Dated : 5-02-2023

M.L. Syal's Helix Institute

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XII cum Competition Course for Medical

Test - 27

MM : 720 Time : 3 hrs. 20 min.

Physics	:	Dual Nature of rad. & matter, Atoms & Nuclei & Semi-conductor devices
Chemistry	:	Electrochemistry, d & f block elements, Coordination Compound
Zoology	:	Biotechnology
Botany	:	Reproduction (Reproduction in organism, Reproduction in flowering plants), Strategies for enhancement. in food production

PHYSICS : SECTION-A

All questions are compulsory in section A

1. Which of the following statements regarding unbiased P-N junction diode is incorrect?
   (1) Net charge on P-type region is + ve
   (2) Drift current is equal and opposite to diffusion current
   (3) There is no net current through the junction
   (4) P region is at lower potential

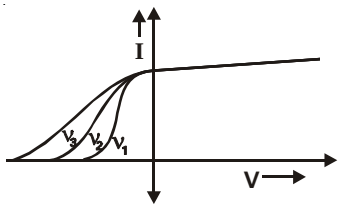
2. The speed of an electron in the orbit of hydrogen atom in the ground state is
   (1) c (2) c/10
   (3) c/2 (4) c/137

3. If E_n and L_n denote the total energy and the angular momentum of an electron in the nth orbit of Bohr atom, then
   (1) $E_n \propto L_n$ (2) $E_n \propto \frac{1}{L_n^2}$
   (3) $E_n \propto \frac{1}{L_n}$ (4) $E_n \propto L_n^2$

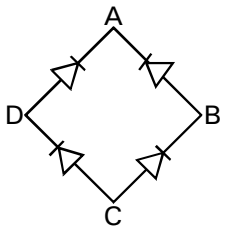
4. In reactors, light nuclei (moderators) are provided along with the fissionable nuclei for slowing down fast neutrons. Which of the following is not the moderator commonly used?
   (1) Water (2) Heavy water
   (3) Graphite (4) Sodium

5. What percentage of radioactive atoms decay in four half lives?
   (1) 80% (2) 88.25%
   (3) 93.75% (4) 96.87%

6. If a graph is plotted between photoelectric current (I) and anode potential (V) for frequencies ν_1, ν_2 and ν_3 then nature of graph is shown below



The relation between ν_1, ν_2 and ν_3 is
   (1) $\nu_1 = \nu_2 = \nu_3$ (2) $\nu_1 > \nu_2 > \nu_3$
   (3) $\nu_1 < \nu_2 < \nu_3$ (4) None of these

7. 

In the diagram, if the input is applied across the terminals A and C, then output across the terminals B and D is

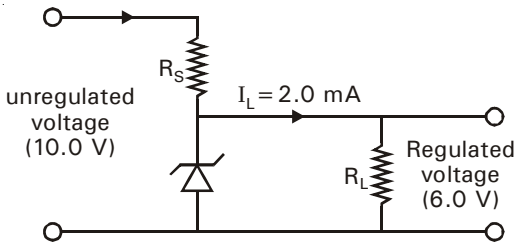
(1) zero
(2) same as input
(3) same as output of full wave rectifier
(4) same as output of half wave rectifier

8. The value of α for a transistor is 0.8. What would be the change in the collector current corresponding to a change of 3mA in the base current in a common emitter arrangement?

(1) 24 mA (2) 12 mA
(3) 18 mA (4) 6 mA

9. For depletion zone of an unbiased p-n junction,

(1) width of the zone is dependent on the densities of the dopants
(2) electric field in the zone is produced by the ionized dopant atoms
(3) both (1) & (2)
(4) neither (1) nor (2)

10. 

In the above figure using zener diode as DC voltage regulator, what should be the value of the series resister R_S, assuming that the zener current as four times the load current?

(1) 150 Ω (2) 800 Ω
(3) 400 Ω (4) 600 Ω

11. If the electron in a hydrogen atom jumps from the fourth orbit to the second orbit, the emitted radiation has wavelength (R is the Rydberg's constant)

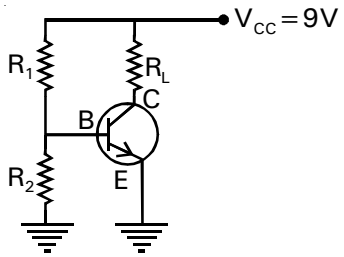
(1) $\frac{36}{5R}$ (2) $\frac{4}{R}$
(3) $\frac{16}{3R}$ (4) $\frac{14}{3R}$

12. **Statement-I** : Einstein's photoelectric equation states that $E_k = h\nu - \phi$. In this equation E_k refers to mean kinetic energy of the emitted electrons.
Statement-II : When yellow light is incident on a surface, no electrons are emitted. Then red light may be suitable for photo emission.

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

13. An electron, an α -particle, and a proton have the same kinetic energy. Then deBroglie wavelengths $\lambda_e : \lambda_p : \lambda_\alpha$ =

(1) 1 : 43 : 85 (2) 85 : 2 : 1
(3) 1 : 54 : 100 (4) 100 : 54 : 1

14. 

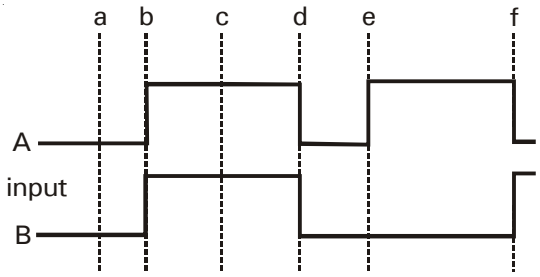
In the given circuit, $R_L = 300\,\Omega$, $\beta = 100$, $I_B = 50\ \mu A$ and $V_{CC} = 9$ V. Then V_{CE} is

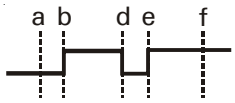
(1) 8 V (2) 5.5 V
(3) 7.5 V (4) 6.5 V

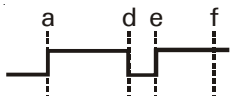
15. Heavy water is used in a nuclear reactor to
(1) provide better cooling
(2) slow down neutrons produced in nuclear reaction
(3) control energy released
(4) control chain reaction

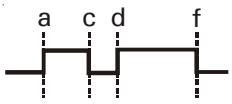
16. **Assertion** : In β^- -decay, an electron comes out of nucleus.
Reason : Electrons exist inside the nucleus.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is false
(4) Assertion is true statement but Reason is false

17. The end of the decay of $_{90}Th^{232}$ is $_{82}Pb^{208}$. The number of α and β particles emitted are
(1) 3, 3 (2) 6, 4
(3) 6, 0 (4) 4, 0

18. 

For the above inputs A and B, which is the output waveform of the OR Gate?
(1) 

(2) 

(3) 

(4) none of the above

19. Which of the following series in the spectrum of the hydrogen atom lies in the visible region of the electromagnetic spectrum ?
(1) Paschen series (2) Balmar series
(3) Lyman series (4) Brackett series

20. Which of the following transitions in a hydrogen atom emits photons of the highest frequency?
(1) $n = 3$ to $n = 2$ (2) $n = 5$ to $n = 4$
(3) $n = 7$ to $n = 6$ (4) $n = 6$ to $n = 4$

21. A proton in a large nucleus, considering all forces, significantly
(1) attracts all other protons
(2) attracts some protons and repels others
(3) attracts all neutrons
(4) both (2) and (3)

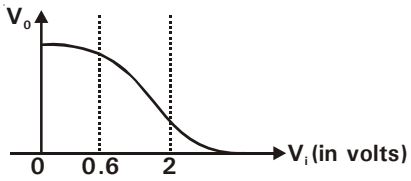
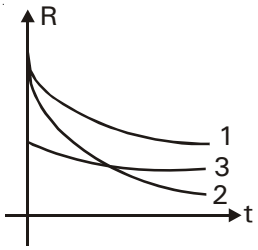
22. 

Figure shows the transfer characteristics of a base biased CE transistor. Then
a. At $V_i = 0.4$ V, transistor is in active state
b. At $V_i = 1$ V, it can be used as an amplifier
c. At $V_i = 0.5$ V, it can be used as a switch turned off
d. At $V_i = 2.5$ V, it can be used as a switch turned on
(1) a, b & c but not d (2) a, b, c & d
(3) c only (4) b, c & d but not a

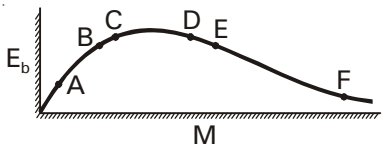
23. The decay constant for the radioactive isotope is 5×10^{-8} s^{-1}. Number of disintegrations taking place in a 0.1 mole of sample per second is about
(1) 10^{16} (2) 3×10^{11}
(3) 3×10^{15} (4) 3×10^{17}

24. de–Broglie wavelength associated with an electron accelerated through a potential difference V is λ. Its wavelength, when the accelerating potential is increased to 4V, will be
(1) λ (2) $0.5\ \lambda$
(3) $0.25\ \lambda$ (4) $2\ \lambda$

25. The graph shows the activity (R) as a function of time 't' for three radioactive samples. Rank the samples according to their half-lives, shortest to longest.



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

26. 

The above is a plot of binding energy per nucleon E_b, against the nuclear mass M; A, B, C, D, E, F correspond to different nuclei. Consider four reactions

(i) $A + B \rightarrow C + e$ (ii) $C \rightarrow A + B + e$
(iii) $D + E \rightarrow F + e$ (iv) $F \rightarrow D + E + e$

where e is the energy released ? In which reaction is e positive ?

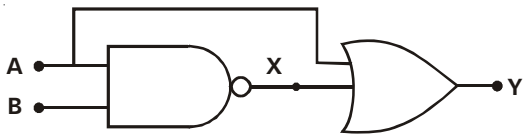
(1) (i) and (iv) (2) (i) and (iii)
(3) (ii) and (iv) (4) (ii) and (iii)

27. The threshold frequency for a certain metal is 2×10^{14} Hz. If light of frequency 5×10^{14} Hz is incident on the metal, what approximately will be the cutoff voltage for the photoelectric emission?

(1) 1.5 V (2) 2.5 V
(3) 3 V (4) 1.25 V

28. A photon of wavelength 1×10^{-7} m has energy 12.3 eV. If light of wavelength 4000 $\overset{o}{A}$, having intensity I, falls on a metal surface, the saturation current is 0.40 mA and the stopping potential is 2.2 V. The work function of the metal is about

(1) 2.5 eV (2) 0.9 eV
(3) 1.2 eV (4) 0.75 eV

29. 

If A = 1 and B = 0, write the output at X and Y.

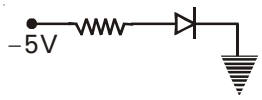
(1) 0 and 1 (2) 1 and 1
(3) 1 and 0 (4) 0 and 0

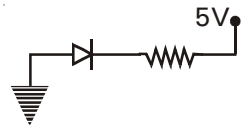
30. Acceleration of electron in second orbit of hydrogen atom is (r = radius of orbit)

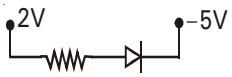
(1) $\frac{h^2}{\pi^2 m^2 r^3}$ (2) $\frac{h^2}{2\pi^2 m^2 r^3}$

(3) $\frac{h^2}{m^2 r^2}$ (4) $\frac{h^2}{4\pi^2 m^2 r^3}$

31. Which of the following diode is forward biased?

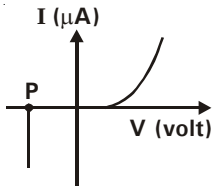
(1) 

(2) 

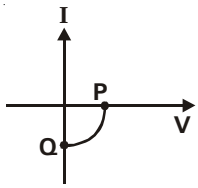
(3) 

(4) 

32. a.



b.



Regarding above figures which is FALSE?

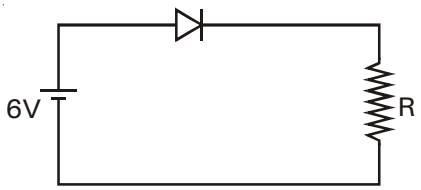
(1) Figure 'a' represents a zener diode

(2) point P in figure 'a' represents reverse breakdown voltage

(3) figure 'b' represents a solar cell

(4) point Q represents open circuit voltage

33.



Voltage drop on the diode is 0.3 V and its maximum power rating is 100 milliwatts. Resistance R required for obtaining maximum current in the circuit is

(1) $15.2\,\Omega$ (2) $17.1\,\Omega$

(3) $21.3\,\Omega$ (4) $19.2\,\Omega$

34. The wavelength λ of de Broglie wave associated with an electron accelerated from rest in a uniform electric field varies with distance travelled (S) as

(1) $\lambda \propto S$ (2) $\lambda \propto S^{-1}$

(3) $\lambda \propto \sqrt{S}$ (4) $\lambda \propto S^{-1/2}$

35. Which of the following processes represents a gamma-decay?

(1) ${}^{A}_{Z}X + \gamma \rightarrow {}^{A}_{Z-1}X + a + b$

(2) ${}^{A}_{Z}X + {}^{1}_{0}n \rightarrow {}^{A-3}_{Z-2}X + c$

(3) ${}^{A}_{Z}X \rightarrow {}^{A}_{Z}X + f$

(4) ${}^{A}_{Z}X + {}_{-1}e \rightarrow {}^{A}_{Z-1}X + g$

PHYSICS : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

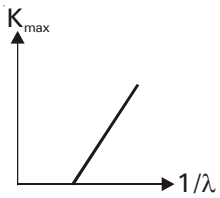
36. A germanium sample is doped with 10^{25} atoms/m^3 of aluminium. Given that intrinsic concentration of electron hole pairs in germanium is 10^{19} m^{-3}, concentration of electrons in the doped sample is

(1) 10^{15} m^{-3} (2) 10^{17} m^{-3}

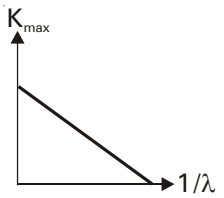
(3) 10^{25} m^{-3} (4) 10^{13} m^{-3}

37. The correct graph between the maximum energy of a photoelectron and the inverse of wavelength of the incident radiation is given by the curve

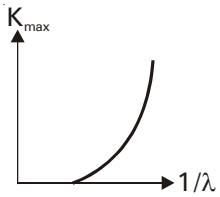
(1)



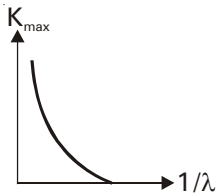
(2)

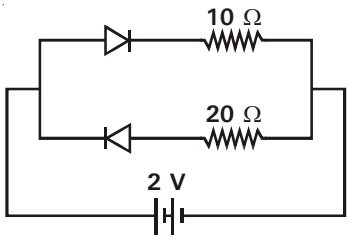


(3)



(4)



38. 

In the above figure, the current supplied by the battery is

(1) 0.1 A (2) 0.2 A
(3) 0.3 A (4) 0.4 A

39. According to Bohr's theory, the radius of the nth orbit of an atom of atomic number Z is proportional to

(1) $\frac{n^2}{Z^2}$ (2) $\frac{n^2}{Z}$
(3) $\frac{n}{Z}$ (4) $n^2 Z^2$

40. Mass defect for a nucleus is 0.06 amu. Binding energy for this nucleus is

(1) 56 MeV (2) 42 MeV
(3) 62 MeV (4) 32 MeV

41. Nuclear forces are

(1) Charge dependent (2) Spin independent
(3) Charge independent (4) Long-range

42. **Assertion** : A pn junction diode offers very high resistance when reserve biased.
Reason : Reverse biasing supresses both diffusion and drift currents in pn junction diode.

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

43. The de-Broglie wavelength of an electron in the 3rd Bohr orbit is related to radius R of the orbit as

(1) $\lambda = 2\pi R$ (2) $\lambda = 3\pi R$
(3) $\lambda = 1.5\pi R$ (4) $\lambda = 2\pi R/3$

44. During the formation of p-n junction

a. electrons diffuse from p-side to n-side
b. electrons diffuse from n-side to p-side
c. holes diffuse from n-side to p-side
d. holes diffuse from p-side to n-side

(1) Both a & b (2) Both b & c
(3) Both b & d (4) Both a & d

45. Cutoff potential for a photocell is 2.5 V. The kinetic energy of most energetic photoelectron is

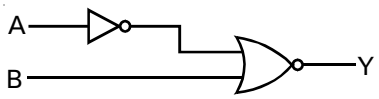
(1) 2.5 J (2) 2.5 eV
(3) zero (4) cannot be found

46. A freshly prepared radioactive source of half life 2 hr emits radiation of intensity which is 64 times permissible safe level. Minimum time, after it would be possible to work safely with this source, is

(1) 6 hr (2) 12 hr
(3) 42 hr (4) 128 hr

47. Let K_1 be the maximum kinetic energy of photoelectrons emitted by a light of wavelength λ_1 and K_2 corresponding to λ_2.
Given $\lambda_1 = 3\lambda_2$, then

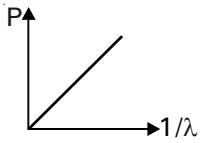
(1) $3K_1 = K_2$ (2) $3K_1 < K_2$
(3) $K_2 = \sqrt{3}\ K_1$ (4) $3K_1 > K_2$

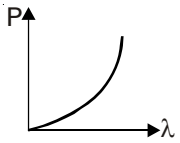
48. 

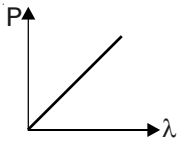
Which of the following boolean expressions gives the output of the given circuit?

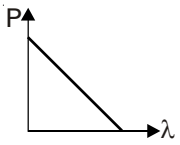
(1) $Y = A\bar{B}$ (2) $Y = \bar{A}B$
(3) $Y = A + \bar{B}$ (4) $Y = \bar{A} + B$

49. Let P be the momentum of a photon of wavelength λ. Slope of which of the following graphs gives Planck's constant?

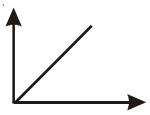
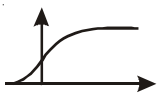
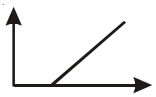
(1) 

(2) 

(3) 

(4) 

50. Match the figures for a given photosensitive material in column I with observations in column II.

Column I		**Column II**
a.		p. graph between stopping potential and frequency of light
b.		q. graph between photoelectric current and intensity of light
c.		r. graph between photoelectric current & potential of collector plate

(1) a-r, b-p, c-q (2) a-q, b-r, c-p
(3) a-r, b-q, c-p (4) a-p, b-r, c-q

CHEMISTRY : SECTION-A

All questions are compulsory in section A

51. The standard Gibb's energy for the given cell reaction in kJ/mole at 298 K is
$Zn(s) + Cu^{+2}(aq) \rightarrow Zn^{+2}(aq) + Cu(s)$; $E^o = 2V$
(1) −192 (2) 192
(3) −384 (4) 384

52. Coordination number and oxidation number of Cr in $K_3[Cr(C_2O_4)_3]$ are respectively
(1) 4 and +2 (2) 6 and +3
(3) 3 and +3 (4) 3 and 0

53. The quantity of electricity in columbs needed to reduce 1 mole of $Cr_2O_7^{2-}$ is
(1) 3 F (2) 6 F
(3) 1 F (4) 4F

54. 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

55. Which one of the following oxides is Amphoteric?
(1) TiO (2) TiO_2
(3) Mn_2O_7 (4) Cu_2O

56. What is the ratio of equivalent weights of $KMnO_4$ as oxidising agent in acidic, alkaline and neutral medium
(1) 3 : 5 : 5 (2) 5 : 3 : 5
(3) 3 : 5 : 1 (4) 1 : 1 : 1

57. Which of the following will give colour to an aqueous solution?
(1) Cu^+ (2) Zn^{2+}
(3) Cr^{3+} (4) Ti^{4+}

58. Which of the following can exhibit optical activity?
(1) Cis$[Co(en)_2Cl_2]$
(2) Cis-$[Pt(NH_3)_2Cl_2]$
(3) trans$[Co(en)_2Cl_2]$
(4) trans-$[Pt(NH_3)_2Cl_2]$

59. A solution of $CuSO_4$ is electrolysed for 10 minute with a current of 1.5 A .The mass of copper deposited at the cathode is
(1) 0.2938 g (2) 6.35 g
(3) 0.3125 g (4) 3.12 g

60. During electrolysis of a solution of $AgNO_3$,9650 coulombs of charge passed through the electroplating both, the mass of silver deposited on the cathode will be
(1) 10.8 gm (2) 21.6 gm
(3) 108 gm (4) 1.08 gm

61. Fuel cells are designed to convert the energy of combustion of fuels directly into electrical energy. Which of the following is NOT the fuel used?
(1) Hydrogen (2) Methane
(3) Methanol (4) Carbondioxide

62. Which of the following is not a π–bonded organometallic compound?
(1) $K[PtCl_3(\eta^2-C_2H_4)]$ (2) $[Cr(\eta^6-C_6H_6)_2]$
(3) $[Fe(\eta^5-C_5H_5)_2]$ (4) $(CH_3)_4Sn$

63. The hybridization of Fe in $K_3[Fe(CN)_6]$ is
(1) sp^3 (2) dsp^3
(3) sp^3d^2 (4) d^2sp^3

64. Standard hydrogen electrode is assigned a zero potential at
(1) 298 K only (2) 273 K only
(3) 303 K only (4) all temperatures.

65. When the sample of copper with zinc impurity is to be purified by electrolysis, the appropriate electrodes are

	Cathode	**Anode**
(1)	Pure zinc	Pure copper
(2)	Impure sample	Pure copper
(3)	Impure zinc	Impure sample
(4)	Pure copper	Impure sample

66. What is true for f-block elements?
(1) There is a greater range of oxidation states in case of actinoids in comparison to lanthanoids
(2) Electronic configuration of actinides is not known with certainty as 5f and 6d sub-shells are very close in energy
(3) Common oxidation states of f-block elements is +3
(4) All are correct

67. Potassium manganate (K_2MnO_4) is formed when
(1) Cl_2 is passed into an aqueous $KMnO_4$ solution
(2) MnO_2 is fused with KOH in air
(3) Formaldehyde reacts with $KMnO_4$ in presence of strong alkali
(4) $KMnO_4$ reacts with concentrated H_2SO_4

68. The cell constant of a conductivity cell
(1) changes with change of electrolyte
(2) changes with change of concentration of electrolyte
(3) changes with temperature of electrolyte
(4) remains constant for a cell

69. The formula dichloridobis (urea) copper (II) is
(1) $[Cu\{O=C(NH_2)_2\}]\ Cl_2$
(2) $[CuCl_2\ \{O=C\ (NH_2)_2\}_2]$
(3) $[Cu\ \{O=C(NH_2)_2\}Cl]Cl$
(4) $[CuCl_2]\ [O=C(NH_2)_2H_2]$

70. Which one of the following complexes is outer orbital complex?
(1) $[Co(NH_3)_6]^{+3}$ (2) $[Fe(CN)_6]^{-3}$
(3) $[Fe(CN)_6]^{-4}$ (4) $[Ni(NH_3)_6]^{+2}$

71. Match the terms given in Column I with the units given in Column II.

Column		**Column II**	
i.	Λ_m	a.	$S\ cm^{-1}$
ii.	E_{Cell}	b.	m^{-1}
iii.	κ	c.	$S\ cm^2\ mol^{-1}$
iv.	G*	d.	V

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

72. Which of the following solutions will have the highest specific conductance?
(1) 0.001 N (2) 0.0001 N
(3) 0.1 N (4) 1.0 N

73. Equivalent conductance of NaCl, HCl and CH_3COONa at infinite dilution are 126.45, 426.16 and 91 $ohm^{-1}\ cm^2$ respectively. The equivalent conductance of CH_3COOH at infinite dilution would be
(1) 101.38 $ohm^{-1}\ cm^2$
(2) 253.62 $ohm^{-1}\ cm^2$
(3) 390.71 $ohm^{-1}\ cm^2$
(4) 678.90 $ohm^{-1}\ cm^2$

74. The cell reaction for given cell is spontaneous if
$Pt;H_2(P_1)|\ H^+(1M)\ ||\ H^+(1M)|(P_2)H_2;Pt$
(1) $P_1 > P_2$ (2) $P_1 < P_2$
(3) $P_1 = P_2$ (4) $P_1 = 1$ atm

75. $[Fe(H_2O)_6]^{+2}$ and $[Fe(CN)_6]^{4-}$ differ in
(1) geometry, magnetic moment
(2) magnetic moment, colour
(3) geometry, hybridisation
(4) hybridisation, no. of unpaired electrons

76. 'A' compound reacts with metal chloride in presence of acid to give an orange red fumes of 'B'. Find A and B respectively
(1) $KMnO_4$, MnO_2 (2) $K_2Cr_2O_7$, CrO_2Cl_2
(3) $K_2Cr_2O_7$, Cr_2O_3 (4) $K_2Cr_2O_7$, PbO

77. **Assertion** :Square planar MABCD has 3 geometrical isomers.
Reason: Square planar MABCD shows optical isomerism also
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

78. For successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionization enthalpy?
(1) Vanadium (Z = 23)
(2) Manganese (Z = 25)
(3) Chromium (Z = 24)
(4) Iron (Z = 26)

79. Which among the following has highest magnetic moment ?
(1) $[Cr(H_2O)_6]^{3+}$ (2) $[Fe(H_2O)_6]^{+2}$
(3) $[Cu(H_2O)_6]^{+2}$ (4) $[Zn(H_2O)_6]^{+2}$

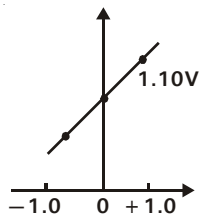
80. Which of the following is a flexidentate ligand?
(1) Cyanido (2) Carbonato
(3) Nitrosyl (4) Thiocyanato

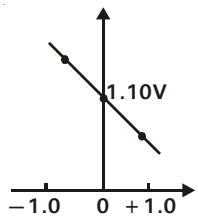
81. The transition metal ion with the least magnetic moment will be with the configuration
(1) $3d^7$ (2) $3d^9$
(3) $3d^2$ (4) $3d^3$

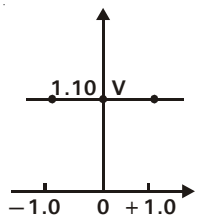
82. Which of the following is used in the treatment of lead poisoning?
(1) EDTA (2) DMG
(3) Cupron (4) α-nitrose-β-napthol

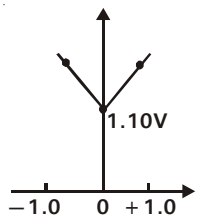
83. Which of the following configuration of ions has zero CFSE in both strong and weak ligand fields?
(1) d^{10} (2) d^8
(3) d^6 (4) d^4

84. Which graph correctly correlates E_{cell} as a function of concentrations for the cell (for different values of M and M')?
$Zn(s) + Cu^{2+}(M) \rightarrow Zn^{2+}(M')\_Cu(s);\ E^\circ_{cell} = 1.10V$
X-axis : $\log_{10}\frac{[Zn^{2+}]}{[Cu^{2+}]}$, Y-axis : E_{cell}

(1)


(2)


(3)


(4)


85. **Statement-I** : For electrical and electolytic both conductance decreases with the increase in temperature .
Statement-II : Kohlrausch law of Independent migration of ions make possible to calculate $\wedge_m^\infty$ for only weak electrolyte.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

CHEMISTRY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

86. Highest oxidation state shown by Mn with flourine is
(1) +6 (2) +7
(3) +4 (4) +2

87. Among TiF_6^{2-}, CoF_6^{3-}, Cu_2Cl_2 and $NiCl_4^{2-}$, the coloured species are
(1) CoF_6^{3-} and $NiCl_4^{2-}$ (2) TiF_6^{2-} and CoF_6^{3-}
(3) $NiCl_4^{2-}$ and Cu_2Cl_2 (4) TiF_6^{2-} and Cu_2Cl_2

88. The increase in equivalent conductance of a weak electrolyte with dilution is due to
(1) increase in degree of dissociation and decrease in ionic mobility
(2) decrease in degree of dissociation and decease in ionic mobility
(3) increase in degree of dissociation and increase in ionic mobility
(4) decrease in degree of dissociation and increase in ionic mobility

89. **Assertion**: Conductivity always increases with decrease in the concentration of electrolyte
Reason: Molar conductivity always increases with decrease in the concentration of electrolyte
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

90. What is not true about ionisation energy of transition elements?
(1) $I.E_2$ of Cr, Mn, V is in the order : V < Cr > Mn
(2) I.E of 5d series is more than 3d & 4d series
(3) Zn, Cd, Hg have low $I.E_1$
(4) $I.E_2$ of Zn, Ni, Cu is in the order : Zn < Cu > Ni

91. Match the items of Column I and Column II.

Column I	**Column II**
i. Lead storage battery	a. maximum efficiency
ii. Mercury cell	b. prevented by galvanisation
iii. Fuel cell	c. gives steady potential
iv. Rusting	d. Pb is anode, PbO_2 cathode

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

92. The cell potential of the following cell
Ni/Ni^{+2} (0.01 M)$||$$Cu^{+2}$(0.1 M)$|$Cu is
Given $E^0_{Cu^{+2}/Cu} = 0.34$ V
$E^0_{Ni^{+2}/Ni} = -0.22$ V
(1) 0.4895 V (2) 0.5895 V
(3) 0.56 V (4) 0.3214 V

93. Which of the following is correct?

(1) If E^{o}_{cell} for a given reaction is negative, then $K_{eq} > 1$

(2) During electrolysis of acidulated water, 1 F liberates 16.8 L of total volume of gases at STP

(3) At equilibrium in an electrochemical cell the E^{o}_{cell} becomes zero

(4) Both (1) and (3)

94. In $Fe(CO)_5$, the Fe–C bond possesses

(1) π character only

(2) ionic character

(3) both σ and π character

(4) σ character only

95. During the electrolysis of a solution of dilute H_2SO_4 by using platinum electrodes, the gas evolved at the anode is

(1) SO_2 (2) O_2

(3) SO_3 (4) H_2

96. Identify the incorrect statement

(1) most ions of d-block are coloured due to d–d transition

(2) most ions of f-block are coloured due to f–f transition

(3) $Sc(H_2O)_6^{3+}$ and $Ti(H_2O)_6^{4+}$ are coloured ions

(4) Cu^{+} is colourless ion

97. Complexes $[Co(NH_3)_5SO_4]Br$ and $[Co(NH_3)_5Br]SO_4$ can be distinguished by

(1) conductance measurement

(2) using $BaCl_2$

(3) using $AgNO_3$

(4) all of these

98. Zr (2nd transition series) has atomic radii 160 pm. The expected atomic radii of Hf (3rd transition series) is

(1) 180 pm

(2) 140 pm

(3) 159 pm

(4) can not be predicted

99. In the equation $\Lambda_{eq} = \text{specific conductance} \times V$, then V for $\frac{1}{10}$ N solution will be

(1) 10 cc (2) 100 c

(3) 1000 cc (4) 10000 cc

100. **Statement-I** : The decrease in metalic radius coupled with increase in atomic mass results in general increase in density of transition element.
Statement-II : In transition elements, there is perfect shielding of one electron by another in the same set of orbitals.

(1) Both statement-I and statement-II are correct

(2) Both statement-I and statement-II are incorrect

(3) Statement-I is correct but statement-II is incorrect

(4) Statement-I is incorrect but statement-II is correct

ZOOLOGY : SECTION-A

All questions are compulsory in section A

101. Which of the folloiwng statements is/are correct?

I. Specific Bt toxin genes have been isolated from *Bacillus thrungienesis*

II. Bt toxin is coded by Cry gene

III. Bt toxin protein exists as inactive protoxins

IV. Bt toxins are produced by butterfly caterpillars

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

(3) III and IV (4) II and IV

102. Match the columns

Column -I		Column -II	
a.	Gene therapy	i.	correct gene defect
b.	Humulin	ii.	A single stranded DNA or RNA tagged with radioactive molecule
c.	Probe	iii.	Diagnostic test
d.	ELISA	iv.	Diabetes mellitus

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

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

103. Transgenic animals are generally produced for all of following needs except:

(1) testing of chemical safety

(2) testing of vaccine safety

(3) stimulation of pathogenicity in humans

(4) production of pharmacologically important proteins

104. Which of the following statement is incorrect w.r.t. gel electrophoresis

(1) DNA fragments are separated on agarose gel which can be visualised after staining with ethidium bromide

(2) Larger the fragments size, farther it moves on gel

(3) DNA fragments resolve according to their size through seiving effect provided by gel

(4) Most commonly used matrix is agarose extracted from sea weeds

105. Which of the following is used as a vector for cloning genes into animals ?
(1) *Baculovirus*
(2) *Retrovirus*
(3) *Salmonella typhimurium*
(4) *Bacillus thrungienesis*

106. The crops engineered for glyphosate are resistant/ tolerant to
(1) Bacteria (2) Insects
(3) Herbicides (4) Fungi

107. **Assertion** : Genetic energineering overcomes the drawbacks of traditional hybridisation
Reason : Genetic Engineering involves creation of a recombinant DNA to introduce desirable genes into target organisms
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

108. Resistance to *Meloidegyne* in Tobacco has been developed by
(1) introducing siRNA into transgenic worms
(2) introducing nematode specific genes into plant
(3) ensuring formation of plant specific RNA into Tobacco to provide resistance against worms
(4) introducing mRNA to interfere production of nematode specific protein

109. α-1 antitrypsin produced in transgenic animals was targeted to treat
(1) cystic fibrosis
(2) protein deficiency in young chidren
(3) emphysema
(4) clotting disorders

110. Genetic modification has all the following effects except for
(1) Increased reliance on chemical pesticides
(2) Increased efficiency of mineral usage by plants
(3) Enhanced nutritional food value
(4) More tolerance towards abiotic stresses

111. Bt toxin gene has been cloned from _____ & expressed in _____
(1) plants ; bacteria
(2) bacteria ; plants
(3) animals ; bacteria
(4) bacteria ; animals

112. Select the option that excludes the given characters applicable to plasmid
a. Circular & transferable
b. Contains essential genes
c. Extra chromosomal
d. Self replicating
e. Single stranded having single Ori
(1) b & e (2) a, d
(3) d, e (4) b, d, e

113. Which of the given transgenic plants is not correctly matched to its application or feature
(1) Golden rice – Biofortification of food
(2) Bt cotton–Pest feeding on plant dies
(3) Tobacco– Pesticide resistance
(4) None of these

114. Which of the following restriction enzymes are used in rDNA technology?
(1) 

(2) 

(3) 

(4) 

115. Which of the following is incorrect ?
(1) *Agrobacterium* infects monocot plants and cereals.
(2) Alternate ADA enzyme therapy offers permanent cure for SCID.
(3) An infection by *Meloidogyne incognitia* increases the yield of Tobacco plant.
(4) All of these

116. What is true for genetically engineered humulin?
a. Chains A and B are produced separately
b. It is exactly similar to human insulin
c. C-peptide is removed during maturation of humulin
d. chain A and B were combined by creating disulphide bonds to form humulin
(1) a, b, c and d (2) a, b and d
(3) b, c and d (4) a, b, and c

117. First Gene Therapy was given to a 4 year old girl in the year _____ and first transgenic cow producing human milk protein was developed in the year _____.
(1) 1990; 1983 (2) 1997; 1994
(3) 1990; 1997 (4) 1994; 1997

118. Match the columns

a. Restriction endonuclease	i. separating two DNA strands of dsDNA
b. Taq polymerase	ii. cleaving terminal nucleotide from DNA strand
c. Exonucleases	iii. adding nucleotides to 3′ OH end of primer
d. High temperature	iv. cleaving sugar-phosphate back bone of plasmid DNA

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

119. When foreign DNA is inserted within the coding sequence of β-galactosidase, it will
(1) produce colour due to insertion activation
(2) produce colour due to insertional inactivation
(3) not produce colour due to insertional inactivation
(4) not produce colour due to insertional activation

120. Mark the correct statement
(1) pBR322 has EcoRI enzyme that can be used as selectable marker in rDNA experiments
(2) Microinjection is not suitable method for transformation of animal cell
(3) 'Ori' is the sequence from where the replication of DNA starts and it also controls the copy number of plasmids
(4) Treating bacterial cell with divalent cations decreases the efficiency with which DNA enters the bacterium

121. Identify palindromic sequence out of the given

(1) 5′ G A A T C 3′ / 3′ C T T A G 5′

(2) 5′ A T G G A T 3′ / 3′ T A C C T A 5′

(3) 5′ C G A T C G 3′ / 3′ G C T A G C 5′

(4) 5′ G T C G G A C 3′ / 3′ C A G C C T G 5′

122. If one circular plasmid with 4 restriction sites for some RE(x) is cut with this enzyme then, how many fragments will be obtained?
(1) Three (2) Four
(3) Five (4) Six

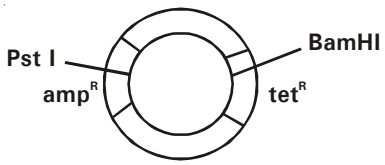
123. Choose the correct pair

	Category	Examples	Exception
(1)	**Sites present on the tet^R region of PBR 322**	**Cla I, Bam H I Sal I**	**Sal I**
(2)	**Lysing enzymes**	**Lysozyme, DNA ligase, chitinase**	**DNA ligase**
(3)	**Features required to facilitate cloning into vector**	**Ori, selectable marker, alkaline phosphatase**	**Selectable marker**
(4)	**Modern biotechnology techniques**	**Wine making, DNA vaccine, IVF technique**	**DNA vaccine**

124. EcoRI identifies the base sequence GAATTC and cuts the____ bond between nucleotides bearing ____
(1) Hydrogen; G & A
(2) Hydrogen; A & T
(3) Phosphodiester; G & A
(4) Phosphodiester; T & C

125. PCR is used to amplify DNA to
(1) detect HIV in suspected AIDS patients
(2) detect mutations in genes in suspected cancer patients
(3) identify many genetic disorders
(4) all of these

126. In the cloning vector pBR 322 shown below the alien DNA is ligated at BamHI and tranferred to bacterium. Which of the following statements are true w.r.t. this ligation?



a. The recombinant-plasmid will lose tetracyclin resistance
b. Growing the bacteria on ampicillin medium will help in selection of recombinants
c. Growing bacteria on tetracycline medium will help in selection of transformants
(1) a, b and c (2) a and b
(3) b and c (4) a only

127. Read the following statements and choose the correct answer.
a. rDNA formation includes cutting of source and vector DNA with same restriction endonuclease
b. Vector and insert with same sticky ends are ligated by using DNA polymerase to form rDNA.
(1) 'a' is correct and 'b' is incorrect
(2) 'a' is incorrect and 'b' is correct
(3) both are correct
(4) both are incorrect

128. How many of the following are required to perform PCR ?
Template DNA, Thermostable DNA Polymerase, Retrovirus , Nuclease, Mg^{2+}, dNTPs, Primers
(1) Six (2) Five
(3) Four (4) Three

129. Foreign /desirable DNA to be introduced into a cell is also called
(1) vehicle DNA (2) passenger DNA
(3) r-DNA (4) vector DNA

130. The two core techniques that enabled birth of modern biotech are
(1) genetic engineering and recombinant DNA technology
(2) genetic engineering and contamination free microbial culture
(3) genetic engineering and plasmid study
(4) enzymology and genetic engineering

131. Which of the following is there in pBR322 as selectable marker
(1) Ampicillin
(2) tet^R
(3) Gene for galactosidase
(4) All of the above

132. A mixture of DNA fragments A, B, C and D, with molecular weights of A + B = C, B < A and D > C position of these fragments from cathode to anode sides of the gel would be
(1) B, A, C, D (2) A, B, C, D
(3) D, C, A, B (4) B, A, D, C

133. Choose the incorrect option
(1) The linking of antibiotic resistance gene with the plasmid vector became possible with DNA ligase
(2) In *Bam HI*, H represents strain of bacteria
(3) Traditional hybridisation involves selective inclusion and multiplication of desired genes
(4) Each restriction endonuclease recognise a specific palindromic sequence

134. **Statement-I :**Biopiracy is use of bio resources by multinational companies and other organisation without proper authorisation.
Statement-II : 37 documented varities of Basmati are grown in India.
(1) Statement-I is correct but statement-II is incorrect
(2) Both statement-I and statement-II are correct
(3) Both statement-I and statement-II are incorrect
(4) Statement-I is incorrect but statement-II is correct

135. In PCR, chemically synthesised oligonucleotides are used as primers. Which of the following primers is used for copying the given ss DNA sequence
3′ A G T C A GG T T C A A G G C C T 5′
(1) 3′ T C A G 5′ (2) 5′ A C A G 3′
(3) 3′ A G G C 5′ (4) 5′ T C A G 3′

ZOOLOGY : SECTION-B

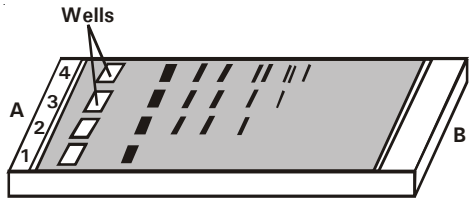
This section has 15 questions, attempt any 10 questions of them.

136. Silencing of a gene can be achieved through
(1) Short interfering RNA
(2) Antisense RNA
(3) RNA interference
(4) All of these

137. Which of the following must be present in a plasmid to be used as a cloning vector based on its ability to produce color in presence of a chromogenic substrate?
a. ori
b. multiple cloning sites
c. one antibiotic resistance gene
d. a reporter gene
e. a reporter enzyme
(1) a, b, c and d (2) a, b, c and e
(3) a, c and e (4) a, b and d

138. The following steps of genetically modifying an organism, are given below. Arrange them chronologically?
A = Introduction of alien DNA into host
B = Maintenance of introduced DNA in host
C = Identification of DNA with desirable genes
(1) A → B → C (2) B → A → C
(3) C → A → B (4) C → B → A

139. Which statements are correct about the gel electrophoresis shown?



(1) DNA fragments near the end B are shorter as compared to fragments near end A
(2) The force for movement of the DNA fragments is provided by the matrix of agarose gel
(3) The end A has the positive electrode
(4) The staining of the separated DNA bands with ethidium bromide is called elution

140. Transgenic models for diseases are animals that help us
a. in vaccine testing
b. in chemical safety testing
c. to develop new treatments for disease
d. to understand how genes contribute to development of disease
(1) a, b, c, d (2) a, b, and d
(3) c and d (4) b and c

141. It is possible to get results in shorter time for chemical safety testing by using GMO that are
(1) more resistant to toxic substances
(2) more sensitive to toxic substances
(3) not exposed to toxic substances
(4) fed excess of toxic substances

142. How many of these techniques serve the purpose of early diagnosis?
r-DNA technology, Serum analysis, ELISA, Urine analysis, PCR
(1) two (2) three
(3) four (4) five

143. Sparged stirred bioreactor
(1) is used for laboratory scale testing of process
(2) only uses batch type culture
(3) provides optimal conditions for achieving desired product
(4) does not provide adequate aeration and mixing of contents

144. **Assertion** : Therapeutic proteins to be taken orally are being redesigned at genetic level to make them free of labile peptide bonds.
Reason : Therapeutic proteins should not be digested in gut but should be absorbed directly.
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

145. Cotton bollworms are controlled by toxic proteins encoded by genes
(1) *cry I Ac* and *cry II Ab*
(2) *cry I Ab* and *cry II Ac*
(3) *cry I Ac* and *cry II Ac*
(4) *cry I Ab* and *cry II Ab*

146. What is true about Engerix?
a. First generation vaccine
b. Second generation vaccine
c. Prepared through r-DNA technology
d. Prepared against bacterial infection
e. Transgenic yeast has been used to prepare it
(1) a, c and d (2) b, c and e
(3) d, c and e (4) a, c, d and e

147. If, spooling is [X] ; Elution is [Y] , then
(1) [X] is used to collect DNA
(2) [Y] is not related to gel electrophoresis
(3) [X] always follows [Y]
(4) [Y] is a technique that digests the DNA strands

148. Bacteria called natural genetic engineer has
(1) *Agrobacterium tumefacien*
(2) T DNA
(3) Tumor inducing plasmid (Ti plasmid)
(4) both (2) and (3)

149. **Statement-I :** Biotechnology is integration of natural science and organisms, cells, parts there of and molecular analogues for products and services.
Statement-II : EFB defines biotechnology by combining both traditional as well as modern view.
(1) Statement-I is correct but statement-II is incorrect
(2) Both statement-I and statement-II are incorrect
(3) Both statement-I and statement-II are correct
(4) Statement-I is incorrect but statement-II is correct

150. Identify the correct sequence in which the enzymes/chemicals are used to isolate DNA from bacteria for r-DNA technology
(1) Cellulase–Chilled ethanol–RNase
(2) Lysozyme–RNase–Chilled ethanol
(3) Cellulase–Chitinase–Lysozyme
(4) lysozyme–Chitinase–Chilled ethanol

BOTANY : SECTION-A

All questions are compulsory in section A

151. Apomixis is development of a new plant
(1) without fusion of gametes
(2) from fusion products of gametes
(3) from stem cuttings
(4) from root cuttings

152. **Statement-I** : Male sex organ, antheridium is found in *Marchantia*.
Statement-II : Antheridium and oogonium both are found at same node in *Chara*.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

153. Which of the following is not function of tapetum?
(1) Helps in pollen wall formation
(2) Helps in anther dehiscence
(3) Transport of nutrients to inner side of anther
(4) Synthesis of callase enzyme for separation of microspore tetrad

154. If a female plant is tetraploid and a male plant is diploid, then the ploidy level of the suspensor and endosperm is respectively
(1) 3x, 3x (2) 3x,5x
(3) 3x, 4x (4) 4x, 4x

155. Arrange the following seeds in order of their decreasing viability period and choose the correct option
(1) *Phoenix, Oxalis,* Lotus, *Lupinus*
(2) *Oxalis,* Lotus*, Phoenix, Lupinus*
(3) *Lupinus*, *Phoenix*, Lotus, *Oxalis*
(4) *Oxalis*, *Lupinus*, *Phoenix*, Lotus

156. Find the option with the correct identification of diagrams (w.r.t. type of endosperm)

(a) (b) (c)

(1) a-nuclear, b-helobial
(2) a-helobial, b-cellular
(3) c-helobial, b-cellular
(4) b-cellular, c-nuclear

157. **Assertion**: Development of zygote depends upon life cycle of organisms
Reason: Zygote is the vital link that ensures the continuity of species
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false

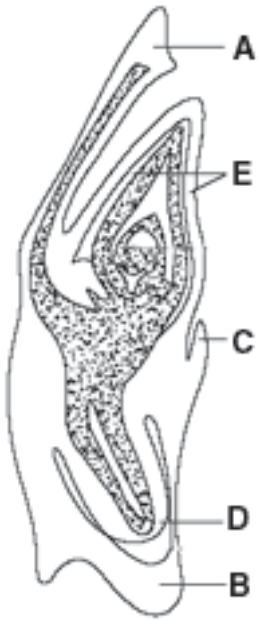
158. Zygote is covered by hard calcareous shell in
(1) mammals and birds
(2) birds and reptiles
(3) mammals and reptiles
(4) reptiles and fungi

159. Which is incorrectly matched?

(1)	Endothecium	nutrition
(2)	Epidermis	protection
(3)	Tapetum	pollenkitt
(4)	Sporogenous cell	potential pollen mother cell

160. Choose the correct pair of statements
a. Emasculation is required in case of unisexual flowers
b. Pollen pistil interaction is a dynamic process
c. Orchid fruit contain only a few tiny seeds
d. Fruits formed as a result of fertilisation could be a false fruit
(1) a & b (2) c & d
(3) a & c (4) b & d

161. Identify the following diagram and label its parts



(1) A-Scutellum, B-Epiblast, C-Coleorhiza, D-Radicle, E-Coleoptile
(2) A-Scutellum, B-Coleorhiza, C-Epiblast, D-Radicle, E-Coleoptile
(3) A-Epiblast, B-Scutellum, C-Coleoptile, D-Radicle, E-Coleorhiza
(4) A-Coleoptile, B-Radicle, C-Coleorhiza, D-Epiblast, E-Scutellum

162. How many of the following plants bear unisexual flowers?
Viola, *Cucurbita*, *Oxalis*, *Papaya*, Castor, Maize, *Commelina*, Date palm, Sweet potato
(1) 4 (2) 3
(3) 5 (4) 6

163. Double fertilization, is referred to as
(1) Two generative fertilizations
(2) Two vegetative fertilizations
(3) One generative fertilization and one vegetative fertilization
(4) Either (1) or (3)

164. Flower with a feathery and sticky stigma, numerous light pollen, reduced petals is characteristically
(1) moth pollinated flower
(2) bird pollinated flower
(3) bee pollinated flower
(4) wind pollinated flower

165. How many statements are true?
a. Pollen products are used as food supplement
b. Caruncle is outgrowth at chalazal end
c. The primary endosperm nucleus develops into endosperm
d. Megaspore divides twice to form an 8-nucleate embryo sac
e. Pollen grains are shed at 3-celled stage in >40% of angiosperms
(1) 2 (2) 3
(3) 4 (4) 5

166. Cleistogamous flower are
(1) male flowers which never open
(2) unisexual flowers which never open
(3) bisexual flowers which never open
(4) open bisexual flowers which perform self pollination in bud condition

167. Which of the following is a disease resistant variety of cauliflower?
(1) Pusa Gaurav
(2) Pusa Sadabahar
(3) Pusa Shubhra
(4) Pusa Komal

168. What is true for meristem culture?
(1) It leads to the formation of haploid plantlets
(2) Apical or axillary meristem can be taken as an explant
(3) It involves fusion of somatic cells
(4) It is not a method of rapid clonal multiplication

169. Which of the following statement is correct?
(1) Earthworm is unisexual
(2) Dioecious term discribes bisexual condition
(3) Dioecious organisms are seen in both plants and animals
(4) Both (1) and (3)

170. Which of the following is mismatched?
(1) Heterogamete – Pea
(2) Isogamete – *Fucus*
(3) Anisogamete – Human
(4) Homogamete – *Cladophora*

171. How many of the following statements are incorrect?
(i) Pollination does not guarantee the transfer of the right type of pollen
(ii) Pollination by wind is more common amongst biotic pollinations
(iii) Chasmogamous flowers are invariably allogamous
(iv) Pollen grain represents male sporophytic generation
(v) Ovule is integumented megasporangium
(1) 1 (2) 2
(3) 3 (4) 4

172. Which of the following statements is not true regarding the structure of pollen grain?
(1) Inner exine is made up of sporopollenin
(2) Inner intine is made up of pectin and cellulose
(3) Generative cell is small and floats in the cytoplasm of vegetative cell
(4) Vegetative cell is bigger and contain abundant food reserve

173. Presence of male and female flowers on same plant prevents
(1) autogamy but not geitonogamy
(2) allogamy but not autogamy
(3) both autogamy and geitonogamy
(4) both autogamy and allogamy

174. Select the incorrect statement
(1) Sexual reproduction is elaborate, complex and slow process
(2) Annual & biennial plants show clear cut phases of life
(3) Juvenile phase is of variable duration in different organisms
(4) In animals, the juvenile phase is not followed by morphological & physiological changes prior to active reprodcutive behaviour

175. Explant is
(1) plant collected after harvesting
(2) exploited part of a plant
(3) small part of the plant meant for tissue culture
(4) uprooted for transplantation

176. Identify the incorrect match
(1) *Amoeba* – Pseudopodiospores
(2) Hydra – Fragmentation
(3) *Penicillium* – Conidia
(4) Flower – Vegetative propagule

177. Pick the option with biofortified crops
(1) Shakti,Rattan,Protina
(2) Himgiri,KaranRai, Reimei
(3) Sonora64, LermaRojo64A
(4) Pusa Sawani, Pusa Sem 2

178. Select the incorrect statement w.r..t reproduction
(1) Reproduction enables the continuity of the species generation after generation
(2) Genetic variation is created and inherited during reproduction
(3) Each organism has evolved its own mechanism to multiply and produce offsprings
(4) Only the internal physiology is responsible for organism's reproductive behaviour

179. Arrange the main steps in palnt breeding programmes in a systematic way
i. collection of variability
ii. testing, release and commercialization of new cultivars
iii. evaluation and selection of parents
iv. selection and testing of superior recombinants
v. cross hybridization among the selected parents
(1) i, iii, v, ii, iv (2) i, iii, v, iv, ii
(3) iv, i, ii, v, iii (4) i, iv, iii, v, ii

180. Name the type of vegetative propagule shown in the picture

(1) Eyes
(2) Rhizome
(3) Bulbil
(4) Leaf buds of *Bryophyllum*

181. If an endosperm cell of angiosperm has 48 chromosomes, the number of chromosome in each pollen will be
(1) 8 (2) 16
(3) 32 (4) 24

182. The megasporangium of wheat plant, on maturation, gives rise to the
(1) endosperm (2) seed
(3) embryo (4) fruit

183. Which one of the following came as a contaminant into India with imported wheat and causes pollen allergy?
(1) Carrot grass (2) Doob grass
(3) Rice (4) Nutmeg

184. Which of the following statements is wrong for SCP?
(1) Microbes like *Spirulina* are easily grown on materials like animal manure and even sewage
(2) They provide an alternate source of proteins for animal and human nutrition
(3) Their production cost is high
(4) It reduces environmental pollution

185. Function of synergid is to
(1) attract pollen tube and bear its shock
(2) fuse with extra male gametes and form endosperm
(3) produce additional embryo
(4) protect egg from pathogens

BOTANY : SECTION-B

This section has 15 questions, attempt any 10 questions of them.

186. How many of the following varieties are rice varieties?
Jaya, Kalyan sona, IR-36, Sonalika, Ratna, IR-8, Taichung native-1, Pusa Lerma, HD-1553
(1) Three (2) Four
(3) Five (4) Six

187. Micropropagation technique is not
(1) used for rapid vegetative multiplication of ornamental plants
(2) used to get plants throughout the year
(3) used for sterile plant which cannot maintain their characters by sexual reproduction
(4) involving gamete formation and their fusion

188. Zoospores are asexual reproductive structures found in
(1) *Ulothrix* (2) *Chlamydomonas*
(3) *Ectocarpus* (4) All the above

189. **Statement-I** : Apomictic embryos in citrus arise from diploid egg.
Statement-II : The bird, Turkey shows parthenogenesis.
(1) Both statement-I and statement-II are correct
(2) Both statement-I and statement-II are incorrect
(3) Statement-I is correct but statement-II is incorrect
(4) Statement-I is incorrect but statement-II is correct

190. For developing pest resistance in crops, which of the following is not a desired character?

(1) Hairy leaves against jassids in Cotton.
(2) Solid stems against sawfly in wheat
(3) Nectar-less cotton varieties against bollworm
(4) Low aspartic acid in Maize against stem borer

191. From the statements given below choose the option that are true for a typical female gametophyte of a flowering plant:

i. It is 8-nucleate and 7-celled at maturity
ii. It shows free-nuclear development
iii. It is situated inside the integument but outside the nucellus
iv. It has an egg apparatus situated at the chalazal end

(1) i & iv (2) ii & iii
(3) i & ii (4) ii & iv

192. Water hyacinth is

(1) one of the most fast growing weed in sea water and standing water
(2) a aquatic herb
(3) a floating plant that drains oxygen from water
(4) both (2) and (3)

193. How many of the following statements are correct?

(i) The most vital event of sexual reproduction is the fusion of gametes
(ii) During embryogenesis, zygote undergoes cell division and cell differentiation
(iii) Sweet potato has bisexual flowers
(iv) Gametes produced during sexual reproduction can be haploid or diploid
(v) Unisexual male flowers are known as staminate flowers

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

194. Identify the correct match

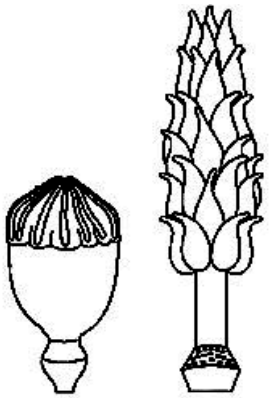
(1) Wheat – Non- albuminous seed
(2) Strawberry – True fruit
(3) Grasses – Apomixis
(4) Orobanche – Single seeded

195. Which of the following groups show external fertilization ?

a. algae b. reptiles
c. birds d. fishes
e. mammals f. amphibians

(1) a, c and d (2) c, e and f
(3) a, d and f (4) d, e & f

196. Identify the type of carpel with the help of diagrams given below



(1) A - Multicarpellary syncarpous
B - Multicarpellary apocarpous
(2) A - Multicarpellary apocarpous
B - Multicarpellary syncarpous
(3) A - Bicarpellary syncarpous
B - Monocarpellary syncarpous
(4) A - Monocarpellary apocarpous
B - Monocarpellary syncarpous

197. Which of the following is not a pre-fertilisation event in flowering plant?

(1) Transfer of pollen grains
(2) Formation of embryo sac
(3) Formation of endosperm
(4) Formation of pollen tube

198. Which of the following are the advantages of seed formation ?

a. seed have better adaptive strategies
b. seed coat provide protection to young embryo
c. they generate new genetic combination
d. pollination and fertilisation are independent of water

(1) a & d only (2) a, b & c only
(3) d only (4) a, b, c & d only

199. Which of the following is edible in Apple ?

(1) Legume (2) Siliqua
(3) Pod (4) Thalamus

200. **Assertion**: During artificial hybridisation of dioecious plants, there is no need for emasculation
Reason: Female parent produces only unisexual flowers

(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion and Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Assertion is false