Physics

1. Which, of the following instruments, cannot show chromatic aberration (as a defect)?

1.	A reflecting telescope	2.	A refracting telescope
3.	A binocular	4.	A magnifying glass

2. An electron moves in a circular orbit with a uniform speed v. It produces a magnetic field B at the centre of the circle. If velocity is increased to $4v$ and the magnetic field at the centre remains unchanged, the radius changes to:
(Take Initial radius = r)
1. $\frac{r}{2}$
2. $\frac{r}{3}$
3. $2r$
4. $3r$

3. A small spherical ball cannot hold one coulomb of charge in air because at this stage:

1.	voltage of the ball becomes high enough to destroy the insulating property of air.
2.	capacity of the ball is too high to hold the charge.
3.	nuclear forces wipe off the charge of the ball.
4.	electromagnetic forces reduce the charge of the ball.

4. n moles of ideal monoatomic gas undergoes a process in which the temperature changes with volume as $T = KV^2$. If the temperature of the gas changes from T_0 to $4T_0$, then the change in internal energy will be:
1. $3nRT_0$
2. $9nRT_0$
3. $\frac{3}{2}nRT_0$
4. $\frac{9}{2}nRT_0$

5. The potential energy of a particle of mass m in a conservative force field can be expressed as $U = \alpha x - \beta y$ where (x, y) denote the position coordinates of the body. The acceleration of the body is:
1. $\frac{\alpha - \beta}{m}$
2. $\frac{\alpha + \beta}{m}$
3. $\frac{\sqrt{\alpha^2 - \beta^2}}{m}$
4. $\frac{\sqrt{\alpha^2 + \beta^2}}{m}$

6. What is the molar-specific heat capacity of a diatomic gas in an isochoric process if it has an additional vibrational mode?
1. $\frac{5}{2}R$
2. $\frac{3}{2}R$
3. $\frac{7}{2}R$
4. $\frac{9}{2}R$

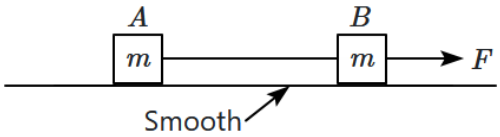
7. Select the correct option based on the statements given below:

Statement I:	When a projectile is at its highest point, its tangential acceleration is zero.
Statement II:	When a projectile is at the highest point of its trajectory, its speed is minimum.

1.	**Statement I** is incorrect and **Statement II** is correct.
2.	Both **Statement I** and **Statement II** are correct.
3.	Both **Statement I** and **Statement II** are incorrect.
4.	**Statement I** is correct and **Statement II** is incorrect.

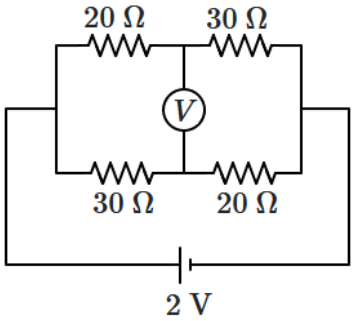
8. A magnifying glass is held in front of a manuscript and it is observed that the letters are enlarged by 5 times (linearly). The focal length of the lens is 5 cm. The lens is held at a distance of (from the manuscript):
1. 1 cm
2. 4 cm
3. 6 cm
4. 1.25 cm

9. Two identical blocks, which are connected by means of a light metallic wire of cross-sectional area α, are dragged along a smooth horizontal plane by means of a horizontal force F. The stress in the wire is:



1.	zero	2.	$\frac{F}{\alpha}$
3.	$\frac{F}{2\alpha}$	4.	$\frac{2F}{\alpha}$

10. The reading of an ideal voltmeter in the circuit shown is:



1.	0.6 V	2.	0 V
3.	0.5 V	4.	0.4 V

11. An electromagnetic wave, propagating along the x-axis, carries momentum:

1.	along x-axis
2.	along y-axis
3.	along z-axis
4.	both along y, z but not along x-axis

12. Which of the following electromagnetic radiations is used for viewing through haze and fog?

1.	Radio wave	2.	Infrared wave
3.	Microwave	4.	Matter wave

13. Two materials $A-a$ paramagnetic substance, and $B-a$ diamagnetic substance are mixed together in equal amounts (equimolar) and made into a solid. They do not react or interact otherwise with each other. The mixture is expected to be:
1. Paramagnetic
2. Diamagnetic
3. Ferromagnetic
4. Non-magnetic

14. Two long parallel wires carrying currents I_1 and I_2 give a magnetic field of 3 G at a point exactly mid-way between the two wires. When one of the currents is reversed, the field becomes 5 G. The ratio of the large current to the smaller one is:

1.	2	2.	$\frac{4}{3}$
3.	$\frac{3}{2}$	4.	4

15. Which of the following particles, is unstable?
1. Proton
2. Neutron
3. Electron
4. Antineutrino

16. A particle is fastened at the end of a string and is whirled in a vertical circle with the other end of the string being fixed. The motion of the particle is:

1.	periodic
2.	oscillatory
3.	simple harmonic
4.	angular simple harmonic

17. Current varying at the rate 4 A/s in a coil generates an EMF of 16 mV in a nearby coil. The mutual inductance of the two coils is:
1. 4.0×10^{-3} mH
2. 4.0×10^{-3} H
3. 2.5×10^{-2} H
4. 2.5×10^{-2} mH

18. Two radiations of photons energies 1 eV and 2.5 eV, successively illuminate a photosensitive metallic surface of work function 0.5 eV. The ratio of the maximum speeds of the emitted electrons is:

1. 1 : 2
2. 1 : 1
3. 1 : 5
4. 1 : 4

19. The dimension of which group of quantities is the same?

h : Planck's constant, K : kinetic energy, ω : angular speed/frequency, F: force, L : inductance, i : current, q : charge, t : time, x: distance

1. $h,\ Ftx,\ Liq$
2. $K, h\omega, \omega Li$
3. $Fx,\ Li^2,\ K\omega$
4. $\frac{Fx}{t},\ Kx,\ ht$

20. Given below are two statements:

Statement I:	The poles of magnets cannot be separated by breaking into two pieces.
Statement II:	The magnetic moment will be reduced to half when a magnet is broken into two equal pieces.

1.	**Statement I** is correct and **Statement II** is incorrect.
2.	**Statement I** is incorrect and **Statement II** is correct.
3.	Both **Statement I** and **Statement II** are correct.
4.	Both **Statement I** and **Statement II** are incorrect.

21. What should be the length of a simple pendulum-based clock that ticks every second?

(take $g = 10\ \text{m/s}^2$; $\pi^2 = 10$)

1.	4 m	2.	2 m
3.	1 m	4.	0.5 m

22. An elevator begins its motion from rest with a constant upward acceleration. It covers a distance of 2 m in the first 0.6 s. A passenger inside the elevator is holding a 3 kg package suspended by a vertical string. What is the tension in the string while the elevator is in motion?

1. 4 N
2. 62.7 N
3. 29.4 N
4. 20.6 N

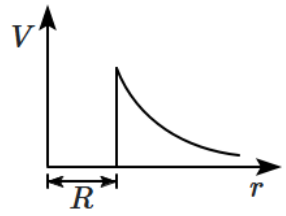
23. Which of the following statements is correct?

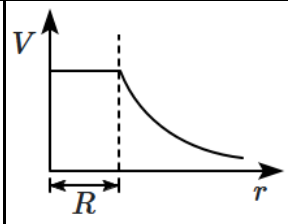
1.	Charges were named as positive and negative by the American scientist Benjamin Franklin.
2.	Gold leaf electroscope can be used to detect charge on a body.
3.	Charge can be created on any substance by the process of induction.
4.	Both (1) and (2) are correct.

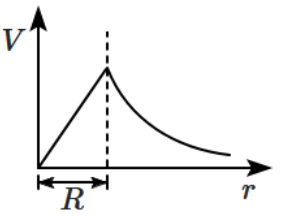
24. With the increase in wavelength of the interfering beam, the fringe width in Young's double-slit experiment:

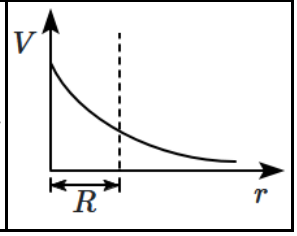
1.	decreases
2.	increases
3.	remains the same
4.	can increase or can decrease

25. The variation of electrostatic potential with radial distance r from the centre of a positively charged metallic thin shell of radius R is given by the graph:

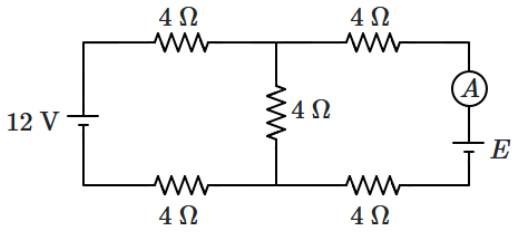
1. 

2. 

3. 

4. 

26. The ammeter (A), in the circuit shown in the figure, reads zero. The EMF E equals:



1.	12 V	2.	6 V
3.	8 V	4.	4 V

27. A charge Q μC is placed at the centre of a cube. The flux coming out from any one of its faces will be (in SI units):

1.	$\frac{Q}{\varepsilon_0} \times 10^{-6}$	2.	$\frac{2Q}{3\varepsilon_0} \times 10^{-3}$
3.	$\frac{Q}{6\varepsilon_0} \times 10^{-3}$	4.	$\frac{Q}{6\varepsilon_0} \times 10^{-6}$

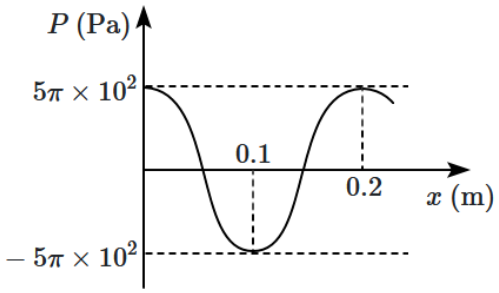
28. A ball is released from the top of a building 180 m high. It takes time t to reach the ground. With what speed should it be projected down so that it reaches the ground in time $\frac{5t}{6}$?

1. 50 ms^{-1}
2. 61 ms^{-1}
3. 11 ms^{-1}
4. 2 ms^{-1}

29. In Young's double-slit experiment, the light of 500 nm is used to produce, an interference pattern. When the distance between the slits is 0.05 mm, the angular width (in degree) of the fringes formed on the screen is close to:

1.	1.7°	2.	0.07°
3.	0.57°	4.	0.17°

30. For a sound wave traveling through the air in the $+x$-direction, the variation of pressure P with position x is shown in the figure. The amplitude of the wave is: (bulk modulus of the air$= 5 \times 10^5$ Pa)



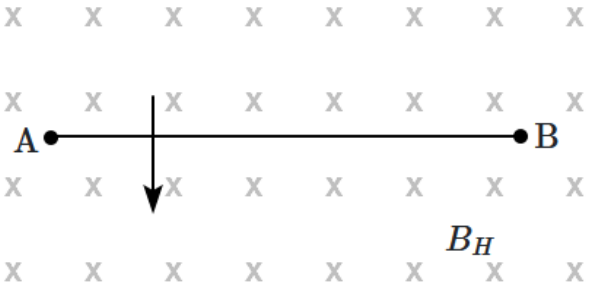
1. 10^{-2} m
2. 10^{-4} m
3. 10^{-1} m
4. 10^{2} m

31. A radioactive element X decays into another, Y, by β -emission, and the resulting daughter nucleus (Y) is in an excited state and decays further, emitting γ-rays. The half-life of γ-emission $T_{\frac{1}{2}}(\gamma) << T_{\frac{1}{2}}(\beta)$, that for β-decay.

A sample of X shows a γ-activity of R; after what time will the γ-activity become $\frac{R}{2}$?

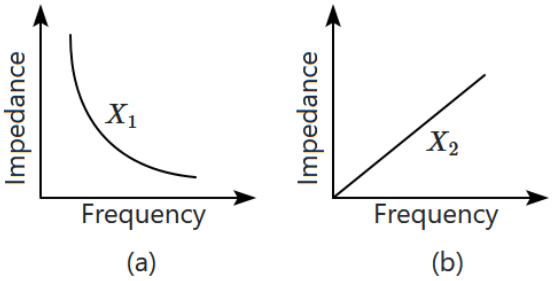
1. $T_{\frac{1}{2}}(\beta)$
2. $T_{\frac{1}{2}}(\gamma)$
3. $2T_{\frac{1}{2}}(\beta)$
4. $2T_{\frac{1}{2}}(\gamma)$

32. A horizontal conducting metallic wire (AB) of length L falls vertically under gravity. A horizontal magnetic field (B_H) exists in the region, as shown. The emf induced in the wire:



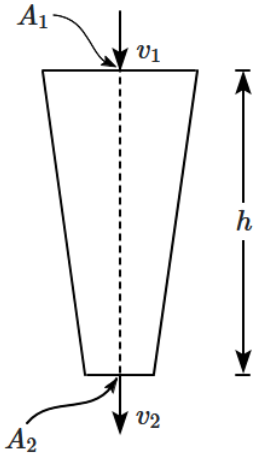
1.	is zero	2.	is constant
3.	increases with time	4.	decreases with time

33. The graph (a) and (b) gives the dependence of two reactive impedances X_1 and X_2 on the frequency of AC voltage applied across them. We can say that:



1.	X_1 is an inductor, X_2 is a capacitor
2.	X_1 is a resistor, X_2 is a capacitor
3.	X_1 is a capacitor, X_2 is an inductor
4.	X_1 is a capacitor, X_2 is a resistor

34. Water flows through a vertical tube with varying cross-sections as shown in the figure. The rate of flow is $52.5\ \text{ml/s}$. Given that the speed of flow $v_1 = 0.35\ \text{m/s}$ and area of cross-section $A_2 = 0.5\ \text{cm}^2$.



Based on the data given above, values of A_1, v_2 & h are calculated.

(a)	$A_1 = 1.0\ \text{cm}^2,\ v_2 = 0.70\ \text{m/s}$
(b)	$A_1 = 1.5\ \text{cm}^2,\ v_2 = 1.05\ \text{m/s}$
(c)	$h = 5\ \text{cm}$
(d)	$h = 10\ \text{cm}$

Choose the correct option from the given ones:

1.	**(b)** and **(c)** only
2.	**(b)** and **(d)** only
3.	**(c)** only
4.	**(d)** only

35. The radius of the innermost electron orbit in a hydrogen atom is 5.3×10^{-11} m. What is the radius of the third orbit?

1.	11.3×10^{-11} m	2.	12.9×10^{-11} m
3.	15.9×10^{-11} m	4.	47.7×10^{-11} m

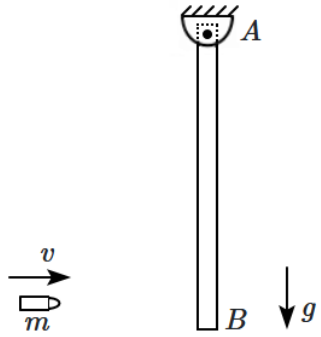
36. Match the following items in **Column-I** with their corresponding descriptions in **Column-II**:

Column-I		**Column-II**	
(A)	Radiation pressure	(I)	Particle nature of radiation
(B)	Threshold wavelength	(II)	Stopping potential
(C)	Maximum kinetic energy of photoelectron	(III)	Maximum wavelength of an incident photon in photoelectric effect
(D)	Quantisation of angular momentum of the electron	(IV)	De-Broglie hypothesis

Codes:

1.	A-I, B-III, C-II, D-IV
2.	A-III, B-I, C-II, D-IV
3.	A-I, B-III, C-IV, D-II
4.	A-IV, B-II, C-I, D-III

37. A uniform rod (AB) of mass $3m$ and length l, is pivoted at A so that it can rotate freely in a vertical plane. The rod is initially in the vertical position, hanging under gravity. A bullet of mass m, travelling horizontally with a velocity v, strikes the rod at the end B and gets embedded in it.



The angular velocity of the system, after the bullet gets embedded, is:

1.	$\frac{v}{l}$	2.	$\frac{2v}{l}$
3.	$\frac{v}{2l}$	4.	$\frac{v}{4l}$

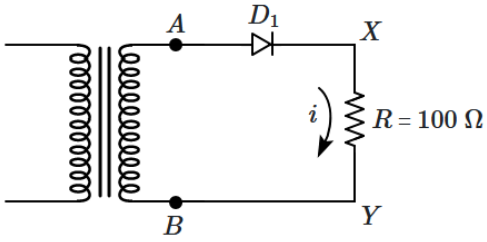
38. The coefficient of linear expansion of brass and steel rods are α_1 and α_2. Lengths of brass and steel rods are L_1 and L_2 respectively. If $(L_2 - L_1)$ remains the same at all temperatures, which one of the following relations holds good?

1. $\alpha_1 L_2^2 = \alpha_2 L_1^2$
2. $\alpha_1^2 L_2 = \alpha_2^2 L_1$
3. $\alpha_1 L_1 = \alpha_2 L_2$
4. $\alpha_1 L_2 = \alpha_2 L_1$

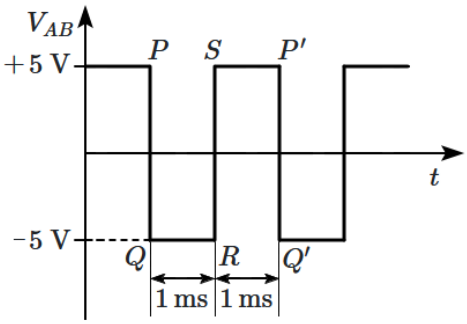
39. In the spectrum of hydrogen, the ratio of the longest wavelength in the Lyman series to the longest wavelength in the Balmer series is:

1.	$\frac{4}{9}$	2.	$\frac{9}{4}$
3.	$\frac{27}{5}$	4.	$\frac{5}{27}$

40. In the circuit shown in the figure (i), the (ideal) diode D_1 has negligible resistance (in forward bias). The voltage $(V_A - V_B) = V_{AB}$ is time varying, as shown in the figure (ii):



Figure(i)



Figure(ii)

The current through the resistance $R = 100\ \Omega$ has a maximum positive value of:

1. 0.05 A
2. 0.1 A
3. 0.025 A
4. 500 A

41. A particle of mass m is projected with a velocity, $v = kv_e$ $(k < 1)$ from the surface of the earth. The maximum height, above the surface, reached by the particle is:

(Where $v_e =$ escape velocity, $R =$ the radius of the earth)

1.	$\frac{R^2 k}{1+k}$	2.	$\frac{Rk^2}{1-k^2}$
3.	$R\left(\frac{k}{1-k}\right)^2$	4.	$R\left(\frac{k}{1+k}\right)^2$

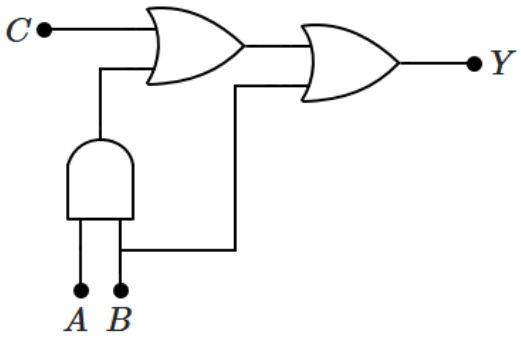
42. The dimensional formula for the wave number is:

1.	$\left[M^0 L^{-1} T^0\right]$	2.	$\left[M^0 L^0 T^{-1}\right]$
3.	$\left[M^0 L^1 T^0\right]$	4.	$\left[M^0 L^0 T^1\right]$

43. A capacitor has a capacitance of C and reactance of X. If both capacitance and frequency are doubled, the new reactance will be:

1.	$4X$	2.	$X/2$
3.	$X/4$	4.	$2X$

44. Consider the binary logic circuit shown in the figure, where the inputs are A, B, C while the output is Y. Then, Y equals:



1. A OR B
2. B OR C
3. A OR C
4. A OR B OR C

45. Two forces of magnitude A and $\frac{A}{2}$ act perpendicular to each other. The magnitude of the resultant force is equal to:

1.	$\frac{A}{2}$	2.	$\frac{\sqrt{5}A}{2}$
3.	$\frac{3A}{2}$	4.	$\frac{5A}{2}$

Chemistry

46. The work done when 1 mole of gas expands reversibly and isothermally from a pressure of 5 atm to 1 atm at 300 K is:

(Given log 5 = 0.6989 and R = 8.314 J K^{-1} mol^{-1})

1. zero J
2. 150 J
3. +4014.6 J
4. -4014.6 J

47. An **aromatic amine (A)** reacts with **alcoholic potash** and another compound **(Y)**, producing a **foul-smelling gas** with the formula C_6H_5NC.
The compound **(Y)** is obtained by reacting **compound (Z)** with **chlorine** (Cl_2) in the presence of **slaked lime**.
What is the identity of **compound (Z)?**

1. $C_6H_5NH_2$
2. CH_3OH
3. CH_3CH_2OH
4. $CHCl_3$

48. In an S_N1 reaction on chiral centres there is

1. 100% racemisation
2. inversion more than retention leading to partial racemisation
3. 100% retention
4. 100% inversion

49. Propyne and propene can be distinguished by:

1. Conc. H_2SO_4
2. Br_2 in CCl_4
3. Dil. $KMnO_4$
4. $AgNO_3$ in ammonia

50. Which of the following compounds does not possess a dipole moment?

1. CH_3Cl
2. H_2O
3. C_6H_6 (Benzene)
4. CH_2N_2

51. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is:

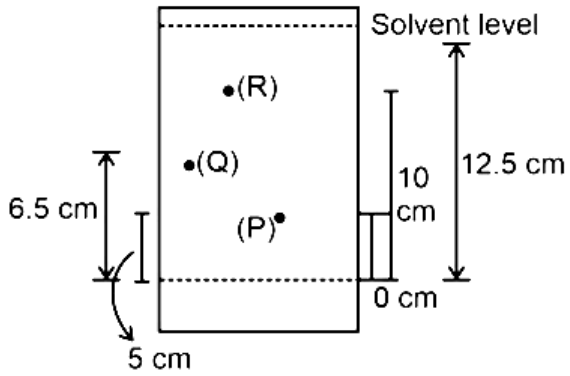
(Charge on electron = 1.60×10^{-19} C)

1. 6×10^{23}
2. 6×10^{20}
3. 3.75×10^{20}
4. 7.48×10^{20}

52. $R - COOH \rightarrow RCH_2OH$. This mode of reduction can be effected only by:

1. $NaBH_4$
2. $KMnO_4$
3. $LiAlH_4$
4. All of the above

53. The ratio of R_f value for P and R is :



1.	0.50	2.	0.80
3.	0.65	4.	2.0

54. The incorrect statement among the following for an ideal solution is:

1. $\Delta H_{\text{Mix}} = 0$
2. $\Delta U_{\text{Mix}} = 0$
3. $\Delta P = P_{\text{obs.}} - P_{(\text{Calculated by Raoult's law})} = 0$
4. $\Delta G_{\text{Mix}} = 0$

55. The vapour pressures of pure liquids A and B are 200 and 300 mmHg, respectively at 298K. On mixing the two liquids, the sum of their initial volumes is equal to the volume of the final mixture. The mole fraction of liquid B is 0.5 in the mixture. The vapour pressure of the final solution, the mole fractions of components A and B in vapour phase, respectively are:

1. 250 mmHg, 0.4, 0.6
2. 500 mmHg, 0.5, 0.5
3. 450 mmHg, 0.5, 0.5
4. 500 mmHg, 0.4, 06

56. Incorrect statement among the following is:

1.	Quartz is extensively used as a piezoelectric material.
2.	Silicones are a group of organosilicon polymers, which have (-R_2SiO-) as a repeating unit.
3.	Basic structural unit in silicates is the SiO_4^{4-} tetrahedron.
4.	Feldspars are not aluminosilicates.

57. The mass ratio of ethylene glycol (62 g/mol) required to make (500 ml, 0.25 M) and (250 ml, 0.25 M) solutions is:

1.	1:1	2.	1:2
3.	2:1	4.	4:1

58. Which compound is responsible for the green flame in the Borate ion test?

1. $(CH_3)_3BO_3$
2. $(C_2H_5)_3BO_3$
3. H_3BO_3
4. $(C_2H_5)_3BO_4$

59. An aqueous solution of X is added slowly to an aqueous solution of Y as shown in List I. The variation in conductivity of these reactions is given in List II. Match list I with List II and select the correct answer using the codes given below the table.

	List-I		**List-II**
(P)	$\underset{X}{(C_2H_5)_3N} + \underset{Y}{CH_3COOH}$	(i)	Conductivity decreases and then increases.
(Q)	$\underset{X}{KI(0.1M)} + \underset{Y}{AgNO_3(0.01M)}$	(ii)	Conductivity decreases and then does not change much.
(R)	$\underset{X}{CH_3COOH} + \underset{Y}{KOH}$	(iii)	Conductivity increases and then does not change much.
(S)	$\underset{X}{NaOH} + \underset{Y}{HI}$	(iv)	Conductivity does not change much and then increases.

Codes:

	P	Q	R	S
1.	(iii)	(iv)	(ii)	(i)
2.	(iv)	(iii)	(ii)	(i)
3.	(ii)	(iii)	(iv)	(i)
4.	(i)	(iv)	(iii)	(ii)

60. The electrons identified by quantum number n and l, (i) n = 4, l = 1 (ii) n = 4, l = 0, (iii) n = 3, l = 2, (iv) n = 3, l = 1 can be placed in order of increasing energy from lowest to highest as:
1. (iv) < (ii) < (iii)< (i)
2. (ii) < (iv) < (i) < (iii)
3. (i) < (iii) < (ii) < (iv)
4. (iii) < (i) < (iv) < (ii)

61. In the following reaction, balancing coefficients X and Y are:
X HI + Y $HNO_3 \rightarrow$NO + I_2 + H_2O
1. X=3, Y=2
2. X=2, Y=3
3. X=6, Y=2
4. X=6, Y=1

62. Match the atomic numbers in **List I** with the corresponding groups in **List II**:

	List-I (Atomic number)		**List-II (Group)**
i.	52	P.	s
ii.	37	Q.	p
iii.	65	R.	f
iv.	74	S.	d

Choose the correct answer from the options given below:
1. (i)-Q, (ii)-P, (iii)-R, (iv)-S
2. (i)-Q, (ii)-P, (iii)-S, (iv)-R
3. (i)-S, (ii)-R, (iii)-P, (iv)-Q
4. (i)-R, (ii)-P, (iii)-Q, (iv)-S

63. The rate Constant of reaction A → B is 0.6×10^{-3} $molL^{-1}$ S^{-1}. If the Concentration of A is 5M, then the concentration of B after 20 min is:
1. 1.08M
2. 3.60M
3. 0.36M
4. 0.72M

64. Which of the following exhibits a pπ-dπ bond?

1.	NO_3^-	2.	BO_3^{3-}
3.	CO_3^{2-}	4.	SO_3^{2-}

65. Among the given compounds, which one would have the lowest value of the hydrolysis constant (K_H) ?
1. $AlCl_3$
2. $CuSO_4$
3. NH_4Cl
4. CH_3COONa

66. What is the primary purpose of a calorimeter?

1.	To measure the mass of substances.
2.	To enable free exchange for the reaction with the surroundings.
3.	To prevent heat exchange with the surroundings.
4.	To increase the temperature of the reactants.

67. Affinity for hydrogen decreases in the group from fluorine to iodine. Which of the halogen acids should have highest bond dissociation enthalpy?

1.	HF	2.	HCl
3.	HBr	4.	HI

68. Identify the incorrect statement.

1.	The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.
2.	Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
3.	The oxidation states of chromium in CrO_4^{2-} and $Cr_2O_7^{2-}$ are not the same.
4.	$Cr^{2+}(d^4)$ is a stronger reducing agent than $Fe^{2+}(d^6)$ in water.

69. The decrease in size from left to right in the actinoid series is greater and more gradual than that in the lanthanoid series due to:

1.	4f orbitals are penultimate
2.	4f orbitals have a greater shielding effect
3.	5f orbitals have a poor shielding effect
4.	5f orbitals have a greater shielding effect

70. An organic compound X having molecular formula $C_5H_{10}O$ yields phenyl hydrazone and gives a negative response to the iodoform test and Tollen's test. It produces n-pentane on reduction. X could be:
1. Pentanal
2. 2-Pentanone
3. 3-Pentanone
4. n-Amyl alcohol

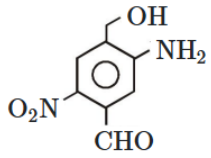
71. The degenerate orbitals of $[\ Cr(H_2O)_6]^{3+}$ are:
1. d_{z^2} and d_{xz}
2. d_{yz} and d_{z^2}
3. d_{xz} and d_{yz}
4. $d_{x^2-y^2}$ and d_{xy}

72. Consider the following compounds:

A.	NH_3
B.	$(CH_3)_3$ N
C.	CH_3NH_2
D.	$(CH_3)_2NH$

The decreasing order of basicity of the amines (A to D) in an aqueous solution is:
1. A > B > C > D
2. B > D > C > A
3. A > C > D > B
4. D > C > B > A

73. What is the IUPAC name of the following compound?



1. 2-Nitro-4-hydroxymethyl-5-aminobenzaldehyde
2. 3-Amino-4-hydroxymethyl-5-nitrobenzaldehyde
3. 5-Amino-4-hydroxymethyl-2-nitrobenzaldehyde
4. 4-Amino-2-formyl-5-hydroxymethylnitrobenzene

74. When zinc rod is directly placed in copper sulphate solution:
1. The blue colour of the solution starts intensifying.
2. The solution remains electrically neutral.
3. The temperature of the solution falls.
4. The weight of the zinc rod starts increasing.

75. What is the oxidation state of a phosphorus atom in hypophosphoric acid?

1.	+3	2.	+4
3.	+5	4.	+3

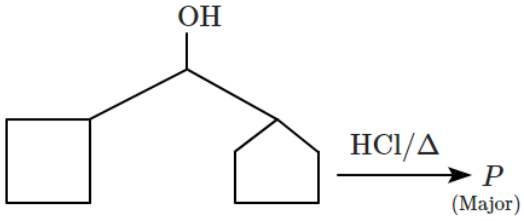
76. The rate constant is given by the equation $k = P.Ze^{-E/RT}$. Which factor should register a decrease for the reaction to proceed more rapidly?
1. T
2. Z
3. E
4. P

77. The difference of secondary and primary valencies of cobalt in the complex $[Co(en)_3]Br_3$ is:

1.	Two	2.	Three
3.	Zero	4.	One

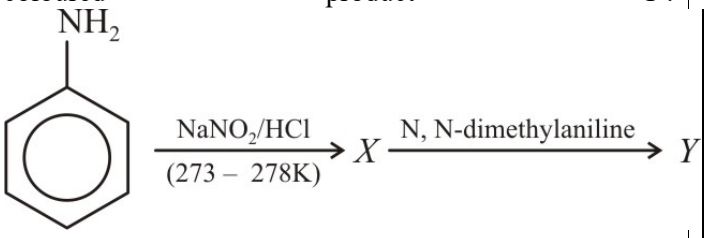
78. In E_2 elimination, some compounds follow Hofmann's rule which means:
1. the double bond goes to the most substituted carbon
2. the compound is resistant to elimination
3. no double bond is formed
4. the double bond goes mainly towards the least substituted carbon

79. Consider the following reaction:

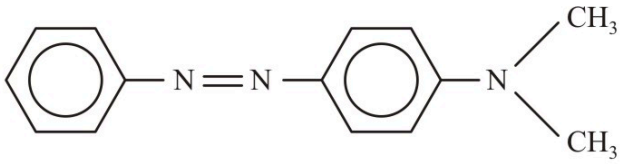


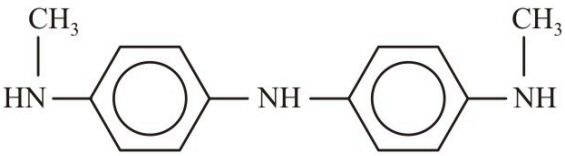
The correct conclusion about product P is:
1. Both rings will be 5-membered.
2. Both rings will be 6-membered.
3. One ring is 5-membered and the other is 6-membered.
4. One of the rings is 4-membered.

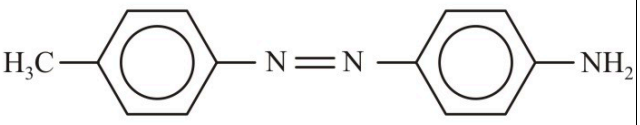
80. Aniline in a set of the following reactions yielded a coloured product 'Y'.

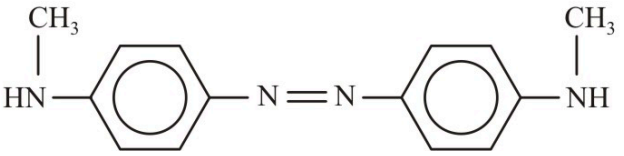


The structure of 'Y' would be

(1) 

(2) 

(3) 

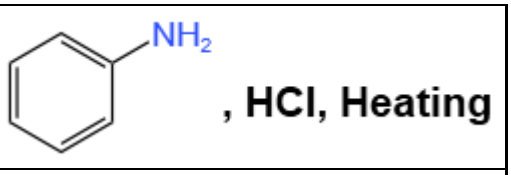
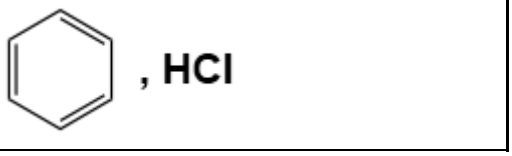
(4) 

81. Mark the appropriate reagent used to distinguish vicinal and geminal dihalides.:

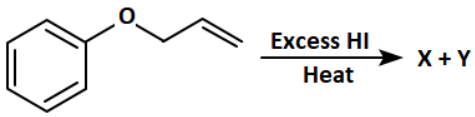
1.	KOH (aq.)	2.	KOH(alc.)
3.	Zn dust	4.	None of these

82. The compound obtained by addition of water to an alkyne having more than two carbons, in the presence of $HgSO_4$ and dilute H_2SO_4 at 333K, is:
1. A vicinal diol
2. An aldehyde
3. An alcohol
4. A ketone

83. Which of the following is suitable to synthesize chlorobenzene?

1.	
2.	Benzene, Cl_2, anhydrous $FeCl_3$
3.	Phenol, $NaNO_2$, HCl, CuCl
4.	

84. In the first step, in esterification reaction, H^+ attacks on:
1. Oxygen atom of an alcohol
2. Doubly bonded oxygen of carboxylic acid
3. Singly bonded oxygen of carboxylic acid
4. Any oxygen atom

85. 

The products X and Y in the above reaction are:
1. Ph-I and CH_2=CH-CH_2-OH
2. Ph-I and I-CH_2-CH(I)-CH_3
3. Ph-OH and I-CH_2-CH(I)-CH_3
4. Ph-OH and CH_2=CH-CH_2-I

86. The concentration of Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is 2.2×10^{-4} mol L^{-1}.
The solubility product of $Ag_2C_2O_4$ is:

1.	2.66×10^{-12}	2.	4.5×10^{-11}
3.	5.3×10^{-12}	4.	2.42×10^{-8}

87. Which of the following is a non-essential amino acid?
1. Cysteine
2. Lysine
3. Methionine
4. Histidine

88. A system that can neither exchange matter nor energy with the surroundings is classified as:
1. Open system
2. Isolated system
3. Closed system
4. Both (1) & (2)

89. The central dogma of molecular genetics states that the genetic information flows from:
1. amino acid - proteins - DNA
2. DNA - carbohydrates - proteins
3. DNA - RNA - proteins
4. DNA - RNA - Carbohydrates

90. PbI_4 does not exist because :
1. Pb^{2+} is more stable than Pb^{4+}.
2. I^- is better reducing agent.
3. Pb^{4+} is more stable than Pb^{2+}.
4. I^- is better oxidising agent.

Biology

91. All the following are parts of human axial skeleton except:

1.	Sternum	2.	Vertebrae
3.	Hyoid	4.	Scapula

92. Which compound is used to stain DNA fragments for visualisation under UV light?
1. Ethidium bromide
2. Methylene blue
3. Safranin
4. Crystal violet

93. Which statement best explains why the pyramid of energy is always upright?

1.	Energy is reused by organisms at higher trophic levels to maintain balance.
2.	Each transfer of energy between trophic levels involves significant energy loss as heat, reducing the energy available at higher levels.
3.	Energy accumulates at higher trophic levels, increasing efficiency in energy transfer.
4.	Energy is distributed evenly across all trophic levels in a stable ecosystem.

94. In a typical human cell:

I:	the total number of bp in DNA present is about 6.6×10^9
II:	the total length of unwinded DNA is approximately 2.2 metres
III:	the dimension of nucleus is approximately 10^{-6} m

1.	Only **I** and **II** are correct
2.	Only **II** and **III** are correct
3.	**I**, **II** and **III** are correct
4.	**I**, **II**, and **III** are incorrect

95. How many ATP molecules are directly synthesized in glycolytic pathway from one glucose molecule?

1. 2	2. 4
3. 6	4. 10

96. Consider the following statements:

I:	RNAi takes place in all eukaryotic organisms as a method of cellular defense.
II:	It involves the silencing of a specific mRNA due to complementary dsDNA molecules that prevent the translation of mRNA.
III:	Fire and Mello got the Nobel Prize for the discovery of RNAi.

Which of the above statements are true?

1.	**I** and **II** only	2.	**I** and **III** only
3.	**II** and **III** only	4.	**I**, **II**, and **III**

97. What analogy did Paul Ehrlich use to explain the importance of species diversity in ecosystems?

1.	An ecosystem as a large machine with each species as a gear
2.	An airplane held together by rivets, where each rivet represents a species
3.	A forest with each tree representing a different ecosystem function
4.	A river where each drop of water symbolizes a different species

98. How can tissue culture be used to produce virus-free plants from infected plants?

1.	By removing the infected leaves and growing them in sterile conditions.
2.	By isolating and growing the virus-free meristem from infected plants.
3.	By using pesticides in the growth medium to kill the virus.
4.	By exposing the infected plants to ultraviolet light to eliminate the virus.

99. Consider the given two statements:

Assertion (A):	Hybrid seeds must be produced every year for cultivating hybrid varieties of crops.
Reason (R):	Hybrid seeds collected from the plants of the first generation maintain their hybrid characters when sown.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True but **(R)** is False
4.	Both **(A)** and **(R)** are False

100. All prokaryotic cells:
1. have a cell wall.
2. can fix atmospheric nitrogen.
3. lack a nuclear membrane.
4. can survive in the absence of oxygen.

101. If '8' Drosophila in a laboratory population of '80' died during a week, the death rate in the population is _____ individuals per Drosophila per week.
1. zero
2. 0.1
3. 10
4. 1.0

102. Myelin sheath around axons in peripheral nervous system and in central nervous system is produced respectively by:
1. Schwann cells; microglia
2. oligodendrocytes; Schwann cells
3. Schwann cells; oligodendrocytes
4. satellite cells; astrocytes

103.

Assertion (A):	Cyclosporin A has been commercialized as a blood- cholesterol lowering agent
Reason (R):	Cyclosporin A is a competitive inhibitor of an enzyme responsible for the biosynthesis of cholesterol

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

104. Consider the given two statements:

Assertion(A):	Homology implies divergent evolution.
Reason(R):	Homologous organs are organs which do similar jobs in two taxa that were not present in their most recent common ancestor but rather evolved separately.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	**(A)** is False but **(R)** is True.

105. During anaphase I, what happens to the homologous chromosomes and the sister chromatids?

1.	Homologous chromosomes separate, and sister chromatids remain associated at their centromeres
2.	Homologous chromosomes and sister chromatids both separate
3.	Homologous chromosomes condense, and sister chromatids align at the equator
4.	Homologous chromosomes pair, and sister chromatids separate

106. Which of the following is an example of an amino-acid derivative hormone?
1. Insulin
2. Epinephrine
3. Cortisol
4. Estradiol

107. In pea seeds, starch synthesis in pea seeds is controlled by one gene. A plant with genotype Bb will produce:
I: large starch grains
II: smaller starch grains
III: intermediate sized starch grains
IV: round seeds
V: wrinkled seeds
1. Only I and IV
2. Only II and V
3. Only III and IV
4. Only III and V

108. Which of the following is not a mode of transmission of HIV?

1.	Blood transfusions	2.	Sharing needles
3.	Casual contact	4.	Sexual contact

109. Consider the given two statements:

Assertion (A):	The logistic growth model is considered a more realistic one for a population growing in a natural habitat.
Reason (R):	No population of any species in nature has at its disposal unlimited resources to permit exponential growth.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains the **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain the **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

110. The thyroid gland:

I:	is composed of two lobes interconnected with a thin flap of connective tissue called isthmus.
II:	is composed of follicles and stromal tissues.
III:	is located in the mediastinum, ventral to aorta.

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

111. Consider the given two statements:

Assertion (A):	India has more biodiversity than Scandinavian countries.
Reason (R):	In general, there is a decrease in biodiversity from tropical latitudes to temperate latitudes.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

112. The transverse section of monocot root shows the following internal tissue organization. Arrange them in correct sequence starting from periphery to the centre.
A. Endodermis
B. Pith
C. Epidermis
D. Pericycle
E. Cortex
Choose the correct answer from the options given below:
1. D, C, E, A, B
2. A, C, E, B, D
3. C, E, A, D, B
4. C, E, D, B, A

113. The first transgenic cow produced:

1.	enzyme to treat emphysema
2.	human protein enriched milk
3.	enzyme to treat phenylketonuria
4.	organs for xenotransplantation

114. Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A):	Some human organs like liver, kidney fail to function normally and transplantation is the only remedy to enable the patient to live a normal life.
Reason (R):	Tissue matching and blood group matching are essential before undertaking any transplant and patient has to take immunosuppresant thereafter.

In the light of the above statements, choose the correct answer from the options given below:

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.	**(A)** is False but **(R)** is True.

115. The site for the location of the electron transport system in the mitochondria is:
1. The outer membrane
2. The inner membrane
3. The intermembrane space
4. Matrix

116. In the human ribcage, true ribs are defined as:

1.	Floating ribs that do not connect to the sternum
2.	Ribs connected indirectly to the sternum via cartilage of other ribs
3.	Ribs directly attached to the sternum via costal cartilage
4.	Ribs that do not articulate with the vertebral column

117. Why are lichens considered excellent indicators of air pollution?

1.	They thrive in environments with high concentrations of nitrogen and sulphur compounds.
2.	They are sensitive to airborne pollutants, which disrupt their symbiotic relationship.
3.	They absorb heavy metals from the environment promoting their growth.
4.	They can metabolize and break down organic pollutants in the air.

118. The ribosomes found in prokaryotic cells are smaller than those in eukaryotic cells. What is the sedimentation rate of prokaryotic ribosomes?

1.	80S	2.	90S
3.	60S	4.	70S

119. 'Toddy', a traditional drink of some parts in southern India, is made by fermenting sap from:

1.	Soyabean	2.	Bamboo shoots
3.	Palms	4.	Sugarcane

120. Regarding the chemical regulation of respiration in humans:

I:	A chemosensitive area is situated adjacent to the rhythm centre which is highly sensitive to CO_2 and hydrogen ions.
II:	Receptors associated with aortic arch and carotid artery can recognise changes in O_2 concentration and send necessary signals to the rhythm centre for remedial actions.
III:	The role of oxygen in the regulation of respiratory rhythm is most significant.

1. Only **I** and **II** are correct
2. Only **II** and **III** are incorrect
3. **I**, **II** and **III** are incorrect
4. Only **I** and **III** are correct

121. Consider the given two statements:

Assertion (A):	Pyramid of energy is always upright, can never be inverted.
Reason (R):	When energy flows from a particular trophic level to the next trophic level, some energy is always lost as heat at each step..

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains the **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain the **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

122. Pleurobrachia and Ctenoplana belong to:
1. Porifera
2. Cnidaria
3. Ctenophora
4. Platyhelminthes

123. Which PGR stimulates the closure of stomata and increases the tolerance of plants to various kinds of stresses?

1.	Abscisic acid	2.	Ethylene
3.	Auxins	4.	Cytokinins

124. What is the key concept behind plant tissue culture?

1.	Growing plants from seeds in a nutrient-rich solution.
2.	Growing whole plants from explants in a sterile nutrient medium.
3.	Reproducing plants by using their fruits and seeds in controlled conditions.
4.	Crossbreeding two different plant species to create hybrids.

125. What type of development do cockroaches exhibit, where they pass through a nymphal stage?
1. Holometabolous
2. Hemimetabolous
3. Ametabolous
4. Paurometabolous

126. To sustain animal visits, the flowers have to provide rewards to the animals.

A:	Nectar and pollen grains are the usual floral rewards.
B:	In some species floral rewards are in providing safe places to lay eggs.

1.	Only **A** is correct	2.	Only **B** is correct
3.	Both **A** and **B** are correct	4.	Both **A** and **B** are incorrect

127. A true-breeding plant is:

1.	one that is able to breed on its own
2.	produced due to cross-pollination among unrelated plants
3.	near homozygous and produces offspring of its own kind
4.	always homozygous recessive in its genetic constitution

128. Identify the incorrect statement:

I:	Axial skeleton comprises 80 bones distributed along the main axis of the body.
II:	The skull is composed of 22 bones.
III:	Cranial bones are 14 in number.
IV:	The facial region is made up of 8 skeletal elements which form the front part of the skull.

1. Only **I** and **II**
2. Only **III** and **IV**
3. Only **II, III** and **IV**
4. Only **I**

129. The epithelial cells of Bowman's capsule, arranged in an intricate manner so as to leave some minute spaces called filtration slits or slit pores, are called as:

1.	Macula densa	2.	Juxtaglomerular cells
3.	Podocytes	4.	Mesangial cells

130. In females, Pelvic Inflammatory Diseases [PID] are frequently the complication of:
1. Streptococcal skin infections
2. Sexually transmitted infections
3. Twin pregnancy
4. Tubectomy surgical procedure

131. Match each item in **Column-I** with one item in **Column-II** and select the best match from the codes given:

	Column-I		**Column-II**
A.	Mechanism of action of Steroid hormones	P.	Activating second messenger systems like cAMP
B.	Mechanism of action of Peptide hormones	Q.	Directly regulating gene expression
C.	Mechanism of action of Thyroid hormones	R.	Binding to cell surface receptors
D.	Mechanism of action of Catecholamines	S.	Increasing basal metabolic rate by regulating gene expression

Codes:

Options	A	B	C	D
1.	P	Q	R	S
2.	S	P	Q	R
3.	R	S	P	Q
4.	Q	R	S	P

132. Dissolution of the synaptonemal complex occurs during :

1.	Zygote	2.	Diplotene
3.	Leptotene	4.	Pachytene

133. Consider the two statements:

Assertion(A):	ABA is also called the stress hormone.
Reason(R):	ABA plays an important role in seed development, maturation and dormancy.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**.
3.	**(A)** is True; **(R)** is False.
4.	**(A)** is False; **(R)** is True.

134. Why are the plants produced through micropropagation called somaclones?

1.	They are genetically identical to the original plant as they arise from single somatic cells.
2.	They contain genetic variations due to recombination during tissue culture.
3.	They result from hybridization between different plant species.
4.	They develop only from seeds, ensuring genetic stability.

135. Inhalation of air into the lungs can be brought about by:

I:	Contraction of diaphragm
II:	Contraction of internal intercostal muscles
III:	Contraction of external intercostal muscles

1. Only **I** and **II**
2. Only **II**
3. Only **I** and **III**
4. Only **III**

136. A grazing food chain is different from a detritus food chain because:

I:	GFC is the major conduit of energy flow in terrestrial ecosystem.
II:	GFC begins with dead organic matter.

1. Only **I** is correct
2. Only **II** is correct
3. Both **I** and **II** are correct
4. Both **I** and **II** are incorrect

137. The notochord, which is a characteristic feature of chordates, is formed during embryonic development from:

1. Endoderm
2. Mesoderm
3. Ectoderm
4. Mesoglea

138. In plant-animal pollinator mutualistic relationships:

I:	Plants need the help of animals for pollinating their flowers and dispersing their seeds.
II:	Plants offer rewards or fees in the form of pollen and nectar for pollinators and juicy and nutritious fruits for seed dispersers.

1.	Only **I** is correct
2.	Only **II** is correct
3.	Both **I** and **II** are correct
4.	Both **I** and **II** are incorrect

139. To maintain the pH and ionic balance of the body fluids, the proximal convoluted tubule selectively secretes all the following into the filtrate except:

I.	Hydrogen ion	II.	Potassium ion
III.	Ammonia	IV.	Bicarbonate ion

1. I & II
2. II & III
3. II & IV
4. Only IV

140. ELISA stands for:

1.	Easily Located Immuno Specific Antigen
2.	Early Live Inactive Surface Antigen
3.	Energy Loaded Intermediate Site on Apoenzyme
4.	Enzyme-Linked Immuno Sorbent Assay

141. In conservation biology, the in-situ conservation strategy is considered superior to ex-situ conservation because:

1.	It eliminates the risk of genetic erosion caused by human intervention.
2.	It completely prevents extinction by ensuring full ecosystem protection.
3.	It preserves species in their natural habitat along with ecological interactions.
4.	It allows rapid reproduction and artificial selection for desirable traits.

142. Consider the given two statements:

Assertion (A):	Natural methods of contraception are most effective and reliable methods of contraception.
Reason (R):	All natural methods of contraception have a very low failure rates when compared to other methods such as IUDs.

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.	**(A)** is False and **(R)** is False.

143. Give below are two statements:

Statement I:	Restriction endonucleases recognise specific sequence to cut DNA known as palindromic nucleotide sequence.
Statement II:	Restriction endonucleases cut the DNA strand a little away from the centre of the Palindromic site.

In the light of the above statements, choose the most appropriate answer from the options given below:
1. **Statement I** is incorrect but **Statement II** is correct.
2. Both **Statement I** and **Statement II** are correct.
3. Both **Statement I** and **Statement II** are incorrect.
4. **Statement I** is correct but **Statement II** is incorrect.

144. Spooling is:

1.	Amplification of DNA
2.	Cutting of separated DNA bands from the agarose gel
3.	Transfer of separated DNA fragments to synthetic membranes
4.	Collection of isolated DNA

145. Consider the given two statements:

Statement I:	No more oogonia are formed and added after birth.
Statement II:	A large number of follicles degenerate during the phase from birth to puberty.

1. **Statement I** is correct; **Statement II** is correct
2. **Statement I** is incorrect; **Statement II** is correct
3. **Statement I** is correct; **Statement II** is incorrect
4. **Statement I** is incorrect; **Statement II** is incorrect

146. Identify the correct set of statements:

(a)	The leaflets are modified into pointed hard thorns in *Citrus* and *Bougainvillea.*
(b)	Axillary buds form slender and spirally coiled tendrils in cucumber and pumpkin.
(c)	Stem is flattened and fleshy in *Opuntia* and modified to perform the function of leaves.
(d)	*Rhizophora* shows vertically upward growing roots that help to get oxygen for respiration.
(e)	Subaerially growing stems in grasses and strawberry help in vegetative propagation.

Choose the correct answer from the options given below:
1. (a), (b), (d), and (e) only
2. (b), (c) only
3. (a), (d) only
4. (b), (c), (d) and (e) only

147. Lecithin, a small molecular weight organic compound found in living tissues, is an example of:
1. Phospholipids
2. Glycerides
3. Carbohydrates
4. Amino acids

148. Study the given two statements:

Statement I:	The eye of the octopus and the eye of mammals are homologous.
Statement II:	Sweet potato and potato are an example of homology.

1.	**Statement I** is incorrect; **Statement II** is correct
2.	**Statement I** is correct; **Statement II** is correct
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is incorrect

149. Identify the incorrect statement regarding photosynthesis in higher plants:

1.	Chlorophyll a is the chief pigment associated with photosynthesis.
2.	Splitting of water is associated with PS II
3.	Cyclic flow of electrons results only in the synthesis of NADH
4.	Biosynthetic phase is dependent on the products of the light reaction

150. Match the following RNA polymerases with their transcribed products:

	Column-I		**Column-II**
(a)	RNA polymerase I	(i)	tRNA
(b)	RNA polymerase II	(ii)	rRNA
(c)	RNA polymerase III	(iii)	hnRNA

Select the correct option from the following:

Options:	(a)	(b)	(c)
1.	i	iii	ii
2.	i	ii	iii
3.	ii	iii	i
4.	iii	ii	i

151. A process in which heritable variations enabling better survival are enabled to reproduce and leave greater number of progeny is called:

1.	Evolution	2.	Saltation
3.	Speciation	4.	Natural selection

152. Consider the given two statements:

Statement I:	Besides the involvement of multiple genes polygenic inheritance also takes into account the influence of environment.
Statement II:	In a polygenic trait the phenotype reflects the contribution of each allele, i.e., the effect of each allele is additive.

1. Statement I is correct; Statement II is correct
2. Statement I is correct; Statement II is incorrect
3. Statement I is incorrect; Statement II is correct
4. Statement I is incorrect; Statement II is incorrect

153. The technique called gamete intrafallopian transfer (GIFT) is recommended for those females:

1.	who cannot provide a suitable environment for fertilisation.
2.	who cannot produce an ovum.
3.	who cannot retain the fetus inside the uterus.
4.	whose cervical canal is too narrow to allow passage for the sperms.

154. Identify the correctly matched pairs:

	Layer in the wall of artery/vein	Made up of
I:	Tunica intima	Squamous epithelium
II:	Tunica media	Skeletal muscle/elastic fibres
III:	Tunica externa	Fibrous connective tissue

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

155. Consider the following statements:

I:	Pteridophytes are the first terrestrial plants to possess vascular bundles.
II:	Main plant body in pteridophytes is sporophyte which is differentiated into true stem and leaves.
III:	Genera like *Selaginella* and *Salvinia* are heterosporous.

Which of the above statements are true?
1. **I** and **II** only
2. **I** and **III** only
3. **II** and **III** only
4. **I**, **II** and **III**

156. Match the plasma proteins in Column I with their function in Column II and select the correct answer from the codes given:

	Column I		**Column II**
A.	Albumins	a.	Hemostasis
B.	Globulins	b.	Transport carriers and immunity
C.	Fibrinogen	c.	Colloid osmotic pressure

Codes:

	A	**B**	**C**
1.	a	b	c
2.	a	c	b
3.	b	a	c
4.	c	b	a

157. Match each item in Column I with one item in Column II and select the best match from the codes given:

	Column I		**Column II**
A.	Valvate aestivation	P.	Sepals touch but do not overlap
B.	Twisted aestivation	Q.	One margin overlaps the next petal
C.	Imbricate aestivation	R.	Sepals overlap irregularly
D.	Vexillary aestivation	S.	Standard overlaps wings, wings overlap keel

Codes:

Options	A	B	C	D
1.	S	Q	R	P
2.	R	P	Q	S
3.	P	Q	R	S
4.	S	R	Q	P

158. What type of neuron is found in the human retina and olfactory membrane?
1. Unipolar
2. Bipolar
3. Multipolar
4. Pseudo-unipolar

159. Which of the following statements are correct regarding female reproductive cycle?

A.	In non-primate mammals, cyclical changes during reproduction are called oestrus cycle.
B.	First menstrual cycle begins at puberty and is called menopause.
C.	Lack of menstruation may be indicative of pregnancy.
D.	Cyclic menstruation extends between menarche and menopause.

Choose the most appropriate answer from the options given below:

1.	**A**, **C** and **D** only	2.	**A** and **D** only
3.	**A** and **B** only	4.	**A**, **B** and **C** only

160. Earth has amazing bio-diversity. The number of species on Earth that are known and described ranges between:

1.	0.8 - 1.0 million	2.	1.7 - 1.8 million
3.	7 – 8 million	4.	20 – 50 million

161. Consider the given two statements:

Assertion (A):	The logistic growth model is considered a more realistic model for most animal populations in natural environmental conditions.
Reason (R):	Most animals are capable of showing active locomotion.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True and **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is False

162. Consider the given two statements:

Assertion (A):	Inspiration can occur if there is a negative pressure in the lungs with respect to atmospheric pressure.
Reason (R):	The thoracic chamber is an airtight chamber.

1.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
2.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**
3.	**(A)** is True, **(R)** is False
4.	**(A)** is False, **(R)** is True

163. Consider the given two statements:

Statement I:	Male frogs can be distinguished by the presence of vocal sacs and a copulatory pad.
Statement II:	Female frogs have vocal sacs and copulatory pads.

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.

164. Citric acid, used in the food and beverage industry, is commercially produced with the help of:
1. *Saccharomyces cerevisiae*
2. *Lactobacillus*
3. *Aspergillus niger*
4. *Streptococcus thermophilus*

165. Match **List-I** with **List-II**

	List-I		**List-II**
(A)	Auxin	(I)	Promotes female flower formation in cucumber
(B)	Gibberellin	(II)	Overcoming apical dominance
(C)	Cytokinin	(III)	Increase in the length of grape stalks
(D)	Ethylene	(IV)	Promotes flowering in pineapple

Choose the correct answer from the options given below:

Options:	(A)	(B)	(C)	(D)
1.	II	I	IV	III
2.	IV	III	II	I
3.	I	III	IV	II
4.	III	II	I	IV

166. The structural genes of the lac operon in E.coli do not include:

1.	lac A	2.	lac I
3.	lac Y	4.	lac Z

167. Consider the given two statements:

Statement I:	Birds are characterized by their pneumatic (hollow) bones and a four-chambered heart.
Statement II:	Birds are cold-blooded and possess air sacs that supplement their respiration.

1.	**Statement I** is correct; **Statement II** is correct
2.	**Statement I** is incorrect; **Statement II** is incorrect
3.	**Statement I** is correct; **Statement II** is incorrect
4.	**Statement I** is incorrect; **Statement II** is correct

168. Chitin, a complex polysaccharide, is found in:

1.	Plant cell wall
2.	The exoskeleton of arthropods and cell walls of most fungi
3.	Bacterial cell wall
4.	Cartilage and other connective tissues

169. Presence of exarch and polyarch vascular bundles is characteristically seen in:

1.	Monocot stem	2.	Monocot root
3.	Dicot stem	4.	Dicot root

170. Consider the given two statements:

Assertion (A):	The sinoatrial (SA) node region of the right atrium is the normal pacemaker of the heart.
Reason (R):	The human heart is myogenic in nature.

1.	**(A)** is True but **(R)** is False
2.	Both **(A)** and **(R)** are True and **(R)** correctly explains **(A)**
3.	**(A)** is False but **(R)** is True
4.	Both **(A)** and **(R)** are True but **(R)** does not correctly explain **(A)**

171. The taxonomic category where you expect to find organisms least similar to one another would be:

1.	Class	2.	Genus
3.	Family	4.	Species

172. In order to produce concentrated urine, a large amount of water could be reabsorbed in the human kidney from:
1. PCT
2. Henle's loop
3. DCT
4. Collecting duct

173. The spleen:

I:	mainly contains lymphocytes and phagocytes.
II:	acts as a filter of the blood by trapping blood-borne micro-organisms.
III:	has a large reservoir of erythrocytes

1. Only **I** and **II** are correct
2. Only **I** and **III** are correct
3. Only **II** and **III** are correct
4. **I**, **II** and **III** are correct

174. Which one of the following structures is haploid in its ploidy level?
1. Primary Endospore Nucleus
2. Microspore Mother cell
3. Protonemal cell of a moss
4. Primary endosperm nucleus in dicot

175. Limbic system is involved in the regulation of sexual behaviour, expression of emotional reactions (e.g., excitement, pleasure, rage and fear), and motivation primarily along with:
1. cerebrum
2. hypothalamus
3. thalamus
4. mid-brain

176. Name the scientist:

I.	He studied the tobacco mosaic virus.
II.	He succeeded in extracting the virus in the form of pure crystals in 1935.
III.	He was able to show that the tobacco mosaic virus is composed of protein and RNA.

1.	D. J. Ivanovsky	2.	W. M. Stanley
3.	M. W. Beijerinck	4.	Louis Pasteur

177. In the hormonal regulation of the male reproductive system:

1.	Spermatogenesis starts due to a significant decrease in the secretion of GnRH
2.	LH acts on Sertoli cells and stimulates the secretion of some factors required for effective spermiogenesis
3.	FSH acts on Leydig cells and stimulates the synthesis and secretion of androgens
4.	Androgens stimulate the process of spermatogenesis

178. The simplest α amino acid is:

1.	Glycine	2.	Alanine
3.	Serine	4.	Lysine

179. Where does the Calvin cycle take place in C_4 plants?

1.	Stroma of bundle sheath chloroplasts
2.	Grana of bundle sheath chloroplasts
3.	Mesophyll chloroplasts
4.	It does not occur in C_4 plants and CO_2 is fixed only by PEP

180. The development of *Periplaneta americana* is:

1.	Paurometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wing pads.
2.	Paurometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wings.
3.	Holometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wing pads.
4.	Holometabolous with nymph moulting about 13 times to reach the adult form and the next to last nymphal stage has wings.