus emits a beta particle. The parent and daughter nuclei are
   (1) isotopes (2) isotones
   (3) isomers (4) isobars
5. In the following nuclear reaction
   $_1H^2 + {}_1H^2 \longrightarrow {}_2He^3 + X$
   The X is:
   (1) neutron (2) positron
   (3) electron (4) meson
6. The majority charge carriers in p-type semiconductor are
   (1) electrons (2) protons
   (3) holes (4) neutrons
7. In a semiconducting material the mobilities of electrons and holes are μ_e and μ_h respectively. Which of the following is true
   (1) $\mu_e > \mu_h$ (2) $\mu_e < \mu_h$
   (3) $\mu_e = \mu_h$ (4) $\mu_e < 0; \mu_h > 0$
8. In forward bias, the width of potential barrier in a p-n junction diode
   (1) increases (2) decreases
   (3) remains constant
   (4) first increases then decreases
9. The forward bias diode is
   (1) 

   (2) 

   (3) 

   (4) 

10. What is β value for transistor whose $\alpha = 0.98$?
    (1) 29 (2) 38
    (3) 49 (4) 56
11. Which of the following relation is correct
    (1) $\sqrt{\varepsilon_0}E_0 = \sqrt{\mu_0}B_0$ (2) $\sqrt{\mu_0\varepsilon_0} = B_0/E_0$
    (3) $E_0 = \sqrt{\mu_0\varepsilon_0}B_0$ (4) $\sqrt{\mu_0}E_0 = \sqrt{\varepsilon_0}B_0$
12. In electromagnetic wave the phase difference between electric and magnetic field vectors $\vec{E}$ and $\vec{B}$ is
    (1) zero (2) $\pi/2$
    (3) π (4) $\pi/4$
13. In double slits experiment, for light of which colour the fringe width will be minimum
    (1) Violet (2) Red
    (3) Green (4) Yellow
14. The bending of beam of light around corners of obstacles is called
    (1) Reflection (2) Diffraction
    (3) Refraction (4) Interference
15. If the amplitude ratio of two sources producing interference is 3 : 5, the ratio of intensities at maxima and minima is
    (1) 25 : 16 (2) 5 : 3
    (3) 16 : 1 (4) 25 : 9
16. A concave mirror of focal length f (in air) is immersed in water ($\mu = 4/3$). The focal length of the mirror in water will be
    (1) f (2) $\frac{4}{3}f$
    (3) $\frac{3}{4}f$ (4) $\frac{7}{3}f$
17. A thin prism of 6º is made of material of refractive index $\frac{5}{3}$. The deviation caused by it is
    (1) 2º (2) 8º
    (3) 4º (4) None of these

18. A strong magnetic field is applied on a stationary electron, then the electron
    (1) moves in the direction of the field
    (2) moves in an opposite direction of the field
    (3) remains stationary
    (4) starts spinning

19. Lorentz force can be calculated by using the formula
    (1) $\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$
    (2) $\vec{F} = q(\vec{E} - \vec{v} \times \vec{B})$
    (3) $\vec{F} = q(\vec{E} + \vec{v} \cdot \vec{B})$
    (4) $\vec{F} = q(\vec{E} \times \vec{v} + \vec{B})$

20. An arc of a circle of radius R subtends an angle $\frac{\pi}{2}$ at the centre. It carries a current i. The magnetic field at the centre will be
    (1) $\frac{\mu_0 i}{2R}$ (2) $\frac{\mu_0 i}{8R}$
    (3) $\frac{\mu_0 i}{4R}$ (4) $\frac{2\mu_0 i}{5R}$

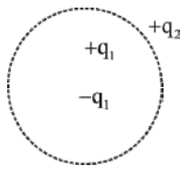
21. Susceptibility is positive and large for a
    (1) paramagnetic substance
    (2) ferromagnetic substance
    (3) non-magnetic substance
    (4) diamagnetic substance

22. Angle of dip at the equator is
    (1) 0º (2) 30º
    (3) 60º (4) 90º

23. Voltage and current in an ac circuit are given by $V = 5\sin\left(100\pi t - \frac{\pi}{6}\right)$ and $I = 4\sin\left(100\pi t + \frac{\pi}{6}\right)$
    (1) voltage leads the current by 30º
    (2) current leads the voltage by 30º
    (3) current leads the voltage by 60º
    (4) voltage leads the current by 60º

24. In an ideal transformer, the voltage and current in the primary are 200 V, 4 A and that in secondary are 2000 V and I amp, the value of I is
    (1) 2 A (2) 0.4 A
    (3) 4 A (4) 40 A

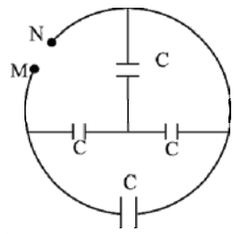
25. Consider the charge configuration and spherical Gaussian surface as shown in the figure. When calculating the flux of the electric field over the spherical surface the electric field will be due to



    (1) q_2
    (2) only the positive charges
    (3) all the charges
    (4) $+q_1$ and $-q_1$

26. In a parallel plate capacitor, the distance between the plates is d and potential difference across the plates is V. Energy stored per unit volume between the plates of capacitor is
    (1) $\frac{\varepsilon_0^2}{2V^2}$ (2) $\frac{1}{2}\varepsilon_0 \frac{V^2}{d^2}$
    (3) $\frac{1}{2}\frac{V^2}{\varepsilon_0 d^2}$ (4) $\frac{1}{2}\varepsilon_0 \frac{V^2}{d}$

27. The equivalent capacity across M and N in the given figure is

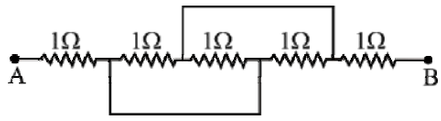


    (1) 5C/3 (2) 2/3C
    (3) C (4) 3/2C

28. Two identical mercury drops each of the radius r are charged to the same potential V. If the mercury drops coalesce to form a big drop of radius R, then potential of the combined drop will be
    (1) $(2)^{3/2}$ V (2) $(2)^{2/3}$ V
    (3) $(3)^{2/3}$ V (4) $(3)^{1/2}$ V

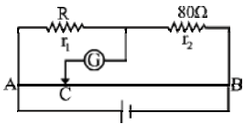
29. Which of the following is vector quantity
    (1) Current density (2) Current
    (3) Wattles Current (4) Power

30. Equivalence resistance between the point A and B is (inΩ)



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

31. AB is a wire of uniform resistance. The galvanometer G shows no current when the length AC=20 cm and CB=80 cm. The resistance R is equal to



(1) 320Ω (2) 8Ω
(3) 20Ω (4) 40Ω

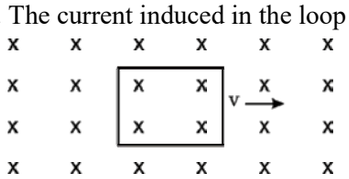
32. The equivalent resistance of n resistors each of same resistance when connected in series is R. If the same resistances are connected in parallel, the equivalent resistances will be
(1) R/n^2 (2) R/n
(3) n^2R (4) nR

33. The work function for tungsten and sodium are 4.5 eV and 2.3 eV respectively. If the threshold wavelength λ for sodium is 5600 Å, the value of λ for tungsten is
(1) 5893 Å (2) 10683 Å
(3) 2862 Å (4) 528 Å

34. In which sequence, the radioactive radiations are emitted in the following nuclear reactions
$${}_{Z}X^{A} \rightarrow {}_{Z+1}Y^{A} \rightarrow {}_{Z-1}K^{A-4} \rightarrow {}_{Z-1}K^{A-4}$$
(1) β, α and γ (2) β, α and γ
(3) β, γ and α (4) γ, α and β

35. The magnetic moment of a steel wire is M. If it is bent into a half circular arc, then what is its new magnetic moment?
(1) M (2) $\frac{2M}{\pi}$
(3) $\frac{M}{2\pi}$ (4) $\frac{M}{\pi}$

36. A conducting square loop of side *l* and resistance R moves in its plane with a uniform velocity *v* perpendicular to one of its sides. A uniform and constant magnetic field B exists along the perpendicular to the plane of the loop as shown in figure. The current induced in the loop is

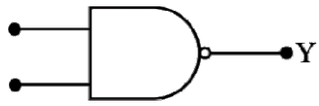


(1) $\frac{Blv}{R}$ clockwise (2) $\frac{Blv}{R}$ anticlockwise
(3) $\frac{2Blv}{R}$ anticlockwise (4) zero

37. Electromagnetic radiation of frequency n, wavelength λ, traveling with velocity *v* in air, enters a glass slab of refractive index μ. The frequency, wavelength and velocity of light in the glass slab will be respectively
(1) $\frac{n}{\mu}, \frac{\lambda}{\mu}, \frac{v}{\mu}$ (2) $n, \frac{\lambda}{\mu}, \frac{v}{\mu}$
(3) $n, \lambda, \frac{v}{\mu}$ (4) $\frac{n}{\mu}, \frac{\lambda}{\mu}, v$

38. Two thin lenses, one of focal length +60 cm and the other of focal length –20 cm are put in contact. The combined focal length is
(1) +15 cm (2) –15 cm
(3) +30 cm (4) –30 cm

39. The given symbol represents



(1) NAND gate (2) OR gate
(3) AND gate (4) NOR gate

40. The Boolean equation of NOR gate is
(1) C = A + B (2) $C = \overline{A+B}$
(3) $C = A \cdot B$ (4) $C = \overline{A \cdot B}$

CHEMISTRY

41. 20 cc of liquid A mixed with 15 cc of liquid B. Volume of resulting solution is 34.9 cc. Which type of solution is this
(1) Ideal solution (2) Non ideal solution
(3) Negative deviation (4) Both (2) and (3)

42. What is the coordination number in a square close packed structure in 2 – D?
(1) 2 (2) 3
(3) 4 (4) 6

43. Which of the following is the monomer of starch?
(1) Glucose (2) Sucrose
(3) Fructose (4) Lactose

44. The E^0_{red} value of A,B,C are 0.68 V, –2.54 V, –0.50V temperature. The order of their reducing power in aqueous solution is
(1) A > B > C (2) A > C > B
(3) C > B > A (4) B > C > A

45. Which of the following element has highest negative value of electron gain enthalpy?
(1) F (2) Br
(3) Cl (4) I

46. When formic acid is treated with conc. H_2SO_4 the gas evolved is
(1) H_2S (2) SO_2
(3) CO (4) CO_2

47. The hybridization state of P–atom in $PCl_5\,(solid)$ is
(1) sp^3 (2) sp^3d^2
(3) sp^3d (4) Both (1) & (2)

48. Concentrated HNO_3 react with iodine to give
(1) HI (2) HOI
(3) $HOIO_2$ (4) $HOIO_3$

49. Most stable oxidation state shown by lanthanoids is
(1) +2 (2) +3
(3) +5 (4) +7

50. EAN of Cr in $[Cr(NH_3)_6]Cl_3$ is
(1) 36 (2) 35
(3) 33 (4) 34

51. The oxidation number of Cr in CrO_5 is
(1) + 10 (2) + 6
(3) + 5 (4) + 3

52. In fcc lattice octahedral voids are formed
(1) Only at body centre
(2) Only at edge centre
(3) At edge centers and body centre
(4) At face centers only

53. Which of the following aqueous solution highest boiling point?
(1) 0.2M NaCl (2) 0.5M glucose
(3) 0.3M $CaCl_2$
(4) All have same boiling point

54. Benzoic acid dimerisen in benzene. Assuming 30% dimerisation, the Van't Hoff factor is
(1) 1.3 (2) 0.7
(3) 0.85 (4) 0.6

55. What is the amount of charge in coulomb required for the conversion of one mole MnO_4^- to 1 mole Mn^{2+}?
(1) 5×96500 (2) 3×96500
(3) 96500 (4) 9650

56. If liquid is dispersed in solid medium then it is
(1) Sol. (2) Emulsion
(3) Aerosol (4) Gel.

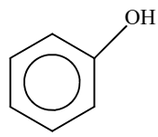
57. For a reaction, when the initial concentration of the reactant increases four times, the half life period decrease 64 times.
The order of the reaction is–
(1) 4 (2) 3
(3) 2 (4) 1

58. What is standard potential of the Tl^{3+}/Tl electrode?
Given (i) $Tl^+ \rightarrow Tl^{3+} + 2e^-, E^\circ = -1.26V$
(ii) $Tl^+ + e^- \rightarrow Tl;\ E^\circ = -0.336V$
(1) 0.987V (2) 1.59V
(3) –1.59V (4) 0.728V

59. Hybridization of Ni in $[Ni(CN)_4]^{2-}$ is
(1) sp^3 (2) dsp^2
(3) sp^3d (4) dsp^3

60. Which of the followings is outer d-orbital complex
(1) $[CoF_6]^{3-}$ (2) $[Cr(NH_3)_6]^{3+}$
(3) $[Mn(CN)_6]^{4-}$ (4) $[CuCl_4]^{2-}$

61. Which one has highest dipole moment?
(1) CH_3F (2) CH_3Cl
(3) CH_3Br (4) CH_3I

62. 

; colour of product is
Colour of product is:
(1) Violet (2) Green
(3) Yellow (4) Orange

63. Which of the following does not have S–S linkage?
(1) $S_2O_8^{2-}$ (2) $S_2O_6^{2-}$
(3) $S_2O_3^{2-}$ (4) Both (1) & (2)

64. Which of the following is explosive?
(1) XeF_2 (2) XeF_4
(3) XeO_3 (4) XeF_6

65. Which of the following is a condensation polymer?
(1) Neoprene (2) Teflon
(3) Acrylonitrile (4) Dacron

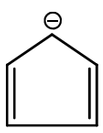
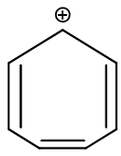
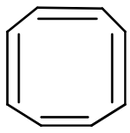
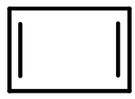
66. Which is used as depressant during froth floatation process?
(1) Cresol (2) Aniline
(3) NaCN (4) Pine oil

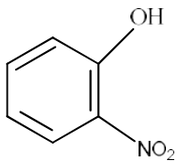
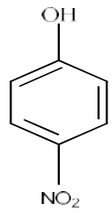
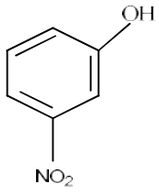
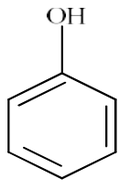
67. Which is used as catalyst in production of polyethene?
(1) Zieglar Natta catalyst
(2) Adams catalyst
(3) MnO_2
(4) V_2O_5

68. Which d–block element shows highest oxidation state?
(1) Pa (2) U
(3) Mn (4) Os

69. Which will show ionization isomerism?
(1) $\left[Co\left(NH_3\right)_5 Br\right]SO_4$
(2) $\left[Co\left(NH_3\right)_5\left(NO_2\right)\right]Br$
(3) $\left[Cr\left(H_2O\right)_5 Cl\right]Cl_2 \cdot H_2O$
(4) Both (1) & (2)

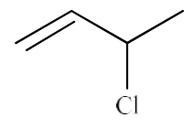
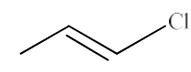
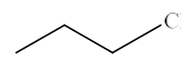
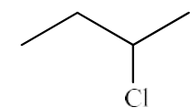
70. For identical central atoms ligands and metal–ligand distance, the correct relationship between crystal field splitting energy is
(1) $\Delta_t = \frac{4}{9}\Delta_\circ$ (2) $\Delta_\circ = \frac{5}{9}\Delta_t$
(3) $\Delta_t = \frac{3}{4}\Delta_\circ$ (4) $\Delta_\circ = \frac{4}{9}\Delta_t$

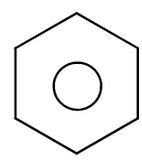
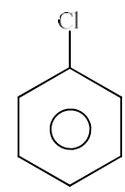
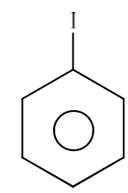
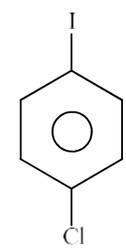
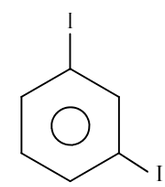
71. Which of the following is non–aromatic?
(1)  (2) 
(3)  (4) 

72. Which one is most acidic?
(1)  (2) 
(3)  (4) 

73. For the reaction $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$
$-\frac{d[N_2O_5]}{dt} = K_1[N_2O_5]$
$+\frac{d[NO_2]}{dt} = K_2[N_2O_5]$
$+\frac{d[O_2]}{dt} = K_3[N_2O_5]$ then
(1) $2K_1 = K_2 = 4K_3$ (2) $K_1 = K_2 = K_3$
(3) $2K_1 = 4K_2 = K_3$ (4) $K_1 = 2K_2 = 3K_3$

74. Spontaneous adsorption of a gas by solid surface produces
(1) $\Delta H = +ve$ (2) $\Delta S = -ve$
(3) $\Delta G = +ve$ (4) $\Delta S = +ve$

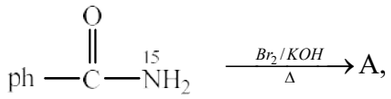
75. The most reactive compound towards SN^1 reaction is –
(1)  (2) 
(3)  (4) 

76.  $+ ICl \xrightarrow[\Delta]{Anhy.AlCl_3} X;\ X\ is -$
(1)  (2) 
(3)  (4) 

77. Fehling's solution test is given by
(1) Benzaldehyde (2) Acetone
(3) Acetaldehyde (4) Both (1) & (3)

78. The reactivity order of the given compounds towards nucleophillie addition reaction
(a) $HCHO$ (b) CH_3CHO
(c) $\left(CH_3\right)_2 CO$
(1) $a > b > c$ (2) $c > b > a$
(3) $b > c > a$ (4) $c > a > b$

79. First member of ketose sugar is
(1) Ketotriose (2) Ketotetrose
(3) ketopentose (4) Ketohexose

80. 

Product 'A' is –
(1) $Ph-\overset{15}{N}H_2$ (2) $Ph-CH_2-\overset{15}{N}H_2$
(3) $Ph-COOH$ (4) $Ph-CH_2-OH$

BIOLOGY

81. Which of the following post-fertilisation event is not associated with gymnosperms
(1) Zygote → Embryo
(2) Ovules → Seeds
(3) Ovary → Fruit
(4) Integument → Seed coat

82. Germinating eye buds can be seen in:
(1) tubers of potato
(2) conidiophore of *Aspergillus*
(3) offset of *Eichhornia*
(4) *Chara*

83. The plant which is commonly known as "Terror of Bengal" reproduces vegetatively by;
(1) corm (2) bulbil
(3) turion (4) offset

84. Pollen grains are well preserved as fossils because of having
(1) pectose (2) cellulose
(3) pecto cellulose (4) sporopollenin

85. In over 60 percent of angiosperms
(1) pollen grains are shed at two celled stage
(2) generative cell divides generally in pollen tube
(3) male gametophytes, present in air, are two celled
(4) all of these

86. Each cell of the which of the following tissue of angiospermic microsporangia is capable of giving rise to a microspore tetrad
(1) Nucellus (2) Sporogenous tissue
(3) Integumentary tapetum
(4) Transfusion tissue

87. Which of the following is equivalent to megasporangia
(1) Carpel (2) Ovule
(3) Ovary (4) Fruit

88. The ploidy of nucellus cells, functional megaspore, female gametophyte and primary endosperm cell is respectively
(1) 2n, n, n, 3n (2) 2n, 2n, n, 2n
(3) 2n, 2n, n, 3n (4) n, 2n, n, 3n

89. The phenomenon wherein, the ovary develops into a fruit without fertilisation is called
(1) parthenocarpy (2) apomixis
(3) parthenogenesis (4) sexual reproduction

90. Find the incorrect one with respect to post fertilisation changes:
(1) nucellus-perisperm
(2) integument-seed coat
(3) pericarp- tapetum
(4) central cell-endosperm

91. Possible blood group in children, from the parents with A and B blood group, are
(1) A and B (2) A, B, AB and 0
(3) both B and 0 (4) both A and 0

92. Heterozygous tall and red flowered pea plants were selfed and total 1000 seeds' were collected. What is the total number of seeds for both heterozygous traits
(1) 250 (2) 750
(3) 1150 (4) 500

93. Which Mendelian cross can produce two genotypes and two phenotypes?
(1) Monohybrid cross
(2) Monohybrid testcross
(3) Incomplete dominance
(4) Codominance

94. The parallelism between factors and chromosome led to the formation of:
(1) Cell theory
(2) Chromosomal theory of inheritance
(3) Pangenesis theory
(4) Performation theory

95. If a character is controlled by six alleles of a gene, then the possible genotypes would be
(1) 21 (2) 729
(3) 64 (4) 42

96. The exchange of chromosome segments between. maternal and paternal chromatids after synapsis in meiosis is called:
(1) interference (2) crossing over
(3) chiasma (4) terminalisation

97. Broad flat face, big and wrinkled tongue, congenital heart disease, many loops on fingertips and flat back of head are due to
(1) trisomy of Y chromosome
(2) trisomy of 21st chromosome

(3) monosomy of X chromosome
(4) monosomy of Y chromosome

98. Mendelian disorders are:
(1) haemophilia and Trisomy of 21
(2) monosomy of X and colour blindness
(3) phenylketonuria and Thalassemia
(4) cystic fibrosis, Klinefelter's syndrome and sickle cell anaemia

99. Which of the following' symptom characterises Turner's syndrome
(1) Broad flat face
(2) Big and wrinkled tongue
(3) Small round head
(4) Rudimentary ovaries

100. A classical example of point mutation is
(1) Down's syndrome
(2) tobacco mosaic
(3) bacterial blight
(4) sickle cell anaemia

101. Which organism was utilised by Taylor *et.al.* to prove semi-conservative replication at chromosomal level
(1) *Ophioglossum* (2) *Lathyrus odoratus*
(3) *Vicia faba* (4) *E. coli*

102. Hershey and Chase
(1) Worked to discover whether it was protein or DNA from the viruses that entered the bacteria
(2) Observed that bacteria that were infected with viruses that had radioactive proteins were not radioactive.
(3) Concluded that proteins did not enter the bacteria from the viruses
(4) All of these

103. Okazaki fragments are formed by one of the strands of DNA, known as
(1) Leading strand
(2) Lagging strand
(3) Continuous strand
(4) Semi discontinuous strand

104. DNA replication observed by Watson and Crick is
(1) Semiconservative
(2) Semidiscontinuous
(3) Conservative and discontinuous
(4) Both (1) & (2)

105. In a transcription unit all the reference point, is made with
(1) Coding stand
(2) Position of UTR
(3) Position of shine Dalgarno sequence
(4) Kozak sequence

106. In eukaryotes, RNAP III catalyzes the synthesis of
(1) All rRNA and tRNA
(2) mRNA, hnRNA and snRNA
(3) 5S rRNA, tRNA and snRNA
(4) 28S, 18S and 5S rRNA

107. The core enzyme requires a factor for termination of RNA synthesis at some sites. This is known as
(1) Sigma factor (2) Rho factor
(3) Gamma factor (4) Alpha particle

108. Genetic code consists of
(1) Adenine and guanine
(2) Guanine and cytosine
(3) Cytosine and uracil
(4) All of these

109. Integral form of the exponential growth equation is
(1) $N_t = N_0 e^{rt}$
(2) $dN/dT = rN$
(3) $N_t = N_0 + [(B + I) - (D + E)]$
(4) $dN/DT = rN\left[\frac{K - N}{K}\right]$

110. The pioneer species in xerarch and hydrach succession are respectively
(1) Lichens and rooted hydrophytes
(2) Lichens and mesophytes
(3) Phytoplankton and lichens
(4) Lichens and phytoplankton

111. Odd one out (with respect to ecosystem)
(1) Productivity
(2) Decomposition.
(3) Energy flow and Nutrient Cycling
(4) Stratification

112. Read the following statement carefully- "Every species has an intrinsic value and it is our moral duty to care for their well being".
What kind of argument it is for conservation of biodiversity?
(1) Narrowly utilitarian (2) Broadly utilitarian
(3) Bioprospecting (4) Ethical

113. Which of the following is an example of exsitu conservation?
(1) Sacred grooves (2) Wildlife sancturies
(3) National park (4) Wildlife safari park

114. Most important and main cause driving animals and plants to extinction is
(1) over exploitation
(2) co-extinctions
(3) habitat loss and fragmentation
(4) alien species invasions

115. Select the incorrect pair with respect to recent extinctions
(1) Steller's sea cow - Indonesia
(2) Thylacine - Australia
(3) Quagga - Africa
(4) Dodo - Mauritius

116. Which is correct sequence of male accessory ducts starting from testis?
(1) Rete testis, vasa efferentia, epididymis, vas deferens
(2) Rete testis, vasa efferentia, vas deferens, epididymis
(3) Rete testis, vas deferens, epididymis, vasa efferentia
(4) Rete testis, vas deferens, vasa efferentia Epididymis

117. The role of Leydig or interstitial cells is
(1) Nourishment to sperms
(2) Give motility to sperms
(3) Synthesize testosterone hormone
(4) All of the above

118. The part of the fallopian tube which is closer to the ovary possess finger like projections called
(1) Infundibulum (2) Isthmus
(3) Ampulla (4) Fimbriae

119. Which of the following hormone is not produced by placenta?
(1) hCG (2) hPL
(3) Estrogen (4) MSH

120. Secretion of which gland has high percentage of fructose?
(1) Prostate gland (2) Cowper's gland
(3) Seminal vesicle (4) Ovaries

121. What is the ploidy level of spermatogonia, primary spermatocyte, primary polar body and spermatid?
(1) Diploid, diploid, haploid, haploid
(2) Diploid, haploid, haploid, diploid
(3) Haploid, haploid, diploid, haploid
(4) Haploid, diploid, haploid, diploid

122. Match the columns and find out the correct combination:

A	FSH	1	Maintenance of endometrium
B	LH	2	Develops female secondary sexual characters
C	Progesterone	3	Contraction of uterine wall
D	Estrogen	4	Development of primary follicle
		5	Rupture of Graafian follicle

(1) A–4 B–5 C–2 D–l (2) A–4 B–5 C–1 D–2
(3) A–4 B–3 C–2 D–5 (4) A–5 B–1 C–2 D–4

123. Which one of the following statements about human sperm is correct?
(1) Acrosome is a pointed structure used for piercing and penetrating the egg, resulting in fertilization
(2) The sperm lysins in the acrosome dissolve the egg envelope facilitating fertilisation
(3) Acrosome serves as sensory structure leading the sperm towards the ovum
(4) Sperm is viable for only upto 24 hours

124. Spermiogenesis is the transformation of
(1) Spermatogonium into primary spermatocyte
(2) Spermatogonium into functional spermatozoa
(3) Primary spermatocytes into secondary spermatocytes
(4) Spermatids into spermatozoa

125. A temporary endocrine gland in the human body is
(1) Pineal gland (2) Corpus cardiacum
(3) Corpus luteum (4) Corpus allatum

126. Meiotic division of the secondary oocyte is completed:
(1) At the time of copulation
(2) After zygote formation
(3) At the time of fusion of a sperm with an ovum
(4) Prior to ovulation

127. Match the following columns and select the correct option

Column - I		Column - II	
A	Placenta	1	Androgens
B	Zona pellucida	2	Human chorionic gonadotropin (hCG)
C	Bulbourethral glands	3	Layer of the ovum
D	Leydig cells	4	Lubrication of the penis

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

128. Select the option including all sexually transmitted diseases
(1) Gonorrhoea, Malaria, Genital herpes
(2) AIDS, Malaria, Filaria
(3) Cancer, AIDS, Syphilis
(4) Gonorrhoea, Syphilis, Genital herpes

129. In which of the following techniques, the embryos are transferred to assist those females who cannot conceive?

(1) GIFT and ZIFT (2) ICSI and ZIFT
(3) GIFT and ICSI (4) ZIFT and IUT

130. Highest cranial capacity is found in
(1) *Homo sapiens* (2) Neanderthal man
(3) Peking man (4) Cro–magnon man

131. Lamarck's theory of evolution is also called
(1) Theory of special creation
(2) Inheritance of acquired characters
(3) Survival of the fittest
(4) Theory of Cosmozoa

132. The "industrial melanism" is the example–for
(1) Mutation theory (2) Natural selection
(3) Lamarckism (4) Germplasm theory

133. Palaeontological evidences for evolution refer to the study of the history of life based on
(1) Development of embryo
(2) Homologous organs
(3) Fossils
(4) Analogous organs

134. Transmission of HIV infection generally occurs by
(1) Sexual contact with infected person
(2) Transfusion of contaminated blood
(3) By sharing infected needles
(4) All of the above

135. Allergens are non-infectious foreign substances that
(1) Increases the secretion of IgA
(2) Increases the secretion of IgE
(3) Increases the secretion of IgG
(4) Increses the secretion of IgM

136. Methanogens grow anaerobically on cellulosic material and produces which of the following gases?
(A) Methane (B) Oxygen
(C) Carbon dioxide
(D) Hydrogen sulphide
(1) A, C and D (2) A, B and D
(3) A and C (4) B, C and D

137. Match the names of the diseases given under Column i with the names of the causal agents given under Column II, choose the answer which gives the correct matching of the alphabets of the two columns

	Disease		Casual agent
A	AIDS	1	*Yersinia pestis*
B	Elephantiasis	2	Hepatitis B virus
C	Jaundice	3	*W.bancrofti*
D	Gonorrhoea	4	*Neisseria gonorrhoeae*
		5	HIV virus

(1) A–5 B–2 C–1 D–4 (2) A–5 B–3 C–2 D–1
(3) A–5 B–3 C–2 D–4 (4) A–5 B–4 C–3 D–2

138. The organisms which cause diseases in plants and animals are called
(1) Pathogens (2) Vectors
(3) Insects (4) Worms

139. Drug called 'Heroin' is synthesised by
(1) Methylation of morphine
(2) Acetylation of morphine
(3) Glycosylation of morphine
(4) Nitration of morphine

140. Match the following list of bacteria and their commercially important products

	Bacterium		Product
A	*Aspergillus niger*	1	Lactic acid
B	*Acetobacter aceti*	2	Butyric acid
C	*Clostridium butylicum*	3	Acetic acid
D	*Lactobacillus*	4	Citric acid

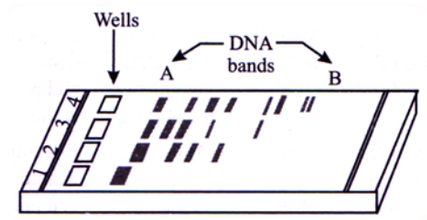
(1) A–2 B–3 C–4 D–1 (2) A–2 B–4 C–3 D–1
(3) A–4 B–3 C–2 D–1 (4) A–4 B–1 C–3 D–2

141. Which of the following option is correctly matched for the microbial drug and its applications?
(1) Statin– Immunosuppressant
(2) Streptokinase– Blood clot buster
(3) Cyclosporin–A – Fruit juice clarifying agent
(4) Pectinase– Blood cholesterol lowering Agents

142. Conversion of milk to curd improves its nutritional value by increasing the amount of:
(1) Vitamin D (2) Vitamin A
(3) Vitamin B_{12} (4) Vitamin E

143. The process of separation and purification of expressed protein before marketing is called
(1) Upstream processing
(2) Downstream processing
(3) Bioprocessing
(4) Post production processing

144. Select the technique and type of DNA fragments (A and B)



	Technique	A	B
(1)	Recombinant DNA technology	Largest	Smallest
(2)	Recombinant DNA technology	Smallest	Largest
(3)	Agarose Gel Electrophoresis	Largest	Smallest
(4)	Agarose Gel Electrophoresis	Smallest	Largest

145. The specific palindromic sequence which is recognized by EcoRI is:
(1) 5' – GGAACC – 3' 3' – CCTTGG – 5'
(2) 5' – CTTAAG – 3' 3' – GAATTC –5'
(3) 5' – GGATCC – 3' 3' – CCTAGG - 5'
(4) 5' – GAATTC – 3' 3' – CTTAAG –5'

146. Which of the following is a restriction endonuclease?
(1) Hind II (2) Protease
(3) DNase I (4) RNase

147. Biopatents are
(A) Right to use invention
(B) Right to use products
(C) Right to use biological entities
(D) Right to use process
(1) A & C (2) C only
(3) A, C, D (4) All of these

148. ADA is an enzyme which is deficient in a genetic disorder SCID. What is the full form of ADA?
(1) Adenosine Deoxy Aminase
(2) Adenosine Deaminase
(3) Aspartate Deaminase
(4) Arginine Deaminase

149. Eli Lilly, an American company, prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of *E.coli* to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating
(1) Peptide bonds (2) Ionic bonds
(3) H–bonds (4) Disulfide bonds

150. Match the columns and find out the correct combination:

A	Bt-cotton	1	Insecticide
B	Flavr–Savr tomato	2	Delayed ripening
C	Hirudin	3	Prevents blood clotting
D	Golden rice	4	Prevent blindness
		5	Vitamin A rich

(1) A – 2 B – 3 C–1 D – 5
(2) A – 3 B – 2, 5 C– 4 D – 1
(3) A –1 B – 2 C–3 D – 4, 5
(4) A – 5 B – 3 C–1 D –2

MATHEMATICS

81. Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Let X denote the random variable of number of aces obtained in the two drawn cards.
Then P(X=1) + P (X=2) =
(1) $52/169$ (2) $24/169$
(3) $\frac{49}{169}$ (4) $25/169$

82. If $Sin^{-1}x + Sin^{-1}y + Sin^{-1}z = 3\pi/2$ then the value of $x^{100} + y^{100} + z^{100}$ is
(1) 1 (2) 0
(3) 2 (4) 3

83. Let A be a skew-symmetric matrix of order n. then
(1) $|A| = 0$ if n is even (2) $|A| = 0$ if n is odd
(3) $|A| = 0$ for all $n \in \mathbb{Z}$ (4) none

84. If $4x+3y = 1$, $y–x = 5$ & $Kx+5y = 1$ are concurrent lines then K=?
(1) 0 (2) 1
(3) 3 (4) 7

85. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 125$ then the value of α is
(1) ± 1 (2) ± 2
(3) ± 3 (4) ± 5

86. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ then value of α for which $A^2 = B$ is
(1) 1 (2) –1
(3) 4 (4) no real values

87. If $\begin{bmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{bmatrix} = x + iy$, then
(1) $x = 3, y = 1$ (2) $x = 1, y = 3$
(3) $x = 0, y = 3$ (4) $x = 0, y = 0$

88. Let A be a square matrix all of whose entries are integers. then which one of the following is true
(1) If $\det A = \pm 1$, then A^{-1} exists but all its entries are not necessarily integers
(2) If $\det A \neq \pm 1$, then A^{-1} exists and all its entries are non integers
(3) If $\det A = \pm 1$. then A^{-1} exists but all its entries are integers
(4) If $\det A = \pm 1$, then A^{-1} need not exists

89. If A and B are square matrices of size $n \times n$ such that $A^2 - B^2 = (A-B)(A+B)$, then which of the following will be always true?
(1) $A = B$ (2) $AB = BA$
(3) either of A or B is a zero matrix
(4) either of A or B is identity matrix

90. The normal to the curve $x = a(1+\cos\theta)$, $y = a\sin\theta$ at 'θ' always passes through the fixed point
(1) (a, a) (2) $(0, a)$
(3) (0,0) (4) $(a, 0)$

91. The function $f(x) = \frac{x}{2} + \frac{2}{x}$ has a local minimum at
(1) $x = 2$ (2) $x = -2$
(3) $x = 0$ (4) $x = 1$

92. A value of c for which conclusion of Mean Value Theorem holds for the function $f(x) = \log_e x$ on the interval [1,3] is
(1) $\log_3 e$ (2) $\log_e 3$
(3) $2\log_3 e$ (4) $\frac{1}{2}\log_3 e$

93. $\int \frac{dx}{\cos x + \sqrt{3}\sin x}$ equals
(1) $\log\tan\left(\frac{x}{2} + \frac{\pi}{12}\right) + C$
(2) $\log\tan\left(\frac{x}{2} - \frac{\pi}{12}\right) + C$
(3) $\frac{1}{2}\log\tan\left(\frac{x}{2} - \frac{\pi}{12}\right) + C$
(4) $\frac{1}{2}\log\tan\left(\frac{x}{2} + \frac{\pi}{12}\right) + C$

94. If $\int \frac{\sin x}{\sin(x-\alpha)}dx = Ax + B\log\sin(x-a), + C$, then value of (A,B) is
(1) $(-\cos\alpha, \sin\alpha)$ (2) $(\cos\alpha, \sin\alpha)$
(3) $(-\sin\alpha, \cos\alpha)$ (4) $(\sin\alpha, \cos\alpha)$

95. If $\int f(x)dx = \psi(x)$, then $\int x^5 f(x^3)dx$ is equal to
(1) $\frac{1}{3}[x^3\psi(x^3) - \int x^2\psi(x^3)dx] + C$
(2) $\frac{1}{3}x^3\psi(x^3) - 3\int x^2\psi(x^3)dx + C$
(3) $\frac{1}{3}x^3\psi(x^3) - \int x^2\psi(x^3)dx + C$
(4) $\frac{1}{3}[x^3\psi(x^3) - \int x^2\psi(x^3)dx] + C$

96. The value of the integral $\int_0^{\pi/2} \frac{\sqrt{\cot x}}{\sqrt{\cot x} + \sqrt{\tan x}}dx$ is
(1) $\pi/4$ (2) $\pi/2$
(3) π (4) none of these

97. For any integer n the integral-
$\int_0^{\pi} e^{\cos^2 x}\cos^3(2n+1)x\,dx$ has the value
(1) π (2) 1
(3) 0 (4) none of these

98. If $g(x) = \int_0^x \cos^4 t\,dt$, then $g(x+\pi)$ equals
(1) $g(x)+g(\pi)$ (2) $g(x) - g(\pi)$
(3) $g(x)\,g(\pi)$ (4) $\frac{g(x)}{g(\pi)}$

99. Let $g(x) = \int_0^x f(t)\,dt$, where f is such that
$\frac{1}{2} \le f(t) \le 1$, for $t \in [0,1]$ and $0 \le f(t) \le \frac{1}{2}$ for $t \in [1,2]$
Then $g(2)$ satisfies the inequality
(1) $-\frac{3}{2} \le g(2) < \frac{1}{2}$ (2) $0 \le g(2) < 2$
(3) $\frac{3}{2} \le g(2) \le \frac{5}{2}$ (4) $2 < g(2) < 4$

100. The area bounded by the curves $y = |x|-1$ and $y = -|x| + 1$ is
(1) 1 (2) 2
(3) $2\sqrt{2}$ (4) 4

101. The area bounded by the parabolas $y = (x+1)^2$ and $= (x-1)^2$ and the line $y = 1/4$ is
(1) 4 sq. units (2) 1/6 sq. units
(3) 4/3 sq. units (4) 1/3 sq. units

102. $\int_0^2 [x^2]dx$ is
(1) $2-\sqrt{2}$ (2) $2+\sqrt{2}$
(3) $\sqrt{2}-1$ (4) $-\sqrt{2}-\sqrt{3}+5$

103. A solution of the differential equation $\left(\frac{dy}{dx}\right)^2 - x\frac{dy}{dx} + y = 0$ is
(1) $y = 2$ (2) $y = 2x$
(3) $y = 2x-4$ (4) $y = 2x^2 - 4$

104. If $x^2 + y^2 = 1$, then
(1) $yy'' - 2(y')^2 + 1 = 0$ (2) $yy'' + (y')^2 + 1 = 0$
(3) $yy'' + (y')^2 - 1 = 0$ (4) $yy'' + 2(y')^2 + 1 = 0$

105. The solution of primitive integral equation $(x^2 + y^2)\,dy = xy\,dx$ *is* $y = y(x)$. If $y(1) = 1$ and $y(x_0) = e$, then x_0 is equal to

(1) $\sqrt{2(e^2 - 1)}$ (2) $\sqrt{2(e^2 + 1)}$

(3) $\sqrt{3}\,e$ (4) $\sqrt{\frac{e^2 + 1}{2}}$

106. For the primitive integral equation $ydx + y^2\,dy = x\,dy$; $x \in R, y > 0, y = y(x), y(1) = 1$, then $y(-3)$ is

(1) 3 (2) 2

(3) 1 (4) 5

107. The differential equation $\frac{dy}{dx} = \frac{\sqrt{1 - y^2}}{y}$ determines a family of circles with

(1) variable radii and a fixed centre at (0, 1)

(2) variable radii and a fixed centre at (0, –1)

(3) fixed radius 1 and variable centres along the x-axis

(4) fixed radius 1and variable centres along the y-axis

108. The order and degree of the differential equation $\left(1 + 3\frac{dy}{dx}\right)^{2/3} = 4\frac{d^3y}{dx^3}$ are

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

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

109. The scalar $\vec{A}.(\vec{B} + \vec{C}) \times (\vec{A} + \vec{B} + \vec{C})$ equals:

(1) 0 (2) $[\vec{A}\ \vec{B}\ \vec{C}] + [\vec{B}\ \vec{C}\ \vec{A}]$

(3) $[\vec{A}\ \vec{B}\ \vec{C}]$ (4) None of these

110. Let $\vec{a}, \vec{b}, \vec{c}$, be three non-coplanar vectors and $\vec{p}, \vec{q}, \vec{r}$, are vectors defined by the relations $\vec{p} = \frac{\vec{b} \times \vec{c}}{[\vec{a}\vec{b}\vec{c}]}$, $\vec{q} = \frac{\vec{c} \times \vec{a}}{[\vec{a}\vec{b}\vec{c}]}$, $\vec{r} = \frac{\vec{a} \times \vec{b}}{[\vec{a}\vec{b}\vec{c}]}$ then the value of the expression $(\vec{a} + \vec{b})\,.\,\vec{p} + (\vec{b} + \vec{c}).\vec{q} + (\vec{c} + \vec{a}).\vec{r}$ is equal to

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

111. Let *a, b, c* be distinct non-negative numbers. If the vectors $a\hat{i} + a\hat{j} + c\hat{k}, \hat{i} + \hat{k}$ and $c\hat{i} + c\hat{j} + b\hat{k}$ lie in a plane, then *c* is

(1) the Arithmetic Mean of *a* and *b*

(2) the Geometric Mean of *a* and *b*

(3) the-harmonic Mean of *a* and *b*

(4) equal to zero

112. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} - \hat{k}$ be three vectors. A vector $\vec{v}$ in the plane of $\vec{a}$ and $\vec{b}$, Whose projection on $\vec{c}$ is $\frac{1}{\sqrt{3}}$ is given by

(1) $\hat{i} - 3\hat{j} + 3\hat{k}$ (2) $-3\hat{i} - 3\hat{j} - \hat{k}$

(3) $3\hat{i} - \hat{j} + 3\hat{k}$ (4) $\hat{i} + 3\hat{j} - 3\hat{k}$

113. The equation of a plane passing through the line of intersection of the planes $x + 2y + 3z = 2$ and $x - y + z = 3$ and at a distance $\frac{2}{\sqrt{3}}$ from the point (3, 1,– l) is

(1) $5x - 11y + z = 17$ (2) $\sqrt{2}x + y = 3\sqrt{2} - 1$

(3) $x + y + z = \sqrt{3}$ (4) $x - \sqrt{2}y = 1 - \sqrt{2}$

114. Let *P* be the image of the point (3,1,7) with respect to the plane $x - y + z = 3$. Then the equation of the plane passing through *P* and containing the straight lime $\frac{x}{1} = \frac{y}{2} = \frac{z}{1}$ is

(1) x + y – 3z = 0 (2) 3x + z = 0

(3) x – 4y + 7z = 0 (4) 2x –y = 0

115. If from each of the three boxes containing 3 white and 1 black, 2 white and 2 black, 1white and 3 black balls. one ball is drawn at random, then the probability that 2 white and 1 black ball will be drawn is

(1) 13/32 (2) 1/4

(3) 1/32 (4) 3/16

116. The probability that at least one of the events *A* and *B* occurs is 0.6. If *A* and *B* occur simultaneously with probability 0.2, then $P(\overline{A}) + P(\overline{B})$ is

(1) 0.4 (2) 0.8

(3) 1.2 (4) 1.4

117. Three boys and two girls stand in a queue. The probability that the number of boys ahead of every girl is at least one more than the number of girls ahead of her, is

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

118. Four persons independently solve a certain problem correctly with probabilities $\frac{1}{2}, \frac{3}{4}, \frac{1}{4}, \frac{1}{8}$ .Then the probability that the problem is solved correctly by at least one of them is

(1) $\frac{235}{256}$ (2) $\frac{21}{256}$

(3) $\frac{3}{256}$ (4) $\frac{253}{256}$

119. The number of real solutions of $\tan^{-1}\sqrt{x(x+1)}+\sin^{-1}\sqrt{x^2+x+1}=\pi/2$ *is*
(1) zero (2) one
(3) two (4) infinite

120. The principal value of $\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$ is
(1) $-\frac{2\pi}{3}$ (2) $\frac{2\pi}{3}$
(3) $\frac{4\pi}{3}$ (4) none

121. If $\alpha=3\sin^{-1}\left(\frac{6}{11}\right)$ and $\beta=3\cos^{-1}\left(\frac{4}{9}\right)$, where the inverse trigonometric functions take only the principal values, then the correct option(s) is (are)
(1) $\cos\beta>0$ (2) $\sin\beta>0$
(3) $\cos(\alpha+\beta)>0$ (4) $\cos\alpha>0$

122. *f is* defined in [-5, 5] as
f (x) = x if x is rational
= $-x$ if x is irrational. Then
(1) *f(x)* is continuous at every *x,* except $x=0$
(2) *f(x)* is discontinuous at every *x,* except $x=0$
(3) *f(x)* is continuous everywhere
(4) *f(x)* is discontinuous everywhere

123. The value of $\lim_{x\to0}\frac{\int_0^{x^2}\sec^2 t\,dt}{x\sin x}$ is
(1) 0 (2) 3
(3) 2 (4) 1

124. If $\lim_{x\to\infty}\left(1+\frac{a}{x}+\frac{b}{x^2}\right)^{2x}=e^2$ then the values of a and b, are
(1) a=1 and b=2 (2) $a=1, b\in R$
(3) $a\in R, b=2$ (4) $a\in R, b\in R$

125. Let α and β be the distinct roots *of* $ax^2+bx+c=0$, then $\lim_{x\to\alpha}\frac{1-\cos(ax^2+bx+c)}{(x-\alpha)^2}$ is equal to
(1) $\frac{a^2}{2}(\alpha-\beta)^2$ (2) 0
(3) $\frac{-a^2}{2}(\alpha-\beta)^2$ (4) $\frac{1}{2}(\alpha-\beta)^2$

126. $\lim_{n\to\infty}\left[\frac{1}{n^2}\sec^2\frac{1}{n^2}+\frac{2}{n^2}\sec^2\frac{4}{n^2}.....+\frac{1}{n}\sec^2 1\right]$ equals
(1) $\frac{1}{2}\sec 1$ (2) $\frac{1}{2}\operatorname{cosec} 1$
(3) tan 1 (4) $\frac{1}{2}\tan 1$

127. The domain of $\sin^{-1}[\log_3(x/3)]$ is
(1) [1, 9] (2) [-1, 9]
(3) [-9, I] (4) [–9,–1]

128. The function $f(x)=\log(x+\sqrt{x^2+1})$,is
(1) neither an even nor an odd function
(2) an even function
(3) an odd function
(4) a periodic function

129. Domain of definition of the function
$f(x)=\frac{3}{4-x^2}+\log_{10}(x^3-x)$
(1) $(-1, 0)\cup(1, 2)\cup.(2,\infty)$ (2) (a, 2*)*
(3) $(-1, 0)\cup$(a, 2) (4) $(1, 2)\cup(2, \infty)$

130. If $f: R\to R$ satisfies $f(x+y)=f(x)+f(y)$, for all x, $y\in R$ and $f(1)=7$, then $\sum_{r=1}^{n}f(r)$
(1) $\frac{7n(n+1)}{2}$ (2) $\frac{7n}{2}$
(3) $\frac{7(n+1)}{2}$ (4) $7n+(n+1)$

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