AJMAL SUPER 40

PHASE - 1

ADMISSION CUM SCHOLARSHIP TEST : 2023

FOR 12th PASSED/APPEARING [CHALLENGERS]

Conducted by : **AJMAL FOUNDATION, Hojai**

TEST BOOKLET SERIES $\boxed{A}$

INSTRUCTIONS TO CANDIDATE

1. Candidates are to use the OMR Answer Sheet provided.
2. It is the candidate's responsibility to write and fill in the **Application Number** (from Admit Card) and **Test Booklet Series** (from Question Paper) carefully and without any omission or discrepancy at the appropriate place in the **OMR Answer Sheet.**
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 on the OMR Answer 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 **OMR 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 (Smart Watch, Mobile,calculator etc.) shall not be used by the examinee during the examination.
10. No candidate will be allowed to leave the Examination Hall before completion of 3 hours.
11. For each correct answer 1 mark will be awarded and for each incorrect answer 0 mark will be deducted.
12. Duration of the exam is **03 hours from 11:00 AM to 02:00 PM.**

For Medical			For Engineering		
Subject	Questions	Marks	Subject	Questions	Marks
Physics	1 to 40	40	Physics	1 to 40	40
Chemistry	41 to 80	40	Chemistry	41 to 80	40
Biology	81 to 150	70	Mathematics	81 to 130	50
Total	150	150	Total	130	130

13. Contravention of any of the instruction mentioned above shall render a candidate liable for disciplinary action as per rule.
14. **Date of Result Declaration : 02 - 04- 2023, Time - 3.00 PM**

Name of the Candidate:

Your Application Number

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PHYSICS

1. The emf produced in a coil is 10 V, when current is changed at a rate of 40 A/s. The magnetic energy stored in the coil, when a current of 0.1 A is flowing through it is

   (1) 1×10^{-3} J
   (2) 1.25×10^{-3} J
   (3) 4×10^{-3} J
   (4) 20×10^{-3} J

2. If in an ideal inductor number of turns are doubled and length is increased to four times, then self inductance

   (1) Becomes half
   (2) Becomes four times
   (3) Remains same
   (4) Becomes 16 times

3. Reactance (X) of a series LC ac circuit varies with frequency (f) as

   (1)
   (2)
   (3)
   (4)
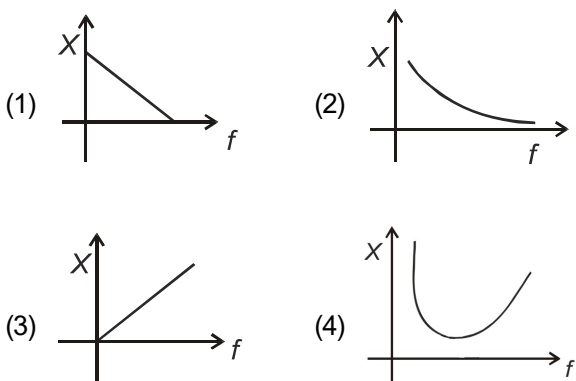
4. In a series LCR circuit connected with an a.c. source value of capacitive reactance and inductive reactance are interchanged, then the value of impedance
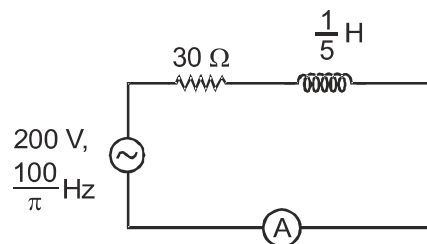
   (1) Increases
   (2) Decreases
   (3) Remain same
   (4) Increase or decrease depending on relative position of L, C and R

5. An alternating voltage and corresponding current are given by $E(\text{volt}) = 120\sin\left(\omega t + \dfrac{\pi}{6}\right)$ and $i(\text{ampere}) = 5\sin\left(\omega t - \dfrac{\pi}{6}\right)$ respectively. The average power dissipated is

   (1) 100 W
   (2) 150 W
   (3) $150\sqrt{3}$ W
   (4) $100\sqrt{3}$ W

6. Find the reading of the a.c. ammeter in the following circuit

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

7. Which of the following describes the transverse nature of electromagnetic wave?

   (1) Reflection
   (2) Refraction
   (3) Polarisation
   (4) Interference

8. Select the incorrect statement from the following

   (1) The oscillating fields of an electromagnetic wave can accelerate charge
   (2) An accelerating charge produces electromagnetic waves
   (3) Microwaves are suitable for radar systems
   (4) The speeds of all electromagnetic waves in a given medium are equal

9. Select the correct relation for angular magnification of a simple microscope when final image is at D from eye (where symbols have their usual meaning)

   (1) $-\dfrac{D}{f}$
   (2) $1 + \dfrac{D}{f}$
   (3) $1 - \dfrac{D}{f}$
   (4) $\dfrac{D}{f}$

10. A ray of light passes from air into a liquid and the angle of incidence is 60°. If the deviation produced is 7°, then the refractive index of the liquid is

    (1) $\dfrac{2\sqrt{3}}{5}$
    (2) $\dfrac{\sqrt{3}}{2}$
    (3) $\dfrac{5}{4}$
    (4) $\dfrac{5\sqrt{3}}{8}$

11. If light consisting of two wavelengths $\lambda_1 = 4000$Å and $\lambda_2 = 5000$Å are used in Young's double slit experiment with slits placed symmetrically, then mark the correct statement

    (1) Both the waves form their respective central maxima at centre of screen
    (2) Fifth maxima of λ_1 coincides with fourth maxima of λ_2
    (3) Both the waves do not form their respective central maxima at centre of screen
    (4) Both (1) & (2)

12. The work function of a metal is 4 eV. The threshold wavelength for photoelectric effect will be nearly

    (1) 310 Å   (2) 3100 nm

    (3) 3.1×10^{-10} m   (4) 3.1×10^{-5} cm

13. If e is charge of an electron, V is potential differences and c is speed of light then, eV/c has unit of

    (1) Energy   (2) Pressure

    (3) Momentum   (4) Intensity

14. On $1 m^2$ area of a sensitive metal, light having frequency more than threshold frequency with intensity $3 W/m^2$ is incident. The wavelength of light is 6.6Å. If efficiency of emission is 10%, then maximum photoelectric current is

    (1) 1.6×10^{-5}A   (2) 1.6×10^{-4}A

    (3) 1.6×10^{-7}A   (4) 1.6×10^{-6}A

15. An α particle of kinetic energy E is projected forwards a gold nucleus with zero impact parameter in Rutherford a-scattering experiment. Its closest approach gold to nucleus is proportional to

    (1) E (2) $\dfrac{1}{E^2}$

    (3) $\dfrac{1}{E}$ (4) $\dfrac{1}{\sqrt{E}}$

16. If λ_1 and λ_2 are wavelengths of de-Broglie waves for electrons in the first and second Bohr's orbit in hydrogen atom, then $\dfrac{\lambda_1}{\lambda_2}$ is equal to

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

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

17. What is the Boolean expression for the gate circuit shown below?
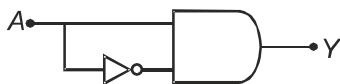
    (1) A.0 = 0   (2) $A.\overline{A} = 0$

    (3) A.1 = A   (4) A.A = A

18. Which of the following is not the use of a P-n Junction?

    (1) Voltage regulation   (2) Rectifier

    (3) Electric eye   (4) Solar cell

19. In a common emitter configuration, the current gain of transistor is $\dfrac{25}{26}$. If collector current is 1mA, then base current is

    (1) 40µA   (2) 4mA

    (3) 0.4mA   (4) 0.96mA

20. A small electric dipole of dipole moment p is kept in a hollow metal sphere S of radius R as shown in figure. Force by the electric dipole on the charge Q at distance $r (>R)$ from the centre of dipole O is
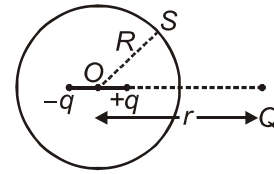

    (1) $\dfrac{2pQ}{4\pi\varepsilon_0 r^3}$ (2) $\dfrac{2pQ}{4\pi\varepsilon_0 (r-R)^3}$

    (3) $\dfrac{2pQ}{4\pi\varepsilon_0 (R+r)^3}$ (4) Zero

21. Two charges $+Q$ and $-2Q$ are separated by a distance r. If the magnitude of electric field midway between the charges is E. Then the electric potential at this point will be

    (1) $-\dfrac{Er}{12}$ (2) $-\dfrac{Er}{6}$ (3) $-\dfrac{Er}{4}$ (4) $-Er$

22. Three charged particles are in equilibrium under their electrostatic force only, then

    (1) The charges cannot have the same sign

    (2) The equilibrium can be completely stable

    (3) All particles need not be collinear

    (4) All the charges must have same magnitude

23. In the diagram shown below, the capacitors X and Y are identical with capacitance 2 µF. The charge on the capacitor X is
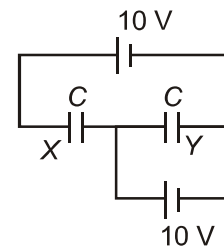
    (1) Zero   (2) 20 µC

    (3) 10 µC   (4) 5 µC

24. On the vertices of a regular pentagon, five charges $+Q, +Q, +Q, +Q, -Q$ are placed and the electric field at centre is E. If the charge $-Q$ is removed, the field at centre

    (1) Will become 2E   (2) Will become $\dfrac{E}{2}$

    (3) Will become zero   (4) Will become 4E

25. A point charge is kept at origin. The electric potential V on x-axis varies with x-coordinate as

(1)

(2)

(3)

(4)
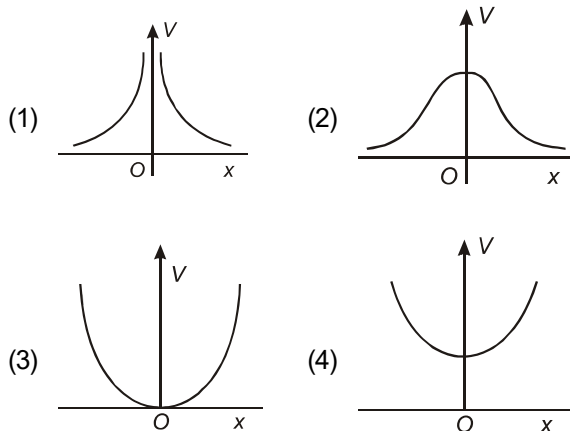
26. An ammeter of resistance 0.1 ohm can allow a maximum current of 2 mA. If 50 mA current is to be measured then approximate resistance to be connected to the ammeter is

(1) $\dfrac{1}{250}\ \Omega$ in parallel
(2) $\dfrac{1}{250}\ \Omega$ in series
(3) $\dfrac{1}{240}\ \Omega$ in parallel
(4) $\dfrac{1}{240}\ \Omega$ in series

27. A wire of length 100 cm is connected to a cell of EMF 2 volt and negligible internal resistance. The resistance of the wire is 6 Ω. The additional resistance required to produce a potential drop of 1 millivolt per cm is

(1) 57 Ω
(2) 114 Ω
(3) 95 Ω
(4) 76 Ω

28. A cell of e.m.f. E is connected across a resistance r. The potential difference between the terminals of the cell is found to be V. The internal resistance of the cell must be

(1) $\dfrac{2(E-V)V}{r}$
(2) $\dfrac{(E-V)r}{V}$
(3) $\dfrac{2(E-V)r}{E}$
(4) $(E-V)r$

29. If a circular current carrying coil has radius 1 m, then at what distance from the centre of the coil on the axis the magnetic induction is $\dfrac{1}{64}$ th of its value at the centre of the coil?

(1) $\sqrt{7}$ m
(2) $\sqrt{15}$ m
(3) $\sqrt{24}$ m
(4) $\sqrt{32}$ m

30. The graph that depicts the variation of magnetic field due to a circular loop of current placed with its centre at origin in x-y plane

(1)

(2)

(3)

(4)
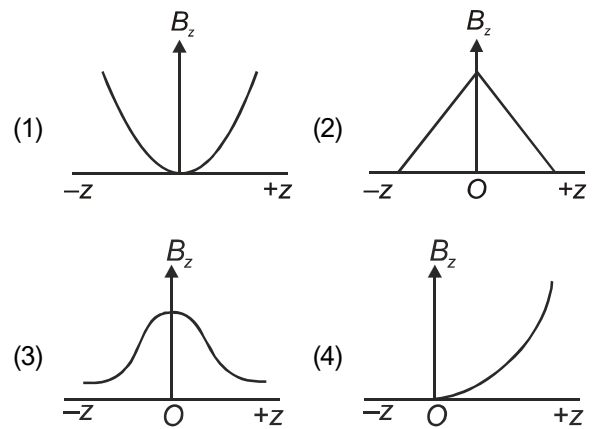
31. A proton moving with constant velocity passes through a region without any change in its velocity. If E and B denote electric and magnetic field respectively, this region must not have

(1) $E = 0,\ B = 0$
(2) $E \neq 0,\ B \neq 0$
(3) $E = 0,\ B \neq 0$
(4) $E \neq 0,\ B = 0$

32. The ratio of magnetic fields due to a current carrying circular coil at points P and Q which are situated on its axis, at distances r and $2r$ from its centre (r >> radius of the coil) is

(1) 1 : 4
(2) 4 : 1
(3) 2 : 1
(4) 8 : 1

33. What is the reading of the ammeter if reading of the voltmeter is 20 volt?

(1) 2 A
(2) 4 A
(3) 5 A
(4) 10 Ω
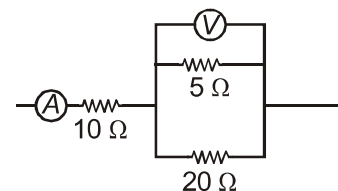
34. **Two long straight conductors with current $I_1 = 3I$ and $I_2 = 2I$ are placed along X and Y axes. The equation of locus of point of zero magnetic induction is :**

(1) $y = x$

(2) $y = \dfrac{2x}{3}$

(3) $y = \dfrac{3}{2}x$

(4) $y = \dfrac{x}{6}$

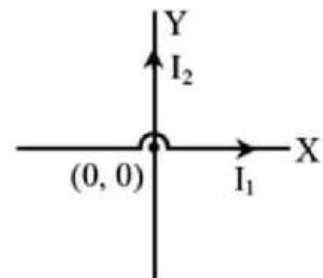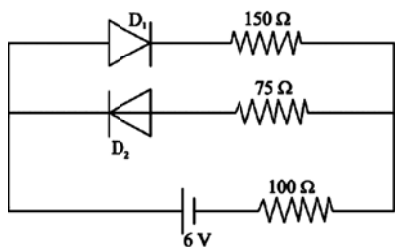35. The circuit shown below contains two ideal diodes, each with a forward resistance of 50Ω. If the battery voltage is 6V, the current through the 100Ω resistance (in Amperes) is:

(1) 0.036

(2) 0.020

(3) 0.027

(4) 0.030

36. The circuit shown here is used to compare the emf of two cells E_1 and E_2 ($E_1 > E_2$).The null point is at C when the galvanometer is connected to E_1 .When the galvanometer is connected to E_2 ,the null point will be
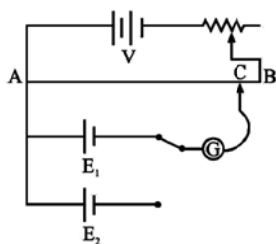
(1) to the left of C
(2) to the right of C
(3) at C itself
(4) no change in null point

37. A polarized light of intensity I_0 is passed through another polarizer whose pass axis makes an angle of 60° with the pass axis of the former. What is the intensity of emerging pollarized light from second polarizer?

(1) $I = I_0$

(2) $I = \dfrac{I_0}{6}$

(3) $I = \dfrac{I_0}{5}$

(4) $\dfrac{I_0}{4}$

38. A diamgnetic material in a magnetic field moves:
(1) Perpendicular to the field
(2) From weaker to stronger parts
(3) From stronger to weaker parts
(4) In none of the above directions

39. A current I flowing through the loop as shown in the adjoining figure. The magnetic field at centre O is :-
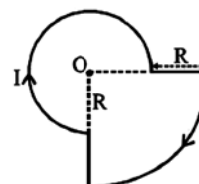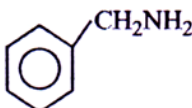
(1) $\dfrac{7\mu_0 I}{16R} \otimes$

(2) $\dfrac{7\mu_0 I}{16R} \odot$

(3) $\dfrac{5\mu_0 I}{16R} \otimes$

(4) $\dfrac{5\mu_0 I}{16R} \odot$

40. N_1 atoms of a radioactive element emit N_2 beta particles per second. The decay constant of the element is (in s^{-1}) :
(1) N_1/N_2
(2) N_2/N_1
(3) $N_1 \ln (2)$
(4) $N_2 \ln (2)$

CHEMISTRY

41. Chloroquine is an example of:
- (1) antipyretic
- (2) antimalarial
- (3) antibacterial
- (4) antitubercular drug

42. Salvarsan is arsenic containing drug which was first used for the treatment of :
- (1) syphilis
- (2) typhoid
- (3) meningitis
- (4) dysentery

43. Which is fully fluorinated polymer?
- (1) Neoprene
- (2) Teflon
- (3) Thiokol
- (4) PVC

44. Which one is classified as a condensation polymer?
- (1) Dacron
- (2) Neoprene
- (3) Teflon
- (4) Acrylonitrile

45. Insulin, a protein acts as:
- (1) an antibody
- (2) a hormone
- (3) an enzyme
- (4) a transport agent

46. The pyrimidine bases present in DNA are:
- (1) cytosine and adenine
- (2) cytosine and guanine
- (3) cytosine and thymine
- (4) cytosine and uracil

47. Glucose on prolonged heating with HI gives :
- (1) hexanoic acid
- (2) 6-iodohexanal
- (3) n-hexane
- (4) l-hexene

48. Which of the following is the strongest base?

(1) [benzene ring with CH₂NH₂] (2) [benzene ring with NHCH₃]

(3) [benzene ring with NH₂ and CH₃] (4) [benzene ring with NH₂]

49. Which of the following amines can be prepared by Gabriel phthalimide reaction?
- (1) n-butylamine
- (2) triethylamine
- (3) ter-butylamine
- (4) neo-pentylamine

50. Hinsberg's reagent is :
- (1) $SOCl_2$
- (2) C_6H_5COCl
- (3) $C_6H_5SO_2Cl$
- (4) $COCl_2$

51. The organic product formed in the reaction;

$C_6H_5COOCH_3 \xrightarrow[(II)H_2O]{(I)LiAlH_4} :$
- (1) $C_6H_5CH_2OH$ and CH_3OH
- (2) C_6H_5COOH and CH_4
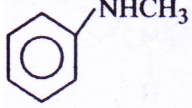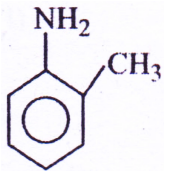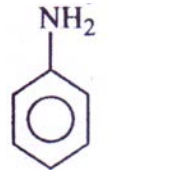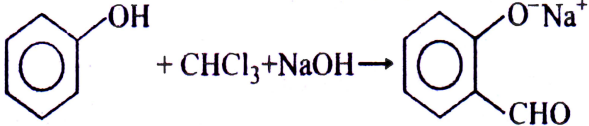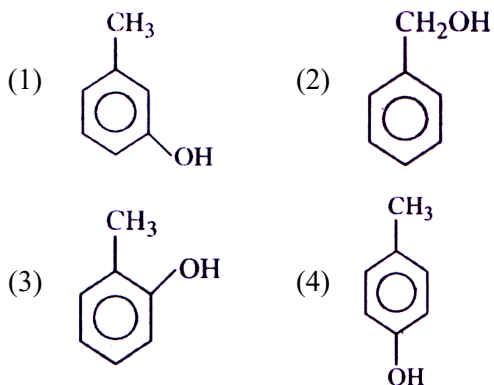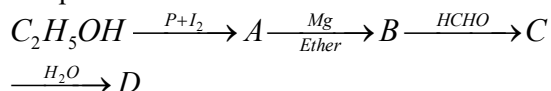- (3) $C_6H_5CH_3$ and CH_3OH
- (4) $C_6H_5CH_3$ and CH_4

52. Which of the following acids has the smallest dissociation constant?
- (1) $CH_3CHFCOOH$
- (2) FCH_2CH_2COOH
- (3) $BrCH_2CH_2COOH$
- (4) $CH_3CHBrCOOH$

53. In the reaction,
$CH_3COOH \xrightarrow{LiAlH_4} A \xrightarrow{PCl_5} B$
$\xrightarrow{Alc.KOH} C$, the product C is :
- (1) Acetaldehyde
- (2) Acetylene
- (3) Ethylene
- (4) Acetyl chloride

54. Which of the following will not undergo aldolcondensation?
- (1) Acetaldehyde
- (2) Propanaldehyde
- (3) Benzaldehyde
- (4) Trideuteroacetaldehyde

55. The increasing order of the rate of HCN addition to compounds A to D is:
- (A) HCHO
- (B) CH_3COCH_3
- (C) $PhCOCH_3$
- (D) $PhCOPh$

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

56. Which of the following on heating with aqueous KOH, produces acetaldehyde?
- (1) CH_3CH_2Cl
- (2) CH_2ClCH_2Cl
- (3) CH_3CHCl_2
- (4) CH_3COCl

57. [benzene ring with OH] $+ CHCl_3 + NaOH \rightarrow$ [benzene ring with O^-Na^+ and CHO]

The electrophile involved in the above reaction is:
- (1) dichloromethyl cation $(\overset{\oplus}{C}HCl_2)$
- (2) dichlorocarbene $(\overset{\bullet\bullet}{C}Cl_2)$
- (3) tricbloromethyl anion $\left(\overset{\ominus}{C}Cl_3\right)$
- (4) formyl cation $\left(\overset{\oplus}{C}Cl_3\right)$

58. The structure of the compound that gives a tribromo derivative on treatment with bromine water is:

(1) [structure: CH_3 with OH at meta position]

(2) [structure: CH_2OH on benzene]

(3) [structure: CH_3 with OH at ortho position]

(4) [structure: CH_3 with OH at para position]

59. The product in the reaction is :

$$C_2H_5OH \xrightarrow{P+I_2} A \xrightarrow[Ether]{Mg} B \xrightarrow{HCHO} C$$
$$\xrightarrow{H_2O} D$$

    (1) ethanol   (2) butanal
    (3) *n*-butanol   (4) *n*-propanol

60. The number of s–s bonds in sulphur trioxide trimer (S_3O_9) is :

    (1) three   (2) two
    (3) one   (4) zero

61. The IUPAC name of $K_3\left[Fe(CN)_6\right]$ is :

    (1) potassium hexacyanoferrate (II)
    (2) potassium hexacyanoferrate (III)
    (3) potassium hexacyano iron (II)
    (4) tripotassium hexacyano iron (II)

62. Which has regular tetrahedral geometry?

    (1) $\left[Ni(CN)_4\right]^{2+}$ (2) SF_4
    (3) $\left[BF_4\right]^-$ (4) XeF_4

63. The structure of the major product formed in the given reaction

[structure: benzene with CH_2Cl and I] $\xrightarrow[DMF]{NaCN}$ is :

(1) [structure: CH_2CN and CN]

(2) [structure: CH_2Cl, CN, I]

(3) [structure: CH_2Cl and CN]

(4) [structure: CH_2CN and I]
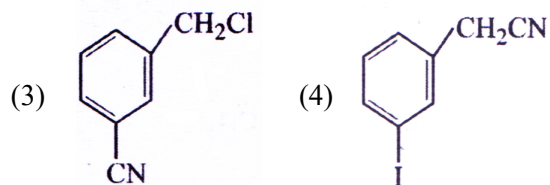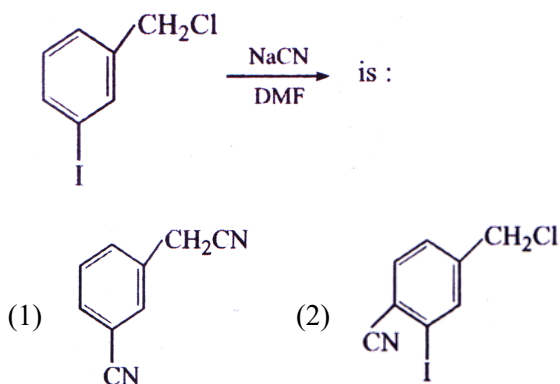
64. Which of the following complex exhibit facial-meridional geometrical isomerism?

    (1) $\left[Pt(NH_3)Cl_3\right]^-$ (2) $\left[PtCl_2(NH_3)_2\right]$
    (4) $\left[Co(NO_2)_3(NH_3)_3\right]$ (3) $\left[Ni(CO)_4\right]$

65. The coordination numbers of Co and Al in $\left[CoCl(en)_2\right]Cl$ and $K_3\left[Al(C_2O_4)_3\right]$, respectively, are: (en = ethane-l,2-diamine)

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

66. In $\left[Cr(C_2O_4)_3\right]^{3-}$, the isomerism shown is:

    (1) ligand   (2) optical
    (3) geometrical   (4) ionization

67. In the dichromate dianion:

    (1) 4 Cr–O bonds are equivalent
    (2) 6 Cr–O bonds are equivalent
    (3) all Cr–O bonds are equivalent
    (4) all Cr–O bonds are non-equivalent

68. The aqueous solution containing which one of the following ions will be colourless?

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

69. Good reducing nature of H_3PO_2 is attributed to the presence of :

    (1) two P–H bonds   (2) one P–H bond
    (3) two P–OH bonds   (4) one P–OH bond

70. The compound that does not produce nitrogen gas by the thermal decomposition is :

    (1) NH_4NO_2 (2) $(NH_4)_2SO_4$
    (3) $Ba(N_3)_2$ (4) $(NH_4)_2Cr_2O_7$

71. The degree of dissociation (α) of a weak electrolyte, A_xB_y is related to van't Hoff factor (i) by the expression:

    (1) $\alpha = \dfrac{i-1}{(x+y-1)}$ (2) $\alpha = \dfrac{i-1}{x+y+1}$
    (3) $a = \dfrac{x+y-1}{i-1}$ (4) $\alpha = \dfrac{x+y+1}{i-1}$

72. Match the refining methods Column I with metals Column II

Column I (Refining Methods)		Column II (Metals)	
I.	Liquation	(A)	Zr
II.	Zone refining	(B)	Ni
III.	Mond process	(C)	Sn
IV.	van Arkel method	(D)	Ga

(1) I–(C); (II)–(D); (III)–(B); (IV)–(A)
(2) I–(B); (II)–(C); (III)–(D); (IV)–(A)
(3) I–(C); (II)–(A); (III)–(B); (IV)–(D)
(4) I–(B); (II)–(D); (III)–(A); (IV)–(C)

73. The half-life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of the chemical reaction will be (log 2 = 0.301) :
(1) 23.03 minutes   (2) 46.06 minutes
(3) 460.6 minutes   (4) 230.3 minutes

74. For a reaction $\frac{1}{2}A \longrightarrow 2B$, rate of disappearance of 'A' is related to the rate of appearance of 'B' by the expression:
(1) $-\frac{d[A]}{dt} = 4\frac{d[B]}{dt}$

(2) $-\frac{d[A]}{dt} = \frac{1}{2}\frac{d[B]}{dt}$

(3) $-\frac{d[A]}{dt} = \frac{1}{4}\frac{d[B]}{dt}$

(4) $-\frac{d[A]}{dt} = \frac{d[B]}{dt}$

75. The van't Hoff factor for $0.1M$ $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is:
(1) 91.3 %   (2) 87 %
(3) 100 %   (4) 74 %

76. On passing a particular amount of electricity in $AgNO_3$ solution, 108 g of Ag is deposited. What will be the volume of $O_2(g)$ in litre liberated at 1bar, 273 K by same quantity of electricity?
(1) 5.68   (2) 6.58
(3) 8.56   (4) 8.65

77. If $E^{\circ}_{Cu^{2+}/Cu} = 0.34\,V$ and $E^{\circ}_{Cu^{+}/Cu} = 0.522\,V$ then calculate $E^{\circ}_{Cu^{2+}/Cu^{+}}$
(1) 0.158 V   (2) –0.158 V
(3) 0.182V   (4) –0.182V

78. Which condition is not satisfied by an ideal solution?
(1) ΔH mixing = 0
(2) ΔV mixing = 0
(3) ΔS mixing = 0
(4) obeyance of Raoult's law

79. Element 'B' forms ccp structure and 'A' occupies half of the octahedral voids, while oxygen atoms occupy all the tetrahedral voids. The structure of bimetallic oxide is :
(1) A_2BO_4 (2) AB_2O_4
(3) A_2B_2O (4) A_4B_2O

80. The given plots represent the variation of the concentration of a reactants R with time for two different reactions (i) and (ii). The respective orders of the reactions are:
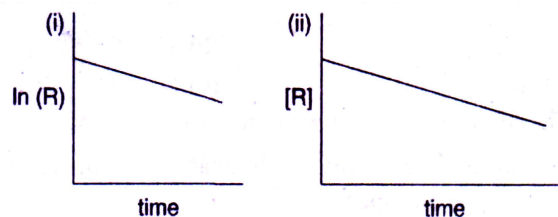
(1) 1, 1   (2) 0, 2
(3) 0, 1   (4) 1, 0

BIOLOGY

SECTION – A

81. A typical angiosperm anther is
    (1) Monothecous and tetrasporangiate
    (2) Bilobed and bisporangiate
    (3) Dithecous and trilobed
    (4) Bilobed and tetrasporangiate

82. Select correct statement
    (1) RNA is more labile due to methyluracil
    (2) DNA is preferred for the transmission of genetic information
    (3) RNA acts as adapter and catalyst
    (4) Presence of thymine confers stability to the helical structure of DNA

83. Discontinuous fragments of DNA which are formed during replication of DNA are joined by
    (1) DNA ligase   (2) Lyase
    (3) DNA polymerase   (4) RNA polymerase

84. Chromosome component of a person affected from Turner's syndrome will be
    (1) 44+XXY   (2) 44+XY
    (3) 44+XO   (4) 44+XX

85. Consider the given figure and select correct option for label marked by A, B, C & D.

    (1) A–DNA dependent DNA polymerase,
        B–Replication
    (2) C–DNA dependent RNA polymerase
        A–RNA dependent DNA polymerase
    (3) C–RNA dependent RNA polymerase,
        D–DNA dependent Ribozyme
    (4) B–RNA dependent DNA polymerase
        D – RNA dependent peptidyl transferase

86. In eukaryotes, a gene is literally not defined as
    (1) Cistron
    (2) Functional unit of inheritance
    (3) A segment of DNA coding for a polypeptide
    (4) DNA sequence which has continuous information for a polypeptide

87. The debate between proteins versus DNA as the genetic material was finally resolved from the experiment of
    (1) Frederick Griffith
    (2) Hershey and Chase
    (3) Watson and Crick
    (4) Meselson and Stahl

88. Organism responsible for ethanol production in breweries is
    (1) Penicillium   (2) Streptococcus
    (3) Saccharomyces   (4) Bacillus

89. Blood-cholesterol lowering agents statins are produced by
    (1) *Streptococcus*
    (2) *Streptobacillus*
    (3) *Trichoderma polysporum*
    (4) *Monascus purpureus*

90. The main source of biofertilizers in terrestrial environments are
    (1) Bacteria only
    (2) Bacteria and fungi
    (3) Fungi and BGA
    (4) Bacteria, cyanobacteria and fungi

91. What does 'S' stands for in the equation log $S = \log C + Z \log A$?
    (1) Species area
    (2) Species richness
    (3) Regression coefficient
    (4) Species interrelationship

92. Microbes are useful to human being in diverse ways. Which of the following products are formed by fermentive activity of yeast?
    (1) Bread, curd, cheese
    (2) Toddy, cheese, curd
    (3) Biogas, biofertilizer, cheese
    (4) Bread, ethanol, wine

93. Myotonic dystrophy which also follows Mendelian pattern of inheritance is
    (1) Autosomal recessive trait
    (2) Holandric trait
    (3) X-linked recessive trait
    (4) Autosomal dominant trait

94. Organisms which can tolerate and thrive in a wide range of temperatures are called
    (1) Stenothermal   (2) Eurythermal
    (3) Ectotherm   (4) Poikilotherms

95. Succession begins with invasion of a bare lifeless area by pioneers (a) which later succeeded by bigger plants and ultimately a stable climax community (b) is formed. Choose correct option for (a) and (b) in hydrosere.
    (1) Lichens, trees ecosystem
    (2) Mosses, grassland
    (3) Sedges, grassland
    (4) Phytoplanktons, forest

96. What is used extensively for removal of particulate matter present in the exhaust from a thermal power plant?
    (1) Catalytic converter
    (2) Agro chemicals
    (3) Pyrolysis
    (4) Electrostatic precipitator

97. Mendel conducted hybridisation experiment on garden pea for seven years during
    (1) 1856-1863   (2) 1726-1733
    (3) 1936-1943   (4) 1859-1866

98. Number of nucleotides in genetic material of $\phi \times 174$ bacteriophage is
    (1) 5386 nucleotides   (2) 5386 base pairs
    (3) 48502 nucleotides   (4) 48502 base pairs

99. Backbone of the polynucleotides chain is formed by
    (1) Sugar and phosphate
    (2) Only sugar
    (3) Nitrogenous base and sugar
    (4) Nitrogenous base and phosphate

100. Virus free plants are developed by culturing
    (1) Apical and axillary meristems
    (2) Lateral meristems
    (3) Cortical cells of stem
    (4) Pith cells of stem

101. In which of the given area pioneer community will take longer time to establish?
    (1) Burnt forest   (2) Flooded plains
    (3) Cut down forest   (4) Bare rock

102. Ten percent law of energy transfer in the ecosystem from one trophic level to another was proposed by
    (1) Reiter   (2) Paul Ehrlich
    (3) A. V. Humboldt   (4) Lindeman

103. All of the given are in-situ conservation strategies of biodiversity, except
    (1) Biosphere reserve
    (2) National park
    (3) Wildlife sanctuaries
    (4) Wildlife safari parks

104. The thickness of zone in a column of air from ground to top of atmosphere is measured in terms of
    (1) Decibel   (2) Dobson unit
    (3) Svedberg unit   (4) Hertz

105. Select the incorrect match
    (1) Rhizome   – Ginger
    (2) Bulb   – Water hyacinth
    (3) Conidia   – Penicillium
    (4) Sucker   – Chrysanthemum

106. A fertilized ovule is called
    (1) Seed   (2) Fruit
    (3) Gamete   (4) Embryo

107. The pyramid of energy is
    (1) Inverted for tree ecosystem
    (2) Always upright for all food chains
    (3) Can be spindle shaped for parasitic food chain
    (4) Inverted in sea

108. Which of the following is an example of organism with recent extinction in Africa?
    (1) Dodo   (2) Quagga
    (3) Thylacine   (4) Steller's sea cow

109. Free-living fungus Trichoderma can be used for
    (1) Killing insects
    (2) Biological control of plant diseases
    (3) Controlling butterfly caterpillars
    (4) Producing cheese

110. A sea anemone attached to the body of hermit crab. The association reflects which of the given population interaction?
    (1) Ectoparasitism   (2) Competition
    (3) Protocooperation   (4) Amensalism

111. Select correct match.

(a)	Broad palm with characteristic palm crease	(i)	Sickle cell anemia
(b)	Gynaecomastia	(ii)	Turner's syndrome
(c)	Rudimentary ovaries	(iii)	Klinefelter's syndrome
(d)	Abnormal RBC shape	(iv)	Down's syndrome

    (1) a(iv), b(iii), c(ii), d(i)
    (2) a(iii), b(iv), c(ii), d(i)
    (3) a(iv), b(iii), c(i), d(ii)
    (4) a(ii), b(iii), c(iv), d(i)

112. Which out-breeding device prevents both autogamy and geitonogamy in papaya?
    (1) Self-incompatibility
    (2) Dichogamy
    (3) Heterostyly
    (4) Dioecism

113. The sugarcane species originally grown in North India and used to get the desirable qualities by crossing with other sugarcane species of South India was
    (1) Saccharum spontaneum
    (2) Saccharum barberi
    (3) Saccharum officinarum
    (4) Saccharum munja

114. About turner's syndrome all of the following are correct, except
    (1) A chromosomal disorder
    (2) Results due to fusion of egg (22 + 0) with sperm (22 + X)
    (3) Rudimentary ovaries
    (4) Normal secondary sexual characters

115. The main source of biofertilisers in terrestrial environments are
    (1) Bacteria only
    (2) Fungi only
    (3) Prokaryotes only
    (4) Bacteria, cyanobacteria and fungi

116. The testes in humans are situated outside the abdominal cavity inside a pouch called scrotum. What is the purpose of it ?
    (1) Providing a secondary sexual feature of exhibiting the male sex
    (2) Maintaining the scrotal temperature lower than the internal body temperature
    (3) Escaping any possible compression by the visceral organs
    (4) Providing more space for the growth of Epididymis

117. The nutritive medium for the ejaculated sperms is mainly provided by the:
    (1) Seminal fluid   (2) Vaginal fluid
    (3) Uterine lining   (4) None of these

118. What is the correct sequence of sperm formation?
    (1) Spermatids, spermatocyte, spermatogonia, spermatozoa
    (2) Spermatogonia, spermatocyte, spermatozoa, spermatids
    (3) Spermatogonia, spermatozoa, spermatocyte, spermatid
    (4) Spermatogonia, spermatocyte, spermatids, spermatozoa

119. The villi which are formed by the chorion, to form the intimate connection with uterine endometrium functions as :
    (1) Gaseous exchange organ only
    (2) Attachment organ only
    (3) Placental structure
    (4) All of these

120. A method of avoiding pregnancy by avoiding physical contact from day 10–17 of the menstrual cycle is called as :
    (1) Coitus interruption
    (2) Conception prevention
    (3) Periodic abstinence
    (4) Barrier method

121. **Assertion:** There are remarkable differences between the reproductive events in the male and in the female.
    Reason: Sperm formation continues even in old men, but formation of ovum ceases in women around the age of fifty years.
    (1) Assertion and reason both are true the reason is correct explanation of assertion.
    (2) Assertion and reason both are true but reason is not correct explanation of assertion.
    (3) Assertion is true but reason is wrong
    (4) Assertion and reason both are wrong.

122. The process of evolution of different species in a given geographical area starting from a point and literally radiating to the other area of geography is called an_____.
    (1) Convergent evolution   (2) Atavism
    (3) Adaptive radiation   (4) Saltation

123. **Assertion:** hCG, hPL and relaxin are produced in women only during pregnancy.
    Reason: Placenta produces several hormones including human chorionic gonadotropin (hCG), human placental lactogen (hPL) and relaxin.
    (1) Assertion and reason both are true the reason is correct explanation of assertion.
    (2) Assertion and reason both are true but reason is not correct explanation of assertion.
    (3) Assertion is true but reason is wrong
    (4) Assertion and reason both are wrong.

124. What is the main reason for decreased maternal and infant mortality rates?
    (1) Better detection and cure of STDs
    (2) Increased number of couples with small families
    (3) Increased number of medically assisted deliveries and better post-natal care
    (4) Improved reproductive health of the society

125. What is true about Intra Uterine Devices (IUDs) ?
    (1) Multiload 375 releases copper make the uterus unsuitable for implantation
    (2) LNG-20 releases hormone which suppress egg motility and the fertilising capacity by sperms
    (3) It is an ideal contraceptives for the females who want to delay pregnancy and/or space children
    (4) All of the above

126. Mark the false statement for related abbreviation:
    (1) ICSI-Sperm directly injected into the ovum
    (2) IUI-Semen directly introduced into uterus
    (3) GIFT-Only sperms or ovum are transferred into fallopian tube of female
    (4) ZIFT-Zygote formed in test tube, transferred into fallopian tube

127. What is correct about test tube baby?
    (1) Fertilization inside female genital tract and growth in test tube
    (2) Rearing of prematurely born baby in incubator
    (3) Fertilization outside and gestation inside womb of mother
   (4) Both fertilization and development are effected outside the female genital tract

128. Elephantiasis in man is caused by :
    (1) *Ancylostoma duodenale*
    (2) *Ascaris lumbricoides*
    (3) *Dracunculus medinensis*
    (4) *Wuchereria bancrofti*

129. Which disease is caused by activation of oncogenes?
    (1) Cholera   (2) Cancer
    (3) TB   (4) Viral flu

130. Here are unlabelled diagram A, B, C, D of different barrier methods. Select the correct option regarding them :

    (A)   (B)

    (C)   (D)
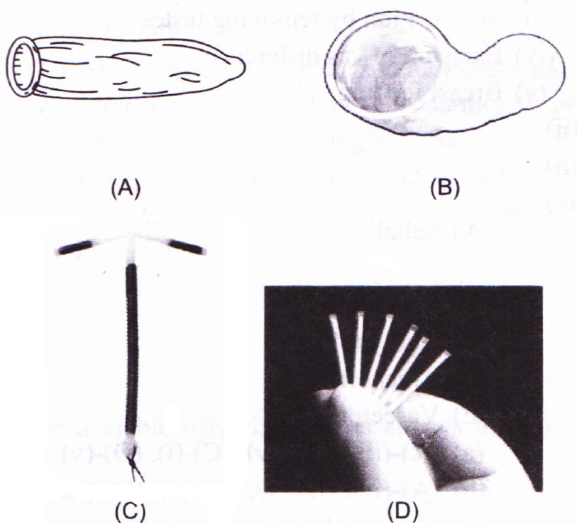
    (1) A-Condom, B-Female condom, C-CuT, D-Vaults
    (2) A-Male condom, B-Cervical cap, C-CuT, D-Vaults
    (3) A-Condom, B-Vaults, C-CuT, D-Implants
    (4) A-Male condom, B-Female condom, C- CuT, D-Implants

131. Match the columns:
    (A) *In Vitro* Fertilization — (i) Transfer of gamete in fallopian tube of female.
    (B) Zygote Intra Fallopian Transfer — (ii) Directly injecting sperms into the ovum under laboratory conditions.
    (C) Intra Uterine Transfer — (iii) Embryo upto 8 blastomere is transferred into fallopian tube.
    (D) Gamete Intra Fallopian Transfer — (iv) Fertilization outside the female body
    (E) Intra Cytoplasmic Sperm Injections — (v) Transfer of embryo with > 8 blastomeres into uterus.

    (1) (A)-(v), (B)-(iv), (C)-(iii), (D)-(ii), (E)-(i)
    (2) (A)-(iii), (B)-(iv), (C)-(v), (D)-(i), (E)-(ii)
    (3) (A)-(iv), (B)-(iii), (C)-(v), (D)-(i), (E)-(ii)
    (4) (A)-(iv), (B)-(iii), (C)-(v), (D)-(ii), (E)-(i)

132. **Assertion:** Reproductive health means a total well-being in all aspects of reproduction, *i.e.,* physical, emotional, behavioural and social.
    Reason : A society with people having physically and functionally normal reproductive organs might be called reproductively healthy.
    (1) Assertion and reason both are true and the reason is correct explanation of assertion.
    (2) Assertion and reason both are true but reason is not correct explanation of assertion.
    (3) Assertion is true but reason is wrong.
    (4) Assertion and reason both are wrong.

133. **Assertion :** Contraceptives pills are not regular requirements for the maintenance of reproductive health.
    Reason: Their regular use causes various ill-effects like nausea, abdominal pain, breakthrough bleeding, irregular menstrual bleeding or even breast cancer.
    (1) Assertion and reason both are true and the reason is correct explanation of assertion.
    (2) Assertion and reason both are true but reason is not correct explanation of assertion.
    (3) Assertion is true but reason is wrong.
    (4) Assertion and reason both are wrong.

134. Choose the correct answer about Miller's experiment:
    (1) Electric discharge in a closed flask containing CH_4, NH_3, H_2, N_2O and water vapour at $800°C$.
    (2) Electric discharge in a closed flask containing NH_4, NH_3, H_2, N_2O and water vapour at $1000°C$.
    (3) Electric discharge in a closed flask containing CH_4, H_2, NH_3 and water vapour at $800°C$.
    (4) Electric discharge in a closed flask containing CO_2, N_2O, NH_3, N_2 and water vapour at $800°C$.

135. Which of the following factor does not affect Hardy-Weinberg's equilibrium?
    (1) Gene migration
    (2) Natural selection
    (3) Genetic drift
    (4) Random mating

136. Branching descent and natural selection are the two key concepts of_____ :
    (1) Lamarckian theory of evolution
    (2) Darwin's theory of evolution
    (3) Weismann theory
    (4) Oparin and Haldane theory

137. Evolution for Darwin was gradual while de Vries believed mutation caused speciation and hence called_____.
    (1) Genetic drift
    (2) Saltation
    (3) Variation
    (4) Gene pool

138. Genetic drift is found in :
    (1) Small population with or without mutated genes
    (2) Large population with random mating
    (3) Animal population
    (4) Plant population

139. A person suffering from a disease caused by *Plasmodium,* experiences recurring chill and fever at the time when :
    (1) The sporozoites released from RBCs are being rapidly killed and broken down inside spleen
    (2) The trophozoites reach maximum growth and give out certain toxins
    (3) The parasite after its rapid multiplication inside RBCs ruptures them, releasing haemozoin
    (4) The microgametocytes and megagametocytes are being destroyed by the WBCs

140. Antihistamine pills are to nullify:
    (1) Allergic reaction
    (2) Malaria
    (3) Typhoid
    (4) None of these

141. Natural cannabinoids are obtained from the:
    (1) Inflorescences of the plant *Cannabis sativa*
    (2) Latex of poppy plant *Papaver somniferum*
    (3) *Erythroxylon coca*
    (4) None of the above

142. Tools of recombinant DNA technology is :
    (1) Restriction enzyme
    (2) Cloning vector
    (3) Competent host
    (4) All of these

143. First recombinant organism was:
    (1) *E. coli* containing antibiotic production Gene
    (2) *Salmonella* containing antibiotic production gene
    (3) *E. coli* containing antibiotic resistant gene
    (4) *Salmonella* containing antibiotic resistant gene

144. Bacterial genes responsible for resistance to antibiotics such as ampicillin, chloramphenicol tetracycline or kanamycin are used as:
    (1) Origin of replication
    (2) Selectable marker
    (3) Cloning vector
    (4) Alternate selectable marker

145. Recombinant DNA technology involves several steps in specific sequence. Choose option which contain correct sequence:
    (i) Isolation of DNA.
    (ii) Isolation of a desired DNA fragment.
    (iii) Transferring the recombinant DNA into the host.
    (iv) Ligation of the DNA fragment into a vector.
    (v) Fragmentation of DNA by restriction endonucleases.
    (vi) Culturing the host cells in a medium at large scale and extraction of the desired product.
    (1) (i), (ii), (iii), (iv), (v), (vi)
    (2) (i), (iii), (ii), (iv), (v), (vi)
    (3) (i), (v), (ii), (iv), (iii), (vi)
    (4) (i), (ii), (v), (iv), (iii), (vi)

146. **Assertion:** Bacteria made 'competent' to take up DNA by treating them with a specific concentration of a divalent cation, such .as calcium.
   **Reason:** Calcium increases the efficiency with which DNA enters the bacterium through pores in its cell wall.

(1) Assertion and reason both are true and the reason is correct explanation of assertion.
(2) Assertion and reason .both are true but reason is not correct explanation of assertion.
(3) Assertion is true but reason is wrong.
(4) Assertion and reason both are wrong.

147. Given figure represents a typical agarose gel electrophoresis showing migration of undigested and digested set of DNA fragments. Select correct option for migration of fragments?
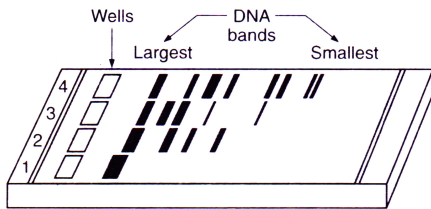

(1) Lane 2 to 4-undigested and lane I-digested set of DNA fragments
(2) Lane I-undigested and lane 2-to 4-digested set of DNA fragments
(3) Lane I to 3-undigested and lane 4-digested set of DNA fragments
(4) Lane 2 and 3-undigested and lane I and 4-digested set of DNA fragments

148. The figure below is the diagrammatic representation of the *E. coli* vector pBR 322. Which one of the given options correctly identifies its certain component (s)?
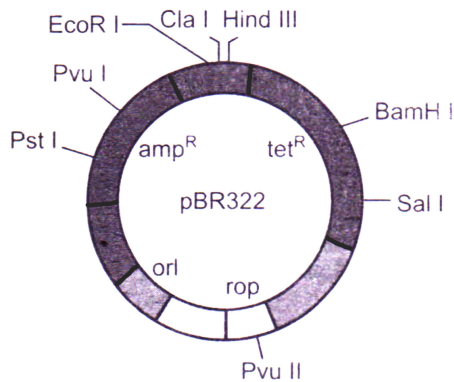

(1) Ori - original restriction enzyme
(2) Rop-reduced osmotic pressure
(3) Hind III, EcoRI - selectable markers
(4) Amp^R, tet^R –antibiotic resistance genes

149. In given diagram 1, 2, 3 and 4 respectively represent.
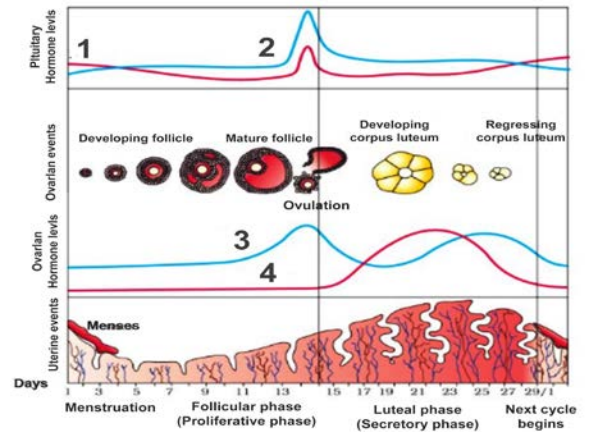
(1) FSH, Estrogen, **LH**, Progesterone
(2) FSH, LH, Progesterone, Estrogen
(3) Progesterone, Estrogen, FSH, **LH**
(4) FSH, **LH,** Estrogen, Progesterone

150. What is represented by given diagram and A, B, C are?
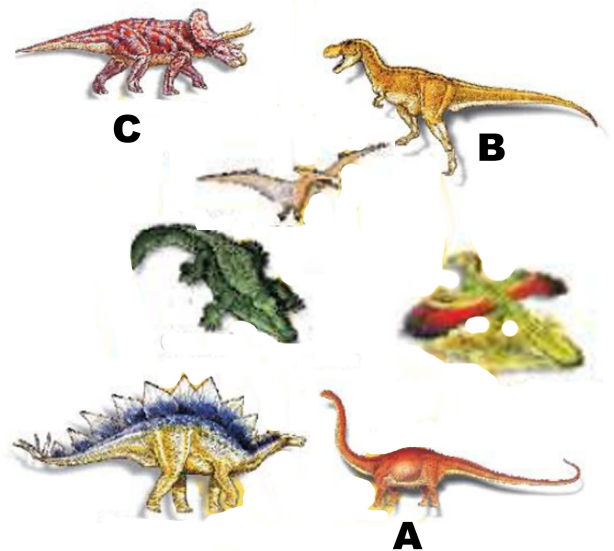
(1) Family tree of Birds, A-Stegosaurus, B-Brachiosaurs, C-Pteranodon
(2) Family tree of Reptiles, A- *Tyrannosaurus,* B-Stegosaurus, C-Triceratops
(3) Family tree of Dinosaurs, A-Brachiosaurs, *B-Tyrannosaurus,* C-Triceratops
(4) None of the above

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MATHEMATICS

81. Find the number of integers in the domain of

$$f(x) = \frac{1}{\sqrt{\ln\left(\cos^{-1}x\right)}}.$$

(1) 2   (2) 3

(3) 1   (4) 0

82. If $x = \cos\theta$ & $y = \sin^3\theta$, then

$$\left| y\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2 \right| \text{ at } \theta = \frac{\pi}{2} \text{ is } -$$

(1) 2   (2) 3

(3) 5   (4) 0

83. The scalar triple product

$$\left[\vec{a}+\vec{b}-\vec{c} \quad \vec{b}+\vec{c}-\vec{a} \quad \vec{c}+\vec{a}-\vec{b}\right] = ?$$

(1) 0   (2) $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

(3) $2\left[\vec{a}\ \vec{b}\ \vec{c}\right]$ (4) $4\left[\vec{a}\ \vec{b}\ \vec{c}\right]$

84. The minimum value of $x^2 + y^2 + z^2$ if $ax + by + cz = p$ is–

(1) $\left(\dfrac{p}{a+b+c}\right)^2$ (2) $\dfrac{p^2}{a^2+b^2+c^2}$

(3) $\dfrac{a^2+b^2+c^2}{b^2}$ (4) 0

85. Least +ve integral value of 'a' for which

$$\log_{\left(x+\frac{1}{x}\right)}\left(a^2 - 3a + 3\right) > 0; \ (x > 0)$$

(1) 1   (2) 2

(3) 3   (4) 4

86. An unbiased die is tossed until a number greater than 4 appears. The probability that an even number of tosses required is

(1) $\dfrac{4}{15}$ (2) $\dfrac{1}{3}$

(3) $\dfrac{2}{5}$ (4) $\dfrac{5}{9}$

87. The boy comes form a family of two children. What is the probability that the other child is his sister?

(1) $\dfrac{1}{2}$ (2) $\dfrac{1}{3}$

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

88. If a set $A = \{3, 7, 11, ...407\}$ & a set $B = \{2, 9, 16, ...703\}$ then n $(A \cap B) =$

(1) 13   (2) 14

(3) 15   (4) 16

89. If M be a square matrix of order 3 such that

$$|M| = 2, \text{ then } \left|adj\left(\frac{M}{2}\right)\right| = ?$$

(1) $\dfrac{1}{2}$ (2) $\dfrac{1}{4}$

(3) $\dfrac{1}{8}$ (4) $\dfrac{1}{16}$

90. The solution of the differential equation

$$\frac{dy}{dx} = (4x + y + 1)^2 \text{ is } -$$

(1) $4x + y + 1 = 2\tan(2x + c)$

(2) $4x + y + 1 = 2\tan(x + 2y + c)$

(3) $4x + y - 1 = 2\tan(2x + c)$

(4) None of these

91. The area enclosed between the curves $y = ax^2$ & $x = ay^2 \ (a > 0)$ is 1 sq.unit, then a=?

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

(3) 1   (4) $\dfrac{1}{3}$

92. If $\displaystyle\int \frac{x^2 - 1}{x^3\sqrt{2x^4 - 2x^2 + 1}}dx = ?$

(1) $\dfrac{\sqrt{2x^4 - 2x^2 + 1}}{x^2} + c$

(2) $\dfrac{\sqrt{2x^4 - 2x^2 + 1}}{x} + c$

(3) $\dfrac{\sqrt{2x^4 - 2x^2 + 1}}{2x^2} + c$

(4) None of these

93. Let, $f(x) = \displaystyle\int e^x(x-1)(x-2)dx$, then $f(x)$ decreases in the interval –

(1) $(2, \infty)$ (2) $(-2, -1)$

(3) $(1, 2)$ (4) $(-\infty, 1) \cup (2, \infty)$

94. A & B are two square matrices, such that $A^2B = BA$ and if $(AB)^{10} = A^K B^{10}$, then $(K - 1020) = ?$

    (1) 2   (2) 3
    (3) –10   (4) 10

95. $\lim\limits_{x \to \frac{\pi}{3}} \dfrac{\sin\left(\frac{\pi}{3} - x\right)}{2\cos x - 1} =$

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

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

96. A function $f : \mathbb{R} \to \mathbb{R}$ is defined as $f(x) = 3x^2 + 1$, then $f^{-1}(x) =$

    (1) $\dfrac{\sqrt{x-1}}{3}$ (2) $\dfrac{1}{3}\sqrt{x+1}$

    (3) f^{-1} does not exist   (4) $\sqrt{\dfrac{x-1}{3}}$

97. For a the integer n, Let $I_n = \int_{-\pi}^{\pi} \left(\dfrac{\pi}{2} - |x|\right)\cos nx\, dx$. Find the value of $[I_1 + I_2 + I_3 + I_4]$ where [.] denotes greatest integer function.

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

98. Number of solutions of the equations $2e^{|x|}\tan^{-1}|x| = 1$ is –

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

99. If $y = ae^x + be^{-3x} + c$, then $\dfrac{\dfrac{d^3y}{dx^3} + 2\dfrac{d^2y}{dx^2}}{\dfrac{dy}{dx}}$ is –

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

100. $n(\geq 3)$ persons are sitting in a row. Two of them are selected at random. The probability that they are not together is

    (1) $\dfrac{n-1}{n}$ (2) $\dfrac{n+1}{n}$

    (3) $\dfrac{n+2}{n}$ (4) $\dfrac{n-2}{n}$

101. $\lim\limits_{n \to \infty}\left(\tan\left(\dfrac{\pi}{2n}\right)\tan\left(\dfrac{2\pi}{2n}\right)....\tan\left(\dfrac{n\pi}{2n}\right)\right)^{\frac{1}{n}} = ?$

    (1) 0   (2) 1   (3) 2   (4) –1

102. If the portion of the line $x + 4y - 3 = 0$ intercepted between the lines $ax - y + 3 = 0$ & $x + by - 1 = 0$ subtends a right angle at the origin, then $\dfrac{2a + 9b}{10} = ?$

    (1) 0   (2) –1
    (3) 1   (4) None of these

103. If $f(x) = |x| + |x-1| + |x-2|, x \in \mathbb{R}$ then $\int_0^3 f(x)\,dx =$

    (1) $\dfrac{9}{2}$ (2) $\dfrac{15}{2}$

    (3) $\dfrac{19}{2}$ (4) None of these

104. The system of equations $\begin{aligned} x + y + z &= 2 \\ 2x + y - z &= 3 \\ 3x + 2y + kz &= 4 \end{aligned}$ has a unique solution, if

    (1) $k \in (-1, 1)$ (2) $k \in (-2, 2)$
    (3) $k \neq 0$ (4) $k = 0$

105. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$ then det (adj (adj A)) is

    (1) $(14)^4$ (2) $(14)^3$
    (3) $(14)^2$ (4) $(14)^1$

106. Which of the following triplets gives the direction cosine of line?

    (1) $\left(\dfrac{1}{\sqrt{3}}, \dfrac{1}{\sqrt{3}}, \dfrac{1}{\sqrt{3}}\right)$ (2) $(1, -1, -1)$
    (3) $(1, -1, 1)$ (4) $(1, 1, 1)$

107. If $I_{10} = \int_0^{\pi/2} x^{10} \sin x\, dx$. Then the value of $I_{10} + 90 I_8 =$

    (1) $10\left(\dfrac{\pi}{2}\right)^6$ (2) $10\left(\dfrac{\pi}{2}\right)^9$

    (3) $10\left(\dfrac{\pi}{2}\right)^7$ (4) None of these

108. From first 100 natural numbers, 3 numbers are selected. If these three numbers are in A.P, then find the probability that these numbers are even

    (1) $\dfrac{1}{66}$ (2) $\dfrac{29}{66}$

    (3) $\dfrac{29}{49}$ (4) $\dfrac{12}{49}$

109. The area bounded by the curves $y=|x|-1$ & $y=-|x|+1$ is –

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

110. $\int_{\pi}^{10\pi}|\sin x|\,dx$

    (1) 18   (2) 19

    (3) 0   (4) None of these

111. $\lim\limits_{x\to\infty}\left[\dfrac{\int_0^x\left(\tan^{-1}x\right)^2 dx}{\sqrt{x^2+1}}\right]$ where [.] is greatest integer function.

    (1) 1   (2) $\dfrac{\pi^4}{4}$

    (3) 2   (4) None of these

112. The system of equations $ax-y-z=a-1$, $x-ay-z=a-1$ and $x-y-ax=a-1$ is Inconsistent if $a^2=$

    (1) 4   (2) 8

    (3) 2   (4) 0

113. If $A=\begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$, $abc=1$, $A^T A=I$, then the value of $a^3+b^3+c^3$, where a, b, c > 0 the value

    (1) 2   (2) 3

    (3) 0   (4) 4

114. How many 3×3 matrices M with entries {0, 1, 2} are there for which the sum of the diagonal entries of $M^T M$ is 5, is –

    (1) 199   (2) 197

    (3) 198   (4) 200

115. If $A=\begin{bmatrix} 3 & 2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{bmatrix}$ & $A^{-1}=\dfrac{1}{K}\text{adj }A$, $K=$

    (1) 7   (2) –7

    (3) $\dfrac{1}{7}$ (4) 11

116. The number of solutions of equation $\sin\pi x=|x|$ are –

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

117. Let $\vec{u}$ & $\vec{v}$ be unit vectors & such that $\vec{u}\times\vec{v}+\vec{u}=\vec{w}$ & $\vec{w}\times\vec{u}=\vec{v}$, then the value of $[\vec{u}\ \vec{v}\ \vec{w}]$ is –

    (1) 2   (2) 1

    (3) 0   (4) 3

118. If $2xy^3 dx+x^2 y^2 dy=ydx-xdy$ & y (2)=1, then y (–1) =

    (1) 0   (2) 3

    (3) –1   (4) 1

119. The range of the function f defined by $f(x)=\dfrac{\sin x\cos 3x}{\sin 3x.\cos x}$ is

    (1) $\left(\dfrac{1}{3},3\right)$ (2) $\left[\dfrac{1}{3},3\right)$

    (3) $R-\left(\dfrac{1}{3},3\right]$ (4) R

120. The value of $\sin^{-1}\left(\sin 10\right)=$

    (1) 10   (2) $3\pi-10$

    (3) $10\pi-3$ (4) $3\pi+10$

121. If $\dfrac{d}{dx}\left(f(x)\right)=e^{-x}f(x)+e^x f(-x)$, then $f(x)$ is, (given $f(0)=0$)

    (1) An even function   (2) An odd function
    (3) Neither even nor odd   (4) can't say

122. Let $\vec{u}=\hat{i}+\hat{j}, \vec{v}=\hat{i}-\hat{j}$ & $\vec{w}=\hat{i}+2\hat{j}+3\hat{k}$. If $\hat{n}$ is a unit vector such that $\vec{u}.\hat{n}=0$ & $\vec{v}.\hat{n}=0$ then $|\vec{w}.\hat{n}|=$

    (1) 1   (2) 2

    (3) 3   (4) 0

123. If $f(n+1)=\dfrac{2f(n)+1}{2}$ for $n=1, 2, 3$ and $f(1)=2,$ then $\dfrac{f(101)}{10}=$

    (1) 5   (2) 52

    (3) 5.2   (4) 6

124. The number of solutions of equation $x^2-5|x|+6=0$ is –

    (1) 2   (2) 3

    (3) 4   (4) 0

125. If $y = 4x - 2x^2$ then maxima will occur at
    (1) 0   (2) 0.5
    (3) 2   (4) 1

126. For what values of a, m & b, lagrarge's mean value theorem is applicable to the function f(x) for

$$x \in [0,2], \ f(x) = \begin{cases} 3, & x = 0 \\ -x^2 + a, & 0 < x < 1 \\ mx + b, & 1 \le x \le 2 \end{cases}$$

    (1) a = 3, m = –2, b = 0
    (2) a = 3, m = –2, b = 4
    (3) a = 3, m = 2, b = 0
    (4) No such a, m, b exist

127. The function of f is continuous and has the property $f(f(x)) = 1 - x$, then

$$f\left(\frac{1}{4}\right) + f\left(\frac{3}{4}\right) =$$

    (1) 1
    (2) –1
    (3) 0
    (4) None of these

128. The solution of $\dfrac{dy}{dx} - y = xy^5$ is

    (1) $\dfrac{1}{y^4} = -x + \dfrac{1}{4} + c.e^{-4x}$

    (2) $\dfrac{1}{x^4} = -y + \dfrac{1}{x} + c.e^{-4x}$

    (3) $y^{-4} = x - 4 + c.e^{-4x}$

    (4) $y^{-4} = -x + 4 + c.e^{-4x}$

129. Let, $f(x) = \log_e^x + 2x^3 + 3x^5$ where $x > 0$
    $g(x)$ is the inverse function of $f(x)$, then
    $g'(5) =$

    (1) $\dfrac{1}{11}$ (2) $\dfrac{1}{22}$

    (3) $\dfrac{2}{11}$ (4) $\dfrac{1}{33}$

130. Let, $x < 0, \cos^{-1} \sqrt{1 - x^2} =$

    (1) $\pi - \cos^{-1} x$ (2) $-\sin^{-1} x$
    (3) $\pi - \sin^{-1} x$ (4) $\sin^{-1} x$