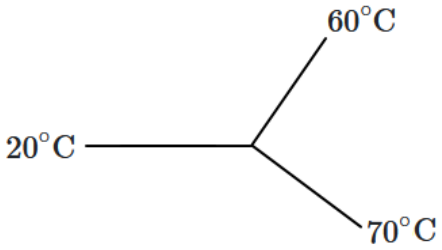
Physics

1. Three identical thermal conductors are connected, as shown in the figure. The temperature of the connected junction is (assuming no heat lost due to radiation):



1.	60°C	2.	20°C
3.	50°C	4.	10°C

2. A person holding a rifle (mass of person and rifle together is 100 kg) stands on a smooth surface and fires 10 shots horizontally, in 5 s. Each bullet has a mass of 10 g with a muzzle velocity of 800 ms^{-1}. The final velocity acquired by the person and the average force exerted on the person are:

1. $-0.08\ ms^{-1}; 16$ N
2. $-0.8\ ms^{-1}; 16$ N
3. $-1.6\ ms^{-1}; 16$ N
4. $-1.6\ ms^{-1}; 8$ N

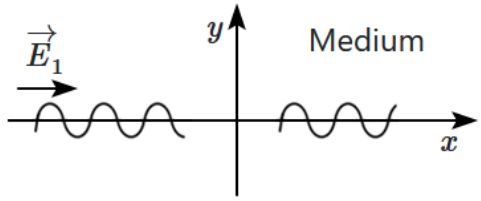
3. The region on the left of the y-axis $(x < 0)$ represents vacuum, and the region on the right $(x > 0)$ represents a transparent medium. An electromagnetic wave travelling along the x-axis given by:

$\vec{E}_1(x,t) = E_1\hat{j}\ \sin(\omega t - k_0 x)$, where $x < 0$,

is incident on to the medium on the right. The transmitted wave in the medium is:

$\vec{E}_2(x,t) = E_2\hat{j}\ \sin(\omega t - 2k_0 x)$, where $x > 0$.

The refractive index of the medium is:

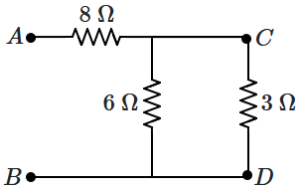


1.	2	2.	$\sqrt{2}$
3.	4	4.	$2\sqrt{2}$

4. A hollow metal sphere of radius R is given $+Q$ charges to its outer surface. The electric potential at a distance $\frac{R}{3}$ from the centre of the sphere will be:

1.	$\frac{1}{4\pi\varepsilon_0}\frac{Q}{9R}$	2.	$\frac{3}{4\pi\varepsilon_0}\frac{Q}{R}$
3.	$\frac{1}{4\pi\varepsilon_0}\frac{Q}{3R}$	4.	$\frac{1}{4\pi\varepsilon_0}\frac{Q}{R}$

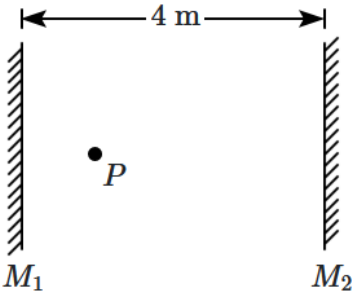
5. A potential difference V_{AB} is impressed across AB and the potential difference across CD (V_{CD}) is measured. Assume, $V_{AB} = 300$ V.



The potential difference across the 3 Ω resistor is:

1.	90 V	2.	60 V
3.	240 V	4.	30 V

6. Two parallel mirrors M_1 and M_2 are placed facing each other on opposite sides of a room. The separation of the mirrors, as shown in the figure below, is 4 m. A point object P is placed at a distance of 1 m from M_1. The separation between the images formed after a single reflection is:

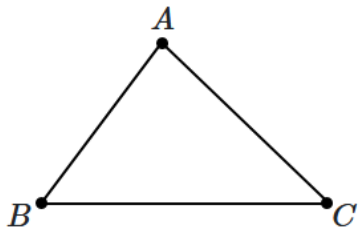


1.	2 m	2.	6 m
3.	8 m	4.	4 m

7. The frequency of oscillation of a mass m suspended by a spring is ν_1. If the length of the spring is cut to one-third of its original length, the same mass oscillates with a new frequency ν_2.The correct relationship between ν_1 and ν_2 is:

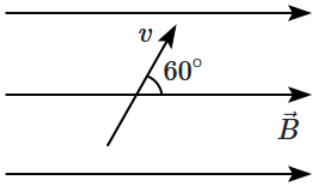
1.	$\nu_2 = 3\nu_1$	2.	$3\nu_2 = \nu_1$
3.	$\nu_2 = \sqrt{3}\nu_1$	4.	$\sqrt{3}\nu_2 = \nu_1$

8. Three forces acting at a point are represented by the three sides of a triangle ABC: $\overrightarrow{AB}, \overrightarrow{BC}, \overrightarrow{CA}$ respectively. The force represented by $\overrightarrow{AB}$ is reversed. The resultant is given by:



1.	$\overrightarrow{BA}$	2.	$\overrightarrow{BC} + \overrightarrow{CA}$
3.	$(\overrightarrow{BC} - \overrightarrow{CA})$	4.	$\overrightarrow{BC} + \overrightarrow{CA} - \overrightarrow{AB}$

9. A proton is projected with a speed v into a magnetic field B of magnitude 1 T with the angle between the proton's velocity and the magnetic field being 60°, as shown. The kinetic energy of the proton is 2 eV (with the proton's mass $= 1.67 \times 10^{-27}$ kg, and charge $e = 1.6 \times 10^{-19}$ C). The pitch of the path of the proton is:



1. 6.28×10^{-2} m
2. 6.42×10^{-4} m
3. 3.14×10^{-2} m
2. 3.14×10^{-4} m

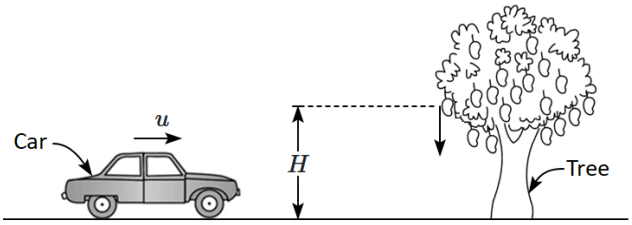
10. A tuning fork vibrates at a frequency of 256 Hz. What would be the minimum length of a closed organ pipe that resonates with the tuning fork?
(take the speed of sound in air $= 360$ ms^{-1})
1. 35.1 cm
2. 38.1 cm
3. 70.2 cm
4. 82.2 cm

11. Given below are two statements:

Assertion (A):	Gauss's law for magnetism states that the net magnetic flux through any closed surface is zero.
Reason (R):	The magnetic monopoles do not exist. North and South poles occur in pairs, allowing vanishing net magnetic flux through the surface.

1.	**(A)** is True but **(R)** is False.
2.	**(A)** is False but **(R)** is True.
3.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
4.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.

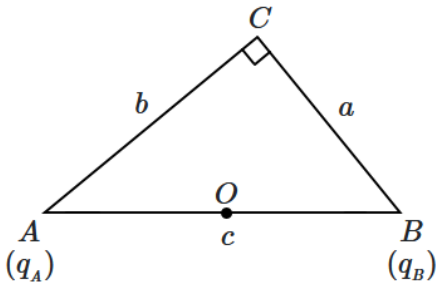
12. A mango falling from a height H from a tree is observed from a car moving with a uniform velocity u, along a road, that passes underneath. The mango hits the car. Assume the size of the car to be negligible, and the acceleration due to gravity to be g.



The relative speed of the mango when it hits the car is:

1.	$u + \sqrt{2gH}$	2.	$u - \sqrt{2gH}$
3.	$\sqrt{u^2 + 2gH}$	4.	$\sqrt{u^2 - 2gH}$

13. Two point charges q_A, q_B are placed at the opposite ends A & B of the hypotenuse of a right-angled triangle ABC ($\angle C = 90^\circ$). The lengths of the sides are denoted by using the standard notation: $l\,(AB) = c, l\,(BC) = a$ & $l\,(AC) = b$. O is the mid-point of the hypotenuse AB.



If the electric field at C is perpendicular to AB, then:

(p)	q_A, q_B are of the same sign
(q)	q_A, q_B are of opposite sign
(r)	$\frac{\lvert q_A\rvert}{b} = \frac{\lvert q_B\rvert}{a}$
(s)	$\frac{\lvert q_A\rvert}{b^3} = \frac{\lvert q_B\rvert}{a^3}$

1. p & r are true
2. p & s are true
3. q & r are true
4. q & s are true

14. Which of the following is not the property of electric charge?

1.	Charge on any body is quantised.
2.	Charge on any isolated system remains conserved.
3.	Unlike mass, the charge is non-relativistic.
4.	Unlike charged bodies always repel each other.

15. A steady current flows through a metallic conductor with a non-uniform cross-section. The quantity/quantities that remain constant along the length of the conductor is/are:

1.	current, electric field, and drift speed
2.	drift speed only
3.	current and drift speed
4.	current only

16. 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. $\frac{9}{2}R$

17. Imagine that there exists a planet whose mass and radius are both half that of the Earth. The acceleration due to gravity on that planet will be:

1. $g/4$
2. $g/2$
3. $2g$
4. $4g$

18. Given below are two statements:

Assertion (A):	A bar magnet is dropped into a long vertical copper tube. Even if air resistance is negligible, the magnet attains a constant terminal velocity. If the tube is heated, the terminal velocity increases.
Reason (R):	The terminal velocity is independent of the eddy currents produced in the copper tube.

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.

19. Given below are two statements:

Statement I:	A single slit of width, a gives a diffraction pattern with a central maximum. The intensity falls to zero at angles of $\pm\frac{\lambda}{a}, \pm\frac{2\lambda}{a}$, etc., with successively weaker secondary maxima in between.
Statement II:	Most interference and diffraction effects exist even for longitudinal waves like sound in air, but polarisation phenomena are special to transverse waves like light waves.

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.

20. The displacement of a particle executing simple harmonic motion is given by, $y = A_0 + A\sin\omega t + B\cos\omega t$.
Then the amplitude of its oscillation is given by:

1.	$A + B$	2.	$A_0 + \sqrt{A^2 + B^2}$
3.	$\sqrt{A^2 + B^2}$	4.	$\sqrt{A_0^2 + (A + B)^2}$

21. Match **List-I** (Spectral Series) with **List-II** (corresponding wave number expressions).

	List-I (Series)		**List-II (Wave number in cm^{-1})**
A.	Balmer series	I.	$R\left(\frac{1}{1^2} - \frac{1}{n^2}\right)$
B.	Lyman series	II.	$R\left(\frac{1}{4^2} - \frac{1}{n^2}\right)$
C.	Brackett series	III.	$R\left(\frac{1}{5^2} - \frac{1}{n^2}\right)$
D.	Pfund series	IV.	$R\left(\frac{1}{2^2} - \frac{1}{n^2}\right)$

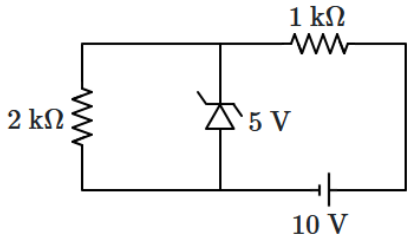
Choose the correct answer from the options given below:

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

22. The mass numbers of two nuclei, A and B, are 27 and 64, respectively. The ratio of their radii is:
1. 3 : 4
2. 5 : 8
3. 2 : 1
4. 1 : 2

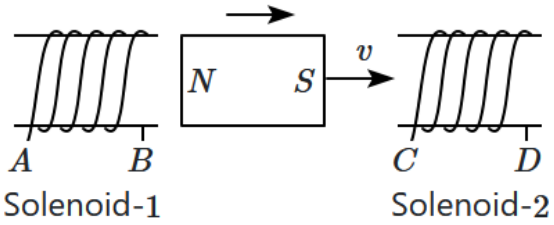
23. The maximum velocity of the photoelectrons emitted by a metal surface is 1.2×10^6 ms^{-1}. Assuming the specific charge of the electron is 1.8×10^{11} C kg^{-1}, the value of the stopping potential (in volts) will be:
1. 2
2. 3
3. 4
4. 6

24. In connection with the circuit drawn below, the value of the current flowing through 2 kΩ resistor is:



1. 5×10^{-4} A
2. 5×10^{-3} A
3. 25×10^{-4} A
4. 25×10^{-3} A

25. 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:

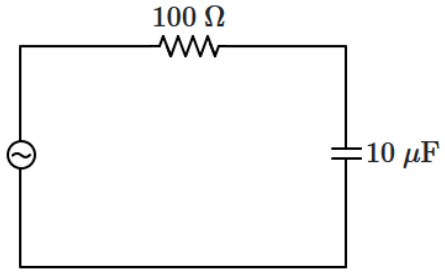


1. BA and CD
2. AB and CD
3. BA and DC
4. AB and DC

26. A man, swimming with a speed u_1, can cross a river fastest in a time, T. His friend, who swims with a speed u_2, reaches the opposite bank in the same time when he swims at an angle of 30° with the bank. Then:

1.	$u_1 = \frac{\sqrt{3}}{2}u_2$	2.	$u_1 = \frac{1}{2}u_2$
3.	$u_1 = \frac{1}{\sqrt{2}}u_2$	4.	$u_1 = \frac{1}{\sqrt{3}}u_2$

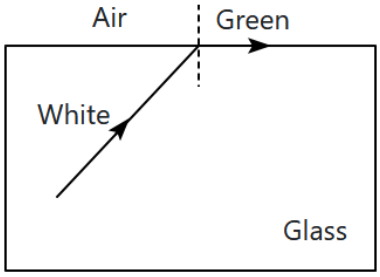
27. An alternating voltage of angular frequency ω is applied to the circuit shown in the figure.



For what value of ω, will the impedance of the capacitor equal that of the resistor?

1. 10^{-3} s^{-1}
2. 10^{3} s^{-1}
3. 10^{-6} s^{-1}
4. 10^{6} s^{-1}

28. Which set of colours would be observed in the air under the conditions depicted in the figure?



1.	yellow, orange, and red
2.	blue, green, and yellow
3.	orange, red, and violet
4.	all of the above

29. A bullet of mass 10 g moving horizontal with a velocity of 400 m/s strikes a wood block of mass 2 kg which is suspended by light inextensible string of length 5 m. As a result, the centre of gravity of the block is found to rise a vertical distance of 10 cm. The speed of the bullet after it emerges horizontally from the block will be:

1.	100 m/s	2.	80 m/s
3.	120 m/s	4.	160 m/s

30. An electromagnetic waveform whose electric field is given by:

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

propagates in space. Here, ω & k are constants.
The phase difference between the $\vec{E}, \vec{B}$ oscillations is:

1.	0	2.	$\frac{\pi}{4}$
3.	$\frac{\pi}{2}$	4.	$\frac{3\pi}{4}$

31. From a disc of radius R and mass M, a circular hole of diameter R, whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?

1. $\frac{13}{32}MR^2$
2. $\frac{11}{32}MR^2$
3. $\frac{9}{32}MR^2$
4. $\frac{15}{32}MR^2$

32. Given below are two statements:

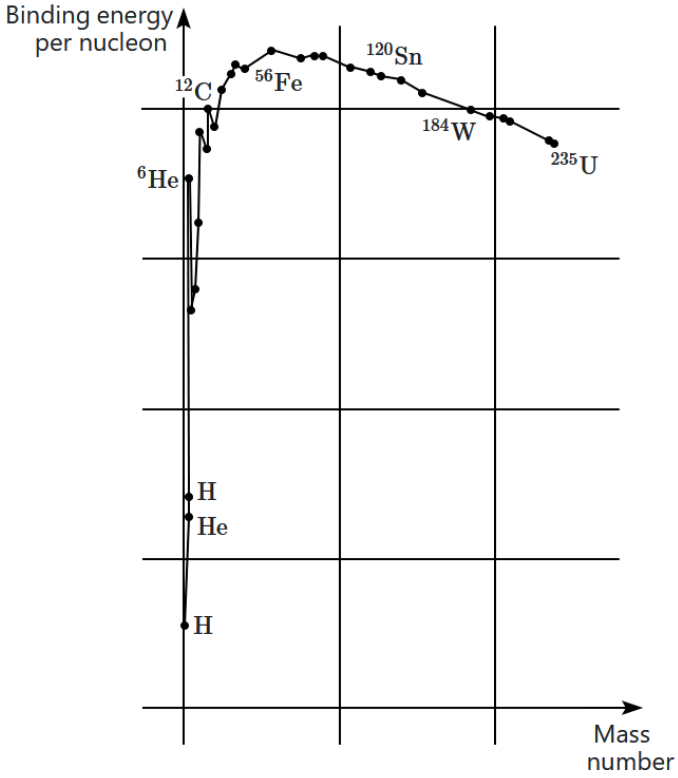
Statement I:	All dimensionless quantities must be constants.
Statement II:	Two quantities having the same dimensions must be proportional to each other.

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.

33. The binding energy per nucleon (MeV/nucleon) is given below for the following:

$^*\mathrm{H} - 1.11$	$^4\mathrm{He} - 7.07$	$^{120}\mathrm{Sn} - 8.50$
$^3\mathrm{He} - 2.57$	$^{12}_6\mathrm{C} - 7.68$	$^{184}\mathrm{W} - 8.01$
$^*\mathrm{H} - 2.83$	$^{56}_{26}\mathrm{Fe} - 8.79$	$^{235}\mathrm{U} - 7.59$

$^*-$ missing data
This data is also represented as a graph plotted against mass number:



After studying the data carefully, answer the following.
A deuteron splits into a proton and a neutron:

$$^2_1\mathrm{H} \longrightarrow {}^1_1\mathrm{H} + {}^1_0\mathrm{n}$$

The Q-value of this reaction is:

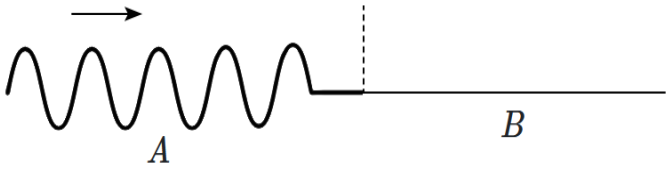
1. $+2.83$ MeV
2. -2.83 MeV
3. $+2.2$ MeV
4. -2.2 MeV

34. Which one of the statements is not true for an isothermal process:

1.	The temperature of the system is kept constant.
2.	In an isothermal process, $PV = \text{constant}$, where P is the pressure and V the volume of the gas.
3.	There is no change in the internal energy of an ideal gas.
4.	The internal energy of an ideal gas changes in an isothermal process.

35. Which of the following gate is called the universal gate?
1. OR gate
2. AND gate
3. NAND gate
4. NOT gate

36. A taut wire (A) with a tension of 80 N is smoothly joined to a second wire (B): wire A has a mass of $8\ \text{g/m}$ while B has a mass of $2\ \text{g/m}$. A mechanical waveform with a wavelength of 40 cm approaches the joint from the side of wire A and is transmitted through wire B. The wavelength of the transmitted wave (on wire B) is:

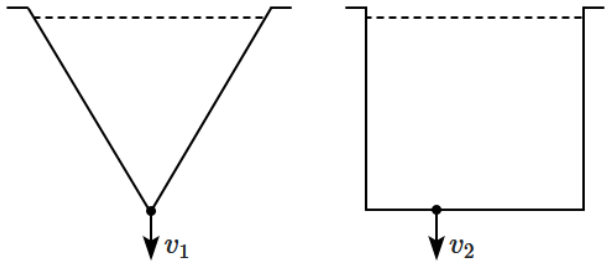


1.	40 cm	2.	80 cm
3.	20 cm	4.	160 cm

37. The potential difference between a pair of similar, parallel, conducting plates is known. What additional information is needed in order to find the electric field strength between the plates?

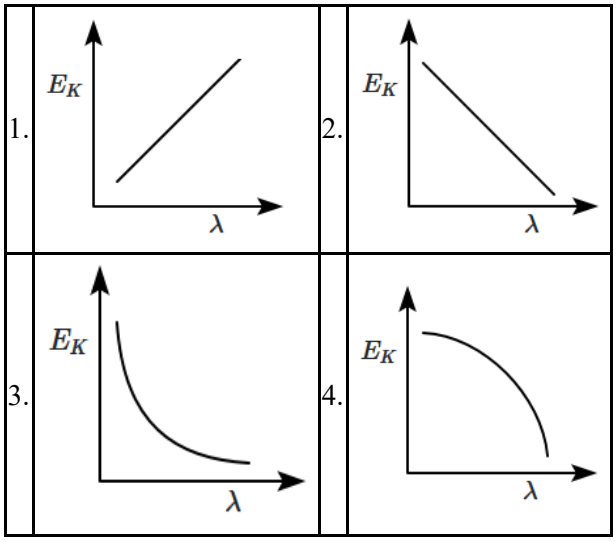
1.	separation of the plates
2.	separation and area of the plates
3.	permittivity of the medium and separation of the plates
4.	permittivity of the medium, separation and area of the plates

38. Water flows out of a conical funnel, with a small bore, and also out of a rectangular tank with a small bore: the respective speeds being v_1, v_2. The cross-sectional areas are the same at the top, while the water levels are also the same in both.

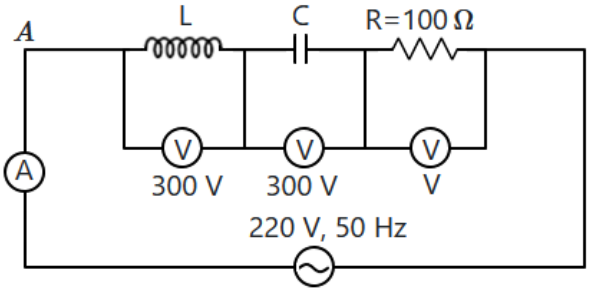


Then:
1. $v_1 = v_2$
2. $v_1 = 2v_2$
3. $\frac{v_1}{v_2}$ = extremely large
4. $\frac{v_1}{v_2}$ = extremely small

39. Which, of the following, shows the correct graph of the de-Broglie wavelength (λ) of a particle and its kinetic energy (E_K)?



40. 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

41. Which of the following statements is true according to Lenz's law of electromagnetic induction?

1.	The induced EMF is such that it supports the change in magnetic flux.
2.	The induced current flows in a direction that opposes the change that caused it.
3.	When the magnetic flux through a coil changes rapidly, the magnitude of the induced EMF is smaller.
4.	The induced charge passing through a circuit depends on the time over which the change in flux occurs.

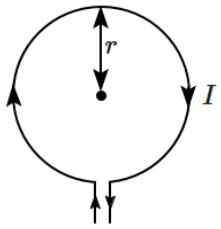
42. How much energy is required to excite an electron in a hydrogen atom from its ground state $(n = 1)$ to the second excited state $(n = 3)$?

1.	12.09 eV	2.	10.2 eV
3.	3.4 eV	4.	1.5 eV

43. In Young's double-slit experiment, 16 fringes are observed in a certain segment of the screen when light of wavelength 700 nm is used. If the wavelength of the light is changed to 400 nm, the number of fringes observed in the same segment of the screen would be:

1.	28	2.	24
3.	18	4.	30

44. A circular coil of wire carrying a current I (ampere) is placed in a uniform magnetic field B, which makes an angle of 60° with the axis of the coil.



The magnetic force on the coil is:

1.	$I.2\pi r.B$	2.	$I.2\pi r.B\cos 60^\circ$
3.	$I.2\pi r.B\sin 60^\circ$	4.	zero

45. In the case of liquids, which of the following statements is correct?

1.	Only the bulk modulus is defined.
2.	Both the bulk modulus and Young's modulus are defined.
3.	Both the bulk modulus and shear modulus are defined.
4.	All three moduli (bulk, Young's, and shear) are defined.

Chemistry

46. Which of the following acts as a lewis acid?
1. NH_3
2. $SnCl_4$
3. CCl_4
4. None of above

47.

Assertion (A):	Methoxy ethane reacts with HI to give ethanol and iodomethane.
Reason (R):	The reaction of ether with HI follows S_N2 mechanism.

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.

48. Which compound will give E1cb reaction?
(1) $CF_3 - CHCl_2$
(2) $C_6H_5 - CH_2 - CH_2 - F$
(3)
$$CH_3 - \underset{l}{\overset{NO_2}{CH}} - \underset{l}{\overset{}{CHC_6H_5}}$$
$$\underset{OCOCH_3}{l}$$
(4) All of these

49. 1.00 g of a non-electrolyte solute (molar mass 250g mol) was dissolved in 51.2 g of benzene. If the freezing point depression constant, K_f of benzene is 5.12 K kg mol^{-1}, the freezing point of benzene will be lowered by:
1. 0.4 K
2. 0.3 K
3. 0.5 K
4. 0.2 K

50. Which of the following compounds will exhibit geometrical isomerism?
1. 1-Phenyl-2-butene
2. 3-Phenyl-1-butene
3. 2-Phenyl-1-butene
4. 1, 1-Dipheny]-1 -propene

51. Diamond and graphite both are made of carbon atoms. Diamond is extremely hard whereas graphite is soft. This is because :

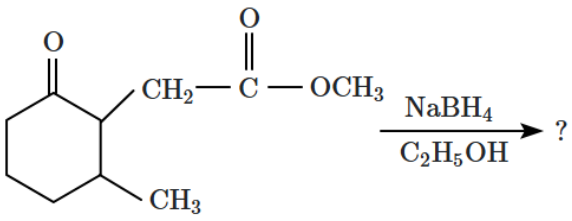
1.	Diamond has carbon-carbon double bond while graphite has carbon-carbon single bond
2.	Diamond is ionic whereas graphite is covalent
3.	Diamond has a strong covalent bond with regular tetrahedron pattern
4.	Certain atoms in diamond are smaller in size

52. Which of the following pairs are metamers of ethyl propionate?
1. C_4H_9COOH and $HCOOC_4H_9$
2. C_4H_9COOH and $CH_3COOC_3H_7$
3. CH_3COOCH_3 and $CH_3COOC_3H_7$
4. $CH_3COOC_3H_7$ and $C_3H_7COOCH_3$

53. For the chemical reaction $N_2(g)+3H_2(g) \rightleftharpoons 2\,NH_3(g)$ the correct option is:

1.	$3\frac{d[H_2]}{dt} = 2\frac{d[NH_3]}{dt}$	2.	$-\frac{1}{3}\frac{d[H_2]}{dt} = -\frac{1}{2}\frac{d[NH_3]}{dt}$
3.	$-\frac{d[N_2]}{dt} = 2\frac{d[NH_3]}{dt}$	4.	$-\frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$

54. The product formed in the following chemical reaction is:



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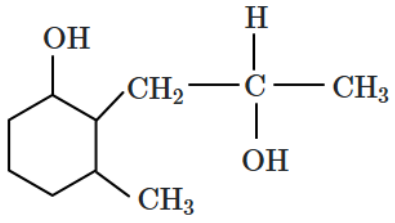

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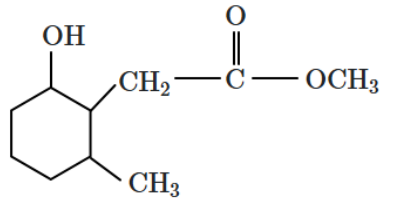

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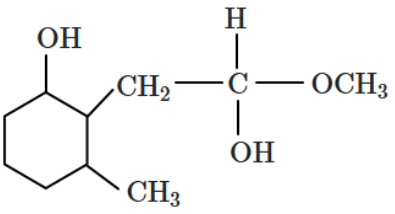

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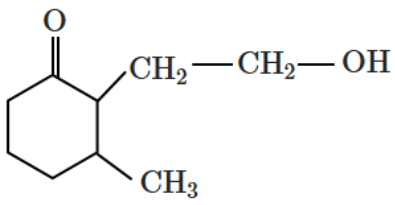


55. The catalytic activity of transition metals and their compounds is ascribed mainly to:
1. their unfilled d-orbitals
2. their ability to adopt variable oxidation states
3. their chemical reactivity
4. their magnetic behaviour

56. 3-Methylpentane forms all the possible monohalogenated products. Among all monohalogenated products, how many products can show optical isomerism?
1. 1
2. 2
3. 3
4. 4

57. $[Fe(H_2O)_6]^{3+}$ and $[Fe(CN)_6]^{3-}$ ions differ in:
1. Oxidation number of the central atom
2. Magnetic nature
3. Co-ordination number
4. Structure

58. Which of the following solution would exhibit abnormal colligative properties?
1. 1 M glucose
2. 0.1 M NaCl
3. 0.1 M sucrose
4. 10 gram glass powder in water

59.

Assertion (A):	The two strands of DNA are complementary to each other
Reason (R):	Hydrogen bonds are formed between specific pairs of bases.

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.

60. Match List I with List II.

	List I (Compound)		**List II (Shape/geometry)**
A.	NH_3	I.	Trigonal Pyramidal
B.	BrF_5	II.	Square planar
C.	XeF_4	III.	Octahedral
D.	SF_6	IV.	Square Pyramidal

Choose the correct answer from the option given below:
1. A-II, B-IV, C-III, D-I
2. A-III, B-IV, C-I, D-II
3. A-II, B-III, C-IV, D-I
4. A-I, B-IV, C-II, D-III

61. Among the given reactions, which one does not result in the formation of a primary amine as the product?

1.	$CH_3CONH_2 \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4}$ Product
2.	$CH_3CONH_2 \xrightarrow{Br_2/KOH}$ Product
3.	$CH_3CN \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4}$ Product
4.	$CH_3NC \xrightarrow[(ii)\ H_3O^+]{(i)\ LiAlH_4}$ Product

62. The following data pertain to the reaction between A and B:

S.No	[A] mol. L^{-1}	[B] mol. L^{-1}	Rate mol. $L^{-1}sec^{-1}$
I	1×10^{-2}	2×10^{-2}	2×10^{-4}
II	2×10^{-2}	2×10^{-2}	4×10^{-4}
III	2×10^{-2}	4×10^{-2}	8×10^{-4}

Which of the following inference(s) can be drawn from the above data?

a.	Rate constant of the reaction is 10^{-4}.
b.	Rate law of the reaction is $k[A][B]$.
c.	Rate of reaction increases four times on doubling the concentration of both the reactants.

Mark the correct option pertaining to question asked above:

1.	**a**, **b** and **c**	2.	**a** and **b**
3.	**b** and **c**	4.	**c** alone

63. When $CH_3CH_2CHCl_2$ is treated with $NaNH_2$, the product formed is:

1. CH_3-CH=CH_2
2. CH_3-C≡CH
3. $CH_3CH_2CH<^{NH_2}_{NH_2}$
4. $CH_3CH_2C<^{Cl}_{NH_2}$

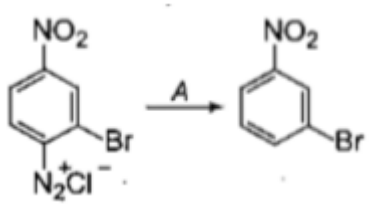
64. Which of the following compounds are gem-dihalides?

(a) Ethylidene chloride
(b) Ethylene dichloride
(c) Methylene chloride
(d) Benzyl chloride

Choose the correct option:

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

65. In a reaction,



A is

1. $HgSO_4/H_2SO_4$
2. Cu_2Cl_2
3. H_3PO_2 and H_2O
4. H^+/H_2O

66. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?

1. $Cl_2 > Br_2 > F_2 > I_2$
2. $Br_2 > I_2 > F_2 > Cl_2$
3. $F_2 > Cl_2 > Br_2 > I_2$
4. $I_2 > Br_2 > Cl_2 > F_2$

67.

Assertion (A):	The boiling point of neopentane is less than that of isopentane
Reason (R):	The higher the branching, the lower the boiling point of a compound.

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.

68. Five moles of an ideal gas at 1 bar and 298 K are expanded into a vacuum till the volume doubles. The work done is:

1. $-RT \ln V_2/V_1$
2. $C_V(T_2 - T_1)$
3. zero
4. $-RT(V_2 - V_1)$

69. In which of the following pairs, both the species are not isostructural?

1. $SiCl_4, PCl_4^+$
2. Diamond, silicon carbide
3. NH_3, PH_3
4. XeF_4, XeO_4

70. Atomic number of Cr and Fe are respectively 24 and 26 which of the following is paramagnetic with the spin of electron?

1. $[Cr(CO)_6]$
2. $[Fe(CO)_5]$
3. $[Fe(CN)_6]^{4-}$
4. $[Cr(NH_3)_6]^{3+}$

71. The molarity of $NaNO_3$ solution (molecular weight of $NaNO_3$ = 85) is 1M. The density of the solution is 1.25 gm/ml. The molality of the solution, approximately, will be:

1. 0.80
2. 0.86
3. 0.96
4. 1

72. Which statement accurately describes the behavior of water in an egg when boiled?:
1. Precipitated out.
2. Adsorbed by the coagulated protein.
3. Absorbed by the eggshell.
4. Both (1) and (3)

73. For the given redox reaction,
$aCr_2O_7^{2-} + bSO_3^{2-}(aq) + cH^+(aq) \rightarrow$
$2aCr^{3+}(aq) + bSO_4^{2-}(aq) + \frac{c}{2}H_2O(\ell)$
the coefficients a, b and c of a balanced equation are found to be, respectively:
1. 8, 1, 3
2. 1, 3, 8
3. 3, 8, 1
4. 1, 8, 3

74. Consider the reaction given below:
$xMnO_2 + yHCl \longrightarrow xMnCl_2 + ZH_2O + aCl_2$
The value of $[(x + y) - (a + z)]$ will be:
1. 1.5
2. 3
3. 2
4. 1

75. In the following sequence of reactions :

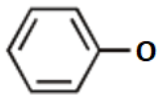
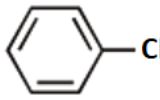
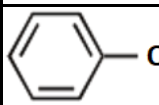
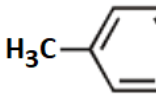
$$CH_3CH_2OH \xrightarrow{KMnO_4} (a) \xrightarrow{SOCl_2,\ NH_3} (b) \xrightarrow{Br_2,\ NaOH} (C)$$

The end product (c) is:
1. Acetone
2. Ethylamine
3. Acetic acid
4. Methylamine

76. The most paramagnetic species is:
1. $Ni^{2+}(Z = 28)$
2. $Fe^{2+}(Z = 26)$
3. $Mn^{2+}(Z = 25)$
4. $V^{3+}(Z = 23)$

77. 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. $(C_2H_5)_3BO_4$

78. An organic compound 'A' ($C_9H_{10}O$) when treated with conc. HI undergoes cleavage to yield compounds 'B' and 'C'. 'B' gives a yellow precipitate with $AgNO_3$ whereas 'C' tautomerizes to 'D'. 'D' gives a positive iodoform test. 'A' could be:

1.	
2.	
3.	
4.	

79. Which of the following species is classified as a Lewis acid but is not a Bronsted acid?
1. BF_3
2. H_3O^+
3. NH_3
4. HCl

80. Which is the correct statement for the given acids?

1.	Phosphinic acid is a monoprotic acid while phosphonic acid is a diprotic acid
2.	Phosphinic acid is a diprotic acid while phosphonic acid is a monoprotic acid
3.	Both are triprotic acids
4.	Both are diprotic acids

81. $PhOH \xrightarrow[NaOH]{Me_2SO_4} P$, P is
(1) Ph–O–SO_2OMe
(2) PhOMe
(3) PhOSO_2OPh
(4) PhMe

82. According to molecular orbital theory, arrange the nitrogen species in each list in ascending order of bond order:

1. $N_2^- < N_2 < N_2^{2-}$
2. $N_2^{2-} < N_2^- < N_2$
3. $N_2 < N_2^{2-} < N_2^-$
4. $N_2^- < N_2^{2-} < N_2$

83. Which of the following actinoids have one electron in 6d orbital?

1. Cf (Atomic number: 98)
2. Np (Atomic number: 93)
3. Pu (Atomic number: 94)
4. Am (Atomic number: 95)

84. 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.

85. The most stable diazonium salt among the following is :

1. p-Nitrobenzene-diazonium chloride
2. 2,4-Dinitrobenzene-diazonium chloride
3. 2,4,6-Trinitrobenzene-diazonium chloride
4. p-Methoxybenzene-diazonium chloride

86. $\wedge_m^o$ for NaCl, HCl and CH_3COONa are 126.4, 425.9, and 91.05 S cm^2 mol^{-1} respectively. If the conductivity of 0.001028 mol L^{-1} acetic acid solution is $4.95 \times 10^{-5} S\, cm^{-1}$, the degree of dissociation of the acetic acid solution is:

1.	0.01233	2.	1.00
3.	0.1233	4.	1.233

87. The standard enthalpy of formation of NH_3 is -46 0. kJ mol^{-1}. If the enthalpy of formation of H_2 from its atoms is -436 kJ mol^{-1} and that of N_2 is -712 kJ mol^{-1}, the average bond enthalpy of N − H bond in NH_3 is:

1. -1102 kJ mol^{-1}
2. -964 kJ mol^{-1}
3. $+352$ kJ mol^{-1}
4. $+1056$ kJ mol^{-1}

88. Given below are two half-cell reactions:

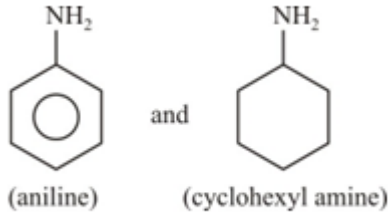
$Mn^{2+} + 2e^- \rightarrow Mn$; $E_0 = -1.18V$

$2Mn^{3+} + 2e^- \rightarrow 2Mn^{2+}$; $E_0 = +1.51V$

The E_0 for $3Mn^{2+} \rightarrow 2Mn^{+3} + Mn$ will be:

1. -2.69V; the reaction will not occur
2. -2.69V; the reaction will occur
3. -0.33V; the reaction will not occur
4. -0.33V; the reaction will occur

89.



(aniline) (cyclohexyl amine)

can be differentiated by:

1. Hinsberg test
2. Iso-cyanide test
3. $NaNO_2$, HCl, then β-Naphthol
4. NaOH

90. Match List-I with List-II

	List-I (Block/group in periodic table)		**List-II (Element)**
A.	Lanthanoid	I.	Ce
B.	d-Block element	II.	As
C.	p-Block element	III.	Cs
D.	s-Block element	IV.	Mn

Choose the correct answer from the options given below:
1. A-I, B-II, C-IV, D-III
2. A-I, B-IV, C-III, D-II
3. A-I, B-IV, C-II, D-III
4. A-IV, B-I, C-II, D-III

Biology

91. Persons with AB blood type can:

1.	donate blood to persons with all blood types as neither A nor B antigens are present on their RBCs
2.	receive blood from persons with all blood types as both A and B antigens are present on their RBCs
3.	receive blood from persons with all blood types as neither A nor B antigens are present on their RBCs
4.	receive blood from persons with all blood types as neither anti-A nor anti-B antibodies are present on his blood plasma

92. Detritivores breakdown detritus into smaller particles. This process is called:

1. Decomposition	2. Catabolism
3. Fragmentation	4. Humification

93. In angiosperms, the fertilized ovule develops into a _____, and the ovary develops into a _____.
1. seed, fruit
2. fruit, seed
3. flower, fruit
4. seed, flower

94. Root knot in Tobacco is caused by the nematode:
1. *Heterodera avenae*
2. *Anguina tritici*
3. *Globodera pallida*
4. *Meloidogyne incognita*

95. Consider the given two statements regarding sclerenchyma:

Statement I:	Sclereids are highly thickened dead cells with very narrow cavities.
Statement II:	Sclereids are commonly found in fruit walls of nuts, seed coat of legumes and leaves of tea.

1. **Statement I** is correct; **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 incorrect; **Statement II** is incorrect

96. Which of the following is not a lipid?

1.	Palmitic acid	2.	Glutamic acid
3.	Cholesterol	4.	Lecithin

97. Consider the given two statements:

Assertion (A):	Being uricotelic is more advantageous than being ammonotelic.
Reason (R):	Uric acid is less toxic and requires less water for excretion compared to ammonia.

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.

98. Who, amongst the following, was the first scientist to discover that plants give off oxygen as a result of splitting water molecules during photosynthesis, not carbon dioxide molecules as thought before?

1.	C. B. Van Niel	2.	T. W. Engelmann
3.	Robert Hill	4.	Jan Ingenhousz

99. Which of the following is not a stop terminator RNA codon?
1. UAA
2. UAG
3. UGA
4. UGG

100. Which of the following will be true regarding the Neanderthal man?
A: A brain size of 1400 cc
B: Lived near East and Central Asia
C: Used hides to protect their body and buried their dead
1. Only **A** and **B**
2. Only **A** and **C**
3. Only **B** and **C**
4. **A**, **B** and **C**

101. The simplest tubular excretory system is the flame cell system, which is found in the animals of the phylum:

1.	Platyhelminthes	2.	Aschelminthes
3.	Annelida	4.	Mollusca

102. In a resting neuron, the axonal membrane is

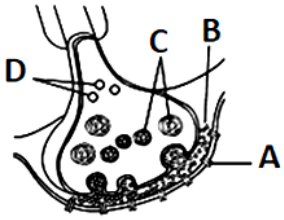
1.	Nearly impermeable to potassium ions (K^+)
2.	Impermeable to positively charged proteins present in the axoplasm
3.	Comparatively more permeable to K^+
4.	Completely permeable to sodium ions

103. *Toxoplasma,* an organism commonly causing opportunistic infection in AIDS patients is a/an:
1. autotrophic bacterium
2. fungus
3. protozoan
4. helminth

104. If the average duration of cardiac cycle were 0.6 seconds, the number of cardiac cycles per minute will be about:

1.	60	2.	75
3.	72	4.	100

105. A diagram showing the axon terminal and synapse is given. Identify correctly at least two of A-D:



1. B- Synaptic connection; D- K^+
2. A- Neurotransmitter; B- Synaptic cleft
3. C- Neurotransmitter; D- Ca^{++}
4. A- Receptor; C- Synaptic vesicles

106. What ensures that only one sperm can fertilize the ovum?
1. Corona Radiata
2. Ground substance around ovum
3. Zona pellucida
4. Acrosome

107. Root hairs develop from the region of:

1.	Elongation	2.	Root cap
3.	Meristematic activity	4.	Maturation

108. Consider the given statements:

I:	The human skeletal system consists of 206 bones.
II:	The femur is the longest bone in the human body.
III:	Cartilaginous joints are immovable.

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

109. Match List-I with List-II

	List-I		**List-II**
(a)	S phase	i.	Proteins are synthesized
(b)	G_2 phase	ii.	Inactive phase
(c)	Quiescent stage	iii.	Interval between mitosis and initiation of DNA replication
(d)	G_1 phase	iv.	DNA replication

Choose the correct answer from the options given below:

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

110. Consider the given two statements:

Assertion (A):	A region is designated as a biodiversity hotspot if it has rich species diversity and high degree of endemism.
Reason (R):	Biodiversity hotspots are areas with high biodiversity that are under no threat from human activities.

1.	Both **(A)** and **(R)** are True and **(R)** is the correct explanation of **(A)**.
2.	Both **(A)** and **(R)** are True but **(R)** is not the correct explanation of **(A)**.
3.	**(A)** is True but **(R)** is False.
4.	Both **(A)** and **(R)** are False.

111. If you are writing the binomial name of an organism you should not:

1.	write the name in italics
2.	separately underline them
3.	start the genus name with a capital letter
4.	start the specific epithet with a capital letter

112. Which one of the following pairs of chemical substances, is correctly categorised?

1.	Pepsin and prolactin - Two digestive enzymes secreted in the stomach
2.	Troponin and myosin - Complex proteins in striated muscles
3.	Secretin and rhodopsin - Polypeptide hormones
4.	Calcitonin and thymosin - Thyroid hormones

113. Identify the correct statement:

1.	Evolution by natural selection works best on a population having no variation.
2.	Mutation is a relatively unimportant source of variation and is not the foundation for evolution.
3.	The effects of genetic drift are most apparent in small populations.
4.	Inbreeding increases the proportion of heterozygous individuals in a population.

114. In the mature mRNA in eukaryotes:
1. exons and introns do not appear
2. exons appear but introns do not appear
3. introns appear but exons do not appear
4. both exons and introns appear

115. Baculoviruses are used in:

1.	Biological control as they specifically target insect pests.
2.	Production of antibiotics.
3.	Fermentation processes in the food industry.
4.	Treatment of bacterial infections in humans.

116. Arteries are best defined as the vessels which:

1.	carry blood away from the heart to different organs
2.	break up into capillaries which reunite to form a vein
3.	carry blood from one visceral organ to another visceral organ
4.	supply oxygenated blood to the different organs

117. ICBN stands for:
1. International Committee of Botanical Nomenclature
2. International Council of Botanical Nomenclature
3. International Code of Botanical Nomenclature
4. International Congress of Botanical Nomenclature

118. The relationship between a clownfish and a sea anemone is an example of which interaction?

1.	Mutualism, as the clownfish receives protection and the anemone attracts prey.
2.	Commensalism, as the anemone is unaffected but benefits the clownfish.
3.	Amensalism, as the anemone is harmed and the clownfish benefits.
4.	Parasitism, as the anemone provides shelter in exchange for food.

119. Integuments of an ovule encircle the nucellus except at the tip where a small opening is organised, called the:

1.	germ pore	2.	chalaza
3.	micropyle	4.	filiform apparatus

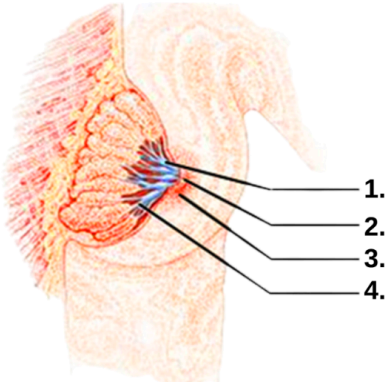
120. Match each item in Column I with one in Column II and select the correct match from the codes given:

	COLUMN I		**COLUMN II**
A	Insemination	P	embryonic development
B	Implantation	Q	transfer of sperms into the female genital tract
C	Gestation	R	delivery of the baby
D	Parturition	S	attachment of blastocyst to the uterine wall

Codes:

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

121. The mammary ampulla in the given diagram is shown by:



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

122. Which enzyme(s) will be produced in a cell in which there is a non-sense mutation in the lac Y gene?

1.	Lactose permease
2.	Transacetylase
3.	Lactose permease and transacetylase
4.	β - galactosidase

123. To promote stem elongation, gibberellins act in concert with:

1.	Auxins	2.	Cytokinins
3.	Ethylene	4.	ABA

124. Which of the following human activities has contributed most significantly to the rapid loss of biodiversity?
1. Habitat loss and fragmentation
2. Migration of species across regions
3. Increased reliance on fossil fuels
4. Climate change exclusively

125. Which of the following represents plasticity in plants?

1.	Development of leaves of different shapes in juvenile and mature cotton plants
2.	Formation of root cap cells from root apical meristem
3.	Thickening of cell walls during the maturation phase
4.	Loss of protoplasm in tracheary elements

126. What will be true for both erythrocytes of many mammals and sieve tube cells of vascular plants?

1.	They are not considered as living cells.
2.	They do not contain a nucleus at maturity.
3.	They divide continuously to produce new cells.
4.	They are fragments of larger cells present in early embryonic stages.

127. Which of the following is true for nucleolus?
1. Larger nucleoli are present in dividing cells.
2. It is a membrane-bound structure.
3. It takes part in spindle formation.
4. It is a site for active ribosomal RNA synthesis.

128. How does an increase in CO_2 concentration generally affect the rate of photosynthesis in C_3 plants?

1.	Decreases the rate of photosynthesis
2.	Increases the rate of photosynthesis up to a point of saturation
3.	Has no effect on the rate of photosynthesis
4.	Causes photorespiration to increase

129. In a chromosome, there is a specific DNA sequence, responsible for initiating replication. It is called as:

1.	recognition sequence	2.	cloning site
3.	restriction site	4.	*ori* site

130. ELISA works on the principle of:

1.	antigen-antibody interaction
2.	radioactive probe tagging
3.	culture of microbe in an artificial medium
4.	histopathology

131. The large holes in 'Swiss cheese' are due to production of a large amount of CO_2 by a bacterium named:
1. *Penicillium camemberti*
2. *Geotrichum candidum*
3. *Kluyveromyces lactis*
4. *Propionibacterium shermanii*

132. World Summit on Sustainable Development (2002) was held in:

1.	Brazil	2.	Sweden
3.	Argentina	4.	South Africa

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

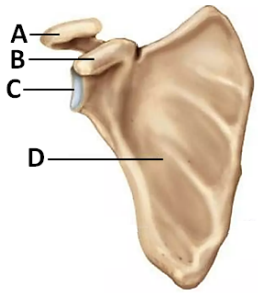
	Column I (Common Name)		**Column II (Biological Name)**
A.	Flying Fish	P.	Pterophyllum
B.	Sea Horse	Q.	*Exocoetus*
C.	Rohu	R.	*Hippocampus*
D.	Angel Fish	S.	Labeo

Codes:

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

134. In cases of female infertility due to the inability to produce ova, which assisted reproductive technology (ART) is used to transfer an ovum collected from a donor into the fallopian tube of another female?
1. In vitro fertilization
2. Zygote intra fallopian transfer
3. Gamete intra fallopian transfer
4. Intra cytoplasmic sperm injection

135. In the given figure of the scapula bone, which alphabet shows the part where the head of humerus articulates [makes a joint]?



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

136. Which group of animals is characterized by a three-chambered heart and ectothermic metabolism?
1. Amphibians
2. Crocodiles
3. Birds
4. Mammals

137. Consider the given two statements:

Assertion (A):	The receptors for insulin are located inside the cell.
Reason (R):	Insulin is lipid soluble.

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

138. The genotype of a husband is I^AI^B and that of a wife is I^Ai. How many different genotypes and phenotypes are possible in their progeny?
1. 2 genotypes; 3 phenotypes
2. 3 genotypes; 4 phenotypes
3. 4 genotypes; 4 phenotypes
4. 4 genotypes; 3 phenotypes

139. Consider the given two statements:

Assertion (A):	Predators help in maintaining species diversity in a community.
Reason (R):	Predators reduce the intensity of competition among competing prey species.

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

140. How many of the given statements regarding IUDs are correct?

I:	Lippes loop is non medicated IUD.
II:	IUDs increase phagocytosis of sperms within the uterus and the Cu ions released suppress sperm motility and the fertilising capacity of sperms.
III:	The hormone releasing IUDs make the uterus unsuitable for implantation and the cervix hostile to the sperms.
IV:	IUDs are ideal contraceptives for the females who want to delay pregnancy and/or space children.
V:	It is one of most widely accepted methods of contraception in India.

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

141. Which of the following statements correctly distinguishes between functional residual capacity (FRC) and residual volume (RV)?

1.	FRC is the volume of air remaining in the lungs after a normal expiration, while RV is the volume of air remaining after a forced expiration.
2.	FRC is the volume of air inhaled during a normal inspiration, while RV is the volume of air exhaled during a normal expiration.
3.	FRC is the total lung capacity minus tidal volume, while RV is the total lung capacity minus vital capacity.
4.	FRC is the volume of air that can be exhaled after a normal expiration, while RV is the volume of air that can be inhaled after a normal inspiration.

142. Consider the given two statements:

Assertion (A):	Emasculation and bagging techniques are vital for the success of artificial hybridization experiments performed by plant breeders.
Reason (R):	In such crossing experiments, it is important to make sure that only the desired pollen grains are used for pollination and the stigma is protected from contamination (from unwanted pollen).

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

143. 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.

144. You are using a plasmid to clone a gene of interest from a donor organism. Why is it desirable to use the same restriction enzyme to cut both the donor DNA and plasmid that also creates 'sticky ends'?

1.	For easy identification of plasmids containing inserts
2.	For easy identification of plasmids with antibiotic resistance
3.	For easy insertion into plasmids of DNA segments from different sources
4.	For ease of transformation

145. How does Atrial Natriuretic Factor (ANF) oppose the Renin-Angiotensin-Aldosterone System (RAAS)?

1.	ANF increases blood pressure and blood volume.
2.	ANF causes vasodilation leading to decrease in blood pressure.
3.	ANF increases the reabsorption of sodium in the distal convoluted tubule.
4.	ANF promotes the secretion of renin from the kidneys.

146. Both autogamy and geitonogamy are prevented in:
1. Monoecy
2. Dioecy
3. Chasmogamy
4. Cleistogamy

147. In the XO type of sex determination, which of the following is true?

1.	Males have one X chromosome.
2.	Females have only one X chromosome.
3.	Both males and females have equal chromosomes.
4.	Males have no X chromosome.

148. What does "withdrawal syndrome" refer to in the context of drug dependence?

1.	The feeling of euphoria after stopping drug use.
2.	The body's ability to cope without drugs after long-term use.
3.	The unpleasant physical and psychological symptoms that occur when drug use is discontinued abruptly.
4.	A state where the body produces antibodies against the drug, leading to self-healing.

149. 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

150. 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.

151. Aldosterone:

1.	acts mainly at the renal tubules and stimulates the excretion of Na^+ and water and reabsorption of K^+ and phosphate ions.
2.	acts mainly at the renal tubules and stimulates the reabsorption of Na^+ and water and excretion of K^+ and phosphate ions.
3.	acts mainly at the collecting duct and stimulates the excretion of Na^+ and water and reabsorption of K^+ and phosphate ions.
4.	acts mainly at the collecting duct and stimulates the reabsorption of Na^+ and water and excretion of K^+ and phosphate ions.

152. Identify the correct statement:

1.	The M phase is the longest phase of the cell cycle.
2.	DNA synthesis occurs only during one specific stage in the cell cycle.
3.	All cells in an organism divide continuously throughout their life.
4.	Mitosis occurs only in diploid cells.

153. During the secondary or biological treatment of sewage water:

I:	The BOD of the waste water gets reduced significantly
II:	The activated sludge contains aerobic micro-organisms that can clump together
III:	The entire activated sludge is pumped into anaerobic sludge digesters

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

154. Identify the incorrect statement:
1. Notochord is derived from embryonic mesoderm
2. Stomochord in hemochordates is actually notochord
3. Chordates have a post-anal tail
4. Pharynx is perforated by gill slits in chordates

155. Regarding ATP synthase (complex V):

I:	The F_1 headpiece is a peripheral membrane protein complex and contains the site for synthesis of ATP from ADP and inorganic phosphate.
II:	F_0 is an integral membrane protein complex that forms the channel through which protons cross the inner membrane.
III:	The F_0 headpiece is a peripheral membrane protein complex and contains the site for synthesis of ATP from ADP and inorganic phosphate.
IV:	F_1 is an integral membrane protein complex that forms the channel through which protons cross the inner membrane.

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

156. Consider the given two statements:

Assertion (A):	India has made prenatal sex determination illegal.
Reason (R):	Amniocentesis can be misused for pre-natal sex determination.

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

157. Which group of enzymes catalyze the chemical reaction where there is linking together of two compounds?
1. Lyases
2. Transferases
3. Isomerases
4. Ligases

158. The members of Kingdom Monera and Kingdom Protista in Whittaker's five kingdom classification resemble each other in:

1.	Cell type	2.	Body organization
3.	Nature of cell wall	4.	Nuclear membrane

159. Mad cow disease in cattle and Cr Jacob disease in humans are due to infection by_____ .
1. Bacterium
2. Virus
3. Viroid
4. Prion

160. Secondary productivity is the rate of formation of new organic matter by:
1. Parasite
2. Consumer
3. Decomposer
4. Producer

161. Volume of air that will remain in the lungs after a normal expiration averages:
1. 1000 mL to 1100 mL.
2. 2100 mL to 2300 mL.
3. 1100 mL to 1200 mL.
4. 2500 mL to 3000 mL.

162. 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.

163. Given below are two statements:

Statement I:	Autoimmune disorder is a condition where body defense mechanism recognized its own cells as foreign bodies
Statement II:	Rheumatoid arthritis is a condition where body does not attack self cells

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.

164. Which of the following is NOT a characteristic feature of bryophytes?
A: Presence of vascular tissues.
B: Gametophyte dominance in the life cycle.
C: Water is necessary for fertilization.
1. Only **A**
2. Only **A** and **B**
3. Only **C**
4. **A**, **B** and **C**

165. Identify the correct descending order [begin with maximum value] of the partial pressure of oxygen at different parts involved in diffusion in comparison to those in the atmosphere:

1.	Atmosphere – Alveoli – Oxygenated blood – Tissues
2.	Alveoli - Atmosphere – Oxygenated blood – Tissues
3.	Atmosphere – Oxygenated blood – Alveoli – Tissues
4.	Tissues – Alveoli – Deoxygenated blood – Oxygenated blood

166. Consider the given two statements:

Assertion (A):	The development of *Periplaneta americana* is holometabolous.
Reason (R):	The development in *Periplaneta americana* is 'complete' and not 'partial'.

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.	Both **(A)** and **(R)** are False

167. Consider the following two statements:

I:	Plasmid can be used as a vector in recombinant DNA technology experiments.
II:	Plasmid is an extrachromosomal, circular, double-stranded DNA found in some bacteria.

1.	Both **I** and **II** are correct and **II** explains **I**
2.	Both **I** and **II** are correct but **II** does not explain **I**
3.	**I** is correct but **II** is incorrect
4.	Both **I** and **II** are incorrect

168. Regarding a flower exhibiting actinomorphic symmetry:

I:	The flower can be divided into two equal halves along any radial plane passing through the center.
II:	The flower can be divided into two equal halves only in one vertical plane.
III:	Examples include mustard, datura, and chilli.
IV:	Radial symmetry is a feature of such flowers.

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 detritus food chain:

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

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

170. Which statement best describes the enzyme-substrate complex?

1.	It increases the activation energy required for the reaction.
2.	It is a temporary association that lowers the activation energy of the reaction.
3.	It is formed permanently during the reaction.
4.	It is formed only in catabolic reactions.

171. Haplodiploidy is a sex-determining mechanism in
1. Humans
2. Honeybees
3. Grasshoppers
4. Fruit flies

172. Skeletal muscle fibres:

1.	contract involuntarily
2.	have a striated appearance
3.	are always uninucleate
4.	are present in the walls of internal organs

173. An organism that makes ATP by aerobic respiration if oxygen is present, but is capable of switching to fermentation if oxygen is absent, is called:
1. Obligate aerobe
2. Obligate anaerobe
3. Facultative anaerobe
4. Microaerophile

174. Consider the given two statements:

Statement I:	Estrogens stimulate growth and activities of female secondary sex organs, development of growing ovarian follicles, and appearance of female secondary sex characters.
Statement II:	Progesterone supports pregnancy.

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

175. What is a function of the pericycle in plants?
1. Photosynthesis
2. Storage of food
3. Secondary growth initiation
4. Protection from pathogens

176. What is the function of intercalated discs in cardiac muscle tissue?
1. Facilitating voluntary control
2. Providing structural support
3. Allowing coordinated contractions of the heart
4. Linking the muscle to bones

177. Identify the incorrect statement:

1.	PCR is now routinely used to detect HIV in suspected AIDS patients.
2.	PCR is being used to detect mutations in genes in suspected cancer patients.
3.	ELISA is based on the principle of antigen-antibody interaction.
4.	ELISA does not detect antibodies and can detect only antigens.

178. The typical growth curve in plants is:
1. sigmoid
2. linear
3. stair-steps shaped
4. parabolic

179. Selection of individuals at both extremes of the phenotypic range is:
1. Stabilizing natural selection
2. Directional natural selection
3. Disruptive natural selection
4. Reverse natural selection

180. Consider the given two statements:

Statement I:	For most animal species, the logistic growth model is considered a more realistic one.
Statement II:	Animals show a higher diversity than plants.

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