Test Series (2023)

MOCK TEST–2

NEET

DURATION : 200 Minutes | **12-03-2023** | **M. MARKS : 720**

Topics Covered

Physics :	Class 12th Complete
Chemistry :	Class 12th Complete
Biology :	**(Botany) :** Class 12th Complete
	(Zoology) : Class 12th Complete

General Instructions:

1. Immediately fill in the particulars on this page of the test booklet.
2. The test is of **3 hour 20 minute** duration.
3. The test booklet consists of **200** questions. The maximum marks are **720**.
4. There are four Section in the Question Paper, Section I, II, III & IV consisting of Section-I **(Physics)**, Section-II **(Chemistry)**, Section-III **(Botany)** & Section IV **(Zoology)** and having **50 Questions** in each part.
5. There is only one correct response for each questions.
6. Each correct answer will give 4 marks while 1 Mark will be deducted for a wrong MCQ response.
7. No student is allowed to carry any textual material, printed or written, bits of papers, pager, mobile phone, any electronic device, etc. inside the examination room/hall.
8. On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator on duty in the Room/Hall. However, the candidates are allowed to take away this Test Booklet with them.

OMR Instructions:

1. Use blue/black dark ballpoint pens.
2. Darken the bubbles completely. Don't put a tick mark or a cross mark where it is specified that you fill the bubbles completely. Half-filled or over-filled bubbles will not be read by the software.
3. Never use pencils to mark your answers.
4. Never use whiteners to rectify filling errors as they may disrupt the scanning and evaluation process.
5. Writing on the OMR Sheet is permitted on the specified area only and even small marks other than the specified area may create problems during the evaluation.
6. Multiple markings will be treated as invalid responses.
7. **Do not fold or make any stray mark on the Answer Sheet (OMR).**

SECTION-I (PHYSICS)

SECTION: A

1. A ring of radius R is uniformly charged; linear charge density is λ. An imaginary sphere of radius R is drawn with its centre on circumference of ring. Total electric flux passing through the sphere would be

(1) $\frac{2\pi R\lambda}{\varepsilon_0}$ (2) $\frac{\pi R\lambda}{\varepsilon_0}$

(3) Zero (4) None of these

2. An electric dipole consists of two opposite charges each 0.05 μC separated by 30 mm. The dipole is placed in a uniform external electric field of 10^6 N/C. The maximum torque exerted by the field on the dipole is

(1) 6×10^{-3} Nm (2) 3×10^{-3} Nm

(3) 15×10^{-3} Nm (4) 1.5×10^{-3} Nm

3. An infinitely long thin straight wire has uniform linear charge density of 1/3 C/m. Then the magnitude of the electric intensity at a point 18 cm away is (given, $\varepsilon_0 = 8.8 \times 10^{-12}$ C^2N/m^2)

(1) 0.33×10^{11} N/C (2) 3×10^{11} N/C

(3) 0.66×10^{11} N/C (4) 1.32×10^{11} N/C

4. A particle of mass 2×10^{-3} kg charge 4×10^{-3} C enters (Approx. zero velocity) in an electric field of 5 V/m, then its kinetic energy after 10 sec is:

(1) 0.1 J (2) 1 J

(3) 10 J (4) 100 J

5. The 500 μF capacitor is charged at a steady rate of 100 μC/sec. The potential difference across the capacitor will be 10 V after an interval of

(1) 5 sec (2) 0.5 sec

(3) 0.05 sec (4) 50 sec

6. Electric potential at any point is given as, $V = -5x + 3y + \sqrt{15}z$, then the magnitude of the electric field is

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

(3) $5\sqrt{2}$ (4) 7

7. If an electron revolves in a circle of radius $\pi/2$ cm with uniform speed 6×10^5 m/s. Find the electric current. (Take, $\pi^2 = 10$).

(1) 9.6×10^{-14} A

(2) 9.6×10^{-13} A

(3) 9.6×10^{-16} A

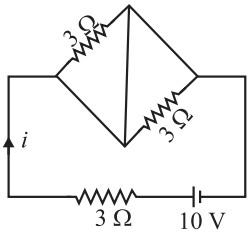
(4) 9.6×10^{-11} A

8. Calculate the electric field in a copper wire of cross-sectional area 2.0 mm^2 carrying a current of 1 A. The conductivity of copper is 6.25×10^7 S/m.

(1) 8×10^{-5} V/m (2) 8×10^{-6} V/m

(3) 8×10^{-3} V/m (4) None of these

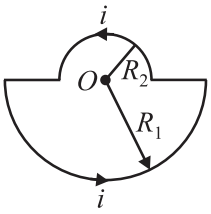
9. Current i as shown in the circuit will be



(1) 10 A (2) 10/3 A

(3) Zero (4) Infinite

10. Find the magnitude and direction of magnetic field at point O in the following case.



(Here $\odot$ = outside, $\otimes$ = inside)

(1) $\frac{\mu_0 i}{4}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)\odot$

(2) $\frac{\mu_0 i}{4}\left(\frac{1}{R_1} - \frac{1}{R_2}\right)\otimes$

(3) $\frac{\mu_0 i}{4}\left(\frac{1}{R_1} + \frac{1}{R_2}\right)\odot$

(4) $\frac{\mu_0 i}{4}\left(\frac{1}{R_1} + \frac{1}{R_2}\right)\otimes$

11. A charged particle is projected in a magnetic field $B = \left(3\hat{i} + 4\hat{j}\right) \times 10^{-2} T$ and the acceleration of the particle is found to be $a = \left(x\hat{i} + 2\hat{j}\right)$ m/s^2. Find the value of x.

(1) –8/3 (2) 8/3

(3) –4/3 (4) 4/3

12. The magnetic field applied on a cyclotron is 3.5 T. What will be the frequency of electric field that must be applied between the Dee's in order to accelerate a proton?

(1) 5.57×10^3 Hz (2) 5.57×10^5 Hz

(3) 5.57×10^7 Hz (4) 5.57×10^8 Hz

13. The magnetic susceptibility of paramagnetic material at –73°C is 0.0075. Find its value at –173°C.

(1) 0.015 (2) 0.15

(3) 0.0015 (4) 0.1

14. At a certain place, the angle of dip is 30° and the horizontal component of earth's magnetic field is 0.50 oersted the earth's total magnetic field (in oersted) is

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

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

15. **Statement (I):** The properties of paramagnetic and ferromagnetic substance are not affected by heating.
Statement (II): As temperature rises, the alignment of molecular magnets gradually decreases.
Which of the following statement(s) is/are correct?

(1) Only I (2) Only II

(3) Both I and II (4) None of these

16. What inductance would be needed to store 1 kwh of energy in a coil carrying a 200 A current? (Take, 1 kwh = 3.6×10^6 J)

(1) 180 H (2) 100 H

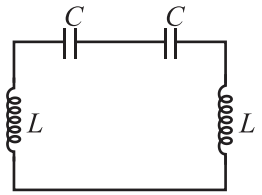
(3) 150 H (4) 200 H

17. A circular ring of diameter 20 cm has a resistance 0.01 Ω. How much charge will flow through the ring, if it is rotated from a position perpendicular to a uniform magnetic field of $B = 2T$ to a position parallel to field?

(1) 4 C (2) 6.28 C

(3) 3.14 C (4) 2.5 C

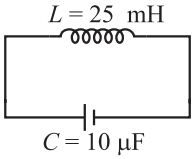
18. The natural frequency of the circuit shown in the figure is



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

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

19. If maximum energy is stored in a capacitor at $t = 0$, then find the time after which current in the circuit will be maximum.



(1) $\frac{\pi}{2}$ ms (2) $\frac{\pi}{4}$ ms

(3) π ms (4) 2 ms

20. The electric current in a circuit is given by [$i = 3 \sin \omega t + 4 \cos \omega t$]. The value of rms current is:

(1) $\frac{5}{\sqrt{2}}$ (2) 5

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

21. The magnetic field in a plane electromagnetic wave is given by $B_y = 2 \times 10^{-7} \sin(0.5 \times 10^3 x + 1.5 \times 10^{11} t)$. This electromagnetic wave is an example of:

(1) A visible light
(2) An infrared wave
(3) A microwave
(4) A radio wave

22. The pressure exerted by an electromagnetic wave of intensity I W/m^2 on a non-reflecting surface is (C is the velocity of light).

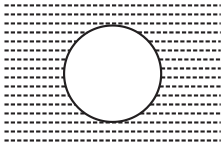
(1) IC (2) IC^2

(3) I/C (4) I/C^2

23. **Assertion:** Ultraviolet radiations of higher frequency wave are dangerous to human being.
Reason: Ultraviolet radiation are absorbed by the atmosphere.

(1) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
(2) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
(3) If Assertion is true but Reason is false.
(4) If both Assertion and Reason are false.

24. An air bubble inside water. It behaves as a



(1) Concave lens
(2) Convex lens
(3) Neither convex nor concave
(4) Cannot say

25. If focal length of objective and eye lenses are 10 cm and 10 mm respectively and tube length is 11 cm, then angular magnification of telescope is:
(1) 10 (2) 5
(3) 100 (4) 50

26. A ray of light passes through an equilateral prism such that the angle of incidence is equal to the angle of emergence and the latter is equal to $(3/4)^{th}$ angle of prism. What will be the deviation?
(1) 45° (2) 37°
(3) 20° (4) 30°

27. In a Young's double slit experiment, if there is no initial phase difference between the light from the two slits, a point on the screen corresponding to the 5^{th} minima has path difference
(1) $5\frac{\lambda}{2}$ (2) $10\frac{\lambda}{2}$
(3) $9\frac{\lambda}{2}$ (4) $\frac{\lambda}{2}$

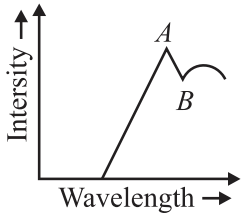
28. A point source of light is placed at the bottom of the water lake. If the area of the illuminated circle on the surface is equal to 3 times the square of the depth of the lake. The refractive index of water is:
(1) $\sqrt{\frac{\pi}{3}+1}$ (2) $\sqrt{\frac{\pi}{3}}+1$
(3) $\frac{\pi}{3}+1$ (4) $\frac{\pi}{4}+1$

29. In Davision and Germer experiment, electron beam of wavelength 1.5 Å is incident on a crystal of lattice spacing 3 Å. Find the incident angle for the first maxima.
(1) 14.4° (2) 16.4°
(3) 3.5° (4) 6.5°

30. If maximum velocity with which an electron can be emitted from a photocell is 4×10^8 cm/sec, the stopping potential is:
(Take, mass of electrons = 9×10^{-31} kg)
(1) 30 V
(2) 45 V
(3) 59 V
(4) 49 V

31. Determine the wavelength of the radiation required to excite an electron in Li^{+2} from the first to the third Bohr orbit.
(1) 11.4 nm
(2) 12.3 nm
(3) 13.4 nm
(4) 15.3 nm

32. Sharp peak point *A* in the following graph represents



(1) Characteristic *X*-rays
(2) Continuous *X*-rays
(3) Bremsstrahlung
(4) Discontinuous spectrum

33. In Moseley's law $\sqrt{\nu} = a(z-b)$, the values of the screening constant for *K*-series and *L*-series of *X*-rays are respectively.
(1) 1, 7.4 (2) 1, 4
(3) 4, 6 (4) 2, 4

34. 1 g of a radioactive substance disintegrates at the rate of 3.7×10^{10} dps. The atomic mass of the substance is 226. Calculate its mean life
(1) 6.8×10^{10} sec (2) 7.2×10^{10} sec
(3) 8.2×10^{11} sec (4) 8.2×10^{10} sec

35. Identify the correct statement given below.
(1) Alpha rays have the highest penetrating power.
(2) Beta rays have the highest penetrating power.
(3) Gamma rays have the highest penetrating power
(4) All these kinds of rays have the same penetrating power

SECTION – B

36. Find the resistivity of a sample in which 10^{19} atoms of phosphorous are added per m^3. Take the resistivity of pure silicon as 3000 Ω-m and the mobilities of electrons and holes as 0.15 m^2/v-s and 0.030 m^2/v-s, respectively.
(1) 4.17 Ω-m (2) 7.05 Ω-m
(3) 8.05 Ω-m (4) 9.01 Ω-m

37. The applied input AC to a half wave rectifier is 60 W and the DC output is 20 W. Find the rectification efficiency.
(1) 50% (2) 60%
(3) 33.3% (4) None of these

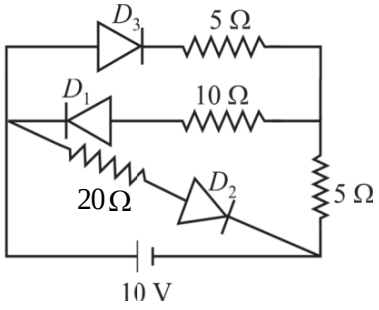
38. A common emitter amplifier gives an output of 3V for an input of 0.01 V. If β of the transistor is 100 and the input resistance is 1 kΩ, then the collector resistance is
(1) 1 kΩ (2) 3 kΩ
(3) 30 kΩ (4) 30 Ω

39. Sum of the two binary numbers $(100010)_2$ and $(11011)_2$ is

(1) $(111101)_2$ (2) $(111111)_2$

(3) $(101111)_2$ (4) $(111001)_2$

40. In the given circuit



The current through the battery is

(1) 0.5 A (2) 1 A

(3) 1.5 A (4) 2 A

41. The current in a wire varies with time according to the relation $i = ((3.0\text{ A}) + (2.0\text{ A/sec})\,t$.

How many coulombs of charge pass a cross-section of the wire in the time interval between $t = 0$ and $t = 4.0$ sec?

(1) 25 C (2) 27 C

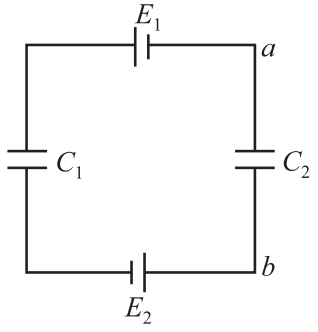
(3) 28 C (4) 29 C

42. An infinite line of charge λ per unit length is placed along the y-axis. The work done is moving a charge q from $A(a, 0)$ to $B(2a, 0)$ is

(1) $\frac{q\lambda}{2\pi\varepsilon_0}\ln 2$ (2) $\frac{q\lambda}{2\pi\varepsilon_0}\ln\left(\frac{1}{2}\right)$

(3) $\frac{q\lambda}{4\pi\varepsilon_0}\ln\sqrt{2}$ (4) $\frac{q\lambda}{4\pi\varepsilon_0}\ln 2$

43. The potential difference between points a and b of circuits shown in the figure is



(1) $\left(\frac{E_1+E_2}{C_1+C_2}\right)C_2$ (2) $\left(\frac{E_1-E_2}{C_1+C_2}\right)C_2$

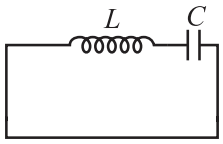
(3) $\left(\frac{E_1+E_2}{C_1+C_2}\right)C_1$ (4) $\left(\frac{E_1-E_2}{C_1+C_2}\right)C_1$

44. The magnetic field at a distance x on the axis of a circular coil of radius R is $(1/8)^{th}$ of that at the centre. The value of x is

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

(3) $R\sqrt{3}$ (4) $R\sqrt{2}$

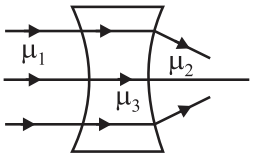
45. In an LC circuit, the capacitor has maximum charge q_0. The value of $\left(\frac{dI}{dt}\right)_{max}$ is:



(1) $\frac{q_0}{LC}$ (2) $\frac{q_0}{\sqrt{LC}}$

(3) $\frac{q_0}{LC}-1$ (4) $\frac{q_0}{LC}+1$

46. From the figure shown, establish a relation between μ_1, μ_2 and μ_3



(1) $\mu_1 < \mu_2 < \mu_3$ (2) $\mu_3 < \mu_2$, $\mu_3 = \mu_1$

(3) $\mu_3 > \mu_2$, $\mu_3 = \mu_1$ (4) None of these

47. The ratio of intensity at the centre of bright fringe to the intensity at a point distant one-fourth of the distance between two successive bright fringes will be:

(1) 4 (2) 3

(3) 2 (4) 1

48. **Assertion:** Only those nuclei which are heavier than lead are radioactive.

Reason: Nuclei of elements heavier than lead are unstable.

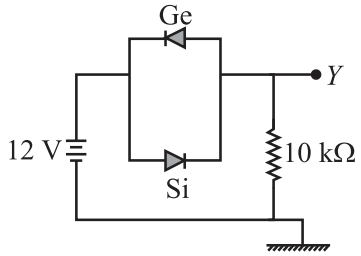
(1) If both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(2) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(3) If Assertion is true but Reason is false.

(4) If both Assertion and Reason are false.

49. Two junction diodes one of Germanium (Ge) and other of Silicon (Si) are connected as shown in figure to a battery of emf 12 V and a load resistance 10 kΩ. The germanium diode conducts at 0.3 V and Silicon diode at 0.7 V. When a current flows in the circuit, the potential of terminal *Y* will be:



(1) 12 V (2) 11 V
(3) 11.3 V (4) 11.7 V

50. Radius of a spherical conductor is 2 m. This is kept in a dielectric medium of dielectric constant 10^6 N/C. Find capacitor of the conductor.

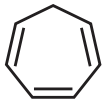
(1) 2.2×10^{-10} F (2) 2.2×10^{-11} F
(3) 2.2×10^{-12} F (4) 2.2×10^{-13} F

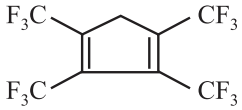
SECTION-II (CHEMISTRY)

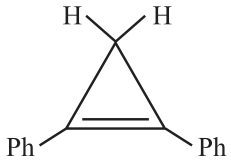
SECTION-A

51. Compound which is the most acidic in nature

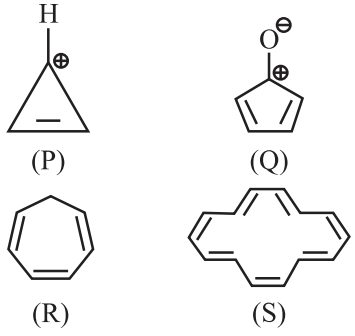
(1) 

(2) 

(3) 

(4) 

52. The compounds that are aromatic among the following are?



(1) R and S
(2) P and Q
(3) Q and S
(4) P and S

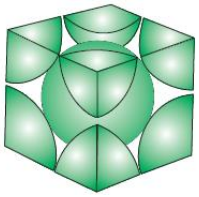
53. The half time of a zero order reaction (A → P) is given by (k = rate constant)

(1) $t_{1/2} = \frac{[A]_0}{2k}$ (2) $t_{1/2} = \frac{2.303}{k}$
(3) $t_{1/2} = \frac{[A]_0}{k}$ (4) $t_{1/2} = \frac{1}{k[A]_0}$

54. A radioisotope ^{41}Ar initially decays at the rate of 34,500 disintegrations/minute, but decay rate falls to 21,500 disintegrations/minute after 75 minutes. The $t_{1/2}$ for ^{41}Ar is

(1) 90 minutes (2) 110 minutes
(3) 180 minutes (4) 220 minutes

55. Analyse the below given unit cell.



How many atoms are present per unit cell?

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

56. What is the coordination number in AAAA type and ABAB type two-dimensional close packing, respectively?

(1) 4 & 4 (2) 4 & 6
(3) 6 & 4 (4) 6 & 6

57. The amalgam of mercury in sodium is an example of

(1) Solid in solid solution

(2) Solid in liquid solution

(3) Liquid in solid solution

(4) Gas in solid solution

58. Which of the following reacts gently with water?

(1) Li (2) Na

(3) K (4) Rb

59. What is the mole fraction of a solute in a 2 m aqueous solution?

(1) 1.770 (2) 0.035

(3) 0.0177 (4) 0.177

60. The standard electrode potential values of the metals is given below.

$Al^{3+} + 3e^- \rightarrow Al(s)$ $E^o = -1.66$

$Ag^+ + e^- \rightarrow Ag(s)$ $E^o = 0.80$

$K^+ + e^- \rightarrow K(s)$ $E^o = -2.93$

$Cr^{3+} + 3e^- \rightarrow Cr(s)$ $E^o = -0.74$

The correct decreasing order of oxidising power of the metal is

(1) Ag > Cr > Al > K

(2) K > Al > Cr > Ag

(3) K > Al > Ag > Cr

(4) Al > K > Ag > Cr

61. What is the structure of xenon hexafluoride?

(1) Octahedral

(2) Pentagonal pyramidal

(3) Trigonal prism

(4) Distorted octahedral

62. The magnetic moment of certain octahedral Co(II) complex is 4.0 BM. The d-electronic configuration is

(1) High spin t_{2g}^4

(2) High spin $t_{2g}^5 e_g^2$

(3) Low spin t_{2g}^4

(4) Low spin $t_{2g}^5 e_g^2$

63. When copper sulphate is electrolysed using platinum electrodes,

(1) Copper is liberated at cathode, sulphur at anode

(2) Copper is liberated at cathode, oxygen at anode

(3) Sulphur is liberated at cathode, oxygen at anode

(4) Oxygen is liberated at cathode, copper at anode

64. $5A \rightarrow 2B$, the rate of reaction $\frac{d[B]}{dt}$ is equal to

(1) $-\frac{5}{2}\frac{d[A]}{dt}$ (2) $-\frac{2}{5}\frac{d[A]}{dt}$

(3) $-\frac{1}{5}\frac{d[A]}{dt}$ (4) $+2\frac{d[A]}{dt}$

65. Choose the incorrect statement.

(1) High values of ionization enthalpy is associated with noble gases

(2) The enthalpy changes associated with the electron attachment of the first and second electron is exothermic and endothermic respectively.

(3) In the Li-atom, the outer electron occupies a 2s orbital rather than 2p orbital.

(4) The valence electron and core electron mean the same.

66. Which of the following quantities are altered by the addition of a catalyst during a chemical reaction?

(1) Enthalpy

(2) Entropy

(3) Activation energy

(4) Internal energy

67. Which of the following metal oxides cannot be reduced to metal by carbon?

(1) Aluminium oxide

(2) Lead oxide

(3) Zinc oxide

(4) Ferric oxide

68. Extraction of gold and silver is done by leaching with cyanide ion. Final recovery of silver is done by

(1) Distillation

(2) Zone refining

(3) Displacement with zinc

(4) Liquation

69. Read the given statements.

A. The symmetrical electron distribution renders the bond of diatomic molecule non-polar

B. The electric dipole moment of both the NH_3 and NF_3 is equal.

C. The dipole moment of a polyatomic molecule is the resultant of all the electric dipole of the bonds.

Choose the correct option.

(1) AB (2) BC

(3) AC (4) ABC

70. The enzyme which decomposes urea into ammonia and carbon dioxide is called

(1) Maltase (2) Urease

(3) Zymase (4) Pepsin

71. Choose the correct statement.

(1) IF_5 is a polar molecule.

(2) The first ionization potential of K is lower than that of Li.

(3) BI_3 is trigonal planar but PI_3 is pyramidal in shape.

(4) All of the above.

72. The type of d-orbital used in the hybrid orbital of trigonal bipyramidal structure is

(1) d_{xy} (2) d_{yz}

(3) d_{xz} (4) d_{z^2}

73. Choose the correct statement

(1) Sterling silver is an example of substitutional alloy

(2) Carbon steel is an example of interstitial alloy

(3) Brass is an example of intermetallic alloy

(4) All of the above

74. Pumice stone is a colloidal solution of

(1) Gas in solid (2) Gas in gas

(3) Liquid in gas (4) Gas in liquid

75. In which of the following compounds, nitrogen exhibits fractional oxidation state?

(1) Hydrazine (2) Ammonia

(3) Hydrogen azide (4) Hydroxyl amine

76. Which of the following oxides of nitrogen is a blue and acidic solid?

(1) NO_2 (2) N_2O_3

(3) N_2O (4) N_2O_5

77. The calculated spin only magnetic moment of Cr^{2+} ion is (in BM)

(1) 3.87 (2) 4.90

(3) 5.92 (4) 2.84

78. **Assertion:** The more number of oxidation states are exhibited by the actinoids than by the Lanthanoids.

Reason: There is a lesser energy difference between 5f and 6d orbitals than that between 4f and 5d orbitals.

(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion.

(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion

(3) Assertion is correct, reason is incorrect

(4) Assertion is incorrect, reason is correct

79. How many rings are present in the complex $[Co(acac)_3]$?

(1) 6 (2) 4

(3) 3 (4) 2

80. Which one of the following complexes is diamagnetic?

(1) $[CoF_6]^{3-}$ (2) $[Ni(CN)_4]^{2-}$

(3) $[NiCl_4]^{2-}$ (4) $[Fe(CN)_6]^{3-}$

81. Which one is the least reactive towards S_N1 reaction?

(1) $C_6H_5CH(C_6H_5)Br$

(2) $C_6H_5CH(CH_3)Br$

(3) $C_6H_5C(CH_3)(C_6H_5)Br$

(4) $C_6H_5CH_2Br$

82. How many stereoisomers does this molecule have?

$CH_3CBr = CHCH_2CH_2CH_3$

(1) 8 (2) 2

(3) 4 (4) 6

83. Which one the following compounds is resistant to the nucleophilic attack by hydroxyl ion?

(1) Diethyl ether (2) Acetonitrile

(3) Acetamide (4) Methyl acetate

84. When phenol is treated with excess bromine water, it gives a white precipitate. The white precipitate is
(1) m-bromophenol
(2) o- and p-bromophenols
(3) 2,4-dibromophenol
(4) 2,4,6-tribromophenol

85. Which of the following statement is not correct?
(1) $La(OH)_3$ is less basic than $Lu(OH)_3$
(2) In lanthanide series ionic radius of Ln^{+3} ion decreases from left to right
(3) La is actually an element of transition series rather than lanthanoids
(4) Atomic radius of Zr and Hf are same because of lanthanoid contraction

SECTION B

86. Which of the following is incorrect?
(1) Any aldehyde on reduction gives a primary alcohol.
(2) Sucrose on reaction with water gives invert sugar.
(3) Tollens reagent is used in the detection of unsaturation.
(4) Bromine water test is used in the detection of unsaturation.

87. Which of the following is not true?
(1) PHBV is a biodegradable polymer.
(2) Nylon-2-nylon-6 is a copolymer and a polyamide.
(3) Amino caproic acid contains six methylene group.
(4) The molar mass of a given polymer is taken as the average of its constituents polymer chain.

88. **Assertion:** Vulcanisation makes natural rubber stiffened and enhances its physical properties.
Reason: The sulphur atom crosslinks with the natural rubber by adding to the double bond of it.
(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(3) Assertion is correct, reason is incorrect
(4) Assertion is incorrect, reason is correct

89. Which of the given is condensation polymer?
Terylene, bakelite, polythene, Teflon
(1) Terylene, bakelite
(2) Bakelite only
(3) Polythene only
(4) Teflon only

90. Nylon is an example of
(1) polyester
(2) polysaccharide
(3) polyamide
(4) polythene

91. Which one of the following is not a condensation polymer?
(1) Melamine (2) Glyptal
(3) Dacron (4) Neoprene

92. Which of the following statements is false?
(1) Artificial silk is derived from cellulose
(2) Nylon-66 is an example of elastomer
(3) The repeat unit in natural rubber is isoprene
(4) Both starch and cellulose are polymers of glucose

93. **Assertion:** DNA is a single stranded helix.
Reason: Adenine forms hydrogen bond with thymine.
(1) Assertion is correct, reason is correct; reason is a correct explanation for assertion
(2) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(3) Assertion is correct, reason is incorrect
(4) Assertion is incorrect, reason is correct

94. Which of the following does not contain C = O bond?
(1) Adenine
(2) Guanine
(3) Thymine
(4) Uracil

95. Which of the following is true about denaturation?
(1) Change in temperature changes the structure
(2) Change in pH changes the structure
(3) Primary protein structure remains intact
(4) All of the above

96. Select the incorrect option.

(1) Myosin is present in muscles.

(2) Keratin is present in wool

(3) Parallel polypeptides chains are held together by hydrogen and disulphide bonds are fibrous protein.

(4) Fibre-like proteins are soluble in water.

97. Which of the following is optically inactive?

(1) Tyrosine (2) Serine

(3) Glycine (4) Phenylalanine

98. Aniline on treatment with bromine water gives

(1) 2-bromoaniline

(2) 4-bromoaniline

(3) 2,4,6-tribromoaniline

(4) 3,5-dibromoaniline

99. Which of the following is not true?

A. Hinsberg's reagent distinguishes 1°, 2°, 3° amines.

B. Aliphatic amine on reaction with nitrous acid produces a very stable diazonium salt.

C. Carbylamine test is positive for secondary amine.

Choose the correct option.

(1) AB (2) BC

(3) AC (4) ABC

100. What is the name of reactive intermediate formed in Hoffmann bromamide degradation?

(1) Nitrene (2) Carbene

(3) Isocyanate (4) Free radical

SECTION-III (BOTANY)

SECTION-A

101. If there are 8 chromosomes in synergids of plant species, then how many chromosomes will be there in cell of endosperm of that plant species?

(1) 24 (2) 16

(3) 4 (4) 8

102. A typical angiosperm embryo sac at maturity is see as

(1) 7 nucleate, 8 celled

(2) 8 nucleate, 8 celled

(3) 4 celled, 8 nucleate

(4) 8 nucleate, 7 celled

103. Type of pollination in *Oxalis* is–

(1) Geitonogamy (2) Apogamy

(3) Autogamy (4) Xenogamy

104. Which of the following statements is true?

(1) All aquatic plants are pollinated by water only

(2) Tassels of corn cob are stigma and style which wave in the wind to trap pollen grains.

(3) *Zostera* grows in fresh water and pollinates by water.

(4) Wind pollinated species possess long, Ribbon like pollen grains.

105. Ovule is attached to placenta by

(1) Hilum (2) Thalamus

(3) Funicle (4) Micropyle

106. Match the following structures with their associated structures & choose the correct option

(A) Nucellus (i) Epicotyl

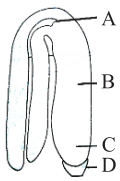
(B) Plumule (ii) Coleorrhiza

(C) Radicle (iii) Endosperm

(D) Polar Nuclei (iv) Perisperm

	A	B	C	D
(1)	i	ii	iii	iv
(2)	iii	i	ii	iv
(3)	iv	i	ii	iii
(4)	iv	ii	iii	i

107.



In the above diagram label the following parts A, B, C, D.

	A	B	C	D
(1)	Plumule	Hypocotyl	Radicle	Root cap
(2)	Plumule	Radical	Root cap	Hypocotyl
(3)	Hypocotyl	Plumule	Radicle	Root cap
(4)	Radicle	Plumule	Hypocotyl	Root cap

108. Pollen grains can be preserved in liquid nitrogen (–196°C) for years. This is called
(1) Fossilisation
(2) Cryopreservation
(3) Freezing
(4) Canning

109. Identify the incorrect pair w.r.t organism/plant & their respective reproductive structures
(1) *Penicillium* – Conidia
(2) *Agave* – Bulbil
(3) *Chlamydomonas* – Zoospores
(4) Ginger – Runner

110. **Assertion:** Asexual reproduction does not produce genetic variability.
Reason: Both mitotic and meiotic divisions occur in asexual reproduction.
(1) Both assertion and reason are true but reason is correct explanation of assertion
(2) Both assertion and reason are true but reason is not correct explanation of assertion
(3) Assertion is true but reason if false
(4) Assertion is false but reason is true

111. Identify the incorrect statement:
(1) Kangaroo rat of deserts meet its water requirements by its internal fat oxidation
(2) CAM pathway enables stomata to remain open during day time
(3) Leaves of *Opuntia* are reduced to spines to avoid water loss
(4) Desert lizards bask in sun when temperature is low

112. Breeding for improved nutritional quality is undertaken with the objectives of improving.
(1) Vitamin content
(2) Protein quality
(3) Oil content and quality
(4) All of the above

113. Which of the following mendelian disorder is not autosome-linked recessive disorder?
(1) Colour blindness
(2) Sickle cell anemia
(3) Thalassemia
(4) Phenylketonuria

114. A son of a mother who is carrier of the gene of colour blindness, has what percent of being colour blind?
(1) 100% (2) 25%
(3) 50% (4) 0%

115. Female heterogamety is found in which of the following organism?
(1) Human (2) *Drosophila*
(3) Housefly (4) Birds

116. Which of the following statements is wrong?
(1) In phenylketonuria, the affected individual lacks an enzyme that converts phenylalanine into tyrosine.
(2) Sickle cell anemia is caused due to substitution of valine by glutamic acid.
(3) Colour blindness occurs in about 8% of males and 0.4% of females.
(4) β-Thalassemia is controlled by a single gene on chromosome 11 of each parent.

117. AUG has function of
(1) It codes for methionine
(2) It acts as a termination codon
(3) It acts as an initiation codon
(4) Both (1) and (3)

118. Gynaecomastia is expressed in
(1) Down syndrome
(2) Klinefelter syndrome
(3) Phenylketonuria
(4) Turner syndrome

119. If a man having blood group AB marries a woman of blood group A. What would be the probability of A blood group in their progenies.
(1) 75% (2) 25%
(3) 50% (4) 100%

120. Find out the pairs which are correctly matched.

A. Cyclosporin-A – *Monascus purpureus*
B. Statins – *Trichoderma*
C. Ethanol – *Saccharomyces*
D. Acetic acid – *Aspergillus*
E. Vitamin B_{12} – *Lactobacillus*
(1) C and E (2) A, B and C
(3) B, C, D and E (4) All are correct

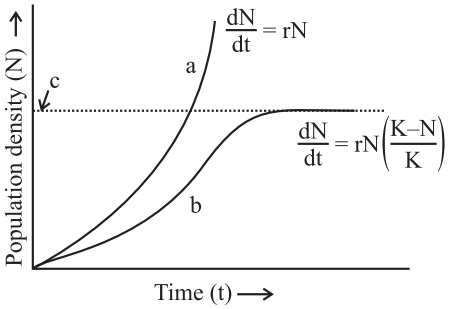
121. Which Biocontrol agent introduced to control butterfly caterpillars?
(1) Dragonflies (2) *Bacillus thuringiensis*
(3) *Agrobacterium* (4) Ladybird

122. Which organisms help is absorption of phosphorus from soil and passes it to plant?
(1) *Aspergillus* (2) *Frankia*
(3) *Azospirillum* (4) *Glomus*

123. Which of the following bacteria exists in free living state in soil and fix atmospheric nitrogen?
(1) *Azotobacter* (2) *Rhizobium*
(3) *Clostridium* (4) Both (1) and (3)

124. A nitrogen fixing organism remains is association with *Azolla* in paddy fields is
(1) *Anabena* (2) *Rhizobium*
(3) *Azotobacter* (4) *Frankia*

125. In the given population growth curve, what does a, b and c represents?



	a	b	c
(1)	Logistic curve	Exponential curve	Carrying capacity
(2)	Lag phase	Steady phase	Log phase
(3)	Exponential curve	logistic curve	carrying capacity
(4)	Exponential curve	carrying capacity	logistic curve

126. Organisms able to maintain homeostasis by physiological and behavioural means are
(1) Conformers (2) Poikilothermal
(3) Homeothermal (4) Both (2) and (3)

127. The stage of suspended development under unfavourable conditions, shown by which of the following organisms
(1) Phytoplanktons (2) Bears
(3) Fishes (4) Zooplanktons

128. Which statement is wrong about predators?
(1) Predators reduces the intensity of competition among competing prey species.
(2) Predators acts as conduits for energy transfer across trophic levels.
(3) A sparrow earing a seed can not be considered as predator.
(4) Predators keep prey population under control.

129. Abingdon tortoise in Galapagos Islands became extinct, when goats were introduced on the Island because
(1) Abingdon tortoise are highly advanced organism.
(2) Abingdon tortoise have great browsing efficiency.
(3) Goats have greater browsing efficiency than Abingdon tortoise.
(4) Goats killed the tortoise on the Island.

130. Barnacles growing on back of a whale is a classical example of
(1) Commensalism
(2) Ammensalism
(3) Mutualism
(4) Interspecific competition

131. **Statement I:** Natality rate increases the population size and population density.
Statement II: Population size always measured is numbers only.
(1) Both statements are correct
(2) Both statements are incorrect
(3) Only statement I is correct
(4) Only statement II is correct

132. **Statement I:** Decomposers has largest population in a food chain.
Statement II: Low temperature and anaerobiosis inhibit decomposition.
(1) Both statements are correct
(2) Both statements are incorrect
(3) Only statement I is correct
(4) Only statement II is correct

133. In a pyramid of biomass if total dry weight of primary consumer is about 37 kg/m^2, it will decrease at tertiary consumer level upto
(1) 11 kg/m^2
(2) 1.5 kg/m^2
(3) 2.5 kg/m^2
(4) 4.5 kg/m^2

134. Which ecological pyramid is always upright, can never be inverted?
(1) Pyramid of energy
(2) Pyramid of biomass
(3) Pyramid of number
(4) All of the above

135. In which zone, large woody vines are more commonly found?
(1) Temperate forests
(2) Tropical rainforest
(3) Polar zone
(4) Both (1) and (2)

SECTION-B

136. The colonisation of tropical pacific Island by humans led to extinction of–
(1) More than 2000 species of native birds
(2) Less than 2000 species of native birds
(3) 784 species of native birds
(4) 1200 species of native birds

137. Total number of wildlife sanctuaries in India are
(1) 90 (2) 500
(3) 448 (4) 34

138. India has only 2.4% of the world's land area, its share of global species diversity is about
(1) 2.4% (2) 5.1%
(3) 7.1% (4) 8.1%

139. Water prevention and control of pollution act passed by government of India in the year
(1) 1974 (2) 1976
(3) 1986 (4) 1987

140. **Assertion:** Inheritance pattern of ABO blood grouping in human shows co-dominance and multiple allelism.
Reason: ABO blood grouping controlled by I gene which possess three alleles, two alleles are completely dominant over the third.
(1) Both assertion and reason are true but reason is correct explanation of assertion
(2) Both assertion and reason are true but reason is not correct explanation of assertion
(3) Assertion is true but reason if false
(4) Assertion is false but reason is true

141. Mammals of cold climates have short ear, short limbs and tails, this is called as
(1) Allen's Rule (2) Cope's Rule
(3) Darwin's Rule (4) Bergman's Rule

142. Which statement is correct among the following statements?
(1) High yielding varieties of crops provide more fodder.
(2) In mass selection, crop produced is only of one genotype.
(3) Pure line represents the progeny of homozygous plant.
(4) Roughage is rich in nutrients, while concentrate is rich in fibres.

143. The collection of plants and seeds having all the diverse alleles for all genes in a given crop is called
(1) Gene library (2) Hybridisation
(3) Germplasm (4) Genome size

144. Maize hybrids developed in 2000 had twice the amount of which amino acids
(1) Lysine (2) Tryptophan
(3) Serine (4) Both (1) and (2)

145. Which of the following is wrongly matched?
(1) Pusa komal – Bacterial blight
(2) Himgiri – Hill bunt
(3) Pusa gaurav – Aphids
(4) Pusa sadabahar – White Rust

146. Which of the following statements about breeding is wrong?
(1) Inbreeding increases homozygosity
(2) Inbreeding exposes harmful recessive genes that are eliminated by selection
(3) Continued inbreeding reduces fertility and productivity
(4) Inbreeding inhibits evolution of purelines in animals

147. In Gobar gas, which has maximum amount?
(1) CO_2 (2) CH_4
(3) C_4H_{10} (4) N_2O

148. Embryo developed from somatic cells is called–
(1) Hybrid (2) Cybrid
(3) Embryoid (4) None of these

149. **Assertion:** Buffaloes breeds can be improved by superovulation and embryo transplantation.
Reason: Superovulation is induced by hormonal injection in high yielding buffaloes.
(1) Both assertion and reason are true but reason is correct explanation of assertion
(2) Both assertion and reason are true but reason is not correct explanation of assertion
(3) Assertion is true but reason if false
(4) Assertion is false but reason is true

150. Which stage of primary succession of plants is shown in the given diagram–

(1) Reed swamp stage
(2) Marsh meadow stage
(3) Scrub stage
(4) Submerged free floating plant stage

SECTION-IV (ZOOLOGY)

SECTION – A

151. Which of the following animal is having longest life span among all four?
(1) Butterfly (2) Crocodile
(3) Crow (4) Tortoise

152. Oestrous cycle is the characteristics of
(1) All mammals
(2) All primates
(3) Female of placental mammals except primates
(4) All vertebrates

153. Refer to the following diseases and choose the correct combination of bacterial diseases
a. Typhoid
b. Elephantiasis
c. Cholera
d. Tuberculosis
(1) a & b only (2) b & c only
(3) a, c & d only (4) a, b, c & d only

154. Which of the following organisms show parthenogenesis?
(1) Rotifers (2) Honey bee
(3) Turkey (4) All of these

155. **Assertion (A):** Asexual reproduction is a rapid mode of reproduction.
Reason (R): It plays an important role in evolution.
(1) Both (A) and (R) are true and the (R) is correct explanation of the (A)
(2) Both (A) and (R) are true but the reason is not the correct explanation of the (A)
(3) Both (A) and (R) are false
(4) (A) is true statement but (R) is false

156. Each testis has about _____ compartments called testicular lobules
(1) 250 (2) 500
(3) 750 (4) 1000

157. Which of the following phase of the menstrual cycle is of shortest duration?
(1) Menstrual phase
(2) Follicular phase
(3) Luteal phase
(4) Ovulatory phase

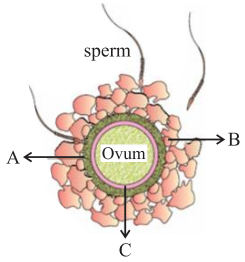
158. Primary sex organs differ from the secondary sex organs in all the following except :
(1) They produce gametes
(2) They secrete hormones
(3) They are concerned with conduction of gametes
(4) Testis in male and ovaries in female are the examples of primary sex organs

159. Which of the following cells secrete testicular hormones called androgens and form endocrine part of the testis?
(1) Leydig cells (2) Interstitial cells
(3) Sertoli cells (4) Both (1) and (2)

160. Which of the following is a set of male accessory ducts ?
(1) Rete testis, vasa efferentia, testes
(2) Rete testis, vasa efferentia, epididymis and vas deferens
(3) Epididymis, ejaculatory duct, urethra
(4) Seminiferous tubules, vasa efferentia, epididymis and vas deferens

161. Vas deferens receives a duct from seminal vesicle and open into urethra as
(1) Urethral meatus (2) Ejaculatory duct
(3) Ureter (4) Epididymis

162. Refer to the following diagram of an ovum surrounded by few sperms :



Which of the following options is correct for the labelled parts A, B and C?

	A	B	C
(1)	Follicular cell	Corona radiata	Perivitelline space
(2)	Zona pellucida	Perivitelline space	Corona radiata
(3)	Zona pellucida	Corona radiata	Perivitelline space
(4)	Perivitelline space	Zona pellucida	Corona radiata

163. Trophoblast is not involved in the formation of
(1) Protective and trophic membranes
(2) Foetal portion of placenta
(3) Body of developing embryo
(4) Chorionic villi

164. Identify the hormones that are secreted in large amount prior to ovulation.
(A) LH (B) FSH
(C) Estrogen (D) Progesterone
(1) A only
(2) A and B only
(3) A, B and C only
(4) A, B, C and D only

165. A sexually transmitted disease that can be treated by antibiotics is
(1) Genital herpes (2) Hepatitis-B
(3) Syphilis (4) AIDS

166. STDs are reported to be very high among persons in the age group of _____ years
(1) 11-12 (2) 15-24
(3) 30-35 (4) 50-60

167. Choose the correct statement regarding infertility.
(1) A large number of couples all over the world are infertile
(2) They are unable to produce children inspite of unprotected sexual co-habitation
(3) Among 15-30% of couples, infertility is a problem
(4) All of these

168. Syphilis is caused by
(1) *Chlamydia trachomatis*
(2) *Neisseria gonorrhoea*
(3) *Herpes simplex virus*
(4) *Treponema pallidum*

169. Where does the fertilised egg gets implanted once it is released into fallopian tubes?
(1) In the ovaries
(2) In the corpus luteum
(3) In the fallopian tube
(4) In the lining of uterus

170. Given below are two statements:
Statement I: Chlamydiasis is caused by *Chlamydia trachomatis.*
Statement II: Genetic warts is not STD.
Choose the appropriate answer.
(1) Statement I is correct but statement II is incorrect
(2) Statement I is incorrect but statement II is correct
(3) Both statement I and II are correct
(4) Both statement I and II are incorrect

171. Non-medicated IUD is
(1) Lippes loop (2) CuT
(3) Cu7 (4) Multiload 375

172. Anthropology is the study of
(1) Evolutionary history of man
(2) Animal habit and behaviour
(3) External characteristics
(4) Internal characteristics

173. The original birds were ____ from which the various Darwin's finches arose.
(1) Insectivorous (2) Cactus eating
(3) Carnivores (4) Seed eating

174. Hugo deVries studied mutation in
(1) *Eucalyptus* (2) *Evening primose*
(3) *Hibiscus* (4) *Vallisneria*

175. Which of the following was called the Darwin's finches?
(1) *Archaeopteryx* (2) *Pterodon*
(3) *Pavo cristatus* (4) Small black bird

176. Seed ferns originated in
(1) Carboniferous period
(2) Devonian period
(3) Silurian period
(4) Cretaceous period

177. **Assertion (A):** *Homo habilis* is thought to be the first human - like being.
Reason (R): Probably they did not eat meat.
(1) Both (A) and (R) are true and the (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but the (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

178. Toxin released in tuberculosis is
(1) Haemotoxin (2) Tuberculin
(3) Hypnotoxin (4) Neurotoxin

179. Which of the following toxic substance is responsible for the chills and fever recurring every three to four days in malaria?
(1) Haemotoxin
(2) Haemoglobin
(3) Haemozoin
(4) Sporozoites

180. Intestinal perforation is the characterstic symptom of

(1) Pneumonia (2) Plague
(3) Typhoid (4) Pertussis

181. Mark the incorrect statement w.r.t. infection of *Entamoeba histolytica*.

(1) It is a protozoan parasite of human
(2) It is characterised by constipation and abdominal pain
(3) It is a parasite in small intestine of man
(4) Houseflies act as mechanical carrier and serve to transmit the parasite from faeces of infected person to food and food products

182. Mark the odd one w.r.t. pathogen.

(1) Typhoid (2) Diptheria
(3) Common cold (4) Plague

183. Typhoid fever could be confirmed by

(1) Widal test (2) Mantoux test
(3) Shick test (4) Dick test

184. Which of the following is an auto immune disease?

(1) Asthma (2) Cirrhosis
(3) AIDS (4) Rheumatoid arthritis

185. Match Column I with Column II

Column I		Column II	
(a)	Allergy	i	*Atropa belladonna*
(b)	Mantoux test	ii	AIDS
(c)	ELISA test	iii	Tuberculosis
(d)	Hallucinogen	iv	IgE antibodies

Choose the correct option.

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

SECTION: B

186. Given below are two statements.

Statement I: Cancer causing virus is called oncogenic virus.

Statement II: Cancer causing genes are called viral oncogenes

Choose the correct option given below.

(1) Statement I is correct but statement II is incorrect
(2) Statement I is incorrect but statement II is correct
(3) Both statement I and statement II are correct
(4) Both statement I and statement II are incorrect

187. Cancer can be detected by

(1) Blood and bone marrow test
(2) MRI
(3) CT scan
(4) All of these

188. The occurrrence of endemic species in South America and Australia is due to

(1) Extinction of these species from other regions
(2) Continental separation
(3) No terrestrial route to these places
(4) Retrogressive evolution

189. What causes the onset of puberty in males ?

(1) Increase in secretion of testosterone by testis
(2) Decrease in secretion of testosterone by testis
(3) Increase in secretion of GnRH by hypothalamus
(4) Decrease in secretion of GnRH by hypothalamus

190. Pure line breeds refers to

(1) Heterozygosity only
(2) Homozygosity only
(3) Heterozygosity and linkage
(4) Heterozygosity and self assortment

191. PCR technique is best for

(1) DNA synthesis
(2) Protein amplification
(3) DNA amplification
(4) DNA ligation

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

(1) Electroporation
(2) Electrophoresis
(3) Ti plasmid infection
(4) Microinjection

193. Addition of antibiotics in chemical engineering process helps in

(1) Mixing and aeration of media
(2) Maintaining anti-foaming condition
(3) Maintaining aseptic condition
(4) Maintenance of constant temperature and pH

194. Which of the following is not an application of PCR?

(1) ELISA
(2) Diagnosis of pathogen
(3) DNA fingerprinting
(4) In palaeontology

195. **Assertion (A):** Taq polymerase is involved in PCR technique

Reason (R): It is highly thermolabile that remains active during denaturation phase

Choose the correct option:

(1) Both (A) and (R) are true and the (R) is the correct explanation of (A)
(2) Both (A) and (R) are true but the (R) is not the correct explanation of (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

196. Methods of producing microbes and pest resistant plants include

(1) RNAi (2) Use of Bt toxin
(3) Gene therapy (4) Both (1) and (2)

197. The main challenge for production of insulin using rDNA technique was getting insulin into matured form using ____ bond.

(1) Hydrogen (2) Peptide
(3) Ionic (4) Disulphide

198. How many varieties of rice have been estimated in India?

(1) 2,000 (2) 20,000
(3) 2,00,000 (4) 27

199. Techniques that serve the purpose of early diagnosis included

(1) PCR (2) ELISA
(3) Serum analysis (4) Both (1) and (2)

200. About what percentage of all existing transgenic animals are mice?

(1) 75 (2) 95
(3) 100 (4) 50

Ranker's Test Series (2023)

MOCK TEST - 2

NEET

DURATION : 200 Minutes | **12/03/2023** | **M. MARKS : 720**

ANSWER KEY

PHYSICS		CHEMISTRY		BOTANY		ZOOLOGY	
1.	(4)	51.	(3)	101.	(1)	151.	(4)
2.	(4)	52.	(4)	102.	(4)	152.	(3)
3.	(1)	53.	(1)	103.	(3)	153.	(3)
4.	(3)	54.	(2)	104.	(2)	154.	(4)
5.	(4)	55.	(2)	105.	(3)	155.	(4)
6.	(4)	56.	(2)	106.	(3)	156.	(1)
7.	(2)	57.	(3)	107.	(1)	157.	(4)
8.	(3)	58.	(1)	108.	(2)	158.	(3)
9.	(2)	59.	(2)	109.	(4)	159.	(4)
10.	(3)	60.	(1)	110.	(3)	160.	(2)
11.	(1)	61.	(4)	111.	(2)	161.	(2)
12.	(3)	62.	(2)	112.	(4)	162.	(3)
13.	(1)	63.	(2)	113.	(1)	163.	(3)
14.	(3)	64.	(2)	114.	(3)	164.	(3)
15.	(2)	65.	(4)	115.	(4)	165.	(3)
16.	(1)	66.	(3)	116.	(2)	166.	(2)
17.	(2)	67.	(1)	117.	(4)	167.	(4)
18.	(1)	68.	(3)	118.	(2)	168.	(4)
19.	(2)	69.	(3)	119.	(3)	169.	(4)
20.	(1)	70.	(2)	120.	(1)	170.	(1)
21.	(3)	71.	(4)	121.	(2)	171.	(1)
22.	(3)	72.	(4)	122.	(4)	172.	(1)
23.	(2)	73.	(4)	123.	(4)	173.	(4)
24.	(1)	74.	(1)	124.	(1)	174.	(2)
25.	(1)	75.	(3)	125.	(3)	175.	(4)
26.	(4)	76.	(2)	126.	(3)	176.	(1)
27.	(3)	77.	(2)	127.	(4)	177.	(2)
28.	(1)	78.	(1)	128.	(3)	178.	(2)
29.	(1)	79.	(3)	129.	(3)	179.	(3)
30.	(2)	80.	(2)	130.	(1)	180.	(3)
31.	(1)	81.	(4)	131.	(3)	181.	(3)
32.	(1)	82.	(2)	132.	(1)	182.	(3)
33.	(1)	83.	(1)	133.	(2)	183.	(1)
34.	(2)	84.	(4)	134.	(1)	184.	(4)
35.	(3)	85.	(1)	135.	(2)	185.	(3)
36.	(1)	86.	(3)	136.	(1)	186.	(3)
37.	(3)	87.	(3)	137.	(3)	187.	(4)
38.	(2)	88.	(1)	138.	(4)	188.	(2)
39.	(1)	89.	(1)	139.	(1)	189.	(3)
40.	(3)	90.	(3)	140.	(1)	190.	(2)
41.	(3)	91.	(4)	141.	(1)	191.	(3)
42.	(2)	92.	(2)	142.	(3)	192.	(3)
43.	(3)	93.	(4)	143.	(3)	193.	(3)
44.	(3)	94.	(1)	144.	(4)	194.	(1)
45.	(1)	95.	(4)	145.	(4)	195.	(3)
46.	(2)	96.	(4)	146.	(4)	196.	(4)
47.	(3)	97.	(3)	147.	(2)	197.	(4)
48.	(4)	98.	(3)	148.	(3)	198.	(3)
49.	(3)	99.	(2)	149.	(2)	199.	(4)
50.	(1)	100.	(3)	150.	(4)	200.	(2)

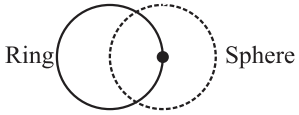
SECTION – I (PHYSICS)

1. **(4)**

As imaginary sphere of radius R is drawn with its centre on circumference of ring.

So, $q_{in} < \pi R\lambda$

Where, λ is linear charge density.



$$\boxed{\phi < \frac{\pi R\lambda}{\varepsilon_0}}$$

2. **(4)**

$q = 0.05\ \mu C = 5 \times 10^{-8}$ C

$E = 10^6$ N/C

Torque acting on an electric dipole placed in an uniform electric field,

$\tau = PE\sin\theta$

For maximum torque, $\theta = 90°$

$\tau_{max} = PE = E(q \times 2a)$

Given $\boxed{2a = 30mm = 0.03m}$

$$\tau_{max} = 10^6\left(5\times10^{-8}\times0.03\right)$$

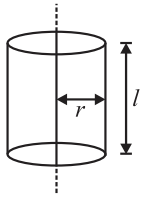
$$= \boxed{1.5\times10^{-3}\ \text{N-m}}$$

3. **(1)**

Charge density of long wire,

$$\boxed{\lambda = \frac{1}{3}\ \text{C/m}}$$

From Gauss's theorem,



$$\oint E\cdot ds = \frac{q}{\varepsilon_0}$$

$$\Rightarrow \quad E\oint ds = \frac{q}{\varepsilon_0}$$

$$E\times 2\pi rl = \frac{q}{\varepsilon_0}$$

$$E = \frac{\left(\frac{q}{l}\right)}{2\pi\varepsilon_0 r}\times\frac{2}{2}$$

$$= \frac{2\left(\frac{q}{l}\right)}{4\pi\varepsilon_0 r}$$

$$= \frac{1}{4\pi\varepsilon_0 r}\times 2\times\left(\frac{q}{l}\right)$$

$$\left[q = \lambda l\right]$$

$$E = \frac{9\times10^9\times2\times\lambda}{r}$$

$$= \frac{9\times10^9\times2\times\frac{1}{3}}{r}$$

$$E = \frac{6\times10^9}{r}$$

$$E = \frac{6\times10^9}{18\times10^{-2}}$$

$$= \frac{1}{3}\times10^{11}$$

$= 0.33 \times 10^{11}$ N/C

$$\Rightarrow \quad \boxed{E = 0.33\times10^{11}\ \text{N/C}}$$

4. **(3)**

Here $q = 4 \times 10^{-3}$ C, $E = 5$ V/m

$t = 10$ sec, $m = 2 \times 10^{-3}$kg

The K.E. of charged particle $= \frac{q^2E^2t^2}{2m}$

$$= \frac{\left(4\times10^{-3}\right)^2(5)^2(10)^2}{2\times2\times10^{-3}}$$

$$= \frac{16\times10^{-6}\times25\times100}{4\times10^{-3}}$$

$$= \boxed{10\ \text{J}}$$

5. **(4)**

Charge on capacitor, when its potential becomes 10 V,

$Q = CV = 500 \times 10^{-6} \times 10$

$Q = 5000 \times 10^{-6}$

$$\boxed{Q = 5000\ \mu\text{C}}$$

$$\therefore \quad \text{Required time} = \frac{5000\times10^{-6}C}{100\times10^{-6}C}\text{sec}$$

$$= \boxed{50\ \text{sec}}$$

6. **(4)**

Given

$V = -5x + 3y + \sqrt{15}Z$

$\vec{E} = -\left(\hat{i}\frac{\delta V}{\delta x} + \hat{j}\frac{\delta V}{\delta y} + \hat{k}\frac{\delta V}{\delta z}\right)$

$= -\left(-5\hat{i} + 3\hat{k} + \sqrt{15}\hat{k}\right)$

$\boxed{\vec{E} = 5\hat{i} - 3\hat{j} - \sqrt{15}\hat{k}}$

$|\vec{E}| = \sqrt{(5)^2 + (3)^2 + \left(\sqrt{15}\right)^2}$

$= \sqrt{25 + 9 + 15}$

$= \sqrt{49} = 7$

$\boxed{|\vec{E}| = 7}$

7. **(2)**

Time period is given by

$T = \frac{2\pi r}{v}$

$\boxed{r = \frac{\pi}{2}\text{ cm} = \frac{\pi}{2} \times 10^{-2}\text{ m}}$

$\boxed{v = 6 \times 10^5\text{ m/s}}$

So, electric current, $i = \frac{ev}{2\pi r}$

$i = \frac{1.6 \times 10^{-19} \times 6 \times 10^5}{2 \times \pi \times \frac{\pi}{2} \times 10^{-2}}$

$= \frac{1.6 \times 10^{-19} \times 6 \times 10^5}{10 \times 10^{-2}}$

$= \boxed{9.6 \times 10^{-13}\text{ A}}$

8. **(3)**

Given, area $A = 2\text{ mm}^2 = 2 \times 10^{-6}\text{ m}^2$

Current, $I = 1$ A

Conductivity, $\sigma = 6.25 \times 10^7$ S/m

As current density, $J = \frac{I}{A} = \sigma E$

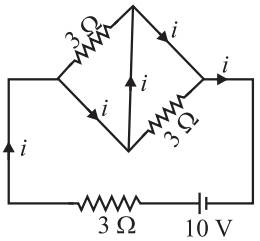
$\therefore$ Electric field, $E = \frac{I}{A\sigma}$

$= \frac{1}{2 \times 10^{-6} \times 6.25 \times 10^7}$

$= \boxed{8 \times 10^{-3}\text{ V/m}}$

9. **(2)**

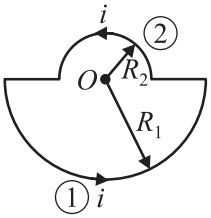
Current will try to flow through the branch which has least resistance.



$i = \frac{V}{R} = \boxed{\frac{10}{3}\text{ Amp}}$

10. **(3)**

The given figure can be drawn as



Magnetic field at O due to straight wires is zero.

Now, $B_1 = \frac{\mu_0 \hat{i}}{4R_1} \odot$

$B_2 = \frac{\mu_0 \hat{i}}{4R_2} \odot$

Net magnetic field at the centre point O,

$B_0 = B_1 + B_2$

$\frac{\mu_0 \hat{i}}{4}\left(\frac{1}{R_1} + \frac{1}{R_2}\right) \odot$

11. **(1)**

We know that

$F_n \perp B$

i.e. the acceleration $a \perp B$

$\Rightarrow \quad a \cdot B = 0$

$\left(x\hat{i} + 2\hat{j}\right) \cdot \left(3\hat{i} + 4\hat{j}\right) \times 10^{-2} = 0$

$(3x + 8) \times 10^{-2} = 0$

$\Rightarrow \quad \boxed{x = \frac{-8}{3}}$

12. **(3)**

The frequency of the field,

$f = \frac{Bq}{2\pi m} = \frac{3.5 \times 1.6 \times 10^{-19}}{2 \times 3.14 \times 1.6 \times 10^{-27}}$

$\boxed{f = 5.57 \times 10^7\text{ Hz}}$

13. **(1)**

Magnetic susceptibility

$\chi_{m_1} = 0.0075, T_1 = -73°\text{C}$

$T_1 = -73 + 273$

$\boxed{T_1 = 200\ \text{K}}$

$\chi_{m_2} = ?, T_2 = -173°\text{C}$

$= -173 + 273$

$\boxed{T_2 = 100\ \text{K}}$

According to curie's law,

$\boxed{\chi_m \propto \frac{1}{T}}$

$\therefore$ Ratio of magnetic susceptibilities,

$$\frac{\chi_{m_2}}{\chi_{m_1}} = \frac{T_1}{T_2} = \frac{200}{100} = 2$$

$\Rightarrow$ $\boxed{\chi_{m_2} = 2\chi_{m_1}}$

$$\chi_{m_2} = 2 \times 0.0075 = \boxed{0.015}$$

14. (3)

$$B_H = B\cos\theta$$

$$B = \frac{B_H}{\cos\theta} = \frac{0.50}{\cos 30°} = \frac{0.5}{\frac{\sqrt{3}}{2}} = \frac{1}{\sqrt{3}}$$

15. (2)

16. (1)

Given

i = 200 A

U = 1 kWh = 3.6×10^6 J

Self-inductance,

$$L = \frac{2U}{i^2} \qquad \boxed{\because U = \frac{1}{2}Li^2}$$

$$= \frac{2\left(3.6\times10^6\right)}{\left(200\right)^2}$$

$\boxed{L = 180\ \text{H}}$

17. (2)

$\Delta\phi = B \cdot A$

$B = 2T$

$$A = \pi r^2 = 3.14 \times \frac{\left(20\times10^{-2}\right)^2}{4}$$

$$\Delta\phi = \frac{2\times3.14\times\left(0.2\right)^2}{4}$$

$\boxed{\Delta\phi = 0.0628\ \text{Weber}}$

As, charge, $|\Delta q| = \frac{\Delta\phi}{R}$

Given R = 0.01 Ω

Now $|\Delta q| = \frac{0.0628}{0.01}$

$\boxed{|\Delta q| = 6.28\ \text{C}}$

18. (1)

$C_{\text{net}} = \frac{C}{2}$ [In series]

$L_{\text{net}} = 2L$ [In series]

$$\omega = \frac{1}{\sqrt{L_{\text{net}}C_{\text{net}}}}$$

$$2\pi f = \frac{1}{\sqrt{L_{\text{net}}C_{\text{net}}}}$$

$\Rightarrow$ $$f = \frac{1}{2\pi\sqrt{L_{\text{net}}C_{\text{net}}}}$$

$$= \frac{1}{2\pi\sqrt{\left(2L\right)\cdot\left(\frac{C}{2}\right)}}$$

$\boxed{f = \frac{1}{2\pi\sqrt{LC}}}$

19. (2)

In L–C oscillation total time in one complete cycle.

$$T = 2\pi\sqrt{LC}$$

$$T = 2\pi\sqrt{25\times10^{-3}\times10\times10^{-6}}$$

$$T = 2\pi\sqrt{25\times10^{-8}}$$

$$T = 2\pi\times5\times10^{-4}$$

$\boxed{T = \pi\times10^{-3}\ \text{sec}}$

After time T/4 capacitor is fully closed, then

$$\frac{T}{4} = \frac{\pi\times10^{-3}}{4} = \boxed{\frac{\pi}{4}\ \text{ms}}$$

20. (1)

$$i_{rms} = \sqrt{\frac{i_1^2 + i_2^2}{2}}$$

$$= \sqrt{\frac{9+16}{2}}$$

$$= \sqrt{\frac{25}{2}}$$

$$= \boxed{\frac{5}{\sqrt{2}}}$$

21. (3)

We have

$B_y = 2 \times 10^{-7} \sin(0.5 \times 10^3 x + 1.5 \times 10^{11} t)$

Comparing with the standard equation, we get

$B_y = B_0 \sin(kx + \omega t)$

$k = 0.5 \times 10^3$

Wavelength, $\lambda = \dfrac{2\pi}{K}$

$= \dfrac{2\pi}{0.5 \times 10^3} = 0.01256 \text{ m}$

$\boxed{\lambda = 0.01256 \text{ m}}$

The wavelength range of microwaves is 10^{-3} to 0.1 m. The wavelength of this wave lies between 10^{-3} m to 0.1 m, so the equation represents a microwave.

22. (3)

Force per unit area is the radiation pressure. When a surface intercepts electromagnetic radiation, a force and a pressure are exerted on the surface.

As the surface in non-reflecting, so, it is completely absorbed and in such case the force is,

$F = \dfrac{IA}{C}$

Where I is intensity of light A is area of surface and C is velocity of electromagnetic wave.

The radiation pressure is the force per unit area

i.e. $\boxed{P = \dfrac{F}{A} = \dfrac{I}{C}}$

23. (2)

24. (1)

Concave lens

25. (1)

Given, focal length of objective lens,

$f_0 = 10$ cm

Focal length of eye lens,

$f_e = 10$ mm $= 1$ cm

Total length $= f_0 + f_e = (10 + 1)$ cm

$= 11$ cm

$|m| = \left|\dfrac{f_0}{f_e}\right| = \dfrac{10}{1} = 10$

26. (4)

Given $\boxed{i = \dfrac{3}{4} \text{ A}}$

We know that

$i = \dfrac{A + \delta_n}{2}$

$\Rightarrow \quad \dfrac{A + \delta_n}{2} = \dfrac{3}{4} A$

$\Rightarrow \quad A + \delta_n = 1.5 \text{ A}$

$\delta_n = 0.5A$

$\boxed{\delta_n = \dfrac{A}{2}}$

Prism is equilateral

So, $\boxed{A = 60°}$

Now, $\delta_n = \dfrac{60}{2}$

$\boxed{\delta_n = 30°}$

27. (3)

In a Young's double sli8t experiment, the path difference for n^{th} minima is given by

$\Delta Y = (2n - 1)\dfrac{\lambda}{2}$

For 5^{th} minima, $n = 5$

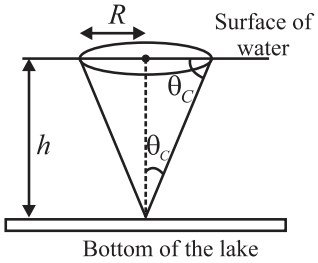
$\therefore \quad \Delta Y = (2 \times 5 - 1)\dfrac{\lambda}{2}$

$= \dfrac{9}{2}\lambda$

$\Rightarrow \quad \boxed{\Delta Y = 9\dfrac{\lambda}{2}}$

28. (1)

We can draw the ray diagram of the given situation as follows,



According to question

$\pi R^2 = 3h^2$

$\Rightarrow \quad \boxed{h^2 = \dfrac{\pi R^2}{3}}$ .....(i)

From above figure

$\sin\theta_C = \dfrac{R}{\sqrt{R^2 + h^2}}$ .....(ii)

Now $\sin\theta_C = \dfrac{\mu_a}{\mu}$

Here, $\mu \Rightarrow$refractive index of water

$\boxed{\mu_a =}$

So, $\boxed{\sin\theta_C = \frac{1}{\mu}}$

$$\frac{1}{\mu} = \frac{R}{\sqrt{R^2 + h^2}}$$

By using equation (i)

$$\frac{1}{\mu} = \frac{R}{\sqrt{R^2 + \frac{\pi R^2}{3}}}$$

$$\Rightarrow \quad \frac{1}{\mu} = \frac{1}{\sqrt{1 + \frac{\pi}{3}}}$$

$$\Rightarrow \quad \mu = \sqrt{1 + \frac{\pi}{3}}$$

29. (1)

Given, d = 3 Å

λ = 1.5 Å

n = 1

For the crystal, we can write,

$2d\sin\theta = n\lambda$

$2 \times 3 \times \sin\theta = 1 \times 1.5$

$$\sin\theta = \frac{1}{4}$$

$$\theta = \sin^{-1}\left(\frac{1}{4}\right)$$

$\boxed{\theta = 14.4°}$

30. (2)

Given,

$v_{max} = 4 \times 10^8$ cm/sec

$= 4 \times 10^6$ m/sec

$$K_{max} = \frac{1}{2} m v_{max}^2$$

$$= \frac{1}{2} \times 9 \times 10^{-31} \times \left(4 \times 10^6\right)^2$$

$= 7.2 \times 10^{-18}$ J

$$= \frac{7.2 \times 10^{-18}}{1.6 \times 10^{-19}} = \boxed{45\,eV}$$

Hence, stopping potential

$$|V_0| = \frac{k_{max}}{e} = \boxed{45 \text{ volt}}$$

31. (1)

Given, for Li^{++}, Z = 3 and as the excitation is from first to third Bohr orbit, so n_1 = 1, n_2 = 3

Using the relation,

$$\frac{1}{\lambda} = Z^2 R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$\frac{1}{\lambda} = (3)^2 R\left(\frac{1}{1^2} - \frac{1}{3^2}\right)$$

$$\frac{1}{\lambda} = 8R$$

Now, $\boxed{\lambda = \frac{1}{8R}}$

$$\lambda = \frac{1}{8 \times 1.097 \times 10^7}$$

$\lambda = 0.114 \times 10^{-7} \simeq \boxed{11.4 \text{ nm}}$

32. (1)

Characteristic *X*-rays

33. (1)

$\boxed{1, 7.4}$

34. (2)

We know that,

Number of nuclei present, $N = \frac{m}{M} N_A$

Where, m = given mass

M = atomic mass

and N_A = Avogadro's number

Activity, $R = \lambda N$

$\boxed{\lambda = \frac{1}{\tau}}$ (where, τ = mean life)

$$R = \frac{1}{\lambda} \times \frac{mN_A}{M}$$

Mean life of substance,

$$\tau = \frac{mN_A}{MR} = \frac{1 \times 6.023 \times 10^{23}}{226 \times 3.7 \times 10^{10}} \text{ sec}$$

$= \boxed{7.2 \times 10^{10} \text{ sec}}$

35. (3)

36. (1)

The conductivity of pure silicon is given by

$\sigma_i = n_i e\left(\mu_e + \mu_n\right)$

Also, the resistivity is reciprocal of conductivity.

$$\therefore \quad \rho_i = \frac{1}{\sigma_i} = \frac{1}{n_i e\left(\mu_e + \mu_h\right)}$$

$$n_i = \frac{1}{\rho_i e\left(\mu_e + \mu_h\right)}$$

$$\Rightarrow \quad n_i = \frac{1}{\rho_i e(\mu_e + \mu_h)}$$

$$= \frac{1}{3000 \times 1.6 \times 10^{-19}(0.15 + 0.030)}$$

$$\boxed{n_i = 1.157 \times 10^{16}\ /\text{m}^3}$$

When 10^{19} atoms of phosphorus (donor atoms) are added per m^3, we have

$$\begin{pmatrix} n_e >>> n_i \\ \text{or } n_e >>> n_h \\ \Rightarrow n_e = 10^{19} \end{pmatrix}$$

$$\therefore \quad \rho = \frac{1}{n_e e \mu_e}$$

$$= \frac{1}{10^{19} \times 1.6 \times 10^{-19} \times 0.15}$$

$$\boxed{\rho = 4.17\ \Omega - \text{m}}$$

37. (3)

Rectification efficiency

$$\eta = \frac{\text{DC Output Power}}{\text{AC Input Power}} \times 100$$

$$= \frac{20}{60} \times 100 = 33.3\%$$

38. (2)

In common emitter amplifier

Voltage gain = Current gain × resistance gain

$$A_V = \beta \times \frac{R_0}{R_i}$$

$$\frac{V_0}{V_i} = \beta \times \frac{R_0}{R_i}$$

$$\frac{3}{0.01} = 100 \times \frac{R_0}{1 \times 10^3}$$

$$R_0 = \frac{30}{0.01} = 3\ \text{k}\Omega$$

$$\boxed{R_0 = 3\ \text{k}\Omega}$$

39. (1)

1 0 0 0 1 0

$\underline{+\ 1\ 1\ 0\ 1\ 1}$

1 1 1 1 0 1

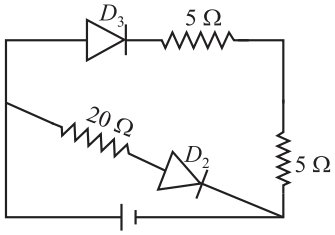
Since $(100010)_2 + (11011)_2$

$= (111101)_2$

40. (3)

In the given circuit, diode D_1, is reverse biased, so it will not conduct. Diodes D_2 and D_3 are forward biased, so they will conduct.

The corresponding equivalent circuit is as shown in the figure.



$$R_{eq} = \frac{(5+5) \times 20}{(5+5) + 20}$$

$$= \frac{200}{30} = \frac{20}{3}\ \Omega$$

$$\boxed{R_{eq} = \frac{20}{3}\Omega}$$

Current through the battery, $I = \dfrac{10V}{\frac{20}{3}\Omega}$

$$= \boxed{1.5\ \text{A}}$$

41. (3)

$$i = \frac{dq}{dt}$$

$$\int_0^q dq = \int_0^4 i\,dt$$

$$q = \int_0^4 (3 + 2t)\,dt$$

$$q = \left[3t + t^2\right]_0^4$$

$q = 12 + 16 - 0$

$$\boxed{q = 28\ \text{C}}$$

42. (2)

Potential due to a line charge at a distance r is given by:

$$V - V_0 = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{r}{r_0}\right)$$

Hence, potential difference between A and B is:

$$V_A - V_B = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{1}{2}\right)$$

Change in potential energy of the charge on moving from A to B is:

$U_B - U_A = q\,(V_B - V_A)$

$W = U_A - U_B$

$= q(V_A - V_B)$

$$\boxed{W = \frac{q\lambda}{2\pi\varepsilon_0} \ln\left(\frac{1}{2}\right)}$$

43. (3)

$$C_{net} = \frac{C_1 C_2}{C_1 + C_2}$$

$E_{total} = E_1 + E_2$

Charge on each capacitor is

$q = C_{net}\, E_{total}$

$$q = \left(\frac{C_1 C_2}{C_1 + C_2}\right)(E_1 + E_2)$$

Thus, potential difference between a and a,

$$V_{ab} = \frac{q}{C_2}$$

$$\Rightarrow \quad V_{ab} = \left(\frac{C_1 C_2}{C_1 + C_2}\right) \cdot \frac{(E_1 + E_2)}{C_2}$$

$$\boxed{V_{ab} = \left(\frac{E_1 + E_2}{C_1 + C_2}\right) C_1}$$

44. (3)

Magnetic field at centre of circular coil

$$B = \frac{\mu_0 N i}{2R} \qquad \text{.....(i)}$$

Given magnetic field B' at distance Z from centre is $\left(\frac{B}{8}\right)$.

$$B' = \frac{1}{8}\left(\frac{\mu_0 N i}{2R}\right) \qquad \text{.....(ii)}$$

From above concept $B' = \dfrac{\mu_0 N i R^2}{2\left(R^2 + Z^2\right)^{\frac{3}{2}}}$ .....(iii)

From equation (ii) and (iii)

$$\frac{\mu_0 N i R^2}{2\left(R^2 + Z^2\right)^{\frac{3}{2}}} = \frac{1}{8}\left(\frac{\mu_0 N i}{2R}\right)$$

$$8R^3 = \left(R^2 + Z^2\right)^{\frac{3}{2}}$$

Taking cube root on both sides

$$2R = \sqrt{R^2 + Z^2}$$

$$\Rightarrow \quad \boxed{Z = \sqrt{3}R}$$

45. (1)

$$(V_C)_{max} = (V_L)_{max}$$

$$\frac{q_0}{C} = L\left(\frac{dI}{dt}\right)_{max}$$

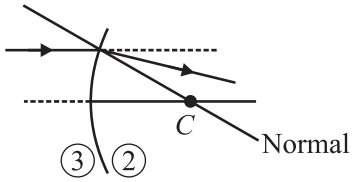
$$\Rightarrow \quad \left(\frac{dI}{dt}\right)_{max} = \frac{q_0}{LC}$$

46. (2)

We can see that between medium 1 and medium 3, then is no deviation.

Thus, $\boxed{\mu_1 = \mu_3}$

Now considering light rays going from medium 3 to medium 2, we observe that the rays bend to words the normal.



Hence, medium 2 is optically denser than medium 3.

$\Rightarrow \quad \mu_2 > \mu_3$

or $\boxed{\mu_1 = \mu_3 < \mu_2}$

47. (3)

$$I = I_{max} \cos^2\left(\frac{\phi}{2}\right)$$

ϕ at one-fourth of the distance between two successive Bright fringes is $\frac{2\pi}{4} = \frac{\pi}{2}$

So, $I = I_{max} \cos^2\left(\dfrac{\frac{\pi}{2}}{2}\right)$

$$= I_{max} \cos^2\left(\frac{\pi}{4}\right)$$

$$= I_{max}\left(\frac{1}{\sqrt{2}}\right)^2$$

$$\boxed{I = I_{max}\left(\frac{1}{2}\right)}$$

$$\Rightarrow \quad \boxed{\frac{I_{max}}{I} = 2}$$

48. (4)

49. (3)

Ge is revere biased and Si is forward biased. Si is at 0.7 V,

So the potential across diodes will be 0.7 V

Thus, potential at Y = potential at R_L

= 12 V – 0.7 V

= 11.3 V

50. (1)

$$\boxed{C = 4\pi\varepsilon_0 R}$$

$$C = \left(\frac{1}{9 \times 10^9}\right) \times (2)$$

$$\boxed{C = 2.2 \times 10^{-10}\ \text{F}}$$

SECTION – II (CHEMISTRY)

51. (3)

Acidic nature of compound is defined using the stability of the conjugate base which is formed when H^+ will be lost from the acid.

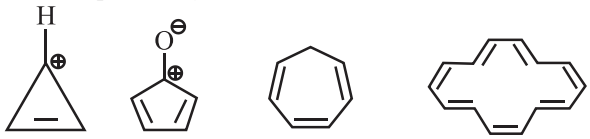
52. (4)

For a compound to be aromatic, it must follow Huckel Rule

I) $(4n + 2)\pi e^-$

II) sp^2 hybridized

III) planar, cyclic



(P) $2\pi e^-$ (Q) $4\pi e^-$ (R) $6\pi e^-$ (S) $14\pi e^-$

but 1 carbon is sp^3 hybridised

Compound P, S follow Huckel rule completely. Therefore they are aromatic in nature.

53. (1)

$$t_{1/2} = \frac{[A]_0}{2k}$$

54. (2)

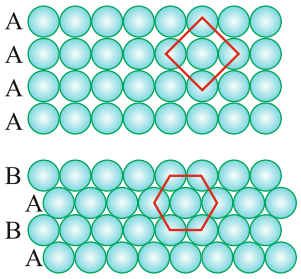
$$\frac{34500}{21500} = \frac{R_0 e^{-\lambda t}}{R_0 e^{-\lambda(t+75)}}, \lambda = 0.00649\,min^{-1}$$

$$t_{1/2} = \frac{0.693}{\lambda} = 106.779\,min \approx 110\,min$$

55. (2)

The given unit cell is BCC type.

56. (2)



57. (3)

Mercury is liquid and sodium is solid.

58. (1)

Having the greatest ionization potential among the given options.

59. (2)

2 molal solution contains 2 moles of solute in 1000g of water, therefore mole fraction of solute is 2/57.5

60. (1)

The higher the value of standard reduction potential (Less negative value), The higher the oxidising power of a metal.

61. (4)

$XeF_6 \rightarrow$ 6 B.P. + 1 L.P.

62. (2)

High spin $t_{2g}^5 e_g^2$

63. (2)

Cation deposits at cathode and anode deposits at anode. Between sulphate and hydroxide anions hydroxide has a preferential deposition at anode.

64. (2)

$$Rate = -\frac{1}{5}\left[\frac{d[A]}{dt}\right] = +\frac{1}{2}\left[\frac{d[B]}{dt}\right]$$

65. (4)

The valence electron and core electron mean the same.

66. (3)

A catalyst alters the path of a chemical reaction which lowers the activation energy.

67. (1)

Aluminium oxide is an oxide of very reactive aluminium metal and hence can be reduced electrolytically.

68. (3)

$4M(s) + 8CN^-(aq) + 2H_2O(aq) + O_2(g) \rightarrow$
$4[M(CN)_2]^-(aq) + 4OH^-(aq)$ (M = Ag or Au)

$2[M(CN)_2]^-(aq) + Zn(s) \rightarrow [Zn(CN)_4]^{2-}(aq) + 2M(s)$

69. (3)

$NH_3 : \mu_1$

$NF_3 : \mu_2$

$\mu_1 > \mu_2$

70. (2)

$NH_2CONH_2(aq) + H_2O(l) \xrightarrow{\text{Urease}} 2NH_3(g) + CO_2(g)$

71. (4)

IF_5 has $\mu \neq 0$ (5 B.P. + 1 L.P.)

K is more electropositive than Li.

$BI_3 \rightarrow$ only 3 B.P., $PI_3 \rightarrow$ 3 B.P. + 1 L.P.

72. (4)

d_{z^2} orbital is involved because it will form axial bonds.

73. (4)

All are correct statements.

74. (1)

Fact-based question.

75. (3)

Each nitrogen carries a charge of –1/3.

76. (2)

Fact-based question.

77. (2)

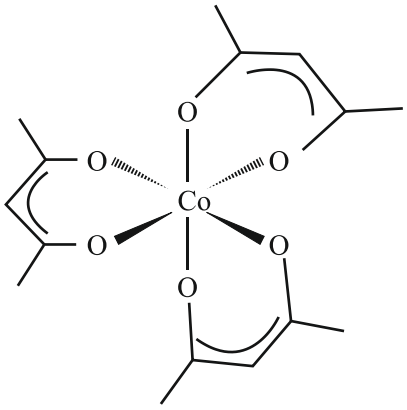
It contains 4 unpaired electrons.

78. (1)

The 5f orbitals are more into space and participate in bonding whereas 4f orbitals are buried deep into the surface and lacks participation.

79. (3)

The structure of the given complex is



80. (2)

All the d-electrons in divalent nickel ion are paired.

81. (4)

S_N1 reactions proceed via the formation of a carbocation intermediate. The less stable the carbocation, the less the reactivity of the alkyl or aryl halide towards the reaction

82. (2)

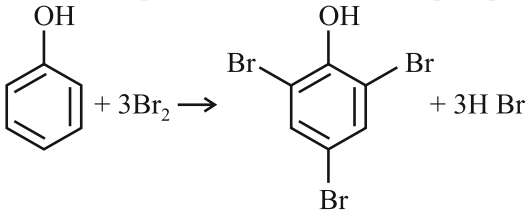
Only cis-trans isomers are possible.

83. (1)

Carbon atom in diethyl ether is saturated whereas in other it is unsaturated and attached to electron-withdrawing groups.

84. (4)

When phenol is treated with bromine water, 2, 4, 6-tribromophenol is formed as white precipitate.



2. 4, 6-Tribromophenol

85. (1)

Across the lanthanoid series, size decreases and so the basicity decreases.

86. (3)

Tollen's reagent is used to detect Aldehydic group.

87. (3)

It contains 5 methylene groups.

88. (1)

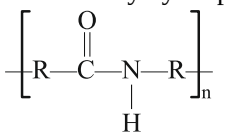
Natural rubber is stiffened by vulcanisation and S-atoms cross-link to it by adding to double bonds.

89. (1)

Bakelite is a polymer of phenol and formaldehyde. Terylene is a condensation polymer of ethylene glycol and terepthalic acid.

90. (3)

The general structure of any nylon polymer is



Amide linkage

Because of the presence of amide linkage, nylon belongs to polyamides.

91. (4)

Condensation polymers are obtained by bifunctional molecules (monomers) with the elimination of smaller molecules whereas additional polymers are obtained from multiple bond containing monomers. Neoprene is a polymer of chloroprene $CH_2 = C(Cl)— CH = CH_2$) so it is an addition polymer, not a condensation polymer.

92. (2)
Nylon-66 is a fibre not a elastomer. As in it the forces of attraction are H-bonding.
All other given statements are true.

93. (4)
DNA is double stranded helix.
Adenine forms H-bonds with Thymine is DNA.

94. (1)
No oxygen/C = O bond is present in adenine (Refer structure).

95. (4)
Any change in temperature/pH can change the protein's structure.

96. (4)
Fibrous proteins are water insoluble.

97. (3)
Glycine is only optically inactive amino acid.

98. (3)
With Br_2/H_2O, trisubstituted bromo derivative of aniline is formed.

99. (2)
Aliphatic amines don't form stable diazonium salts. Carbylamine test is given by 1° amines only.

100. (3)
Isocyanate intermediate is formed in Hoffmann Bromamide degradation.

SECTION – III (BOTANY)

101. (1)
Synergids are haploid cells present in embryo sac. Endosperm is triploid in angiosperms so, If there are 8 chromosomes in synergids, 8 × 3 = 24 chromosomes will be present in endosperm.

102. (4)
A typical embryo sac of angiosperms is 8 nucleate and 7 celled, as it consists of 3 antipodal cells, 2 synergids and one egg cell with one nucleus each and a large central cell with two nuclei.

103. (3)
Oxalis plant produces two types of flowers i.e. Chasmogamous and cleistogamous flower. Chasmogamous flowers have exposed anthers and stigma while cleistogamous howers donot open at all. Pollination is autogamous type i.e. transfer of pollen grains from anther to stigma of same flower of same plant.

104. (2)
Aquatic plants like water lily and hyacinth pollination by insects or wind is possible as flowers of these plants emerge above the level of water. *Zostera* is a marine sea grass. Pollen grains of water pollinating plants are long, ribbon – like with wet mucilaginous covering.

105. (3)
Ovule is attached to placenta by means of a stalk called funicle.

106. (3)
In some seeds like black pepper remnants of nucleus are present. This is perisperm. The portion of embryonal axis above the level of cotyledon is epicotyl which terminates into plumule or stem tip. Radicle and root cap enclosed is undifferentiated sheath called coleorrhiza.
2 polar nuclei fused with a male gamete to form triploid endosperm.

107. (1)
Refer NCERT Ch-02 Page No. 35

108. (2)
Pollen grains preserved in liquid nitrogen at – 196°C for years, this is called cryopreservation.

109. (4)
Ginger reproduces vegetatively by Rhizome. The Rhizome is the modification of stem.

110. (3)
There is no gamete formation and no exchange of genes is asexual reproduction as there is a single parent who transmits all its genes to its offspring.
Only mitotic divisions occur in asexual reproduction. It donot involve any meiosis as there is no gamete formation.

111. (2)
CAM pathway is a special photosynthetic pathway exhibited by desert plants that enables stomata to remain closed during day time to minimise water loss.

112. (4)

Biofortification is breeding crops with higher levels of vitamin, minerals, oil, fats, higher proteins.

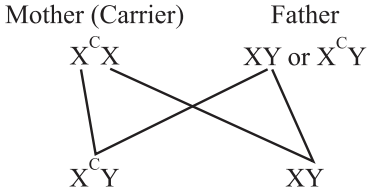
113. (1)

Colour blindness is a sex-linked recessive disorder which occurs due to mutation in certain genes present on X-chromosome.

114. (3)

The gene that lead to colour blindness are present on X-chromosomes.

Males have only one X-chromosome and females have two X-chromosomes.



So, son having 50% probability of being colour blind.

115. (4)

In birds (Hen), females has a pair of dissimilar chromosomes (ZW) while males have (ZZ) so, this comes under female heterogamety.

116. (2)

Sickle cell anaemia is a Autosome linked recessive disorder which occurs due to point mutation, the substitution of glutamic acid by valine at sixth position of beta globin chain of haemoglobin.

117. (4)

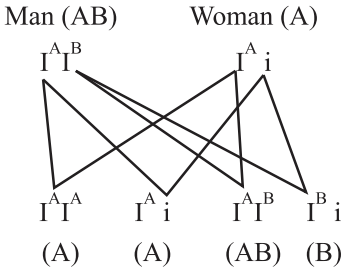
AUG acts as a initiator codon in translation as well as it codes for amino acid methionine.

118. (2)

Gynecomastia is a condition seen in Klinefelter syndrome i.e. enlarged breast tissue in males.

In this the affected males have XXY sex chromosomes.

119. (3)



So, there is 50% probability of blood group A in progenies.

120. (1)

Cyclosporin-A is a Immuno-suppressive agent produced by Fungus *Trichoderma polysporum*. Statins are produced by yeast *Monascus purpureus*, it acts as a blood cholesterol lowering agent. Acetic acid produced by *Acetobacter aceti*.

121. (2)

Bacillus thuringiensis (Bt) used as a biocontrol agent to control butterfly caterpillars.

122. (4)

Many members of genus *Glomus* form mycorrhizae. It absorbs phosphorus from the soil and passes it to the plant.

123. (4)

Azotobacter, Azospirillum, Rhodospirillum, Clostridium lives in free state in soil and fix atmospheric nitrogen.

124. (1)

In paddy field, cyanobacteria (i.e., *Nostoc, Anabena, Oscillatorio*) serves as an important biofertiliser. They remain in association with *Azolla* in paddy fields and fix atmospheric nitogen.

125. (3)

a is exponential growth curve when responses are not limiting the growth, b-represents logistic curve when responses are limiting the growth. c is carrying capacity denoted as k.

126. (3)

Homeothermal or warm blood animals can maintain their internal body temperature. They are referred to as regulators.

127. (4)

Many zooplankton species in lakes and ponds enter diapause (a stage of suspended devp.) to avoid unfavourable conditions.

128. (3)

A sparrow eating a seed is no less like predation.

129. (3)

It is an example of competition between two species. Due to greater browsing efficiency of goats, Abingdon tortoise became extinct due to lack of food.

130. (1)

Barnacles growing on back of whale is an example of commensalism where barnacles gets benefitted while whale neither harmed nor benefitted.

131. (3)

Population size need not to be necessarily measured in numbers. It can be measured in terms of biomass also in certain cases.

132. (1)

Decomposers have largest population in a food chain low temperature inhibits decomposition warm and moist environment favours decomposition.

133. (2)

Refer NCERT Ch-14 Page no. 248.

Pyramid of biomass shows a sharp decrease in biomass at higher trophic levels.

134. (1)

Pyramid of energy can never be inverted because when energy flows from a trophic level to next level, some energy is always lost as heat.

135. (2)

Large woody vines are commonly found in tropical rainforests.

136. (1)

Human activities cause great harm to biodiversity. Habitat loss in one major evil quartet. Tropical pacific Islands colonisation led to more than 2000 species of native birds extinction.

137. (3)

India currently has 14 biosphere reserves, 90 national parks and 448 wildlife sanctuaries.

138. (4)

India has only 2.4% of world's land area, its share of global species diversity is an impressive 8.1%. This is what makes our country one of 12 mega diversity county of the world.

139. (1)

Water prevention and control of pollution act passed in 1974 by government of India.

140. (1)

ABO blood grouping in human is a classical example of multiple allelism as there are more than two alleles which control blood grouping out of there alleles, two alleles are completely dominant, hence it is also an example of co-dominance which is an exception to Mendel's law of dominance.

$I^A I^B \rightarrow$ AB (Blood group)

Here I^A and I^B are co-dominant alleles.

141. (1)

Cold climate animals have small ears limbs to minimise heat loss. This is called Allen's rule.

142. (3)

High yielding varieties of crops proved less fodder, due to dwarfness of high yielding varieties of crops, they yield less fodder (hay). Varieties developed by mass selection have wide variability wide genetic base and stability. Concentrates are low in fibres and rich in proteins and other nutrients. Roughage is rich in fibres.

143. (3)

A collection of plants and seeds having diverse alleles of all the genes of a crop is called germplasm collection.

144. (4)

In 2000, maize hybrids that had twice the amount of amino acids lysine and tryptophan. Compared to existing maize hybrids were developed.

145. (4)

Pusa sadabahar is a variety of chilli and it is resistant to diseases like chilly virus, TMV, leaf curl. *Pusa swamin* of (*Brassica*) is resistant to disease white rust.

146. (4)

Inbreeding is necessary if we want to evolve a pureline in animals.

147. (2)

Methane gas is produced in greater amount is gobar gas because of the presence of *Methanobacterium* in cow dung.

148. (3)

Embryoid is embryo which develop from somatic cells not from gametic cells. It is somatic embryogenesis.

149. (2)

Breed of Cattles, Rabbits, Buffaloes etc. can be improved by super ovulation and embryo transplantation when an animal is injected with hormones (FSH) to induce follicle maturation, they produce 6-8 eggs instead of one egg. It has the objective to produce large number of embryos for embryo transfer.

150. (4)

The given stage is submerged free floating plant stage of primary succession

SECTION – IV (ZOOLOGY)

151. (4)

Tortoise has longest life span among given animals in question 1.

152. (3)

Oestrous cycle is the characteristic of non-primate placental mammals.

153. (3)

Typhoid, cholera and tuberculosis are caused due to bacterial infection.

154. (4)

Rotifers, honey bees and turkey shows parthenogenesis.

155. (4)

Asexual reproduction is a rapid mode of reproduction. It plays less or no role in evolution.

156. (1)

Each testis has about 250 compartments called testicular lobules.

157. (4)

Ovulatory phase of the menstrual cycle is of shortest duration (one day).

158. (3)

Primary sex organs produce gamete and secrete hormones, testis in male and ovaries in female are primary sex organs.

159. (4)

Leydig or Interstitial cells secrete testicular hormones called androgens and form endocrine part of the testis.

160. (2)

Male accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens.

161. (2)

Vas deferens receives a duct from seminal vesicle and open into urethra as ejaculatory duct.

162. (3)

A = Zona pellucida
B = Corona radiata
C = Perivitelline space

163. (3)

Trophoblast is not involved in the formation of body of developing embryo.

164. (3)

The hormones that are secreted in large amount prior to ovulation are LH, FSH and estrogen.

165. (3)

Syphilis is a sexually transmitted disease that can be treated by antibiotic.

166. (2)

STDs are reported to be very high among persons in the age group of 15-24 years.

167. (4)

A large number of couples all over the world are infertile. They are unable to produce children inspite of unprotected sexual co-habitation. Among 15-30% of couples, infertility is a problem.

168. (4)

Syphilis is caused *Treponema pallidum*
Chlamydiasis = *Chlamydia trachomatis*
gonorrhoea = *Neisseria gonorrhoea*
Genital Herpes = *Herpes simplex virus*

169. (4)

The fertilised egg finally implants in the uterus once it is released into fallopian tube.

170. (1)

Chlamydiasis is caused by C*hlamydia trachomatis* Genital warts is an STD caused by *Human papilloma virus.*

171. (1)

Non medicated IUD is lippes loop·CuT, Cu7 and multiload 375 are copper releasing IUDs.

172. (1)

Anthropology is the study of evolutionary history of man.

173. (4)

The original birds were seed eating from which the various Darwins finches arose.

174. (2)

Hugo de Vries studied mutation in evening primrose.

175. (4)

Small black birds were called the Darwin finches.

176. (1)

Seed ferns originated in carboniferous period.

177. (2)

Homo habilis is thought to be first human like being and probably they did not eat meat.

178. (2)

Toxin release in tuberculosis is tuberculin.

179. (3)

Haemozoin is a toxic substance which is responsible for the chills and fever recurring every 3-4 days in malaria.

180. (3)

Intestinal perforation is the characterstic symptom of typhoid.

181. (3)

Entamoeba histolytica is a protozoan parasite of human. It is characterised by constipation and abdominal pain, housefly act as mechanical carrier and serve to transmit the parasite from faeces of infected person to food and food product.

182. (3)

Common cold is a viral disease.

183. (1)

Typhoid fever could be confirmed by Widal test.

184. (4)

Rheumatoid arthritis is an autoimmune disease

185. (3)

Allergy = IgE Antibody
Mantoux test = Tuberculosis
ELISA test = AIDS
Hallucinogenic = *Atropa belladonna*

186. (3)

Cancer causing viruse is called oncogenic virus and cancer causing gene is called viral oncogene.

187. (4)

Cancer can be detected by blood and bone marrow test, MRI and CT scan.

188. (2)

The occurrrence of endemic species in South America and Australia is due to continental separation.

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189. (3)

The onset of puberty in males is due to increase in secretion of GnRH by hypothalamus.

190. (2)

Pureline breeds refers to homozygosity only.

191. (3)

PCR technique is best for DNA amplification.

192. (3)

Ti plasmid infection is used to introduce genes in dicot plants

193. (3)

Addition of antibiotics in chemical engineering process help in maintaining aseptic condition.

194. (1)

ELISA is not an application of PCR.

195. (3)

Taq polymerase is involved in PCR technique. Taq polymerase is highly thermostable that remains active during denaturation phase.

196. (4)

Methods of producing microbes and pest resistant plants include RNAi and use of Bt-toxin.

197. (4)

The main challenge for production of insulin using rDNA technique was getting insulin into matured from using disulphide bond.

198. (3)

2,00,000 varieties of rice have been reported in India.

199. (4)

Techniques that solve the purpose of early diagnosis include PCR and ELISA.

200. (2)

95% of all transgenic animals are mice.