Aakash
Medical | IIT-JEE | Foundations

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MM : 720 Final Test Series(P1)-2024-25_Test-08B **Time : 180 Min.**

Topics Covered:
Physics: Dual Nature of Radiation and Matter, Atoms, Nuclei, Semiconductor Devices, Experimental Skills
Chemistry: Some Basic Concepts of Chemistry, Structure of Atom, Classification of Elements and Periodicity in Properties
Botany: The Living World, Biological Classification, Plant Kingdom
Zoology: Biotechnology: Principles and Processes, Biotechnology and Its Applications

General Instructions :
Duration of Test is 3 hrs.
The Test consists of 180 questions. The maximum marks are 720.
There are four parts in the question paper consisting of Physics, Chemistry, Botany and Zoology having 45 questions in each part of equal weightage.
Each question carries +4 marks. For every wrong response, –1 mark shall be deducted from the total score. Unanswered/unattempted questions will be given no marks.
Use blue/black ballpoint pen only to darken the appropriate circle.
Mark should be dark and completely fill the circle.
Dark only one circle for each entry.
Dark the circle in the space provided only.
Rough work must not be done on the Answer sheet and do not use white fluid or any other rubbing material on the Answer sheet.

PHYSICS

1. An intrinsic semiconductor is converted into *p*-type semiconductor by doping it with

(1) Phosphorous

(2) Arsenic

(3) Aluminium

(4) Germanium

2. A nucleus with mass number 200 breaks into two fragments each of mass number 100, the binding energy per nucleon of unfragmented nuclei is 7.5 MeV while that of fragments is 8.5 MeV. Energy released in the process will be

(1) 100 MeV

(2) 200 MeV

(3) 1700 MeV

(4) 1500 MeV

3. In a photoelectric effect experiment, if number of photon available is increased, then

(1) Number of electrons absorbing the photon increases.

(2) Number of electrons absorbing the photon remains same.

(3) Number of electrons coming out of the metal increases.

(4) Both (1) and (3)

4. Given below are two statements
Statement (I): Light emitting diode (LED) is designed to operate under forward biasing.
Statement (II): Solar cell is designed to operate under reverse bias condition.
In the light of the above statements, choose the most appropriate answer from the options given below.

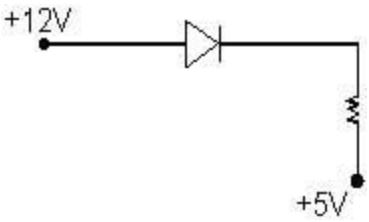
(1) Both statement (I) and statement (II) are correct

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

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

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

5. In which of the following diode is reversed Biased?

(1)


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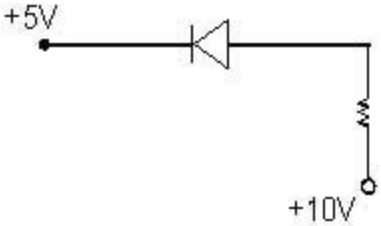

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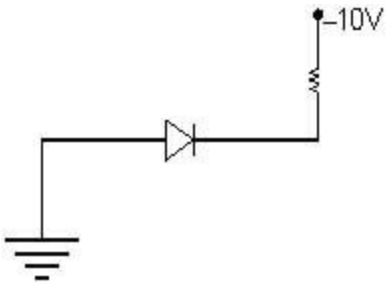

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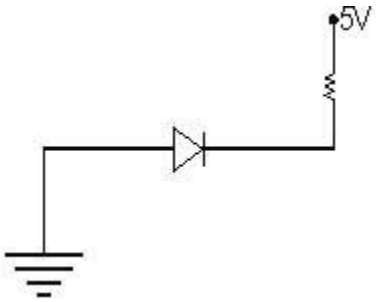


6. A screw gauge has least count of 0.1 mm and its circular scale is divided into 50 equal divisions. The pitch of the screw gauge is

(1) 1 mm

(2) 0.1 mm

(3) 5 mm

(4) 10 mm

7. Nuclear reactions obey the law of conservation of

(1) Mass-energy

(2) Charge

(3) Momentum

(4) All of the above

8. A nucleus at rest splits into two nuclear parts having radii in the ratio 1 : 4. Their magnitude of velocities are in the ratio

(1) 64 : 1

(2) 16 : 1

(3) 1 : 16

(4) 1 : 4

9. The de-Broglie wavelength of an electron moving with kinetic energy of 169 eV is nearly

(1) 944×10^{-1} nm

(2) 944×10^{-2} nm

(3) 944×10^{-3} nm

(4) 944×10^{-4} nm

10. The solids which have the positive temperature coefficient of resistance are

(1) Metals

(2) Insulator only

(3) Semiconductors only

(4) Insulators and semiconductors

11. According to Bohr's model for hydrogen and hydrogen type atoms. Match the Column I with Column II.

	Column I		**Column II**
(a)	Frequency	(i)	Proportional to n
(b)	Angular momentum	(ii)	Proportional to $\frac{Z}{n}$
(c)	Linear momentum	(iii)	Proportional to $\frac{Z^2}{n^3}$
(d)	Radius	(iv)	Proportional to $\frac{n^2}{Z}$

(1) (a)(i); (b)(iii); (c)(ii); (d)(iv)

(2) (a)(iii); (b)(i); (c)(iv); (d)(ii)

(3) (a)(ii); (b)(i); (c)(iii); (d)(iv)

(4) (a)(iii); (b)(i); (c)(ii); (d)(iv)

12. Consider the following statements out of which one is labelled as Assertion (A) and other as reason (R).
Assertion (A): In the process of photoelectric emission, all the emitted photoelectrons have same kinetic energy (KE)
Reason (R): According to Einstein's photo electric equation, $(K.E.)_{max} = h\nu - \varphi$
In the light of above statements, choose the correct option.

(1) Both (A) and (R) true and (R) is the correct explanation of (A)

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

(3) Both (A) and (R) are false

(4) (A) is false but (R) is true

13. The electron concentration in an *n*-type semiconductor is the same as hole concentration in a *p*-type semiconductor. An external field (electric) is applied across each of them. Compare the currents in them.

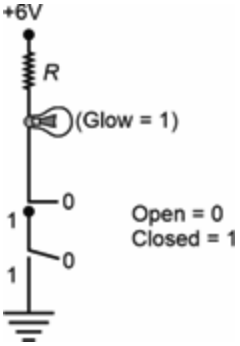
(1) No current will flow in *p*-type, currents will only flow in *n*-type.

(2) Current in *n*-type = current in *p*-type

(3) Current in *p*-type > current in *n*-type

(4) Current in *n*-type > current in *p*-type

14. Identify the equivalent logic gate represented by the given circuit.



(1) OR

(2) AND

(3) NAND

(4) NOR

15. Choose the set of correct statements from the following.
Statement (A): Threshold frequency does not depends on intensity of incident light.
Statement (B): The intercept on *x*-axis of a graph drawn between stopping potential on *y*-axis and frequency on *x*-axis gives threshold frequency.
Statement (C): There is no time lag between incidence of photon and emission of photo electrons.
The correct option is

(1) Statements A and B are correct only

(2) Statements A and C are correct only

(3) Statements B and C are correct only

(4) All statements A, B and C are correct

16. When $_{90}X^{288}$ gets converted into $_{80}Y^{260}$, then the number of α and β-particle emitted will be respectively

(1) 7, 4

(2) 5, 7

(3) 4, 7

(4) 7, 7

17. An α particle is moving in a circular path of radius *r* in the presence of magnetic field *B*. The de-Broglie wavelength associated with the particle will be (q → charge on α particle)

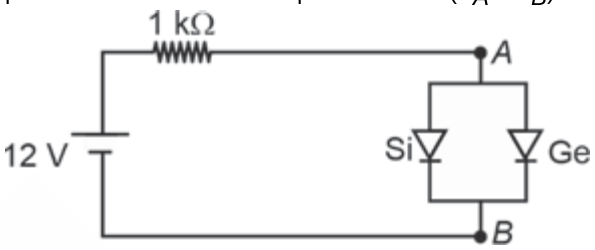
(1) $\frac{hr}{qB}$

(2) $\frac{hB}{qr}$

(3) $\frac{h}{qBr}$

(4) $\frac{hr^2}{qB}$

18. A circuit containing diodes is shown in the figure. The potential difference across point *A* and *B* ($V_A - V_B$) is



(1) 11.7 V

(2) 11.3 V

(3) 0.7 V

(4) 0.3 V

19. Let ν_1 be the frequency of first line of Lyman series and ν_2 be the frequency of first line of Balmer series, then the frequency of second line of Lyman series is

(1) $\nu_1 - \nu_2$

(2) $\nu_1 + \nu_2$

(3) $\nu_2 - \nu_1$

(4) $\frac{\nu_1\nu_2}{\nu_1+\nu_2}$

20. If the nuclear radius of ^{64}X nucleus is 4.8 fermi then the nuclear radius of ^{125}Y nucleus is

(1) 4.8 fermi

(2) 6 fermi

(3) 3.8 fermi

(4) 7.5 fermi

21. The ratio of product of energy and radius of orbiting electron for hydrogen atom in 5th and 7th stable orbit is

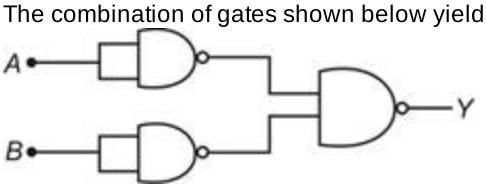
(1) 1 : 1

(2) 25 : 49

(3) 49 : 25

(4) 125 : 343

22. The combination of gates shown below yields



(1) OR gate

(2) NOT gate

(3) NOR gate

(4) NAND gate

23. The force that allows electron to move around the nucleus is

(1) Nuclear force

(2) Weak nuclear force

(3) Electrostatic force

(4) Gravitational force

24. The work function of a metal is 2 eV. Its threshold wavelength is about

(1) 620 nm

(2) 1240 nm

(3) 310 nm

(4) 900 nm

25. Which energy state of doubly ionized lithium (Li^{++}) has the same energy as that of the ground state of hydrogen? (Z for lithium = 3)

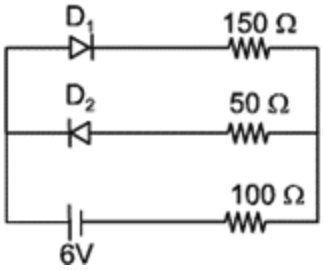
(1) $n = 2$

(2) $n = 3$

(3) $n = 6$

(4) $n = 4$

26. The circuit shown in figure contains two diodes each with a forward resistance of 50 Ω and infinite reverse resistance. If the battery voltage is 6 V, then the current through the 100 Ω resistance is



(1) 0.04 A

(2) 0.02 A

(3) 0.2 A

(4) 0.15 A

27. A point source of light is placed at a distance of 2 m from a photocell and cut-off potential is found to be V_0. If distance between point source and photocell is halved, then cut-off potential will be

(1) V_0

(2) $4V_0$

(3) $2V_0$

(4) $\frac{V_0}{2}$

28. In measurement of mass of a given object by the principle of moments, the meter scale is hung from its mid-point. A known weight of mass 4 kg is hung at one end of meter scale and a unknown weight of mass m kg is hung 20 cm from the centre at other side of the balance. The value of mass m is

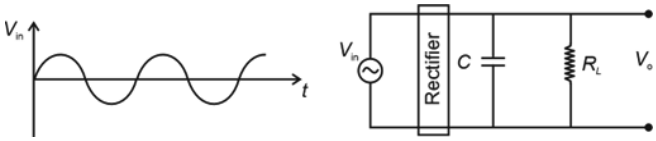
(1) 1.6 kg

(2) 4 kg

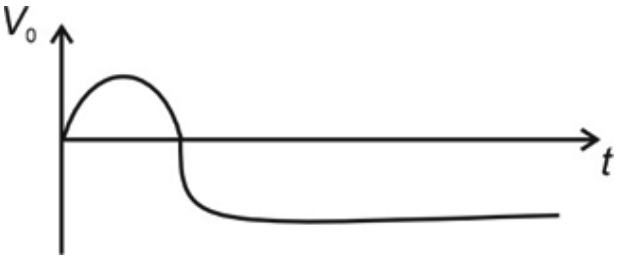
(3) 8 kg

(4) 10 kg

29. A full wave rectifier with an input ac voltage (V_{in}) is shown.



Choose the correct output voltage (V_0)

(1)


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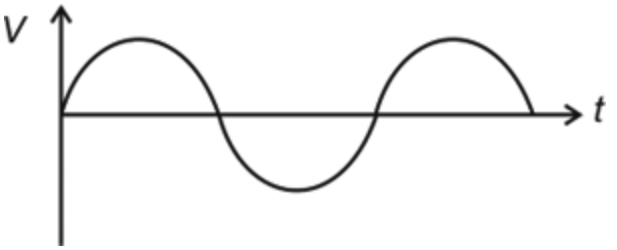

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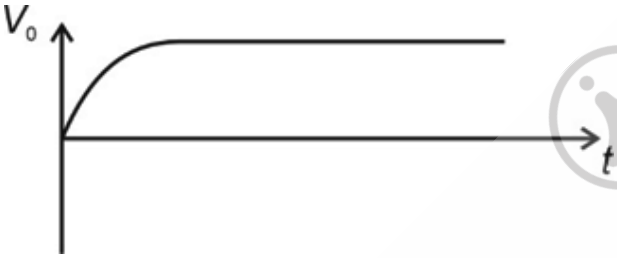

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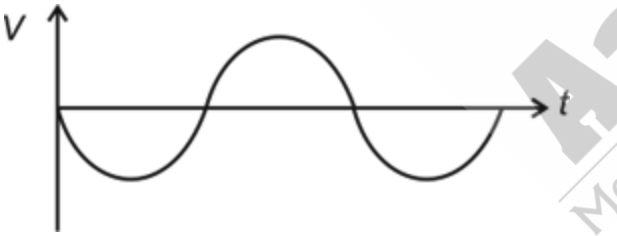


30. A screw gauge advances by 4 mm in 8 rotations. There are 50 divisions on circular scale. Find the least count of screw gauge.

(1) 0.01 cm

(2) 0.01 mm

(3) 0.05 mm

(4) 0.05 cm

31. A capillary tube of radius r is immersed in water and water rises to height h in tube. The mass of water rise in capillary tube is 6 g. Another capillary tube of radius $2r$ is immersed in water. The mass of water that will rise in the tube is

(1) 9 g

(2) 10 g

(3) 12 g

(4) 3 g

32. ${}_6C^{12}$ absorbs an energetic neutron and emits a ${}_{-1}\beta^0$ particle. The resulting nucleus will be

(1) ${}_7N^{14}$

(2) ${}_7N^{13}$

(3) ${}_5B^{13}$

(4) ${}_6C^{13}$

33. **Assertion (A):** In a p-type semiconductor, the number of electrons is less than intrinsic semiconductor.
Reason (R): Rate of recombination of electrons with holes would increase due to the increase in the number of holes.
In the light of above statements, choose the correct option.

(1) Both (A) and (R) true and (R) is the correct explanation of (A)

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

(3) Both (A) and (R) are false

(4) (A) is true but (R) is false

34. The binding energy of the nucleus ${}_{80}X^{198}$ will be represented as
(m_p = mass of proton, m_N = mass of neutron, m_X = mass of nucleus)

(1) $(198\, m_p - m_X)c^2$

(2) $(198\, m_N - m_X)c^2$

(3) $(80\, m_p + 118 m_N - m_X)c^2$

(4) $(118\, m_p + 80 m_N - m_X)c^2$

35. The binding energies per nucleon are 5 MeV, 6 MeV and 7 MeV for the nuclei, X^3, Y^4 and Z^5 respectively. If one nucleus of X combines with one nucleus of Z to give two nuclei of Y, then

(1) 2 MeV of energy absorbed

(2) 2 MeV of energy released

(3) 6 MeV of energy released

(4) 6 MeV of energy absorbed

36. The radius of second stationary orbit in Bohr's atom is r. The radius of the third orbit in the same atom will be

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

(2) $\frac{9}{4}r$

(3) $3r$

(4) $9r$

37. Blue light can eject photo-electron from a photo-sensitive surface while yellow light cannot. Then

(1) Violet light can eject photo-electron

(2) Orange light cannot eject photo-electron

(3) Green light may or may not eject photo-electron

(4) All of the above

38. When a nucleus with atomic number *Z* and mass number *A* undergoes a radioactive decay process, then
(a) Both *Z* and *A* will decrease, if the process is α-decay
(b) *Z* will decrease but *A* will increase, if the process is β^+ decay
(c) Z will increase but *A* will not change, if the process is β^- decay
(d) Both *Z* and *A* will remain unchanged, if the process is γ decay
The **correct** option is

(1) (a) and (d) are only true

(2) (a), (c) and (d) are only true

(3) (c) and (d) are only true

(4) All (a), (b), (c) and (d) are true

39. A tuning fork of frequency 160 Hz is vibrated just above a cylindrical tube. The length of the tube *L* = 170 cm. Water is slowly poured into the tube. The minimum height of water required for resonance is (speed of sound in air = 320 m s^{-1})

(1) 10 cm

(2) 20 cm

(3) 15 cm

(4) 150 cm

40. If the wavelength of the incident radiation changes from λ_1 to λ_2, then the maximum kinetic energy of the emitted photo-electrons changes from K_1 to K_2, then work function of the emitter surface is

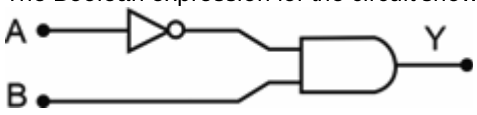
(1) $\frac{K_2-K_1}{\lambda_1-\lambda_2}$

(2) $\frac{K_2\lambda_2-K_1\lambda_1}{\lambda_1-\lambda_2}$

(3) $\frac{K_2\lambda_1-K_1\lambda_2}{\lambda_1-\lambda_2}$

(4) $\frac{K_1\lambda_1-K_2\lambda_2}{\lambda_1-\lambda_2}$

41. The Boolean expression for the circuit shown in figure is



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

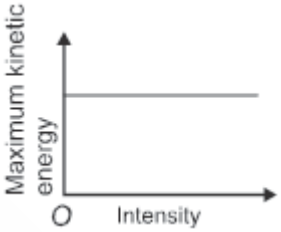
(2) $Y = AB$

(3) $Y = \overline{A+B}$

(4) $Y = \bar{A}B$

42. If frequency of incident light is constant, then choose the correct option.

(1)



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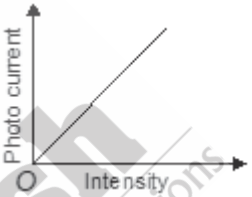
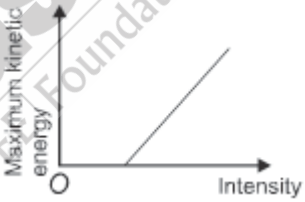


(3)



(4) Both (1) & (2)

43. When a hydrogen atom is raised from first excited state to 2^{nd} excited state, then

(1) Both KE and PE increases

(2) Both KE and PE decreases

(3) PE increases and KE decreases

(4) KE increases and PE decreases

44. Binding energy per nucleon of nuclei '*A*' and '*B*' are 6.8 MeV and 5 MeV respectively. Then correct option is

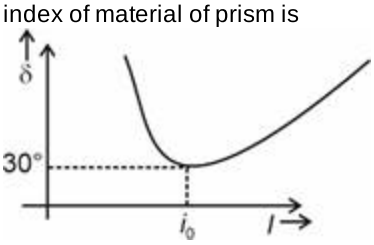
(1) *B* is more stable

(2) *A* is more stable

(3) *A* & *B* are equally stable

(4) Stability does not depend on binding energy per nucleon

45. While performing an experiment to study variation of angle of deviation with angle of incidence a student plots the following graph. The angle of prism is 60°. The refractive index of material of prism is



(1) 1.414

(2) $2\sin^{-1}(0.7)$

(3) $2\sin^{-1}(0.85)$

(4) 2

CHEMISTRY

46. Number of carbon atoms present in 540 u of glucose is

(1) $18\ N_A$

(2) $3\ N_A$

(3) 18

(4) 72

47. Mass of ammonia produced on reaction of 10 g of hydrogen gas with 56 g of nitrogen gas is

(1) 24.23 g

(2) 66 g

(3) 56.67 g

(4) 48.41 g

48. If 3.01×10^{22} molecules of urea are present in 50 mL of an aqueous solution then the molarity of the solution will be

(1) 0.5 M

(2) 1.5 M

(3) 1 M

(4) 2.5 M

49. If the mass ratio of methane and sulphur dioxide is 1 : 4, then the ratio of their atoms will be

(1) 1 : 4

(2) 2 : 3

(3) 5 : 3

(4) 2 : 1

50. Consider the following sets of quantum numbers

	n	*l*	*m*	*s*
(a)	4	2	–2	$+\frac{1}{2}$
(b)	3	1	+2	$-\frac{1}{2}$
(c)	5	3	+1	$+\frac{1}{2}$
(d)	2	0	–1	$-\frac{1}{2}$

The correct sets are

(1) (a) and (c) only

(2) (a) and (b) only

(3) (a), (b) and (c) only

(4) (a), (b), (c) and (d)

51. The total energy of electron in second orbit of Li^{2+} ion is

(1) -8.72×10^{-18} J

(2) -4.18×10^{-20} J

(3) -4.9×10^{-18} J

(4) -2.09×10^{-18} J

52. Element with atomic number 44 belongs to

(1) 6^{th} period and 6^{th} group

(2) 5^{th} period and 8^{th} group

(3) 5^{th} period and 10^{th} group

(4) 6^{th} period and 10^{th} group

53. Symbols of elements having atomic number 104 and 109 respectively are

(1) Uuq and Une

(2) Unt and Une

(3) Unq and Unn

(4) Unq and Une

54. Energy of one mole of photons of radiation having wavelength 1200 nm will be
(h = 6.6×10^{-34} Js)

(1) 9.9×10^{4} J

(2) 4.5×10^{5} J

(3) 3.3×10^{6} J

(4) 2.1×10^{3} J

55. Volume of CO_2 liberated at STP on the complete combustion of 80 g of methane gas in presence of excess of O_2 gas is

(1) 224 L

(2) 56 L

(3) 112 L

(4) 22.4 L

56. Given below are the two statements

Statement I : Na^+ is larger in size as compared to Mg^{2+}

Statement II : Na^+ and Mg^{2+} are isoelectronic species.

In light of above statements, choose the correct 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 statement II are correct

(4) Both statements I and statement II are incorrect

57. Consider the following pair of elements
(a) N and S
(b) Mg and B
(c) Li and Mg
(d) Be and Al
The pairs of elements which are diagonally related are

(1) (a) and (b) only

(2) (c) and (d) only

(3) (b), (c) and (d) only

(4) (a), (c) and (d) only

58. Number of protons, neutrons and electrons in $^{237}_{93}\mathrm{Np}$ respectively are

(1) 93, 237, 93

(2) 93, 144, 93

(3) 144, 237, 93

(4) 93, 93, 144

59. Given below are the two statements

Statement I: Energy of 2*s* orbital of lithium is greater than energy of 2*s* orbital of hydrogen.

Statement II: Energies of the orbitals in the same subshell decrease with increase in the atomic number (Z_{eff})

In light of above statements, choose the correct 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 statement II are correct

(4) Both statement I and statement II are incorrect

60. If 12.5 g of an impure sample of $CaCO_3$ on heating gives 5.6 g of calcium oxide then percentage purity of the compound will be

(1) 75%

(2) 80%

(3) 85%

(4) 90%

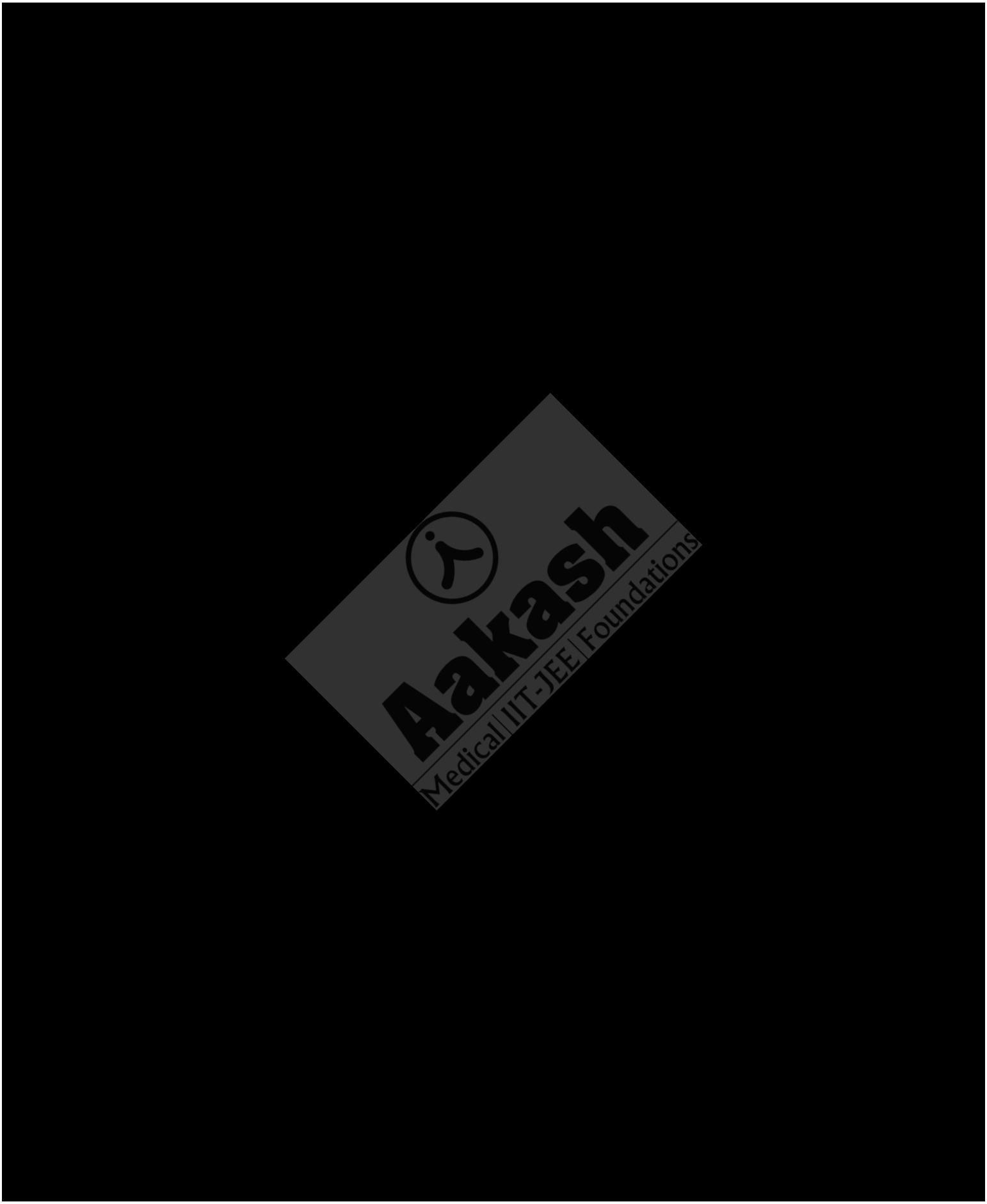
61. If the mass percentage of sulphur in a compound is 5% then the minimum molar mass of the compound will be

(1) 320 g mol^{-1}

(2) 640 g mol^{-1}

(3) 1280 g mol^{-1}

(4) 400 g $mole^{-1}$


Aakash
Medical|IIT-JEE|Foundations

72. Mass of NaOH required to react completely with 10 ml of 3 M HCl solution is

(1) 1.5 g

(2) 1.2 g

(3) 2.5 g

(4) 1.8 g

73. The mass of precipitate formed when 100 mL of 34% $\frac{W}{V}\%$ solution of $AgNO_3$ is mixed with 100 mL of 11.7% $\frac{W}{V}\%$ $NaCl$ solution (Atomic masses: Ag = 108 u, N = 14 u, O = 16 u, Na = 23 u, Cl = 35.5 u) is

(1) 15.6 g

(2) 20.5 g

(3) 28.7 g

(4) 35.1 g

74. Which of the following transitions in the hydrogen atom will give rise to the least energetic photon?

(1) n = 4 to n = 3

(2) n = 5 to n = 4

(3) n = 6 to n = 5

(4) n = 7 to n = 6

75. Number of degenerate orbitals in 3^{rd} excited state of hydrogen atom is

(1) 9

(2) 4

(3) 3

(4) 16

76. Which of the following series of transition in the spectrum of hydrogen atom fall in ultraviolet region?

(1) Balmer series

(2) Brackett series

(3) Lyman series

(4) Paschen series

77. An organic compound contains carbon, hydrogen and oxygen. Its elemental analysis gave C, 40% and H, 6.67% by mass. The empirical formula of the compound will be

(1) CHO

(2) CH_2O

(3) CH_2O_2

(4) CH_4O

78. For multielectronic species the correct order of energy of the given orbitals will be

(1) $4f > 4d > 5p > 5s$

(2) $5p > 5s > 4f > 4d$

(3) $4f > 5p > 4d > 5s$

(4) $5p > 4d > 4f > 5s$

79. The element which has the highest negative electron gain enthalpy is

(1) F

(2) Cl

(3) Br

(4) I

80. Given below are the two statements

Statement I: Electronegativity is a qualitative measure of the ability of an atom in a chemical compound to attract shared electrons to itself.

Statement II: Sulphur is the most electronegative element of the third period in periodic table.

In light of above statements, choose the correct answer.

(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

81. Match the IUPAC name given in column A with its IUPAC official name given in column B.

	Column-A		**Column-B**
a.	Unnilennium	(i)	Copernicium
b.	Ununbium	(ii)	Mendelevium
c.	Unnilquadium	(iii)	Meitnerium
d.	Unnilunium	(iv)	Rutherfordium

Which of the following options is correct?

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

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

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

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

82. Most electropositive element among the following is

(1) Li

(2) Cs

(3) Na

(4) K

83. Consider the given elements and their respective electronic configurations.
A: $1s^2\ 2s^2\ 2p^6$
B: $1s^2\ 2s^2\ 2p^5$
C: $1s^2\ 2s^2\ 2p^3$
D: $1s^2\ 2s^2\ 2p^6\ 3s^1$
The correct order of the increasing ionisation potential is

(1) A < D < B < C

(2) D < B < C < A

(3) C < D < B < A

(4) D < C < B < A

84. The orbital angular momentum of 3*d* electron is

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

(2) $\sqrt{6}\hbar$

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

(4) $\sqrt{5}\hbar$

85. Orbital in which electron density is not along the axis, is

(1) $2p_x$

(2) $3p_y$

(3) $4p_z$

(4) $3d_{xy}$

86. Consider the following statements
(a) Variation of heat capacity of solids can be explained by particle nature of electromagnetic radiation
(b) Diffraction of light can be explained by wave nature of electromagnetic radiation
(c) Work function of lithium is lesser than sodium
The correct statement(s) is/are

(1) (a) only

(2) (a) and (b) only

(3) (b) and (c) only

(4) (a), (b) and (c)

87. Which among the following is an incorrect statement about canal rays?

(1) Canal rays are positively charged gaseous ions in discharge tube

(2) The charge to mass ratio of canal rays depends on the gas from which these originate

(3) Canal rays may carry a multiple of the fundamental unit of electrical charge

(4) Canal rays originate from anode surface

88. If a 60 watt bulb emits monochromatic radiation of wavelength 600 nm then number of photons emitted per second by the bulb will be

(1) 1.8×10^{20}

(2) 3.6×10^{21}

(3) 1.8×10^{21}

(4) 3.6×10^{20}

89. Mass percent of glucose in an aqueous solution is 18%. The molality of glucose solution is

(1) 1.22 m

(2) 1.86 m

(3) 2.21 m

(4) 0.75 m

90. If the uncertainty in position of a particle is twice of that of its momentum, then uncertainty in its velocity will be

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

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

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

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

BOTANY

91. Select the **odd** one out w.r.t. taxonomic categories of wheat.

(1) Poaceae

(2) Sapindales

(3) Poales

(4) Monocotyledonae

92. Read the following statements and select the **correct** option.
Statement (A): Lower the taxa, less are the characteristics that the members within the taxon share.
Statement (B): Higher the category, greater is the difficulty of determining the relationship to other taxa at same level.

(1) Only statement (A) is correct

(2) Only statement (B) is correct

(3) Both statements (A) and (B) are correct

(4) Both statements (A) and (B) are incorrect

93. Which of the following statements is **correct** w.r.t. the organism that causes bovine spongiform encephalopathy (BSE)?

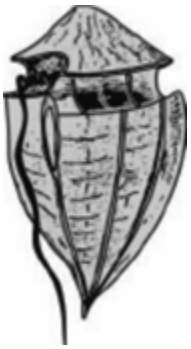
(1) It was discovered by T.O. Diener.

(2) It is an agent consisting of abnormally folded protein.

(3) It is always smaller than viruses.

(4) It is a nucleoprotein and the genetic material is infectious.

94.



Identify the **correct** statement w.r.t. the above organism.

(1) It is a fresh water organism found in stagnant water.

(2) It is photosynthetic in the presence of sunlight but in the absence of sunlight they behave like heterotrophs.

(3) Its cell wall has stiff cellulose plates on the outer surface.

(4) It has a protein rich layer called pellicle instead of a cell wall, which makes their body flexible.

95. All are the basis for the division of the kingdom fungi into various classes, **except**

(1) Morphology of the mycelium

(2) Mode of spore formation

(3) Fruiting bodies

(4) Mode of nutrition

96. Match column I with column II and select the **correct** option.

	Column I		**Column II**
(a)	Wheat rust	(i)	*Ustilago*
(b)	Bread mould	(ii)	*Albugo*
(c)	Parasitic fungus on mustard	(iii)	*Rhizopus*
(d)	Smut fungus	(iv)	*Puccinia*

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

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

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

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

97. __A__ can fix atmospheric nitrogen in specialised cells called __B__.
Fill in the above blanks from the correct option given below.

	A	B
(1)	*Rhizobium*	Heterocysts
(2)	*Nostoc*	Heterocysts
(3)	*Anabaena*	Mesosomes
(4)	Slime mould	Plasmodium

(1) (1)

(2) (2)

(3) (3)

(4) (4)

98. Mycelium is aseptate and coenocytic in

(1) *Penicillium*

(2) *Mucor*

(3) *Alternaria*

(4) *Trichoderma*

99. Select the **correctly** matched pair.

(1) Psilopsida – *Adiantum*

(2) Pteropsida – *Dryopteris*

(3) Sphenopsida – *Selaginella*

(4) Lycopsida – *Psilotum*

100. Which of the following pairs of disease is caused by prions?

(1) PSTD and mumps

(2) Mad cow disease in cattle and Cr-Jacob disease in humans.

(3) Small pox and mad cow disease

(4) Potato spindle tuber disease and mad cow disease

101. All are specific epithets of *Solanum,* **except**

(1) *tuberosum*

(2) *nigrum*

(3) *aestivum*

(4) *melongena*

102. Which of the following taxonomic categories is showing the correct hierarchical arrangement in ascending order w.r.t. housefly?

(1) Muscidae → Insecta → Diptera → Arthropoda

(2) Arthropoda → Insecta → Diptera → Muscidae

(3) Muscidae → Diptera → Insecta → Arthropoda

(4) Arthropoda → Diptera → Insecta → Muscidae

103. State true (T) or false (F) and select the **correct** option.
(a) Genera are aggregates of closely related species.
(b) Families are characterised on the basis of both vegetative and reproductive features of plant species.
(c) Convolvulaceae and Solanaceae are included in the order Poales, mainly based on floral characters.
(d) The word systematics is derived from the Latin word 'systema'.

	a	b	c	d
(1)	T	T	F	F
(2)	T	T	F	T
(3)	F	T	F	T
(4)	F	F	T	T

(1) (1)

(2) (2)

(3) (3)

(4) (4)

104. Who used *Systema Naturae* as the title of his publication?

(1) Ernst Mayr

(2) Darwin

(3) Carolus Linnaeus

(4) Aristotle

105. Which one of the following categories of taxonomic hierarchy will have maximum number of common characters?

(1) Family

(2) Class

(3) Order

(4) Division

106. Identify the stored food present in the members to which *Dictyota* belongs

(1) Starch

(2) Mannitol and laminarin

(3) Floridean starch

(4) Glycogen and amylopectin

107. Select the **incorrectly** matched pair of the given algae w.r.t. economic importance.

(1) *Gelidium* – Agar is obtained

(2) *Fucus* – Rich source of iodine

(3) *Gracilaria* – It gives algin , a hydrocolloid

(4) *Chlorella* – Rich in proteins

108. Read the following statement (A–D).
(A) The plant body is attached to substratum by root like structures that may be unicellular.
(B) The dominant phase of the plant is haploid stage that generates gametes by mitosis.
(C) The sporophyte is not free-living but attached to the photosynthetic gametophyte for nourishment
(D) They are heterosporous vascular cryptogams and fail to develop seed.
Select the **correct** statements w.r.t. the group of plants called the amphibians of the plant kingdom.

(1) Only (A), (B) and (D)

(2) Only (C) and (D)

(3) Only (A), (B) and (C)

(4) Only (B) and (D)

109. Select the algae in which anisogamous type of sexual reproduction occurs

(1) *Volvox*

(2) *Fucus*

(3) *Polysiphonia*

(4) *Eudorina*

110. Read the following Assertion (A) and Reason (R) and select the **correct** option.
Assertion (A): Gymnosperms are plants in which ovules are not enclosed by any ovary wall and remain exposed.
Reason (R): In gymnosperms, the male and the female gametophyte do not have an independent free-living existence.

(1) Both (A) and (R) are true and (R) is the correct explanation of (A).

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(3) (A) is true but (R) is false.

(4) Both (A) and (R) are false.

111. Choose the **incorrect** statement.

(1) Consciousness is the most obvious and technically complicated feature of all living organisms.

(2) Plants respond to external factors like light, water, temperature etc.

(3) Prokaryotes cannot sense and respond to the environmental cues.

(4) Photoperiod affects reproduction in seasonal breeders.

112. Which of the following statements is **not** true w.r.t. slime moulds?

(1) During unfavourable conditions, the plasmodium differentiates and forms fruiting bodies

(2) The spores possess true walls and are extremely resistant

(3) The spores are dispersed by air currents

(4) Slime moulds are the only parasitic protists

113. Select the type of genetic material which is found in TMV

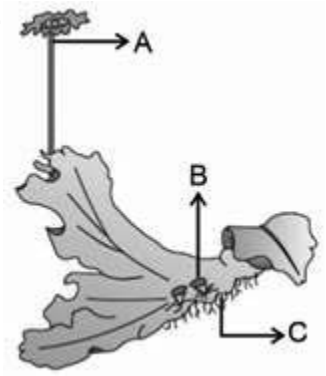
(1) ssRNA

(2) dsDNA

(3) ssDNA

(4) dsRNA

114.



In the above diagram, the structure that helps in asexual reproduction by forming buds is/are

(1) A only

(2) B only

(3) B and C

(4) A and C

115. ICBN stands for

(1) International Code for Biological Nomenclature

(2) International Code for Botanical Nomenclature

(3) Indian Code of Biological Nomenclature

(4) Indian Code of Botanical Nomenclature

116. Identify the **correctly** printed scientific name

(1) *Mangifera indica Linnaeus*

(2) *Mangifera Indica* Linnaeus

(3) *Mangifera indica* Linn.

(4) Mangifera Indica Linn

117. Monkey, gorilla and gibbon is placed under the order, named

(1) Animalia

(2) Mammalia

(3) Primata

(4) Chordata

118. Which of the following is **not** an edible fungus?

(1) *Agaricus*

(2) Morels

(3) Truffles

(4) *Puccinia*

119. Identify the **incorrect** statement w.r.t. Archaebacteria.

(1) They differ from other bacteria in having a different cell wall structure

(2) Cell wall contains branched chain lipids

(3) They have introns in their genetic sequence

(4) They can also survive in most harsh habitats

120. Read the following statements and choose the **correct** option.

Assertion : Natural system of classification classify organisms on the basis of their natural affinities.

Reason : Fossils play important role in natural system of classification to elucidate evolutionary relationship among organisms.

(1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion.

(2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.

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

(4) Both Assertion and Reason are false statements.

121. Dorsiventral thalloid gametophyte is absent in all, **except**

(1) *Funaria*

(2) *Sphagnum*

(3) *Polytrichum*

(4) *Marchantia*

122. Which of the following option includes taxa belonging to the same rank?

(1) *Homo, Felis, pardus*

(2) Solanaceae, *leo*, Convolvulaceae

(3) *Mangifera, Solanum, Panthera*

(4) *Hominidae, Triticum*, Dicotyledonae

123. Match the column I with column II and select the **correct** option.

Column I	**Column II**
a. Methanogens	(i) Photoautotrophic
b. Halophiles	(ii) Guts of ruminants
c. Thermoacidophiles	(iii) Heterotrophic
d. Cyanobacteria	(iv) Hot water springs

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

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

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

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

124. Identify the **incorrect** statement w.r.t. gymnosperms.

(1) In *Cycas,* small specialised roots called coralloid roots are associated with N_2 fixing cyanobacteria.

(2) In conifers, the needle like leaves reduce the surface area thus they can withstand extremes of temperature humidity and wind.

(3) In *Cycas*, male cones and megasporophylls are borne on different trees.

(4) The stems are unbranched in *Cedrus* and branched in *Pinus*

125.

The above organism belongs to the class,

(1) Pteropsida

(2) Sphenopsida

(3) Lycopsida

(4) Psilopsida

126. Select the **mismatched** pair

(1) *Chara* – Chlorophyll *a*, *b* are major pigments.

(2) *Ectocarpus* – Pear shaped gametes

(3) *Porphyra* – Chlorophyll *a*, *d* and phycoerythrin are major pigments.

(4) *Volvox* – Produce nonmotile male and female gametes

127. Read the following statements and select the correct option
Statement A : No non-living object exhibits metabolism.
Statement B : Isolated metabolic reactions *in vitro* are said to be living reactions.

(1) Only statement (A) is correct

(2) Only statement (B) is correct

(3) Both statements are incorrect

(4) Both statements are correct

128. Which of the given categories has maximum number of organisms?

(1) Kingdom

(2) Species

(3) Order

(4) Class

129. Select the **correct** option to fill the blanks.

Characters	**Monera**	**Protista**	**Fungi**
Cell type	A	Eukaryotic	B
Cell wall	Non-cellulosic	C	Chitin
Body organisation	D	Cellular	E

(1) A-Prokaryotic, B-Eukaryotic, D-Cellular

(2) B-Eukaryotic, D-Tissues, E-Organ

(3) A-Eukaryotic, C-Absent, E-Loose tissue

(4) B-Prokaryotic, C-Chitin, D-Cellular

130. Which of the following is **not** asexual spore?

(1) Zoospore

(2) Sporangiospore

(3) Zygospore

(4) Conidia

131. *Cuscuta* is a/an
(a) Eukaryotic organism
(b) Heterotrophic organism
(c) Parasite
(d) Plant

(1) Only (a) is correct

(2) Only (a) & (d) are correct

(3) Only (a), (b) & (d) are correct

(4) All (a), (b), (c) & (d) are correct

132. Lichen is association between

(1) Fungi and roots of higher plants

(2) Two autotrophic partners

(3) Algae and cyanobacteria

(4) Autotrophic and heterotrophic partners

133. Read the following statements and state **true (T)** or **false (F)** for them.
a. Numerical taxonomy considers hundreds of characters simultaneously.
b. Cytotaxonomy is based on information like chromosome number, structure and behaviour.
c. Bentham and Hooker are proponents of artificial system of classification.
d. Chemotaxonomy is based on chemical constituents of the plants.

	a	b	c	d
(1)	T	T	T	T
(2)	T	T	F	T
(3)	T	T	F	F
(4)	F	F	T	T

(1) (1)

(2) (2)

(3) (3)

(4) (4)

134. Protonema is

(1) A type of spore

(2) A gametophytic stage

(3) Spore producing structure

(4) Diploid structure

135. How many of the following features differentiates between red algae and brown algae?
a. Presence of flagella in asexual spores
b. Main component of cell membrane
c. Type of stored food material
d. Mode of vegetative reproduction

(1) 2

(2) 1

(3) 4

(4) 3

ZOOLOGY

136. For replication of a foreign piece of DNA, it has to be linked with _____ of an autonomously self- replicating DNA in a host. Select the correct option to fill in the blank.

(1) *rop*

(2) Selectable marker

(3) *ori*

(4) Restriction site

137. If the gene of interest which is 20 kb long is present at the middle of a DNA fragment, then which of the following enzymes can be used to separate out this gene of interest?

(1) Exonuclease

(2) Restriction endonuclease

(3) DNA ligase

(4) DNA polymerase

138. One linear and one closed circular DNA molecule is digested with same restriction enzyme recognising a unique site, occurring once in each. How many fragments will be obtained respectively?

(1) 1, 2

(2) 2, 1

(3) 1, 1

(4) 2, 2

139. How many cycles of PCR are required for obtaining 512 molecules of dsDNA, if the process starts with one molecule of dsDNA ?

(1) 8

(2) 9

(3) 7

(4) 6

140. All of the following methods of diagnosis are suitable for early detection of a disease, **except**

(1) ELISA

(2) PCR

(3) Urine analysis

(4) RDT

141. Which of the following is/are required in a bioreactor for achieving the desired product?
(a) Raw materials
(b) Optimum temperature
(c) Optimum pH
(d) Salts, vitamins and substrate
Select the **correct** option.

(1) (a), (b) and (c) only

(2) (b), (c) and (d) only

(3) (a), (c) and (d) only

(4) (a), (b), (c) and (d)

142. All of the following are correct w.r.t. continuous culture system, **except**

(1) Produces a larger biomass which leads to higher yield of desired protein.

(2) Cells having rDNA can multiply in this culture.

(3) Cells are maintained in their physiologically most active log phase

(4) The used medium is drained out from one side only once at the end.

143. Identify the palindromic sequence in the following and choose the **correct** option.

(1) 5'GAATTC3'
3'CTTUUG5'

(2) 5'GAATTC3'
3'CTTAAG5'

(3) 5'CCTTGGA3'
3'GGACCT5'

(4) 5'CGATAC3'
3'GCTAAG5'

144. How many techniques mentioned below is/are included under biotechnology?
(a) *In vitro* fertilisation leading to a test tube baby
(b) Synthesising a gene and using it
(c) Developing a DNA vaccine
(d) Correcting a defective gene
Choose the **correct** option.

(1) Zero

(2) Two

(3) Three

(4) Four

145. Which of the following is **not** a feature of the plasmids?

(1) Transferable

(2) Replicates with the main genome

(3) Double stranded

(4) Circular structure

146. In the year 1963, the two enzymes responsible for restricting the growth of bacteriophage in _____ were isolated. One added methyl groups to DNA, while the other cuts DNA.
Select the correct option to fill in the blank.

(1) *E.coli*

(2) *Salmonella typhimurium*

(3) *Agrobacterium tumefaciens*

(4) *Haemophilus influenzae*

147. Read the following statements and select the correct option.
Statement (A): To make bacterial cells competent to take up DNA, they are treated with a specific concentration of a divalent cation such as calcium.
Statement (B): rDNA is forced into competent cells by heat shock method.

(1) Both statements (A) and (B) are correct

(2) Both statements (A) and (B) are incorrect

(3) Only statement (A) is correct

(4) Only statement (B) is correct

148. Nematode resistant tobacco plants were created by using a vector named

(1) *Agrobacterium tumefaciens*

(2) *Meloidogyne incognita*

(3) *Bacillus thuringiensis*

(4) *Salmonella typhimurium*

149. *Bt* toxin does not kills the *Bacillus thuringiensis* because

(1) Its inactivated form binds to the surface of midgut epithelial cells of the target insects only.

(2) It exists as a protoxin in *Bacillus thuringiensis*

(3) Pores cannot be created in *Bacillus thuringiensis's* cell wall even by the activated form of Bt toxin.

(4) It is converted into an active non-harmful form of toxin due to the alkaline pH of the *Bacillus thuringiensis*'s gut

150. Periodic infusion of genetically engineered lymphocytes (having functional ADA cDNA) is required as a treatment for ADA deficiency as

(1) They only produce the enzyme once and then get destroyed

(2) These are not immortal cells

(3) They are not recognised as self-cells and get destroyed soon

(4) They are not able to phagocytise the foreign cells.

151. Arrange the following steps in correct order of their sequence as followed in RDT.
(a) Transfer of rDNA into the host
(b) Isolation of desired DNA fragment
(c) Culturing the host cell at a large scale
(d) Ligation of a DNA fragment into a vector
Choose the correct option.

(1) b → a → d → c

(2) b → d → a → c

(3) b → c → d → a

(4) b → d → c → a

152. Select the **incorrect** statement w.r.t. tissue culture.

(1) Somatic hybridisation involves growth and fusion of protoplast isolated from the same plant.

(2) Carbon source, inorganic salts, vitamins, amino acids and growth regulators are some ingredients that must be added in the nutrient media.

(3) Plants obtained after micro-propagation are genetically identical to the original plant from which they were taken.

(4) Whole plant could be regenerated from explants under sterile conditions in a special nutrient media.

153. **Assertion (A) :** Plasmid carries all genes providing vital genetic information of bacteria.
Reason (R) : It is self replicating, linear, chromosomal DNA.
In the light of above statements, choose the **correct** option.

(1) Both Assertion and Reason are true and Reason is the correct explanation of the Assertion

(2) Both Assertion and Reason are true but Reason is not the correct explanation of the Assertion

(3) Assertion is true statement but Reason is false

(4) Both Assertion and Reason are false statements

154. Read the following statements.
Statement A : Traditional hybridisation procedures used in plant and animal breeding, very often lead to inclusion and multiplication of undesirable genes along with desired genes.
Statement B : The technique of genetic engineering allows us to isolate and introduce only desirable genes without introducing undesirable genes into the target organisms.
Choose the **correct** option.

(1) Only statement A is correct

(2) Only statement A is incorrect

(3) Both statements A and B are incorrect

(4) Both statements A and B are correct

155. The organisation setup by Indian government which makes decisions regarding the validity of GM research and the safety of introducing GM organisms for public services is

(1) Council for Scientific and Industrial Research

(2) Genetic Engineering Approval Committee

(3) Indian Patents Authority

(4) Research Committee on Genetic Manipulation

156. Proinsulin and mature insulin differ from each other as in latter

(1) Only A and C chains are present

(2) C-peptide is absent

(3) Disulphide bonds are completely absent

(4) Only one disulphide bond is present

157. In which step of PCR cycle, the high temperature breaks the hydrogen bonds between the two strands of the DNA double helix?

(1) Denaturation

(2) Annealing

(3) Extension

(4) Polymerisation

158. Biofortified crop like Golden rice, developed transgenically, is nutritionally rich in _____.
Select the option which fills the blank **correctly.**

(1) Vitamin B

(2) Vitamin K

(3) Vitamin D

(4) Vitamin A

159. Orange coloured bands of DNA in an ethidium bromide stained gel can be seen, when the gel is exposed to

(1) X-rays

(2) UV light

(3) β-rays

(4) Radio waves

160. RNAi takes place in all eukaryotic organisms as a method of cellular defence. This method involves silencing of a specific mRNA due to a complementary

(1) ssRNA

(2) ssDNA

(3) dsDNA

(4) dsRNA

161. Which of the following is not a critical research area of biotechnology?

(1) Providing the best catalyst in the form of improved organism usually a microbe or pure enzyme

(2) Creating optimal conditions through engineering for a catalyst to act

(3) Use of better management practices and use of agrochemicals

(4) Downstream processing technologies to purify the protein/organic compound

162. Human insulin formed by recombinant DNA technology have advantage over the bovine insulin because

(1) It has slow rate of absorption as compared to bovine insulin

(2) It does not induce unwanted immunological responses

(3) It can be digested easily

(4) It causes toxicity in some humans only

163. Given below are some reasons for the production of transgenic animals.
(a) For study of normal physiology and development
(b) Chemical safety and testing
(c) For production of useful biological products
(d) Study of diseases
(e) To test the vaccine safety
How many of the above given reasons are true ?

(1) One

(2) Five

(3) Three

(4) Two

164. Transgenic animals are used in toxicity testing of a drug for safety of human beings. In such cases, alien gene is introduced in animals to make them

(1) More sensitive to toxic substances than non-transgenic animals

(2) Resistant to toxic substances for better tolerance

(3) Less sensitive to toxic substances than normal human beings

(4) Non-reactive to toxic substances for safer use in human beings

165. Which of the following proteins is used for the treatment of emphysema?

(1) α-lactalbumin

(2) α-1-antitrypsin

(3) Tissue-plasminogen activator

(4) Interferon

166. In an imaginary situation, if one wants to insert a foreign DNA in a human cell, which of the following would be the best option for the direct gene transfer?

(1) Biolistics

(2) Gene gun

(3) Microinjection

(4) Transfer mediated by *Agrobacterium*

167. A technique of molecular diagnosis which aims at detection of pathogen through antigen-antibody interaction is

(1) PCR

(2) Southern blotting

(3) ELISA

(4) Northern blotting

168. If a gene of interest is successfully ligated at *Sal* I site of pBR322, then which of the following is true w.r.t its consequences upon the process of transformation in host cells?

(1) Recombinants would not grow in ampicillin containing medium

(2) Recombinants would be tetracycline sensitive

(3) Non transformants would be ampicillin and tetracycline resistant

(4) All transformants would be ampicillin sensitive

169. Which of the following must not be used in any condition to isolate the genetic material from the yeast?

(1) Ribonuclease

(2) Chitinase

(3) Protease

(4) Deoxyribonuclease

170. **Assertion (A):** Hypothetically, if all the other parameters are kept same and choice is given in between natural bacteriophage and plasmid for production of rDNA, bacteriophage would be the priority for a researcher.
Reason (R): Higher copy number of bacteriophage would led to higher number of molecules of rDNA inside the host cell which would help researcher to obtain more copies of rDNA.
In the light of above statements, select the correct option.

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

(2) Both (A) and (R) are true and (R) is the correct explanation of (A)

(3) Both (A) and (R) are false

(4) (A) is true but (R) is false

171. Bt toxin gene has been cloned from the __X__ and been expressed in __Y__ to provide resistance against __Z__, ultimately creating a biopesticide.
Identify X, Y and Z and choose the **correct** option.

	X	**Y**	**Z**
(1)	Plants	Bacteria	Insects
(2)	Bacteria	Plants	Insects
(3)	Insects	Plants	Bacteria
(4)	Bacteria	Insects	Plants

(1) (1)

(2) (2)

(3) (3)

(4) (4)

172. Match column I with column II.

	Column I		**Column II**
(a)	Lepidopteran	(i)	*Meloidogyne incognita*
(b)	Coleopteran	(ii)	Mosquito
(c)	Dipteran	(iii)	Armyworm
(d)	Nematode	(iv)	Beetle

Select the **correct** option.

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

(1) (1)

(2) (2)

(3) (3)

(4) (4)

173. Attempts that have been made to patent uses by other countries for products and processes based on Indian traditional herbal medicines like turmeric, neem, are examples of

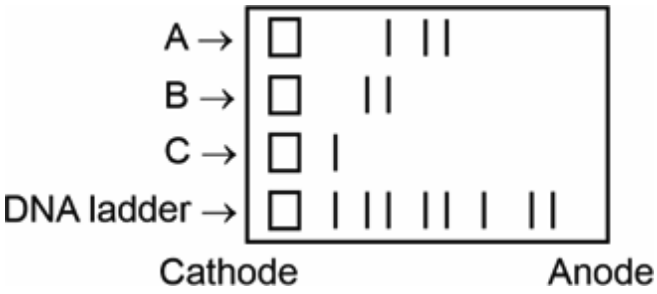
(1) Bioethics

(2) Bioremediation

(3) Biopiracy

(4) Biofortification

174. Result of a restriction digestion experiment is shown below. Here, a sample containing a linear DNA fragment of size 8 Kb is added in lane C, in which no RE is added. In lane A and B, DNA sample containing RE 1 and 2 are added respectively along with the same length of linear DNA as that added in lane C.



Choose the correct option w.r.t. the gel shown above.

(1) In lane B, the restriction enzyme added has only one recognition site in DNA.

(2) No fragments of DNA in lane A is of equal size as that of fragments in lane B.

(3) In lane A, the restriction enzyme added has three recognition sites in DNA.

(4) The fragments in lane B are smaller than the fragments in lane A.

175. Select the **correct** statement w.r.t. the PCR.

(1) Sequence of nitrogen bases in primer and the corresponding DNA template to which it attaches is same from 5′ to 3′ direction.

(2) Primers attach to DNA template in extension step.

(3) Primers are elongated *via Taq* polymerase in 5′ to 3′ direction always.

(4) A single type of primer is used for amplifying dsDNA template.

176. Which of the following is included in upstream processing?

(1) Separation and purification of products

(2) Formulation of product with suitable preservatives

(3) Quality control testing

(4) The expression of foreign genes in host cells to produce a desirable protein

177. Stirrer in stirred-tank bioreactor has been designed for

(1) Formation of the substrate

(2) Ensuring anaerobic conditions in culture vessel

(3) Addition of preservatives to the product

(4) Increasing availability of oxygen throughout the process

178. A single PCR reaction involves three temperature dependent steps. Their correct sequence is

(1) Annealing → Denaturation → Amplification

(2) Denaturation → Annealing → Extension

(3) Extension → Annealing → Denaturation

(4) Annealing → Extension → Denaturation