Physics

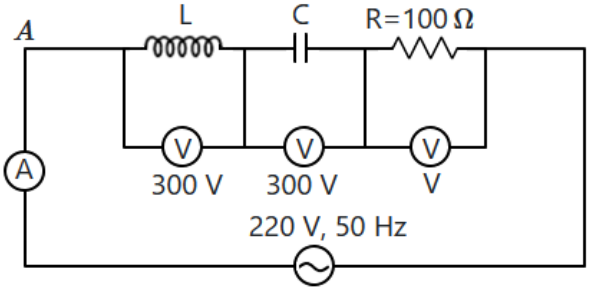
1. The ratio of the mass densities of the nuclei ^{40}Ca and ^{16}O is close to:

1.	0.1	2.	2
3.	5	4.	1

2. In which of the following cases, do we get very strong reflected rays and very weak refracted rays?

1.	light passing from water to air
2.	light passing from glass to diamond
3.	light passing from water to glass
4.	light passing from air to glass

3. In the circuit shown below, what will be the reading of the voltmeter and the ammeter respectively?



1. 800 V, 2 A
2. 300 V, 2 A
3. 220 V, 2.2 A
4. 100 V, 2 A

4. A source of sound of frequency 160 Hz, when moving with a speed v towards a fixed identical vibrating source, produces a beat frequency of 10 Hz in the ground frame. The speed of sound in air is 340 m/s. The speed v equals:

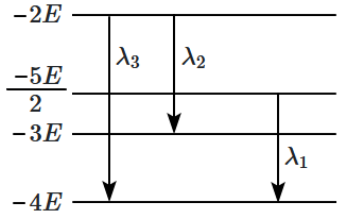
1. 20 m/s
2. $\frac{68}{3}$ m/s
3. $\frac{85}{4}$ m/s
4. 25 m/s

5. Given below are two statements:

Assertion (A):	When an AC circuit contains only a resistor, its power is at a minimum.
Reason (R):	The power of a circuit is independent of the phase angle.

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.

6. Some energy levels of a molecule are shown in the figure with their wavelengths of transitions.



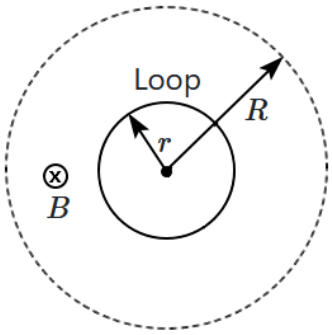
Then:

1.	$\lambda_3 > \lambda_2, \lambda_1 = 2\lambda_2$	2.	$\lambda_3 > \lambda_2, \lambda_1 = 4\lambda_2$
3.	$\lambda_1 > \lambda_2, \lambda_2 = 2\lambda_3$	4.	$\lambda_2 > \lambda_1, \lambda_2 = 2\lambda_3$

7. An elastic ball rebounds vertically to a height h above the ground, the period of its motion will be:

1.	$\sqrt{\frac{2h}{g}}$	2.	$\sqrt{\frac{8h}{g}}$
3.	$\sqrt{\frac{h}{2g}}$	4.	$2\sqrt{\frac{h}{g}}$

8. A circular region of radius R, has a uniform magnetic field within it, increasing at a constant rate: $\frac{dB}{dt} = k$. Consider a circular loop of radius r $(r < R)$, concentric with the region. The EMF induced in the loop is proportional to:



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

9. The electric field due to an infinitely long thin straight wire with uniform linear charge density λ at a radial distance r from the wire is: (ε_0 is the permittivity of free space)

1.	$\frac{\lambda}{4\pi\varepsilon_0 r^2}$	2.	$\frac{\lambda}{2\varepsilon_0}$
3.	$\frac{\lambda}{2\pi\varepsilon_0 r^2}$	4.	$\frac{\lambda}{2\pi\varepsilon_0 r}$

10. The displacement of a particle along x-axis is given by $x = a\sin 2\omega t$. The motion of the particle corresponds to:

1.	simple harmonic motion of frequency ω/π.
2.	simple harmonic motion of frequency $3\omega/2\pi$.
3.	non-simple harmonic motion.
4.	simple harmonic motion of frequency $\omega/2\pi$.

11. What happens to the mass number and the atomic number of an element when it emits γ-radiation?

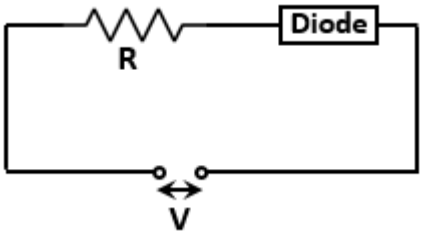
1.	mass number decreases by four and atomic number decreases by two.
2.	mass number and atomic number remain unchanged.
3.	mass number remains unchanged while the atomic number decreases by one.
4.	mass number increases by four and the atomic number increases by two.

12. A copper rod of 88 cm and an aluminium rod of an unknown length have an equal increase in their lengths independent of an increase in temperature. The length of the aluminium rod is:

$\left(\alpha_{Cu} = 1.7 \times 10^{-5}\ \mathrm{K}^{-1} \text{ and } \alpha_{Al} = 2.2 \times 10^{-5}\ \mathrm{K}^{-1}\right)$

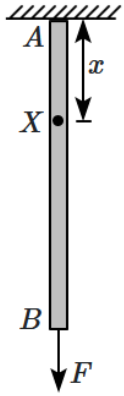
1. 68 cm
2. 6.8 cm
3. 113.9 cm
4. 88 cm

13. An ideal p-n junction diode is connected in the circuit. Which of the following is correct?



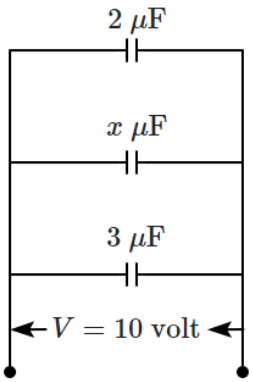
1.	in forward biasing, the diode resistance is R.
2.	in reverse biasing, the diode resistance is R.
3.	in forward biasing, the diode resistance is zero.
4.	in reverse biasing, the diode resistance is zero.

14. A uniform metallic wire is suspended from the ceiling and a force F is applied at its lower end, causing it to extend in length by s. Consider a point X on the wire, at a distance x from its upper end A. This point moves down by: (length $AB = l$)



1.	s	2.	$\frac{s}{x}l$
3.	$s\frac{x}{l}$	4.	$s\frac{x^2}{l^2}$

15. In the given circuit diagram, the total charge stored in capacitors is 50 μC. The value of capacitor x is:



1. 3
2. 0
3. 2
4. 1

16. Light emitted from a hydrogen atom during the transition from $n = 4$ to $n = 2$ is incident on cesium metal with a work function of 1.9 eV. The maximum kinetic energy of the emitted photoelectrons will be:

1. 2.55 eV
2. 0.65 eV
3. 25.5 eV
4. 6.5 eV

17. Given below are two statements:

Assertion (A):	The ratio $\frac{\vec{a} \times \vec{b}}{\vec{a} \cdot \vec{b}} = \tan\theta$, where θ is the angle between the vectors $\vec{a}, \vec{b}$.
Reason (R):	The $\vec{a} \times \vec{b}$ has the magnitude: $ab \sin\theta$, and $\vec{a}.\vec{b}$ has the magnitude: $ab \cos\theta$, where θ is the angle between the vectors $\vec{a}, \vec{b}$.

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.

18. A wire connects two blocks of masses M, $2M$; both lying on a smooth horizontal plane.

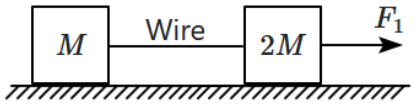


Figure 1

When a force F_1 is applied to $2M$ as shown in figure 1, the wire just breaks. On the other hand, when F_2 is applied to M as shown in figure 2,

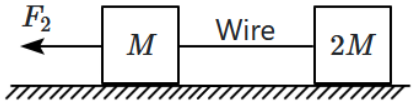


Figure 2

the wire just breaks. Assume that the mass of the wire is negligible. Then:

1.	$F_1 = F_2$
2.	$F_1 > F_2$
3.	$F_1 < F_2$
4.	Any of the above is possible

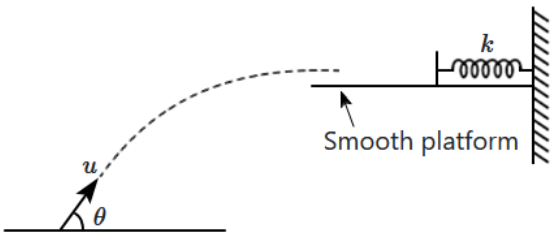
19. A particle having charge q, mass m is shot into a region where there is a uniform magnetic field B_0 perpendicular to the direction of its motion. After traversing a distance s_0, the particle emerges with a velocity that is opposite to its initial direction. The speed of the particle is:

1.	$\frac{qB_0}{m}s_0$	2.	$\frac{qB_0}{m}\frac{s_0}{2}$
3.	$\frac{qB_0}{m}\frac{s_0}{\pi}$	4.	$\frac{qB_0}{m}\frac{\pi s_0}{2}$

20. Assume that the earth and the sun are spherical bodies with uniform mass distributions. If the radius of the sun is halved without changing its mass, the force of gravitation on the earth, exerted by the sun, will:

1.	be doubled
2.	be 4 times (quadrupled)
3.	be halved
4.	remain unchanged

21. A ball of mass m is projected with a speed u, at an angle of θ with the horizontal. At its highest point, it moves on a smooth horizontal platform with a spring of spring constant k attached, and the ball compresses the spring. The maximum compression in the spring is x. Then:



1.	$\frac{1}{2}mu^2 = \frac{1}{2}kx^2$	2.	$\frac{1}{2}mu^2cos^2\theta = \frac{1}{2}kx^2$
3.	$\frac{1}{2}mu^2 = \frac{1}{2}kx^2cos^2\theta$	4.	$\frac{1}{2}mu^2sin^2\theta = \frac{1}{2}kx^2$

22. Given below are two statements:

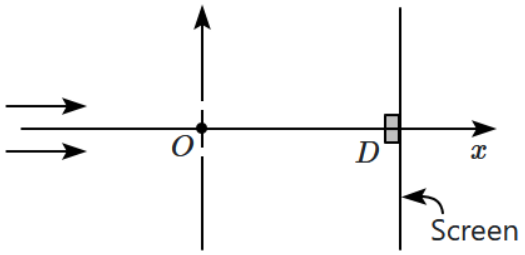
Statement I:	Kirchhoff's current law is a consequence of the conservation of energy as applied to electric circuits.
Statement II:	Kirchhoff's voltage law is a consequence of the conservation of charge.

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.

23. Young's double-slit experiment is setup, as shown in the figure, with the origin (O) taken at the centre of the double-slit. The two slits are at $y = 0.1$ mm and at $y = -0.1$ mm; the screen is perpendicular to the x-axis at $x = 50$ cm. The light waves incident onto the double-slit are given by:

$$\psi(x,t) = A\sin 2\pi(5\times 10^{14}\ \text{s}^{-1})\left(t - \frac{x}{3\times 10^8\ \text{m/s}}\right)$$

A detector for photons is placed on the screen.



If this photon-detector is moved on the screen, along the y-axis, the minimum rate of detection will be encountered (above $y = 0$) at:

1. $y = 1.5$ mm
2. $y = 0.75$ mm
3. $y = 1500$ nm
4. $y = 3000$ nm

24. The equipotential surfaces for a uniform electric field in space are:

1. concentric spheres
2. coaxial cylinders
3. parallel planes
4. any of the above

25. A pair of equal and opposite charges of magnitude Q are placed a distance d apart. At the mid-point of these charges, is placed a dipole of dipole moment p. The maximum possible torque on the dipole is:

1.	$p \cdot \frac{2kQ}{(d/2)^2}$	2.	$p \cdot \frac{2kQ}{(d/2)}$
3.	$p \cdot \frac{kQ}{(d/2)^2}$	4.	$p \cdot \frac{kQ}{(d/2)}$

26. On increasing the number density of a gas in a vessel, the mean free path of a gas:
1. decreases
2. increases
3. remains the same
4. becomes double

27. Compute the ratio of specific heats (C_P/C_V) of an equimolar mixture of hydrogen and helium.

1.	$\frac{23}{15}$	2.	$\frac{3}{2}$
3.	2	4.	$\frac{7}{3}$

28. An α-particle and a proton of the same kinetic energy move along circular paths of radii r_α and r_p respectively, in the same magnetic field. The ratio (r_α/r_p) equals:

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

29. 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.	$\frac{5}{27}$

30. A silicon wafer of n-type material with a cross-sectional area of 3.14×10^{-6} m^2, a conductivity of 5.8×10^7 siemens per metre, and an electron mobility of 0.0032 m^{2}V^{-1}s^{-1} is subjected to an electric field of 20 milli-V/m. (neglect hole concentration)
Match the items in **Column-I** with those in **Column-II**:

	Column-I		**Column-II**
(A)	The electron concentration in the wafer is	(P)	1.16×10^6 SI units
(B)	The current density in the wafer is	(Q)	3.64 SI units
(C)	The current flowing through the wafer is	(R)	6.4×10^{-5} SI units
(D)	The drift velocity of electrons is	(S)	1.13×10^{29} SI units

1.	A(P), B(Q), C(R), D(S)
2.	A(P), B(S), C(R), D(Q)
3.	A(S), B(P), C(Q), D(R)
4.	A(Q), B(P), C(R), D(S)

31. The diameter of a thin wire is measured by:
1. Screw gauge
2. Spherometer
3. Spectrometer
4. Venturimeter

32. A hydraulic automobile lift is designed to lift cars with a maximum mass of 500 kg. The area of the cross-section of the piston carrying load is 5×10^{-2} m^2. The maximum pressure that smaller piston would have to bear is: (take $g = 9.8$ m/s^2)
1. 9.8×10^4 Pa
2. 9.8×10^7 Pa
3. 3.9×10^5 Pa
4. 4.9×10^6 Pa

33. An electromagnetic wave is given by:

$\vec{E} = E_0(\hat{i} + \hat{j})\sin(\omega t - kz)$

is travelling in space, where $\vec{E}$ is the electric field at (x, y, z) at time t.

The direction of propagation of the wave is along the vector:

1. $\hat{i} + \hat{j}$
2. $\hat{i} + \hat{j} + \hat{k}$
3. $\hat{k}$
4. $(\hat{i} + \hat{j}) \times \hat{k}$

34. Which logic gate corresponds to the truth table given below?

Input		Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

1. NOR
2. NAND
3. OR
4. NOT

35. A steel bar magnet has a magnetic moment of 2.5 A-m^2 and a mass of 6.6×10^{-2} kg. If the density of the material is 6.6×10^3 kg-m^{-3}, the intensity of magnetisation of the magnet is:

1. 2.5×10^5 A-m^{-1}
2. 2.5×10^{-5}A-m^{-1}
3. 1.25×10^5A-m^{-1}
4. 1.25×10^{-5}A-m^{-1}

36. 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

37. The time taken by sunlight to pass through a glass slab of thickness 5 mm and refractive index 1.5 is:

1.	$\left(\frac{5}{3}\right) \times 10^{-8}$ s	2.	$\left(\frac{5}{2}\right) \times 10^{-11}$ s
3.	$\left(\frac{5}{3}\right) \times 10^{-11}$ s	4.	$\left(\frac{5}{2}\right) \times 10^{-8}$ s

38. Ultraviolet photons, each of energy 20 eV, are incident onto a gas of H-atoms, causing the emission of electrons. The kinetic energy of the emitted electrons has the value:

1. 6.4 eV
2. 7.2 eV
3. 3.2 eV
4. 13.6 eV

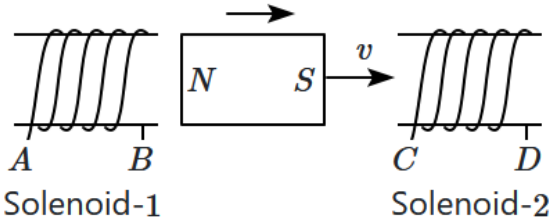
39. A person sitting on the ground floor of a building notices through the window, of height 1.5 m, a ball dropped from the roof of the building crosses the window in 0.1 s. What is the velocity of the ball when it is at the topmost point of the window? $\left(g = 10\ \text{m/s}^2\right)$

1.	15.5 m/s	2.	14.5 m/s
3.	4.5 m/s	4.	20 m/s

40. A gun is fired horizontally with its shell travelling at a velocity of 100 m/s, initially. It impacts the ground after 10 s. Assume that there is no air resistance and take $g = 10\ \text{m/s}^2$. The velocity of impact is:

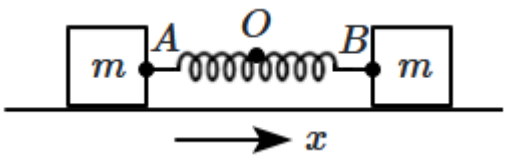
1.	0 m/s	2.	200 m/s
3.	150 m/s	4.	$100\sqrt{2}$ m/s

41. In the above diagram, a strong bar magnet is moving towards solenoid-2 from solenoid-1. The direction of induced current in solenoid-1 and that in solenoid-2, respectively, are through the directions:



1. BA and CD
2. AB and CD
3. BA and DC
4. AB and DC

42. Two identical blocks are connected by an ideal spring and the system is allowed to oscillate, when undergoing horizontal displacements in opposite directions, with the centre-of-mass at rest. O is the mid-point of the spring, A is the left end point, B is the right end-point. The motion of A is described by: $x_A = A_0 \sin\,\omega t$ (displacement is taken to be positive rightward).
Then, the motion of the point B is described by:



1.	$x_B = A_0 \sin \omega t$	2.	$x_B = A_0 \cos \omega t$
3.	$x_B = A_0 \sin(\omega t + \pi)$	4.	$x_B = A_0 \cos(\omega t + \pi)$

43. If a standard bar magnet is heated then its magnetism:

1.	increases	2.	decreases
3.	remains unchanged	4.	vanishes completely

44. An electromagnetic wave, given by its electric field $\vec{E}$, is travelling in space: $\vec{E} = E_0 \hat{j} \sin 2\pi\left(10^3\ \text{s}^{-1} t - \frac{x}{\lambda}\right)$
The wave is travelling along:

1.	the positive x-axis
2.	the negative x-axis
3.	the positive y-axis
4.	the negative y-axis

45. An empty earthen pitcher is kept under a water tap and water starts filling up as the tap is opened. The pitch of the sound produced:

1.	goes on decreasing
2.	goes on increasing
3.	first increases and then decreases
4.	does not change

Chemistry

46. 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.

47. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by passing hydrogen gas around the platinum wire at one atm pressure. The oxidation potential of the electrode would be:

1.	0.59 V	2.	0.118 V
3.	1.18 V	4.	0.059 V

48. The type of isomerism shown by CH_3CONH_2 and $HCONHCH_3$ is:

1. Position isomerism
2. Chain isomerism
3. Tautomerism
4. Functional isomerism

49. Which of the following substitution of benzene is ortho-para in electrophilic substitution and ortho-para in nucleophilic substitution ?

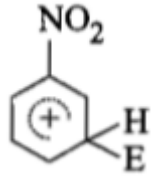
(1) -NO_2

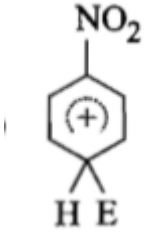
(2) -NO

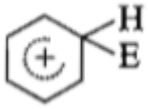
(3) -SO_3H

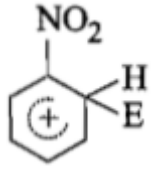
(4) -SO_2Me

50. The electrophile. $E^{\oplus}$ attacks the benzene ring to generate the intermediate σ- complex. Of the following which σ- complex is of lowest energy?

1. 

2. 

3. 

4. 

51. The spin-only magnetic moment of the $[ZCl4]^{2-}$ complex is 3.87 Bohr Magnetons (BM).
Identify the metal ion represented by Z.

1.	Co	2.	Ni
3.	Mn	4.	Cu

52. What will be the freezing point of a solution when 45g of ethylene glycol ($C_2H_6O_2$) is mixed with 600g of water?

(K_f for water 1.86 K kg mol^{-1} and freezing pt of pure water is 273.15 K)

1. 2.25 K
2. 270.9 K
3. 271.9 K
4. 270 K.

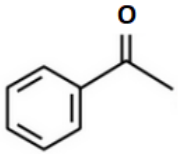
53. IUPAC name of $[Pt(NH_3)_3(Br)(NO_2)Cl]Cl$ is:

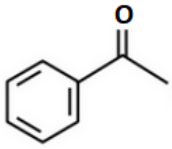
1.	Triamminebromidochloridonitroplatinum(IV)Chloride
2.	Triamminebromonitrocholoroplatinum(IV)Chloride
3.	Triamminechlorobromonitroplatinum(IV)Chloride
4.	Triamminenitrochlorobromoplatinum(IV)Chloride

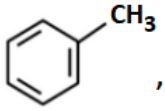
54. The correct options for the rate law that corresponds to overall first order reaction is:

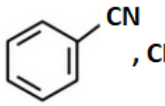
1.	$Rate = k[A]^0[B]^2$	2.	$Rate = k[A][B]$
3.	$Rate = k[A]^{1/2}[B]^2$	4.	$Rate = k[A]^{-1/2}[B]^{3/2}$

55. The incorrect method to synthesize benzaldehyde is:

1. 

2. 

3. 

4. 

56. Which of the following does not represent a redox reaction?

1. $Cr_2O_7^{2-} + 2OH^- \rightarrow CrO_4^{2-} + H_2O$
2. $SO_4^{2-} + 2I^- + 2H^+ \rightarrow I_2 + H_2S + H_2O$
3. $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$
4. $PCl_5 \rightarrow PCl_3 + Cl_2$

57. In the boiling of egg, entropy

1. decreases
2. increases
3. remains unchanged
4. cannot be predicted

58. The correct statement regarding dry cells among the following is:

a.	It is also known as the Leclanche cell.
b.	The electrolyte is a moist paste of ammonium chloride (NH_4Cl) and zinc chloride ($ZnCl_2$).
c.	The cathodic reaction is : $MnO_2 + NH_4^+ + e^- \rightarrow MnO(OH) + NH_3$

1.	Only a and b are correct	2.	Only c is correct
3.	Only b and c are correct	4.	All are correct

59. Match the substance given in Column I with the application given in Column II and mark the appropriate option:

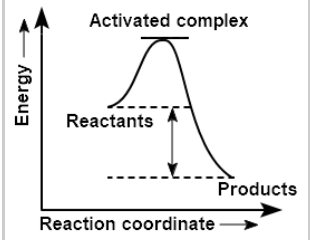
	Column I (Substance)		**Column II (Application)**
A.	Liquid helium	(i)	Chlorinating agent
B.	Argon	(ii)	Inert atmosphere (metallurgy)
C.	PCl_5	(iii)	Cryogenics
D.	P_4O_{10}	(iv)	Dehydrating agent

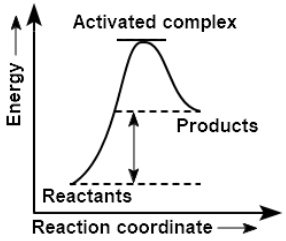
	A	B	C	D
1.	(iii)	(ii)	(i)	(iv)
2.	(iii)	(iv)	(i)	(ii)
3.	(ii)	(iii)	(i)	(iv)
4.	(ii)	(iv)	(i)	(iii)

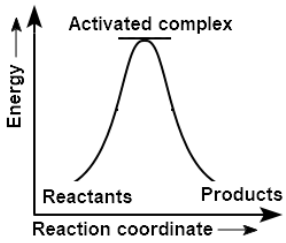
60. Which of the following has the maximum mass?

1. 0.1 gram molecule of oxygen.
2. 10 ml H_2O at STP
3. 3.01×10^{22} molecules of H_2SO_4
4. 1 gram atom of hydrogen.

61. The correct representation of an exothermic reaction is:

1. 

2. 

3. 

4. Both 1 and 2

62. Consider the given two statements:

Assertion (A):	A five times increase in pressure at equilibrium doesn't change K_p for the following reaction $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
Reason (R):	K_p depends on the degree of dissociation, not on total pressure.

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.

63. Which of the following statements is/are correct?

(a)	Heat like work is a way of transferring energy.
(b)	Heat is not a property of the system, whereas temperature is a property of the system.
(c)	Reactions that are accompanied by the evolution of heat are called endothermic reactions.
(d)	Those reactions in which heat is absorbed are known as exothermic reactions.

1. **a** and **b**
2. **b**, **c** and **d**
3. **b** and **c**
4. None of the above

64. Why are acetylenic hydrogens acidic?

1.	The sigma electron density of the C-H bond in acetylene is closer to carbon, which has 50% s-character.
2.	Acetylene has only one hydrogen on each carbon.
3.	Acetylene contains the least number of hydrogens among the possible hydrocarbons having two carbons.
4.	Acetylene belongs to the class of alkynes with the molecular formula C_nH_{2n-2}.

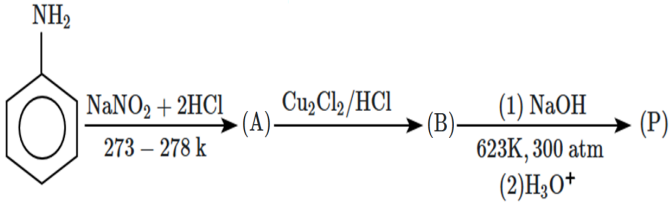
65. The correct order for boiling points of the following compounds is:

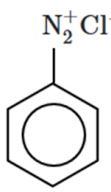
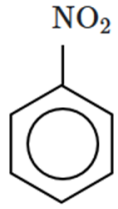
1.	$AsH_3 > PH_3 > NH_3 > SbH_3 > BiH_3$
2.	$BiH_3 > SbH_3 > NH_3 > AsH_3 > PH_3$
3.	$NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$
4.	$PH_3 > NH_3 > AsH_3 > SbH_3 > BiH_3$

66. Enzymes that utilize ATP in phosphate transfer require an alkaline earth metal (M) as the cofactor. M is:

1.	Sr	2.	Be
3.	Mg	4.	Ca

67. Identify the product labeled **(P)** in the given-below sequential reaction:

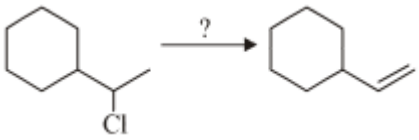


1.		2.	
3.		4.	

68. An amphoteric oxide among the following is:

1.	V_2O_5	2.	CrO_3
3.	Mn_2O_7	4.	V_2O_3

69. In order to accomplish the following conversion, what reagent and conditions would be required?



1. Cold sodium hydroxide
2. Hot conc. sodium hydroxide
3. Potassium tertiary butoxide and heat
4. Hot water

70. The oxidation states of P atom in $POCl_3$, H_2PO_3 and $H_4P_2O_6$ respectively, are:

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

71. Identify more than one correct resonance structures of carbon dioxide from the ones given below:

a. $^{-}O - C = O^{+}$

b. $O = C = O$

c. $^{-}O \equiv C - O^{+}$

d. $^{-}O - C \equiv O^{+}$

Choose the correct option:

1.	(a, b)	2.	(b, c)
3.	(c, d)	4.	(b, d)

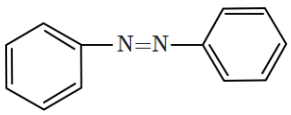
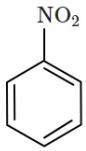
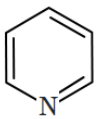
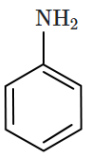
72. Generally, water-soluble vitamins (i.e., vitamins B and C) cannot be stored in our body, except for which of the following vitamins?

1. Vitamin B_1
2. Vitamin B_6
3. Vitamin B_{12}
4. Vitamic C

73. Which statement about the coordination number of a cation is true?

1.	Metal ions exhibit only a single characteristic co-ordination number.
2.	The coordination number is equal to the number of ligands bonded to the metal atom.
3.	The coordination number is determined solely by the number of empty d-orbitals in the atom.
4.	Coordination number is equal to the number of coordinate bonds between the metal cation and ligands.

74. The Kjeldahl's method for the estimation of nitrogen can be used to estimate the amount of nitrogen in which one of the following compounds?

1.		2.	
3.		4.	

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

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

76. Mark the incorrect order of the bond angle:

1. $NH_3 > NF_3$
2. $NF_3 < PF_3$
3. $NH_3 > PH_3$
4. $NH_3 > H_2O$

77. The chain growth of a silicone is stopped by adding:

1. Me_3SiCl
2. Me_2SiCl_2
3. $MeSiCl_3$
4. $SiCl_4$

78. Match the molecules in **Column-A** with their corresponding geometries in **Column-B**.

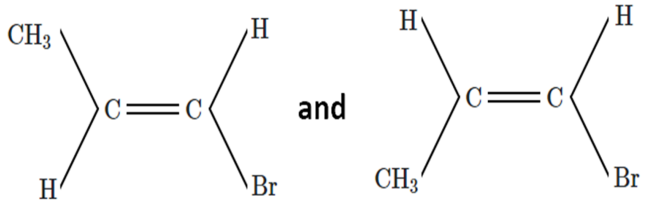
	Column-A (Molecule)		**Column-B (Molecular Geometry)**
(A)	ICl	(P)	T-shape
(B)	ICl_3	(Q)	Pentagonal Bipyramidal
(C)	ClF_5	(R)	Linear
(D)	IF_7	(S)	Square Pyramidal

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

79. Which of the following aqueous solutions of electrolytes will exhibit the least elevation in boiling point?

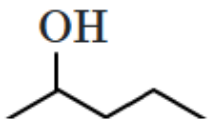
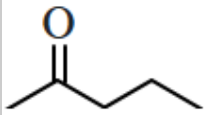
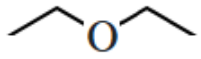
1.	0.05 M NaCl	2.	0.1 M KCl
3.	0.1 M $MgSO_4$	4.	1 M NaCl

80. What is the relationship between the following compounds?



1. Configurational isomers
2. Conformational isomers
3. Constitutional isomers
4. Structural isomers

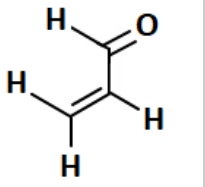
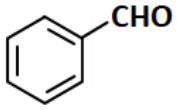
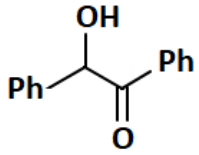
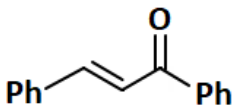
81. Consider the following compounds:

a.		b.	
c.		d.	

Which option correctly ranks their boiling points from highest to lowest?

1.	d > a > b > c	2.	a > b > d >c
3.	a > d > c > b	4.	a > d > b > c

82. The compound, among the following that cannot give a positive Tollen's test is:

1.		2.	
3.		4.	

83. The correct arrangement of the filling of sub-shells in a ground state atom according to the Aufbau principle is:

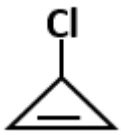
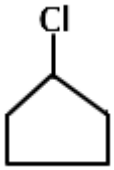
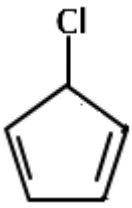
1. 3s 3p 3d
2. 3p 4s 3d
3. 3d 4s 4p
4. 4p 4d 4f

84. Given that the threshold frequency of the metal is $1.4 \times 10^{15} sec^{-1}$, what is the minimum energy required to eject a photoelectron from the metal?

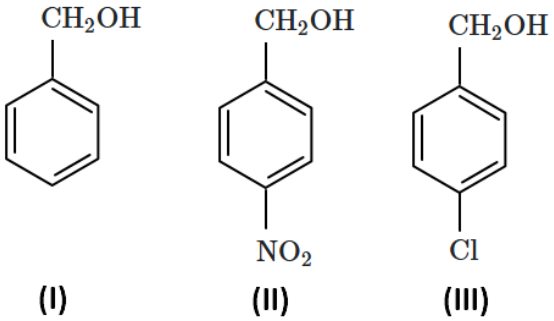
[given: $h = 6.6 \times 10^{-34} Jsec$]

1. $9.24 \times 10^{-19} J$
2. $9.24 \times 10^{-18} J$
3. $4.62 \times 10^{-19} J$
4. $4.62 \times 10^{-18} J$

85. Which compound is least reactive towards S_N1 reaction with aqueous KOH ?

1.		2.	
3.		4.	$(CH_3)_2CH - Cl$

86. Which option shows the correct increasing order of reactivity of the following compounds with HBr/HCl?



(I) (II) (III)

1. I < II < III
2. II <I < III
3. II < III < I
4. III < II < I

87. An alkene, obtained by the dehydration of an alcohol(A), on ozonolysis gives two molecules of acetaldehyde for every molecule of alkene. the alcohol (A) is:

1. $CH_3\,CH_2\,CH_2\,OH$
2. $CH_3\,CH_2\,OH$
3. $CH_3\,CH = CHCH_2\,OH$
4. $CH_3\,CH_2\,\underset{\underset{OH}{|}}{CH}\,CH_3$

88. Mark the conditions that favour the maximum product formation in the given reaction.

$A_2\,(g)\, + B_2\,(g) \rightleftharpoons X_2\,(g\,), \Delta_r H = -X\ k\ J$

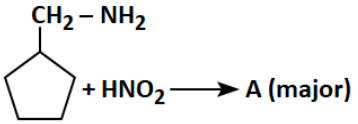
1. Low temperature and High pressure
2. Low temperature and Low pressure
3. High temperature and High pressure
4. High temperature and Low pressure

89. Incorrect statements among the following are:

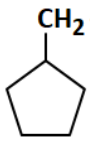
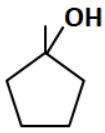
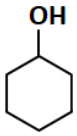
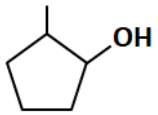
(a)	Group I radicals are precipitated as chloride
(b)	Group IV radicals are precipitated as sulphide
(c)	Group V radicals are precipitated as hydroxide
(d)	Group III radicals are precipitated as chloride

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

90. Given the following reaction:



The compound $'A'$ in the above reaction is:

1.		2.	
3.		4.	

Biology

91. Identify the correct chronological arrangement of the components of the cardiac conduction nodal tissue:

1.	SA node, AV bundle, AV node, Purkinje fibers
2.	SA node, AV node, AV bundle, Purkinje fibers
3.	AV node, AV bundle, SA node, Purkinje fibers
4.	AV node, SA node, Purkinje fibers, AV bundle

92. What is the key difference between bryophytes and pteridophytes?

1.	Bryophytes are vascular plants, whereas pteridophytes are non-vascular.
2.	Bryophytes have seeds, while pteridophytes reproduce through spores.
3.	Pteridophytes have a well-developed vascular system, unlike bryophytes.
4.	Bryophytes are predominantly aquatic, while pteridophytes are terrestrial

93. What type of cartilage forms the pubic symphysis in humans?

1.	Elastic	2.	Fibrous
3.	Hyaline	4.	Calcified

94. Determine which of the following statements about reproductive strategy of populations much below the carrying capacity is most likely to be correct?

1.	They typically inhabit stable environments.
2.	They produce a few offspring with high survival rates.
3.	They have a high intrinsic growth rate.
4.	They reproduce multiple times in their life and have a very long life span

95. Industrial melanism is a phenomenon that best demonstrates:

1.	The overuse of industrial pollutants leading to genetic mutations in species.
2.	The ability of a species to change color in response to industrial pollution.
3.	Evolution through natural selection, where darker individuals become more common due to industrial pollution.
4.	The disappearance of industrial pollutants from the environment due to the adaptation of microorganisms.

96. Consider the given two statements:

Statement I:	Properties of tissues are present in the constituent cells and similarly properties of cellular organelles are present in the molecular constituents of the organelle.
Statement II:	All living organisms – present, past and future, are linked to one another by the sharing of the common genetic material, but to varying degrees.

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

97. Malpighian tubules in cockroaches:

Statement I:	are a ring of 6-8 blind tubules present at the junction of foregut and midgut.
Statement II:	play an important role in excretion but no role in osmoregulation.

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

98. Which part of our brain is involved in thermoregulation and osmoregulation?
1. Corpora quadrigemina
2. Cerebellum
3. Hypothalamus
4. Pons varolii

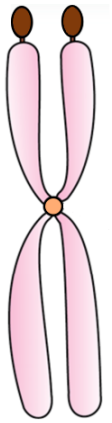
99. Given below are two statements:

Statement I:	RNA mutates at a faster rate.
Statement II:	Viruses having RNA genome and shorter life span mutate and evolve faster.

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

1.	**Statement I** is false but **Statement II** is true.
2.	Both **Statement I** and **Statement II** are true.
3.	Both **Statement I** and **Statement II** are false.
4.	**Statement I** is true but **Statement II** is false.

100. The given figure shows a:



1.	A metacentric chromosome with a centromere and two kinetochores
2.	A sub-metacentric chromosome
3.	An abnormal lamp brush chromosome
4.	A metacentric chromosome with primary and secondary constrictions

101. Which one of the following pair of animals comprises 'jawless fishes'?
1. Lampreys and eels
2. Mackerals and rohu
3. Lampreys and hagfishes
4. Guppies and hagfishes

102. Which of the following statements about recombinant DNA technology and insulin production is correct?

1.	Insulin from animal sources is identical to human insulin and does not cause allergic reactions.
2.	Insulin is synthesized as a pro-hormone in humans, requiring processing to become active.
3.	Recombinant insulin production involves a single DNA sequence encoding both A and B chains of insulin.
4.	Bacteria used for recombinant insulin production produce mature insulin directly without further processing.

103. 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.

104. Unauthorized acquisition and commercial exploitation of biological resources, such as plants, animals, microorganisms, or traditional knowledge associated with these resources, often from indigenous or local communities is called as:
1. Bioremediation
2. Biopiracy
3. Bioprospecting
4. Biofortification

105. Which of the following is a commercial blood cholesterol-lowering agent?

1.	Lipase	2.	Cyclosporin A
3.	Statin	4.	Streptokinase

106. Any part of a plant taken out and grown in a test tube under sterile conditions in special nutrient media for generating new plants is called:

1.	Implant	2.	Explant
3.	Supplant	4.	Plantlet

107. Which of the following layers are found in the respiratory diffusion membrane?

1.	Capillary endothelium, alveolar epithelium, and basement membrane
2.	Alveolar epithelium, alveolar macrophages, and capillary endothelium
3.	Mucous layer, alveolar epithelium, and capillary endothelium
4.	Basement membrane, mucous layer, and alveolar macrophages

108. Which of the following correctly explains the intercalary meristem and its role in plant growth?

1.	A meristematic tissue located at the apex of the root, responsible for the elongation of primary roots.
2.	A meristematic tissue occurring between mature tissues, contributing to the regeneration of parts removed by grazing herbivores, particularly in grasses.
3.	A secondary meristematic tissue responsible for producing cork and secondary vascular tissues in woody plants.
4.	A permanent tissue forming the protective covering of leaves and stems, minimizing water loss.

109. Despite being highly effective, why are surgical sterilization methods (vasectomy and tubectomy) not widely adopted as a preferred contraceptive option?

1.	They are expensive and require long-term hospitalization.
2.	They lead to severe hormonal imbalances and long-term health risks.
3.	They have poor reversibility, making it difficult to restore fertility if needed.
4.	They are prone to frequent failures and unwanted pregnancies.

110. The peak secretion of which of the following hormones does not coincide with the day, in the menstrual cycle, of the peak secretion of other three hormones?
1. Oestrogen
2. Progesterone
3. LH
4. FSH

111. Which of the following fruits is a true fruit developed from the ovary?
1. Apple
2. Strawberry
3. Fig
4. Mango

112. The key event taking place in anaphase-I of meiosis is:
1. Separation of homologous chromosomes
2. Separation of non-homologous chromosomes
3. Separation of sister chromatids
4. Separation of non-sister chromatids

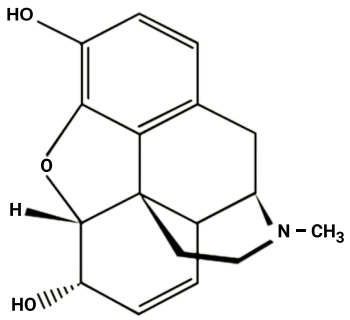
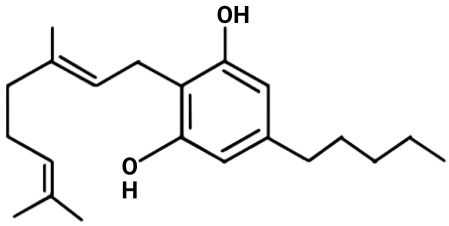
113. The process by which cancer cells spread from their original location to another part of the body is called as:

1.	metagenesis	2.	metastasis
3.	teratogenesis	4.	mitosis

114. The second vertical strata in an ecosystem is usually occupied by:
1. herbivores
2. trees
3. shrubs
4. grasses

115. Menstrual flow occurs due to the lack of:
1. FSH
2. Oxytocin
3. Vasopressin
4. Progesterone

116. Identify the molecules (a) and (b) shown below and select the right option giving their source:

(a)	
(b)	

	Molecule	Source	Use
1.	(a) Cocaine	*Erythroxylum coca*	Accelerates the transport of dopamine
2.	(b) Heroin	*Cannabis Sativa*	Depressant and slows down body functions
3.	(b) Cannabinoid	*Atropa belladonna*	Produces hallucinations
4.	(a) Morphine	*Papaver somniferum*	Sedative and painkiller

117. 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.

118. Consider the given two statements:

I:	The right kidney is located slightly lower than the left kidney.
II:	The average weight of human kidney varies between 120 g and 170 g.

1. Only **I** is correct
2. Only **II** is correct
3. Neither **I** nor **II** are correct
4. Both **I** and **II** are correct

119. Consider the two statements:

Assertion (A):	The cerebral cortex is referred to as the grey matter.
Reason (R):	Myelin sheaths around the axons give the cerebral cortex a grey appearance.

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

120. Consider the given two statements:

Statement I:	The number of mitochondria per cell is variable and depends on the physiological activity of the cell.
Statement II:	The mitochondria are always spherical and have a fixed size of 0.5µm in diameter and 1.0µm in length.

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

121. Thalassemia is caused by mutations that reduce the production of hemoglobin chains. Which form of thalassemia results from mutations in the HBB gene, which is located on chromosome 11?

1. Alpha-thalassemia
2. Beta-thalassemia
3. Gamma-thalassemia
4. Delta-thalassemia

122. Which one of the following experiments of Frederick Griffith resulted in the discovery of bacterial transformation?

1.	S-stain(heat-killed) → injected in to Mice → Mice lived
2.	S-strain (heat killed) + R-strain(live) → injected in to Mice → Mice died
3.	S-stain → injected in to Mice → Mice died
4.	R-strain → injected in to Mice → Mice lived

123. Thermostable DNA polymerase used in PCR was isolated from:
1. *Thermus aquaticus*
2. *Escherichia coli*
3. *Agrobacterium tumefaciens*
4. *Bacillus thuringiensis*

124. Amensalism can be represented as:
1. Species A (–) : Species B (–)
2. Species A (+) : Species B (0)
3. Species A (–) : Species B (0)
4. Species A (+) : Species B (+)

125. In the case of Poriferans, the spongocoel is lined with flagellated cells called:
1. Oscula
2. Choanocytes
3. Mesenchymal cells
4. Ostia

126. Which enzyme is responsible for hydrolyzing ATP to power the contraction cycle in skeletal muscles?
1. Myosin kinase
2. Tropomyosin ATPase
3. Myosin ATPase
4. Actin phosphatase

127. Which of the following statements regarding morphology of frog is not true?

I:	Above the mouth, a pair of nostrils is present.
II:	Eyes are bulged and covered by a nictitating membrane that protects them while on land.
III:	On either side of eyes, a membranous tympanum (ear) receives sound signals.

1. Only **II**
2. Only **II** and **III**
3. Only **I**
4. None, all statements are correct

128. Which one of the following is not observed in biodiversity hot spots?
1. Endemism
2. Accelerated species loss
3. Lesser interspecific competition
4. Species richness

129. Identify the incorrect statement:

1.	Non-albuminous seeds, like those of peas and groundnuts, have no residual endosperm.
2.	The perisperm is a residual, persistent nucellus found in seeds such as black pepper.
3.	Albuminous seeds, such as wheat, retain a part of the endosperm during embryo development.
4.	The micropyle facilitates the entry of carbon dioxide during seed germination.

130. The sex of the baby in humans is decided at:

1.	fertilization	2.	implantation
3.	first cleavage division of zygote	4.	puberty

131. Consider the given two statements:

Assertion (A):	Although Mendel published his work on inheritance of characters in 1865 but it remained unrecognised till 1900.
Reason (R):	In 1900, three Scientists, Avery, Macleod, McCarty, independently rediscovered Mendel's results on the inheritance of characters.

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.

132. Which of the following alcoholic drinks is naturally fermented and produced without distillation?

1.	Wine	2.	Whisky
3.	Rum	4.	Brandy

133. The fungus used in the industrial preparation of citric acid is:

1.	*Penicillium chrysogenum*	2.	*Clostridium butylicum*
3.	*Trichoderma harzianum*	4.	*Aspergillus niger*

134. Consider the given two statements:

Statement I:	Both photosynthesis and aerobic cellular respiration occur in plant cells but only aerobic cellular respiration occurs in animal cells.
Statement II:	Both photosynthesis and aerobic cellular respiration occur during the daylight hours, but only aerobic cellular respiration occurs at night.

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

135. Terrestrial organisms, like mammals, adapted to excrete urea instead of ammonia primarily because:

1.	Ammonia can be stored for long periods in the body without toxicity.
2.	Urea requires less water for excretion compared to ammonia, conserving water.
3.	Urea can be excreted directly from the skin without using the kidneys.
4.	Urea is more toxic than ammonia and requires less energy to produce.

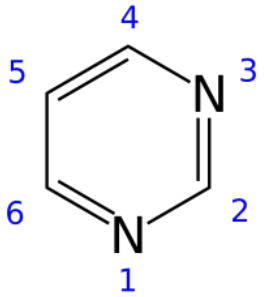
136. Which one of the following is not found in Gymnosperms?
1. Sieve Cells
2. Albuminous Cells
3. Tracheids
4. Vessels

137. Embryo with more than 16 blastomeres formed due to in vitro fertilisation is transferred into?
1. uterus
2. fallopian tube
3. fimbriae
4. cervix

138. What provides the electrons needed to replace those removed from photosystem II during non cyclic photophosphorylation?

1.	PS I	2.	Oxygen
3.	Water	4.	Carbon dioxide

139. The skeletal formula (showing numbering convention for substituent groups) of a simple aromatic ring shown below will be a part of the structure of all the following except:



1.	Thymine	2.	Cytosine
3.	Uracil	4.	Adenine

140. Match each item in Column-I with one in Column-II and select the correct match from the codes given:

	Column-I		**Column-II**
A.	*Vallisneria*	P.	Pollinated by insects
B.	*Zostera*	Q.	Water pollinated plant found in fresh water
C.	Water lily	R.	Water pollinated plant found in marine water

Codes:

	A	**B**	**C**
1.	P	Q	R
2.	P	R	Q
3.	Q	R	P
4.	Q	P	R

141. During inhalation, the diaphragm contracts and flattens. What is the direct consequence of this action on the volume of the thoracic cavity?
1. It decreases
2. It fluctuates
3. It remains unchanged
4. It increases

142. The functions of hormones of Fight or Flight do not include:

1.	pupillary dilation
2.	piloerection
3.	increase in the strength of heart contraction
4.	storage of glucose into glycogen resulting in a decreased concentration of glucose in the blood

143. Who coined the term 'Kinetin'?

1.	Skoog and Miller	2.	Darwin
3.	Went	4.	Kurosawa

144. Match each term in Column-I with its correct description in Column-II and select the correct match from the codes given:

	Column-I		**Column-II**
A.	Monoecious	P.	plants with unisexual flowers which occur on the same individual
B.	Dioeceous	Q.	plants having either only male or only female flowers
C.	Unisexual	R.	flower having both male and female structures
D.	Bisexual	S.	flower having either male or female structures

Codes:

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

145. Which of the following describes the substrate concentration at which an enzyme-catalyzed reaction achieves half Vmax?

1.	K_m value	2.	K_{cat} value
3.	pK_a value	4.	Q_{10}

146. Match the following concerning the activity/function and the phytohormone involved:

	Column I		**Column II**
(a)	Fruit ripener	(i)	Abscisic acid
(b)	Herbicide	(ii)	GA 3
(c)	Bolting agent	(iii)	2, 4-D
(d)	Stress hormone	(iv)	Ethephon

Select the correct option from following:

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

147. Select the correct events that occur during inspiration.
(a) Contraction of diaphragm
(b) Contraction of external inter-costal muscles
(c) Pulmonary volume decreases
(d) Intra pulmonary pressure increases

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

148. Calcium released into the sarcoplasm during muscle contraction:

1.	binds to the actin and myosin and makes them work together.
2.	breaks apart ATP to ADP and P.
3.	removes the tropomyosin block.
4.	causes the release of acetylcholine.

149. Stem is modified into a fleshy cylindrical structure in:

1.	*Euphorbia*	2.	*Pistia*
3.	*Citrus*	4.	*Bougainvillea*

150. In frogs, vasa efferentia:

I:	are 100-120 in number that arise from testes
II:	enter the kidneys on their side and open into Bidder's canal

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

151. Which of the following correctly describes histopathological studies in cancer diagnosis?

1.	Histopathology involves using non-ionizing radiation to detect changes in internal tissues.
2.	Histopathology involves the examination of a thin section of tissue under a microscope to detect cancerous changes.
3.	Histopathology is the process of detecting genetic mutations in cancerous cells using molecular biology techniques.
4.	Histopathology refers to the removal of a tumour through surgery and its subsequent analysis for cancer cells.

152. Amongst the recent extinctions, Thylacine got extinct from:
1. Mauritius
2. Africa
3. Russia
4. Australia

153. The autonomic nervous system innervates:
I: cardiac muscle
II: glands
III: skeletal muscle
IV: smooth muscle
1. Only I, II and III
2. Only I, II and IV
3. Only II, III and IV
4. I, II, III and IV

154. In the hierarchical classification, as we go higher from species to kingdom, the number of common characteristics among organisms:
1. Increases
2. Fluctuates
3. Remains constant
4. Decreases

155. The industrial melanism observed in moth populations in England demonstrates:

1.	Divergent evolution due to common ancestry.
2.	Convergent evolution in response to similar habitats.
3.	Natural selection favoring individuals better adapted to a changing environment.
4.	Mutation-driven evolution independent of environmental factors.

156. Acromegaly is a metabolic disorder caused by:

1.	Excess secretion of growth hormone in childhood
2.	Excess secretion of growth hormone in adulthood
3.	Deficiency of growth hormone in adulthood
4.	Deficiency of growth hormone in childhood

157. How many of the following can be characterized as action of gibberellins on plants?

I:	They can be used to increase the length of grape stalks.
II:	They can elongate and improve the shape of apple.
III:	They speed up malting process in brewing industry.
IV:	They hasten the maturity period of juvenile conifers.
V:	They promote bolting in many plants with rosette habit.

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

158. A certain road accident patient with an unknown blood group needs an immediate blood transfusion. His one doctor friend at once offers his blood. What was the blood group of the donor?
1. Blood group B
2. Blood group AB
3. Blood group O
4. Blood group A

159. A dominant trait:
1. is the most common trait in a population.
2. is expressed in a heterozygous organism (hybrid).
3. reappears in the F_2 of a monohybrid cross.
4. always confers a selective advantage to the organism.

160. Which condition is characterized by a diminished ability of the kidney to conserve water, leading to water loss and dehydration, due to an impairment affecting the synthesis or release of ADH?
1. Gigantism
2. Acromegaly
3. Diabetes Insipidus
4. Pituitary dwarfism

161. Which of the following is not a mollusk?

1.	Cuttle fish	2.	Devil fish
3.	Tusk Shell	4.	Flying fish

162. Evaluate the following statements and choose the correct option:

I:	Gene therapy involves the introduction of a functional gene into the cells of an individual to treat genetic disorders.
II:	RNA interference (RNAi) is a technique used to silence specific genes by degrading their structural genes located on template DNA.
III:	Transgenic organisms are those that have been genetically modified to express desirable traits.

1. **I** and **II** are correct.
2. **II** and **III** are correct.
3. **I** and **III** are correct.
4. All statements are correct.

163. Which of the following best defines adaptive radiation?

1.	The diversification of a group of organisms into various forms that are adopted to different ecological niches.
2.	The migration of a species to a new habitat, leading to the evolution of new traits for survival.
3.	The extinction of species that cannot adapt to environmental changes.
4.	The evolution of similar traits in unrelated species due to similar environmental pressures.

164. Consider the given two statements:

Assertion (A):	When carbohydrates are used as substrate and are completely oxidised, the RQ will be 1.
Reason (R):	The respiratory quotient depends upon the type of respiratory substrate used during respiration.

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

165. Regarding the double helix of DNA, all the following will be correct except:
1. The two strands of polynucleotides are antiparallel i.e., run in the opposite direction.
2. The backbone is formed by the sugar-phosphate-sugar chain.
3. The nitrogen bases are projected more or less perpendicular to this backbone but face inside.
4. A and G of one strand compulsorily base pairs with C and T, respectively, on the other strand.

166. Which of the following factors is responsible for the formation of concentrated urine?

1.	Hydrostatic pressure during glomerular filtration.
2.	Low levels of antidiuretic hormone.
3.	Maintaining hyperosmolarity towards inner medullary interstitium in the kidneys.
4.	Secretion of erythropoietin by Juxtaglomerular complex.

167. Which scientist conducted an experiment with ^{32}p and ^{35}s labelled phages for demonstrating that DNA is the genetic material?
1. James D. Watson and F.H.C Crick
2. A.D. Hershey and M.J. Chase
3. F. Griffith
4. O.T. Avery, C.M. MacLeod and M. McCarty

168. In red algae:

I:	Phycoerythrin is a major photosynthetic pigment.
II:	Floridean starch is stored food.
III:	Cell wall contains polysulphate esters.
IV:	Flagella are 2, unequal with lateral insertion.

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

169. The amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis is:
1. Primary production
2. Primary productivity
3. Secondary production
4. Secondary productivity

170. Identify the correctly matched pair:

	Scientist	Contribution
I:	Connell	Competitive release
II:	Gauss	Competitive exclusion principle
III:	MacArthur	Resource partitioning
IV:	Tillman	Rivet popper hypothesis

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

171. Which of the following sexually transmitted diseases (STDs) is not completely curable?

1.	Hepatitis-B	2.	Syphilis
3.	Gonorrhea	4.	Chlamydia

172. The largest extinct carnivore marsupial, thylacine, was a native of:
1. Brazil
2. South Africa
3. Peru
4. Australia

173. The motile bacteria are able to move by:
1. fimbriae
2. flagella
3. cilia
4. pili

174.

Assertion (A):	Repeated amplification of DNA in Polymerase Chain Reaction is achieved by the use of a thermostable DNA polymerase.
Reason (R):	Such DNA polymerase remains active during the high temperature-induced denaturation of double-stranded DNA, a step in Polymerase Chain Reaction.

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 True.

175. If 20 J of energy is trapped at the producer level, then how much energy will be available to peacocks as food in the following chain?
Plant → mice → snake → peacock

1.	0.02 J	2.	0.002 J
3.	0.2 J	4.	0.0002 J

176. How many of the given pairs are correctly matched?
I: Zygotene: Synaptonemal complex
II: Pachytene: Recombinase
III: Anaphase II: Splitting of centromere
1. 0
2. 1
3. 2
4. 3

177. Which of the following is not a desirable feature of a cloning vector?
1. Presence of two or more recognition sites
2. Presence of origin of replication
3. Presence of a marker gene
4. Presence of single restriction enzyme site

178. 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.	Calvin cycle	P.	C3 pathway
B.	PEP carboxylase	Q.	CO_2 acceptor
C.	Grana	R.	Stacked thylakoids
D.	Photon	S.	Light energy

Codes:

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

179. Consider the given two statements:

Assertion (A):	The sinoatrial node (SAN) is called the pacemaker of the heart.
Reason (R):	The SAN generates the maximum number of action potentials per minute in the heart.

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.

180. Viruses, viroids, and prions are non-cellular entities that do not fit into the five-kingdom classification system. Which of these are misfolded proteins?
I: Viroids
II: Prions
III: Viruses
1. Only **III**
2. Only **I** and **II**
3. Only **II**
4. **I**, **II** and **III**