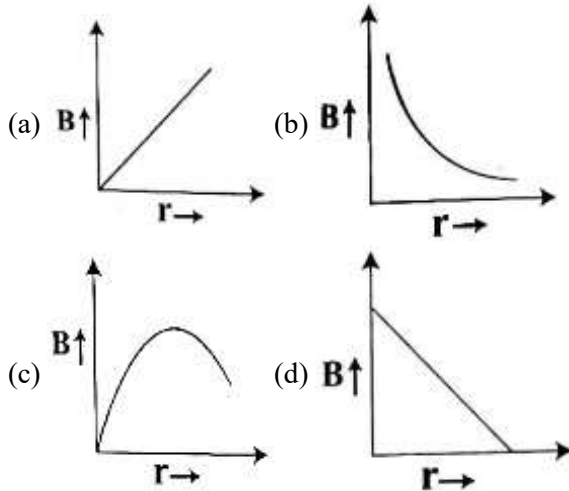


Physics

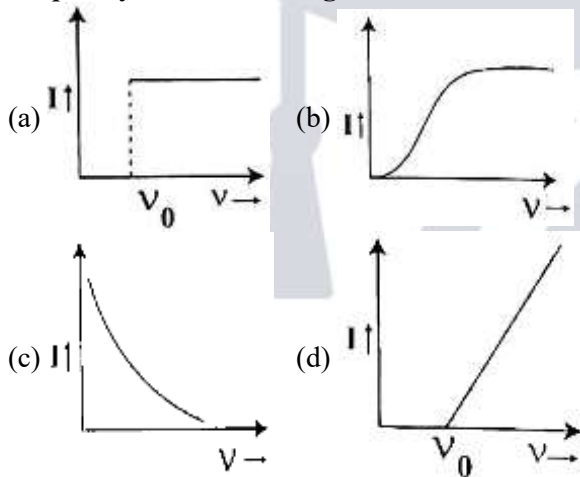
1. Which of the following graphs represents the variation of magnetic field B with perpendicular distance ' r ' from an infinitely long, straight conductor carrying current?



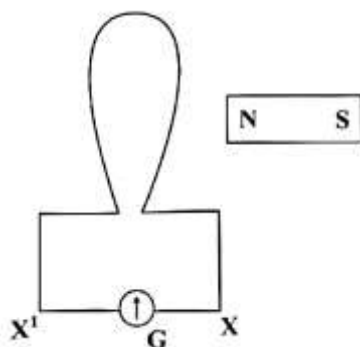
2. If we consider an electron and a photon of same de-Broglie wavelength, then they will have Same.

- (a) Angular momentum (b) Energy
 (c) Velocity (d) Momentum

3. The anode voltage of a photocell is kept fixed. The frequency of the light falling on the cathode is gradually increased. Then the correct graph which shows the variation of photo current I with the frequency ν of incident light is.



4. When a bar magnet is pushed towards the coil, along its axis, as shown in the figure, the galvanometer pointer deflects towards X. When this magnet is pulled away from the coil, the galvanometer pointer



- (a) deflects towards X^1 (b) does not deflect
 (c) oscillates (d) deflects towards X

5. A square loop of side 2 m lies in the $Y - Z$ plane in a region having a magnetic field $\vec{B} =$

$(5\hat{i} + 3\hat{j} - 4\hat{k})T$. The magnitude of magnetic flux through the square loop is.

- (a) 20 Wb (b) 12 Wb
(c) 16 Wb (d) 10 Wb

6. In domestic electric mains supply, the voltage and the current are.

- (a) AC voltage and DC current
(b) DC voltage and DC current
(c) DC voltage and AC current
(d) AC voltage and AC current

7. A sinusoidal voltage produced by an AC generator at any instant t is given by an equation $V = 311\sin 314t$. The rms value of voltage and frequency are respectively.

- (a) 200 V, 50 Hz (b) 220 V, 100 Hz
(c) 220 V, 50 Hz (d) 200 V, 100 Hz

8. A series LCR circuit containing an AC source of 100 V has an inductor and a capacitor of reactance 24Ω and 16Ω respectively. If a resistance of 6Ω is connected in series, then the potential difference across the series combination of inductor and capacitor only is.

- (a) 80 V (b) 400 V
(c) 8 V (d) 40 V

9. Match the following types of waves with their wavelength ranges.

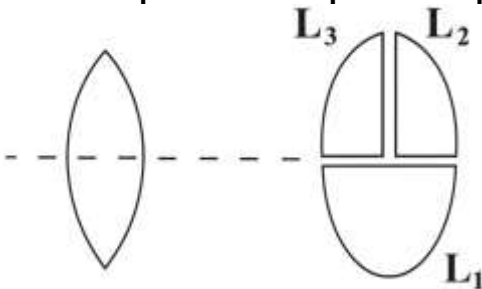
Waves		Wavelength ranges	
i.	Microwave	a.	700 nm to 400 nm
ii.	Visible light	b.	1 nm to 10^{-3} nm
iii.	Ultraviolet	c.	0.1 m to 1 mm
iv.	X-rays	d.	400 nm to 1 nm

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

10. A ray of light passes from vacuum into a medium of refractive index n . If the angle of incidence is twice the angle of refraction, then the angle of incidence in terms of refractive index is.

- (a) $\sin^{-1}\left(\frac{n}{2}\right)$ (b) $2\cos^{-1}\left(\frac{n}{2}\right)$
(c) $2\sin^{-1}\left(\frac{n}{2}\right)$ (d) $\cos^{-1}\left(\frac{n}{2}\right)$

11. A convex lens has power P . It is cut into two halves along its principal axis. Further one piece (out of two halves) is cut into two halves perpendicular to the principal axis as shown in figure. Choose the incorrect option for the reported lens pieces.

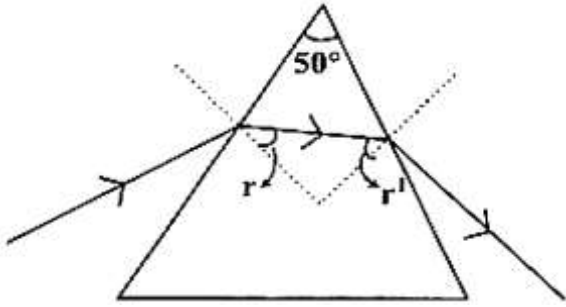


- (a) Power of L_2 is $\frac{P}{2}$ (b) Power of L_3 is $\frac{P}{2}$
(c) Power of L_1 is P (d) Power of L_1 is $\frac{P}{2}$

12. The image formed by an objective lens a compound microscope is.

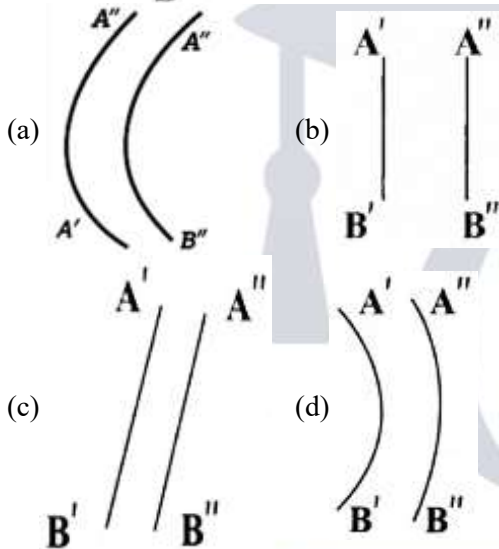
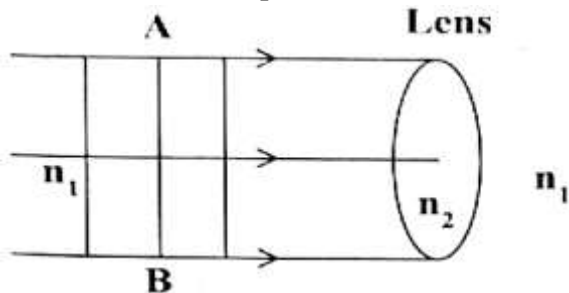
- (a) Real and diminished (b) Real and enlarged
(c) Virtual and enlarged (d) Virtual and diminished

13. If r and r' denote the angles inside the prism having angle of prism 50° considering that during interval of time from $t = 0$ to $t = t$, r varies with time as $r = 10^\circ + t^2$. During this time r' will vary with time as.



- (a) $40^\circ + t^2$ (b) $50^\circ - t^2$
(c) $50^\circ + t^2$ (d) $40^\circ - t^2$

14. If AB is incident plane wave front then refracted wave front is ($n_2 > n_1$)



15. The total energy carried by the light wave when it travels from a rarer to a non-reflecting and non-absorbing medium.

- (a) remains same
(b) increases
(c) either increases or decreases depending upon angle of incidence
(d) decreases

16. If the radius of first Bohr orbit is r , then the radius of the second Bohr orbit will be.

- (a) $8r$ (b) $4r$
(c) $2\sqrt{2}r$ (d) $2r$

17. Match the following types of nuclei with examples shown

Column-I		Column- II	
(A)	Isotopes	(i)	${}_3\text{Li}^7, {}_4\text{Be}^7$
(B)	Isobars	(ii)	${}_8\text{O}^{18}, {}_9\text{F}^{19}$

(C)	Isotones	(iii)	${}_1\text{H}^1, {}_1\text{H}^2$
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- (a) A - ii, B - iii, C - I (b) A-i, B-iii, C-ii
(c) A - iii, B - ii, C - I (d) A-iii, B-i, C-ii

18. Which of the following statements is incorrect with reference to 'Nuclear force'?

- (a) Nuclear force becomes attractive for nucleon distances larger than 0.8 fm
(b) Nuclear force becomes repulsive for nucleon distances less than 0.8 fm
(c) Nuclear force is always attractive
(d) Potential energy is minimum, if the separation between the nucleons is 0.8 fm

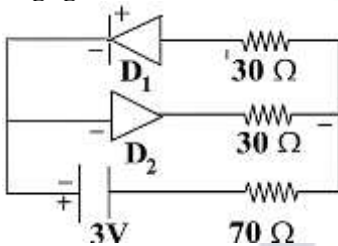
19. The range of electrical conductivity (σ) and resistivity (ρ) for metals, among the following, is.

- (a) $\rho \rightarrow 10^{-5} - 10^6 \Omega \text{ m}, \sigma \rightarrow 10^{-5} - 10^{-6} \text{ Sm}^{-1}$
(b) $\rho \rightarrow 10^{11} - 10^{19} \Omega \text{ m}, \sigma \rightarrow 10^{-11} - 10^{-19} \text{ Sm}^{-1}$
(c) $\rho \rightarrow 10^2 - 10^8 \Omega \text{ m}, \sigma \rightarrow 10^{-2} - 10^{-8} \text{ Sm}^{-1}$
(d) $\rho \rightarrow 10^{-2} - 10^{-8} \Omega \text{ m}, \sigma \rightarrow 10^2 - 10^8 \text{ Sm}^{-1}$

20. Which of the following statements is correct for an n-type semiconductor?

- (a) The donor energy level lies closely above the top of the valence band
(b) The donor energy level lies at the half way mark of forbidden energy gap
(c) The donor energy level does not exist
(d) The donor energy level lies just below the bottom of the conduction band

21. The circuit shown in the figure contains two ideal diodes D_1 and D_2 . If a cell of emf 3V and negligible internal resistance is connected as shown, then the current through 70Ω resistance (in ampere) is.



- (a) 0.01 (b) 0.02
(c) 0.03 (d) 0

22. In determining the refractive index of a glass slab using a travelling microscope, the following readings are tabulated.

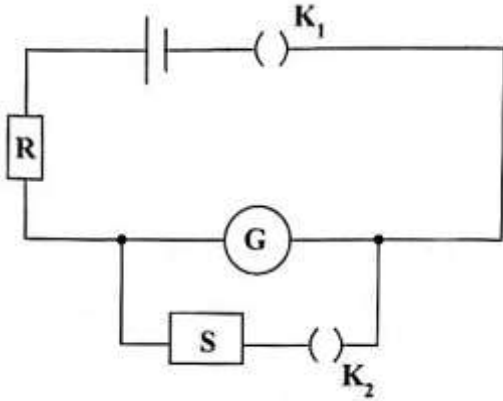
- (A) Reading of travelling microscope for ink mark = 5.123 cm
(B) Reading of travelling microscope for ink mark through glass slab = 6.123 cm
(C) Reading of travelling microscope for chalk dust on glass slab = 8.123 cm

From the data, the refractive index of a glass slab is

- (a) 1.500 (b) 1.601
(c) 1.399 (d) 1.390

23. In an experiment to determine the figure of merit of a galvanometer by half deflection method, a student constructed the following circuit.

He unplugged a resistance of 5200Ω in R. When K_1 is closed and K_2 is open, the deflection observed in the galvanometer is 26 div. When K_2 is also closed and a resistance of 90Ω is removed in S, the deflection becomes 13 div. The resistance of galvanometer is nearly



- (a) 45.0Ω (b) 103.0Ω
(c) 91.6Ω (d) 116.0Ω

24. While determining the coefficient of viscosity of the given liquid, a spherical steel ball sinks by a distance $h = 0.9$ m. The radius of the ball is $r = \sqrt{3} \times 10^{-3}$ m. The time taken by the ball to sink in three trials are tabulated as follows.

Trial No.	Time taken by the ball to fall by h (in second)
1.	2.75
2.	2.65
3.	2.70

The difference between the densities of the steel ball and the liquid is 7000 kg m^{-3} . If $g = 10.0 \text{ ms}^{-2}$, then the coefficient of viscosity of the given liquid at room temperature is

- (a) 0.14 Pa.s (b) $0.14 \times 10^{-3} \text{ Pa.s}$
(c) 14 Pa.s (d) 0.28 Pa.s

25. Which of the following expressions can be deduced on the basis of dimensional analysis?

(All symbols have their usual meanings)

- (a) $x = A \cos \omega t$ (b) $N = N_0 e^{-\lambda t}$
(c) $F = 6\pi\eta r v$ (d) $s = ut + \frac{1}{2}at^2$

26. Two stones begin to fall from rest from the same height, with the second stone starting to fall ' Δt ' seconds after the first falls from rest. The distance of separation between the two stones becomes ' H ', ' t_0 ' seconds after the first stone starts its motion. Then t_0 is equal to.

- (a) $\frac{H}{\Delta t} + \frac{\Delta t}{2g}$ (b) $\frac{H}{g\Delta t} - \frac{\Delta t}{2}$
(c) $\frac{H}{g\Delta t} + \frac{\Delta t}{2}$ (d) $\frac{H}{g\Delta t}$

27. In the projectile motion of a particle on a level ground, which of the following remains constant with reference to time and position?

- (a) Average velocity between any two points on the path
(b) Horizontal component of velocity
(c) Angle between the instantaneous velocity with the horizontal
(d) Vertical component of the velocity of the projectile

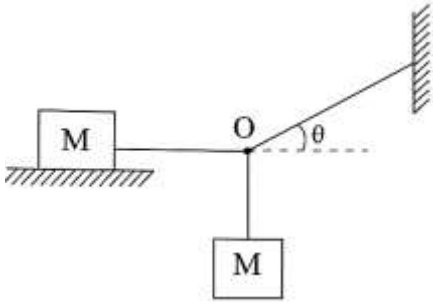
28. A particle is in uniform circular motion. The equation of its trajectory is given by $(x - 2)^2 + y^2 = 25$, where x and y are in meter.

The speed of the particle is 2 ms^{-1} . When the particle attains the lowest ' y ' co-ordinate, the acceleration of the particle is (in ms^{-2})

- (a) $0.4\hat{j}$ (b) $0.8\hat{i}$
(c) $0.8\hat{j}$ (d) $0.4\hat{i}$

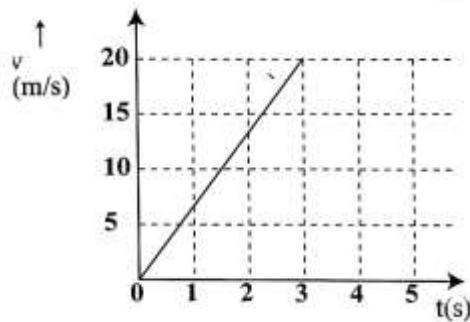
29. A wooden block of mass M lies on a rough floor. Another wooden block of the same mass is

hanging from the point O through strings as shown in the figure. To achieve equilibrium, the coefficient of static friction between the block on the floor with the floor itself is.



- (a) $\mu = \cot \theta$ (b) $\mu = \sin \theta$
 (c) $\mu = \tan \theta$ (d) $\mu = \cos \theta$

30. A block of certain mass is placed on a rough floor. The coefficients of static and kinetic friction between the block and the floor are 0.4 and 0.25 respectively. A constant horizontal force $F = 20 \text{ N}$ acts on it so that the velocity of the block varies with time according to the following graph. The mass of the block is nearly (Take $g \approx 10 \text{ ms}^{-2}$)



- (a) 4.4 kg (b) 1.2 kg
 (c) 1.0 kg (d) 2.2 kg

31. A body of mass 0.25 kg travels along a straight line from $x = 0$ to $x = 2 \text{ m}$ with a speed $v = kx^{3/2}$ where $k = 2 \text{ SI units}$. The work done by the net force during this displacement is.

- (a) 8 J (b) 16 J
 (c) 32 J (d) 4 J

32. During an elastic collision between two bodies, which of the following statements are correct?

- I. The initial kinetic energy is equal to the final kinetic energy of the system.
 II. The linear momentum is conserved.
 III. The kinetic energy during Δt (the collision time) is not conserved.

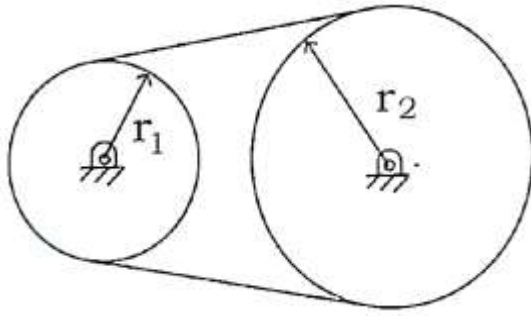
- (a) II and III only (b) I and III only
 (c) I, II and III (d) I and II only

33. Three particles of mass 1 kg, 2 kg and 3 kg are placed at the vertices A, B and C respectively of an equilateral triangle ABC of side 1 m. The center of mass of the system from vertex A (located at origin) is

- (a) $\left(\frac{7}{12}, \frac{3\sqrt{3}}{12}\right)$ (b) $\left(\frac{9}{12}, \frac{3\sqrt{3}}{12}\right)$
 (c) $\left(\frac{7}{12}, \frac{6+3\sqrt{3}}{12}\right)$ (d) (0,0)

34. Two fly wheels are connected by a non-slipping belt as shown in the figure.

$I_1 = 4 \text{ kg m}^2$, $r_1 = 20 \text{ cm}$, $I_2 = 20 \text{ kg m}^2$ and $r_2 = 30 \text{ cm}$. A torque of 10 Nm is applied on the smaller wheel. Then match the entries of column I with appropriate entries of column II.



I	Quantities	II	Their numerical values (in SI units)
(a)	Angular acceleration of smaller wheel	(i)	$\frac{5}{3}$
(b)	Torque on the larger wheel	(ii)	$\frac{100}{3}$
(c)	Angular acceleration of larger wheel	(iii)	$\frac{5}{2}$

- (a) a-ii, b-iii, c-I (b) a -iii, b-i, c-ii
(c) a-ii, b-i, c-iii (d) a-iii, b-ii, c-i

35. If r_p, v_p, L_p and r_a, v_a, L_a are radii, velocities and angular momenta of a planet at perihelion and aphelion of its elliptical orbit around the Sun respectively, then

- (a) $r_p > r_a, v_p > v_a, L_a > L_p$
(b) $r_p < r_a, v_p > v_a, L_a = L_p$
(c) $r_p > r_a, v_p < v_a, L_a = L_p$
(d) $r_p < r_a, v_p < v_a, L_a < L_p$

36. The total energy of a satellite in a circular orbit at a distance $(R + h)$ from the center of the Earth varies as [R is the radius of the Earth and h is the height of the orbit from Earth's surface]

- (a) $-\frac{1}{(R+h)}$ (b) $\frac{1}{(R+h)^2}$
(c) $-\frac{1}{(R+h)^2}$ (d) $\frac{1}{(R+h)}$

37. Two wires A and B are made of same material. Their diameters are in the ratio of 1: 2 and lengths are in the ratio of 1: 3. If they are stretched by the same force, then increase in their lengths will be in the ratio of.

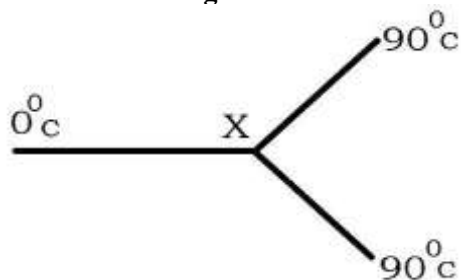
- (a) 3: 4 (b) 2: 3
(c) 3: 2 (d) 4: 3

38. A horizontal pipe carries water in a streamlined flow. At a point along the pipe, where the cross-sectional area is 10 cm^2 , the velocity of water is 1 ms^{-1} and the pressure is 2000 Pa . What is the pressure of water at another point where the cross-sectional area is 5 cm^2 ?

[Density of water = 1000 kgm^{-3}]

- (a) 300 Pa (b) 400 Pa
(c) 500 Pa (d) 200 Pa

39. Three metal rods of the same material and identical in all respects are joined as shown in the figure. The temperatures at the ends of these rods are maintained as indicated. Assuming no heat energy loss occurs through the curved surfaces of the rods, the temperature at the junction x is



- (a) 60°C (b) 30°C
(c) 20°C (d) 45°C

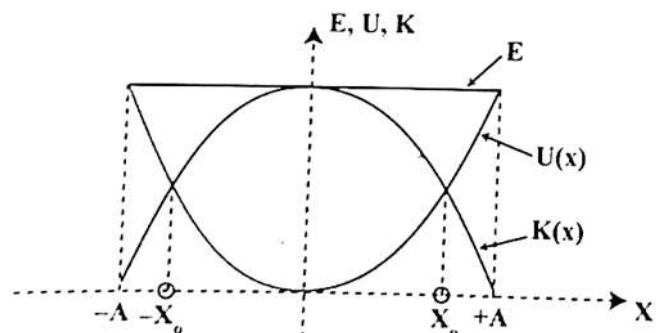
40. A gas is taken from state A to state B along two different paths 1 and 2. The heat absorbed and work done by the system along these two paths are Q_1 and Q_2 and W_1 and W_2 respectively. Then.

- (a) $W_1 = W_2$
(b) $Q_1 - W_1 = Q_2 - W_2$
(c) $Q_1 + W_1 = Q_2 + W_2$
(d) $Q_1 = Q_2$

41. At 27°C temperature, the mean kinetic energy of the atoms of an ideal gas is E_1 . If the temperature is increased to 327°C, then the mean kinetic energy of the atoms will be.

- (a) $\frac{E_1}{\sqrt{2}}$ (b) $\sqrt{2}E_1$
(c) $2E_1$ (d) $\frac{E_1}{2}$

42. The variations of kinetic energy $K(x)$, potential energy $U(x)$ and total energy as a function of displacement of a particle in SHM is as shown in the figure. The value of $|x_0|$ is

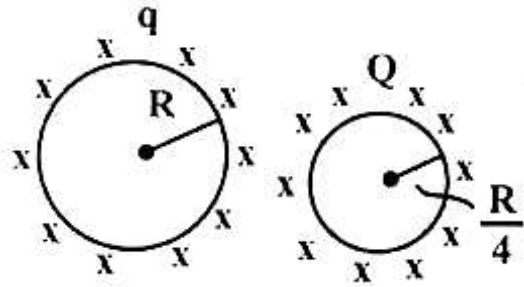


- (a) 2 A (b) $\frac{A}{\sqrt{2}}$
(c) $\sqrt{2} A$ (d) $\frac{A}{2}$

43. The angle between the particle velocity and wave velocity in a transverse wave is [except when the particle passes through the mean position]

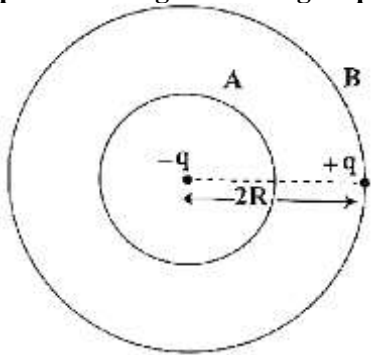
- (a) $\frac{\pi}{4}$ radian (b) $\frac{\pi}{2}$ radian
(c) π radian (d) Zero radian

44. A metallic sphere of radius R carrying a charge q is kept at certain distance from another metallic sphere of radius $R/4$ carrying a charge Q . What is the electric flux at any point inside the metallic sphere of radius R due to the sphere of radius $R/4$?



- (a) $\frac{Q}{\epsilon_0} - \frac{q}{\epsilon_0}$ (b) Zero
(c) $\frac{q}{\epsilon_0} - \frac{Q}{\epsilon_0}$ (d) $\frac{Q}{\epsilon_0}$

45. You are given a dipole of charge $+q$ and $-q$ separated by a distance $2R$. A sphere 'A' of radius 'R' passes through the centre of the dipole as shown below and another sphere 'B' of radius '2R' passes through the charge $+q$. Then the electric flux through the sphere A is

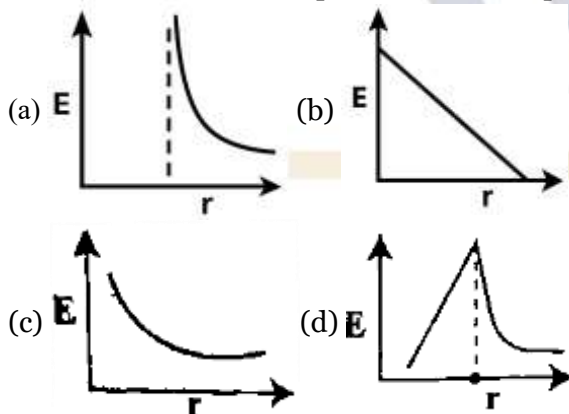


- (a) q/ϵ_0 (b) Zero
(c) $2q/\epsilon_0$ (d) $-q/\epsilon_0$

46. A potential at a point A is $-3V$ and that at another point B is $5V$. What is the work done in carrying a charges of $5mC$ from B to A?

- (a) $-0.04J$ (b) $-0.4J$
(c) $-4J$ (d) $-40J$

47. Charges are uniformly spread on the surface of a conducting sphere. The electric field from the center of sphere to a point outside the sphere varies with distance r from the center as.



48. Match column -I with Column -II related to an electric dipole of dipole moment $\vec{P}$ that is placed in a uniform electric field $\vec{E}$

Column -I Angle between $\vec{P}$ and $\vec{E}$	Column-II Potential energy of the dipole
(a) 180°	(i) $-pE$

(b) 120°	(ii) pE
(c) 90°	(iii) $\frac{1}{2}$ pE
	(iv) Zero

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

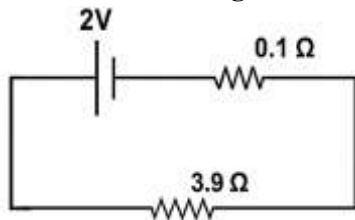
49. Which of the following statements is not true?

- (a) Work done to move a charge on an equipotential surface is not zero
(b) Equipotential surfaces are the surfaces where the potential is constant
(c) Equipotential surfaces for a uniform electric field are parallel and equidistant from each other.
(d) Electric field is always perpendicular to an equipotential surface

50. Which of the following is a correct statement?

- (a) Gauss's law is true for any open surface
(b) Gauss's law is not applicable when charge are not symmetrically distributed over a closed surface
(c) Gauss's law does not hold good for a charge situated outside Gaussian surface
(d) Gauss's law is true for any closed surface

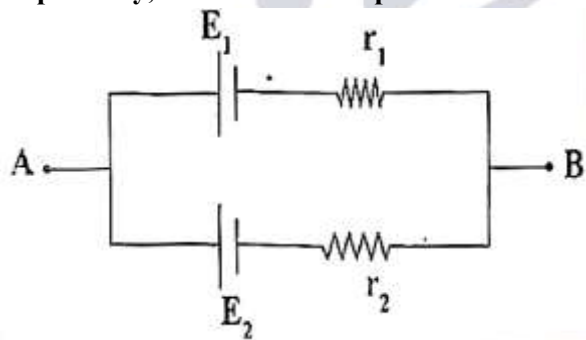
51. In the following circuit, the terminal voltage across the cell is.



- (a) 1.68 V (b) 1.95 V
(c) 2.71 V (d) 0.52 V

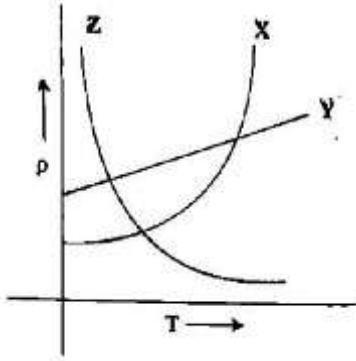
52. Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 ($E_2 > E_1$ and $r_2 > r_1$)

respectively, are connected in parallel as shown in figure. The equivalent emf of the combination is E_{eq} . Then



- (a) $E_1 < E_2 < E_{eq}$ and E_{eq} is nearer E_2
(b) $E_{eq} > E_2$
(c) $E_{eq} < E_1$
(d) $E_1 < E_{eq} < E_2$ and E_{eq} is nearer E_1

53. The variations of resistivity ρ with absolute temperature T for three different materials X, Y and Z are shown in the graph below. Identify the materials X, Y and Z.

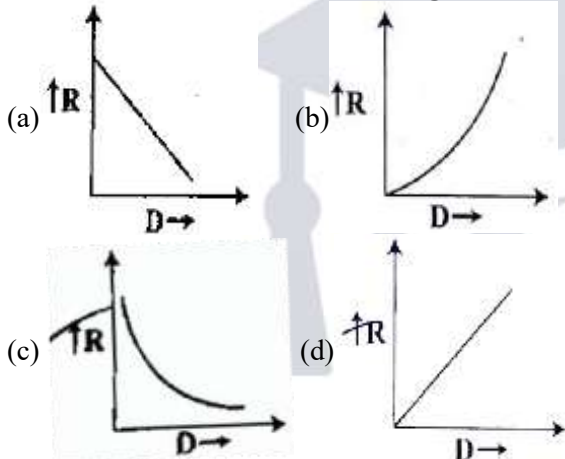


- (a) X -copper, Y -semiconductor, Z -nichrome
 (b) X-semiconductor, Y-nichrome, Z - copper
 (c) X - nichrome, Y -copper, Z -semiconductor
 (d) X -copper, Y -nichrome, Z -semiconductor

54. Given a current carrying wire of non-uniform cross -section, which of the following is constant throughout the length of wire.

- (a) Drift speed
 (b) Current and drift speed
 (c) Current only
 (d) Current, electric field and drift speed

55. The graph between variation of resistance of a metal wire as a function of its diameter keeping other parameters like length and temperature constant is



56. Two thin long parallel wires separated by a distance 'r' from each in vacuum carry a current of I ampere in opposite directions . Then they will.

- (a) Attract each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r}$
 (b) Repel each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r}$
 (c) Repel each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r^2}$
 (d) Attract each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r^2}$

57. A solenoid is 1 m long and 4 cm in diameter. It has five layers of windings of 1000 turns each and carries a current of 7A. The magnetic field at the center of the solenoid is.

- (a) 0.4396×10^{-5} T
 (b) 4.396×10^{-2} T
 (c) 43.96×10^{-2} T
 (d) 439.6 T

58. Two similar galvanometers are converted into an ammeter and a milliammeter. The shunt resistance of ammeter as compared to the shunt resistance of milliammeter will be.

- (a) Zero (b) More
 (c) Less (d) Equal

59. Which of the following statements is true in respect of diamagnetic substances?

- (a) They are feebly attracted by magnets
- (b) Permeability is greater than 1000
- (c) Susceptibility decreases with temperature
- (d) Susceptibility is small and negative

60. Identify the correct statement

- (a) A current carrying conductor produces an electric field around it
- (b) A straight current carrying conductor has circular magnetic field lines around it.
- (c) The direction of magnetic field due to a current element is given by Flemings Left Hand Rule
- (d) The magnetic field inside a solenoid is nonuniform

Chemistry

61. In the reaction between hydrogen sulphide and acidified permanganate solution,

- (a) H_2S is oxidised to SO_2 , MnO_4^- is reduced to MnO_2
- (b) H_2S is reduced to SO_2 , MnO_4^- is oxidised to Mn^{2+}
- (c) H_2S is oxidised to S , MnO_4^- is reduced to Mn^{2+}
- (d) H_2S is reduced to S , MnO_4^- is oxidised to Mn^{2+}

62. A member of the Lanthanoid series which is well known to exhibit +4 oxidation state is.

- (a) Europium
- (b) Erbium
- (c) Cerium
- (d) Samarium

63. In which of the following pairs, both the elements do not have $(n-1)d^{10}ns^2$ configuration?

- (a) Zn, Cd
- (b) Cd, Hg
- (c) Ag, Cu
- (d) Cu, Zn

64. A ligand which has two different donor atoms and either of the two ligates with the central metal atom/ion in the complex is called .

- (a) Unidentate ligand
- (b) Polydentate ligand
- (c) Ambidentate ligand
- (d) Chelate ligand

65. Which of the following statements are true about $[\text{NiCl}_4]^{2-}$?

- (a) The complex has tetrahedral geometry.
- (b) Co-ordination number of Ni is 2 and oxidation state is +4 .
- (c) The complex is sp^3 hybridised.
- (d) It is a high spin complex.

(e) The complex is paramagnetic

- (a) a, b, d and e
- (b) b, c, d and e
- (c) a, b, c and d
- (d) a, c, d and e

66. Which formula and its name combination is incorrect?

- (a) $[\text{CoCl}_2(\text{en})_2]\text{Cl}$, Dichloridobis (ethane-1, 2diamine) cobalt(III) chloride
- (b) $[\text{Co}(\text{NH}_3)_5(\text{CO}_3)]\text{Cl}$, Pentaammine carbonylcobalt (III) chloride
- (c) $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$, Diammine chloridonitrito-N-platinum (II)
- (d) $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$, Potassium trioxalatochromate (III)

67. In the complex ion $[\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}$, the Co-ordination number of Fe is.

- (a) 5
- (b) 6
- (c) 3
- (d) 4

68. Match List-I with List-II for the following reaction pattern

Glucose $\xrightarrow{\text{Reagent}}$ Product $\rightarrow$ Structural prediction

List-I (Reagents)	List-II (Structural prediction)
a) Acetic anhydride	i) Glucose has an aldehyde group
b) Bromine water	ii) Glucose has a straight chain of six carbon atoms

c) Hydroiodic acid	iii) Glucose has five hydroxyl groups
d) Hydrogen cyanide	iv) Glucose has a carbonyl group

Choose the correct answer from the options given below.

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

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

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

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

69. The correct sequence of α -amino acid, hormone, vitamin, carbohydrates respectively is

(a) Glutamine, Insulin, Aspartic acid, Fructose

(b) Arginine, Testosterone, Glutamic acid, Maltose

(c) Aspartic acid, Insulin, Ascorbic acid, rhamnose

(d) Thiamine, Thyroxine, Vitamin A, Glucose

70. Which examples of carbohydrates exhibit α – link (α – glycosidic link) in their structure?

(a) Amylose and Amylopectin

(b) Cellulose and Glycogen

(c) Glucose and Fructose

(d) Maltose and Lactose

71. In the titration of potassium permanganate (KMnO_4) against Ferrous ammonium sulphate (FAS) solution, dilute sulphuric acid but not nitric acid is used to maintain acidic medium, because

(a) Nitric acid doesn't act as an indicator

(b) Nitric acid itself is an oxidising agent

(c) Nitric acid is a weak acid than sulphuric acid

(d) It is difficult to identify the end point

72. The group reagent $\text{NH}_4\text{Cl}_{(s)}$ and aqueous NH_3 , will precipitate which of the following ion.

(a) Al^{3+} (b) Ba^{2+}

(c) Ca^{2+} (d) NH_4^+

73. In the preparation of sodium fusion extract, the purpose of fusing organic compound with a piece of sodium metal is to.

(a) Convert the elements of the compound from covalent form to ionic form

(b) Convert the elements of the compound from ionic form to covalent form

(c) Decrease the melting point of the compound

(d) Convert the organic compound into vapour state

74. The sodium fusion extract is boiled with concentrated nitric acid while testing for halogens.

By doing so, it

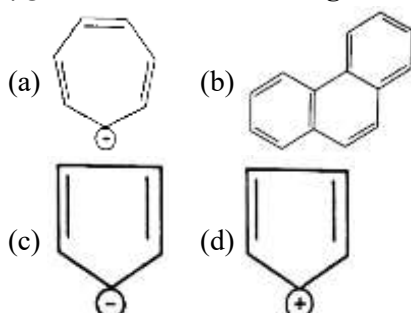
(a) increases the solubility of AgCl

(b) increases the concentration of NO_3^- ion

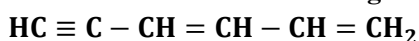
(c) decomposes Na_2S and NaCN , if formed

(d) helps in precipitation of AgCl

75. Which of the following is not an aromatic compound?



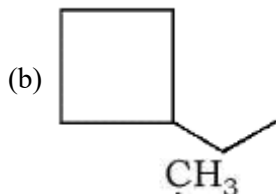
76. The IUPAC name of the given organic compound is



- (a) Hexa - 5 -yn-1,3-diene
 (b) Hexa-1,3-dien - 5 - yne
 (c) Hexa - 3, 5-dien -1-yne
 (d) Hexa-1-yn-3,5-diene

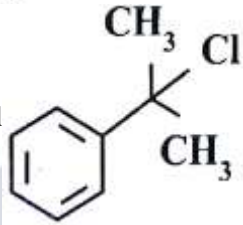
77. Among the following, identify the compound that is not an isomer of hexane.

- (a) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$



- (c) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \end{array}$
 $\begin{array}{c} \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{CH}_2 - \text{CH}_3 \\ | \\ \text{CH}_3 \end{array}$

- (d) 

78. The organic compound  can be classified as .

- (a) Benzyl halide (b) Aryl halide
 (c) Alkyl halide (d) Allylic halide

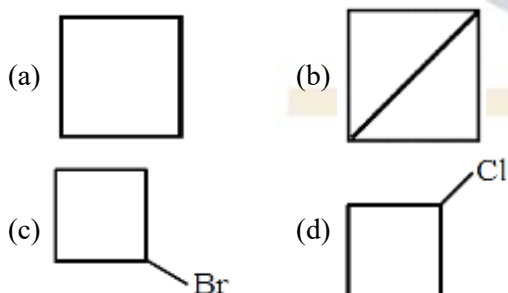
79. Chlorobenzene reacts with bromine gas in the presence of Anhy AlBr_3 to yield p-Bromochlorobenzene. This reaction is classified as.

- (a) Nucleophilic substitution reaction
 (b) Electrophilic substitution reaction
 (c) Addition reaction
 (d) Elimination reaction

80. The organometallic compound $(\text{CH}_3)_3\text{CMgBr}$ on reaction with D_2O produces.

- (a) $(\text{CD}_3)_3\text{CD}$ (b) $(\text{CD}_3)_3\text{COD}$
 (c) $(\text{CH}_3)_3\text{CD}$ (d) $(\text{CH}_3)_3\text{COD}$

81. The major product formed when 1 - Bromo-3Chlorocyclobutane reacts with metallic sodium in dry ether is.



82. Ethyl alcohol is heated with concentrated Sulphuric acid at $413\text{ K}(140^\circ\text{C})$. The major product formed is.

- (a) $\text{CH}_3 - \text{O} - \text{C}_3\text{H}_7$ (b) $\text{CH}_2 = \text{CH}_2$
 (c) $\text{CH}_3\text{COOC}_2\text{H}_5$ (d) $\text{C}_2\text{H}_5 - \text{O} - \text{C}_2\text{H}_5$

83. Phenol can be distinguished from propanol by using the reagent.

- (a) Iron metal (b) Iodine in alcohol
 (c) Sodium metal (d) Bromine water

84. Match the following with their pK_a values

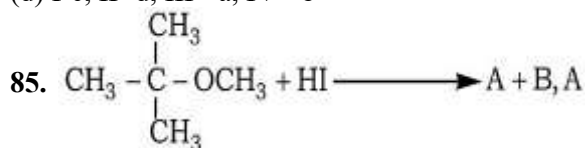
	Acid	pKa
I	Phenol	(a) 16
II	p-Nitrophenol	(b) 0.78
III	Ethyl alcohol.	(c) 10
IV	Picric acid	(d) 7.1

(a) I - a, II - d, III - c, IV - b

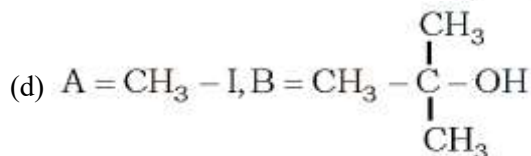
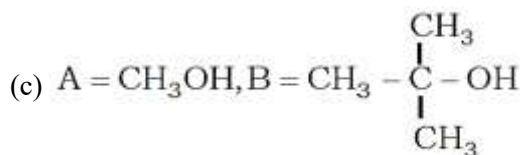
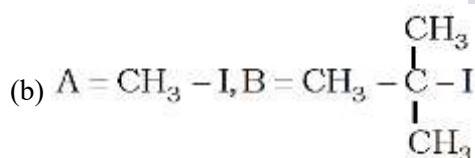
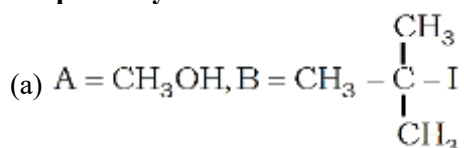
(b) I-a, II - b, III - c, IV - d

(c) I-b, II - a, III - d, IV - c

(d) I-c, II -d, III - a, IV - b



Respectively are.



86. Oxidation of Toluene with chromyl chloride followed by hydrolysis gives Benzaldehyde.

This reaction is known as.

- (a) Kolbe reaction
- (b) Stephen reaction
- (c) Cannizzaro Reaction
- (d) Etard Reaction

87. Statement-I: Reduction of ester by DIBAL-H followed by hydrolysis gives aldehyde.

Statement-II: Oxidation of benzyl alcohol with aqueous KMnO_4 leads to the formation of Benzaldehyde.

Among the above statements, identify the correct statement.

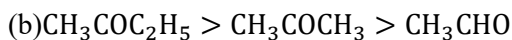
- (a) Statement-I is true but statement-II is false
- (b) Statement-I is false but statement-II is true
- (c) Both statements-I and II are true
- (d) Both statements-I and II are false

88. Arrange the following compounds in their decreasing order of reactivity towards

Nucleophilic addition reaction.

$\text{CH}_3\text{COCH}_3, \text{CH}_3\text{COC}_2\text{H}_5, \text{CH}_3\text{CHO}$

- (a) $\text{CH}_3\text{COCH}_3 > \text{CH}_3\text{CHO} > \text{CH}_3\text{COC}_2\text{H}_5$



89. Which of the following has most acidic Hydrogen?

(a) Dichloroacetic acid

(b) Trichloroacetic acid

(c) Chloroacetic acid

(d) Propanoic acid

90. Which of the following reagents are suitable to differentiate Aniline and N -methylaniline chemically?

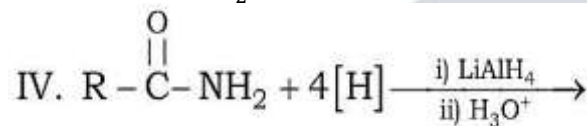
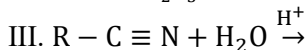
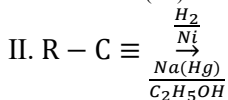
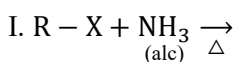
(a) Br_2 water

(b) Conc. Hydrochloric acid and anhydrous zinc chloride

(c) Chloroform and Alcoholic potassium Hydroxide

(d) Acetic anhydride

91. Which of the following reaction/s does not yield an amine?



(a) Only II

(b) Only III

(c) Both II and IV

(d) Both I and IV

92. Match the compounds given in List-I with the items given in List-II

List-I	List-II
(I) Benzenesulphonyl Chloride	(a) Zwitterion
(II) Sulphanilic acid	(b) Hinsberg reagent
(III) Alkyl Diazonium salts	(c) Dyes
(IV) Aryl Diazonium salts	(d) Conversion to alcohols

(a) I-a, II-c, III-b, IV-d (b) I-c, II-a, III-d, IV-b

(c) I-b, II-a, III-d, IV-c (d) I-c, II-b, III-a, IV-d

93. The number of orbitals associated with 'N' shell of an atom is.

(a) 32

(b) 3

(c) 4

(d) 16

94. According to the Heisenberg's Uncertainty principle, the value of $\Delta v \cdot \Delta x$ for an object whose mass is 10^{-6} kg is.

($h = 6.626 \times 10^{-34} \text{Js}$)

(a) $4.0 \times 10^{-26} \text{ m}^{-2} \text{ s}^{-1}$

(b) $3.5 \times 10^{-25} \text{ m}^{-2} \text{ s}^{-1}$

(c) $5.2 \times 10^{-29} \text{ m}^{-2} \text{ s}^{-1}$

(d) $3.0 \times 10^{-24} \text{ m}^{-2} \text{ s}^{-1}$

95. Given below are two statements.

Statement-I: Adiabatic work done is positive when work is done on the system and internal energy of the system increases

Statement-II: No work is done during free expansion of an ideal gas

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

- (a) Statement-I is true but Statement-II is false
- (b) Statement-I is false but Statement-II is true
- (c) Both Statement-I and Statement-II are true
- (d) Both Statement-I and Statement-II are false

96. Which one of the following reactions has $\Delta H = \Delta U$?

- (a) $C_6H_6(l) + \frac{15}{2} O_2(g) \rightarrow 6CO_2(g) + 3H_2O(l)$
- (b) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$
- (c) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
- (d) $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$

97. Identify the incorrect statements among the following:

- (a) All enthalpies of fusion are positive.
 - (b) The magnitude of enthalpy change does not depend on the strength of the intermolecular interactions in the substance undergoing phase transformations.
 - (c) When a chemical reaction is reversed, the value of $\Delta_r H^\circ$ is reversed in sign.
 - (d) The change in enthalpy is dependent of path between initial state (reactants) and final state (products)
 - (e) For most of the ionic compounds, $\Delta_{sol} H^\circ$ is negative.
- (a) b, d and e (b) a, d and e
(c) a and c only (d) a, b and d

98. Which of the following statements is/are true about equilibrium?

- (a) Equilibrium is possible only in a closed system at a given temperature
 - (b) All the measurable properties of the system remain constant at equilibrium.
 - (c) Equilibrium constant for the reverse reaction is the inverse of the equilibrium constant for the reaction in the forward direction.
- (a) Only c (b) a, b and c
(c) Only a (d) Only b

99. According to Le Chatelier's principle, in the reaction $CO(g) + 3H_2(g) \rightleftharpoons CH_4(g) + H_2O(g)$, the formation of methane is favoured by

- (a) increasing the concentration of CO
 - (b) increasing the concentration of H_2O
 - (c) decreasing the concentration of CH_4
 - (d) decreasing the concentration of H_2
- (a) b and d (b) a and d
(c) a and b (d) a and c

100. The equilibrium constant at 298 K for the reaction $A + B \rightleftharpoons C + D$ is 100. If the initial concentrations of all the four species were 1 M each, then equilibrium concentration of D (in $molL^{-1}$) will be

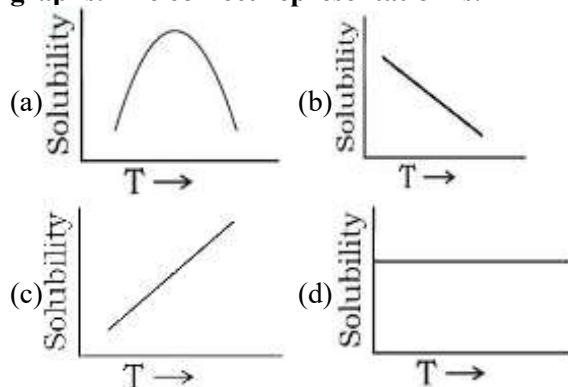
- (a) 1.818 (b) 1.182
- (c) 0.818 (d) 0.182

101. Among the following 0.1 m aqueous solutions, which one will exhibit the lowest boiling point elevation, assuming complete ionization of the compounds in solution?

- (a) Aluminium sulphate (b) Potassium sulphate
- (c) Sodium chloride (d) Aluminium chloride

102. Variation of solubility with temperature T for a gas in liquid is shown by the following

graphs. The correct representation is.



103. 180 g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a vessel. The temperature at which water boils at (a) 0.13 bar is _____ (given, K_b for water is $0.52 \text{ K kg mol}^{-1}$. Boiling point for pure water is 373.15 K)

- (a) 373.15 K (b) 373.0 K
 (c) 373.202 K (d) 373.67 K

104. If N_2 gas is bubbled through water at 293 K , how many moles of N_2 gas would dissolve in 1 liter of water? Assume that N_2 exerts a partial pressure of 0.987 bar .

[Given K_H for N_2 at 293 K is 76.48 K bar]

- (a) 7.16×10^{-5} (b) 7.16×10^{-4}
 (c) 7.16×10^{-3} (d) 0.716×10^{-3}

105. The correct statement/s about Galvanic cell is/are

- (a) Current flows from cathode to anode
 (b) Anode is positive terminal
 (c) If $E_{\text{cell}} < 0$, then it is spontaneous reaction
 (d) Cathode is positive terminal
 (a), b and c (b) a and d only
 (c) b only (d) a and b only

106. The electronic conductance depends on.

- (a) The number of valence electrons per atom
 (b) Concentration of the electrolyte
 (c) Size of the ions
 (d) Nature of electrolyte added

107. For a given half cell, $Al^{3+} + 3e^- \rightarrow Al$ on increasing the concentration of aluminium ion, the electrode potential will

- (a) No change
 (b) First increase then decrease
 (c) Increase
 (d) Decrease

108. Match the following and select the correct option for the quantity of electricity, in $C \text{ mol}^{-1}$, required to deposit various metals at cathode.

List-I

List-II

- (a) Ag^+ i. $386000 C \text{ mol}^{-1}$
 (b) Mg^{2+} ii. $289500 C \text{ mol}^{-1}$
 (c) Al^{3+} iii. $96500 C \text{ mol}^{-1}$
 (d) Ti^{4+} iv. $193000 C \text{ mol}^{-1}$

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

109. Catalysts are used to increase the rate of a chemical reaction. Because it

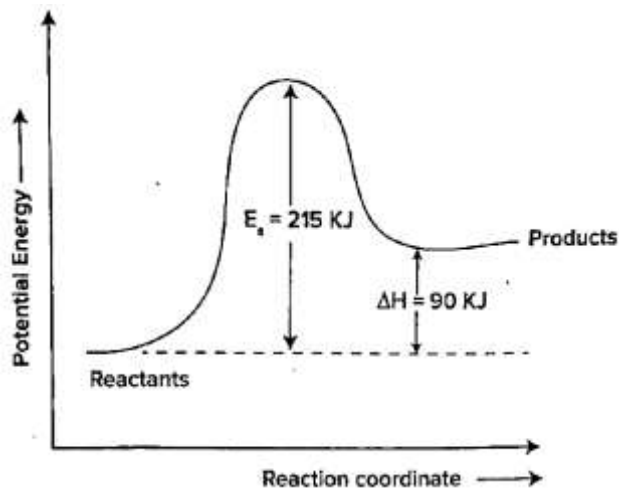
- (a) Decrease the activation energy of the reaction
 (b) Brings about improper orientation of reactant molecules
 (c) Increases the potential energy barrier

(d) Increases the activation energy of the reaction

110. Half-life of a first order reaction is 20 seconds and initial concentration of reactant is 0.2 M. The concentration of reactant left after 80 seconds is.

- (a) 0.05 M (b) 0.0125 M
(c) 0.2 M (d) 0.1 M

111. In the given graph, E_a for the reverse reaction will be.



- (a) 215 KJ (b) 90 KJ
(c) 305 KJ (d) 125 KJ

112. For the reaction $2\text{N}_2\text{O}_{5(g)} \rightarrow 4\text{NO}_{2(g)} + \text{O}_{2(g)}$ initial concentration of N_2O_5 is 2.0 mol L^{-1} and after 300 min, it is reduced to 1.4 mol L^{-1} . The rate of production of NO_2 (in $\text{mol L}^{-1} \text{ min}^{-1}$) is.

- (a) 4×10^{-4} (b) 2.5×10^{-3}
(c) 4×10^{-3} (d) 2.5×10^{-4}

113. Which of the following methods of expressing concentration are unitless?

- (a) Molality and Mole fraction
(b) Mass percent (W/W) and Molality
(c) Molality and Molarity
(d) Mole fraction and Mass percent (W/W)

114. Select the INCORRECT statement/s from the following:

- (a) 22 books have infinite significant figures.
(b) In the answer of calculation 2.5×1.25 has four significant figures.
(c) Zero's preceding to first non-zero digit are significant.
(d) In the answer of calculation $12.11 + 18.0 + 1.012$ has three significant figures
(a) (b) and (c) only (b) (b) and (d) only
(c) (a) and (b) only (d) (b), (c) and (d)

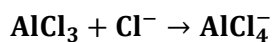
115. Given below are the atomic masses of the elements:

Element:	Atomic Mass(gmol^{-1}):
Li	7
Na	23
Cl	35.5
K	39
Ca	40
Br	80
Sr	88
I	127
Ba	137

Which of the following doesn't form triad?

- (a) Cl, Br, I (b) Cl, K, Ca
(c) Li, Na, K (d) Ba, Sr, Ca

116. The change in hybridisation (if any) of the 'Al' atom in the following reaction is



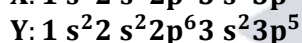
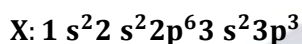
- (a) sp^2 to sp^3
 (b) sp^3 to sp^3d
 (c) sp^3 to sp^2
 (d) No change in the hybridisation state

117. Match List-I with List-II and select the correct option:

List-I (Molecule/ion)	List-II (Bond order)
(a) NO	(i) 1.5
(b) CO	(ii) 2.0
(c) O_2^-	(iii) 2.5
(d) O_2	(iv) 3.0

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

118. The electronic configuration of X and Y are given below:



Which of the following is the correct molecular formula and type of bond formed between X and Y ?

- (a) X_2Y_3 , coordinate bond
 (b) XY_3 , covalent bond
 (c) X_2Y , covalent bond
 (d) X_3Y , ionic bond

119. Match List-I with List - II

List-I (Types of redox reactions)	List-II (Examples)
(a) Combination reaction	(i) $\text{Cl}_{2(g)} + 2\text{Br}^-_{(aq)} \rightarrow 2\text{Cl}^-_{(aq)} + \text{Br}_{2(l)}$
(b) Decomposition reaction	(ii) $2\text{H}_2\text{O}_{2(aq)} \rightarrow 2\text{H}_2\text{O}_{(l)} + \text{O}_{2(g)}$
(c) Displacement reaction	(iii) $\text{CH}_{4(g)} + 2\text{O}_{2(g)} \xrightarrow{\Delta} \text{CO}_{2(g)} + 2\text{H}_2\text{O}_{(l)}$
(d) Disproportionation Reaction	(iv) $2\text{H}_2\text{O}_{(l)} \xrightarrow{\Delta} 2\text{H}_{2(g)} + \text{O}_{2(g)}$

Choose the correct answer from the options given below.

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

120. In the following pairs, the one in which both transition metal ions are Colourless is.

- (a) V^{2+} , Ti^{3+} (b) Zn^{2+} , Mn^{2+}
 (c) Ti^{4+} , Cu^{2+} (d) Sc^{3+} , Zn^{2+}

Mathematics

121. Consider the following statements:

Statement-I: The set of all solution of the linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ are $x < 3$ and $x \geq 2$ respectively.

Statement-II: The common set of solution of linear inequalities $3x + 8 < 17$ and $2x + 8 \geq 12$ is $(2,3)$.

Which of the following is true?

- (a) Statement-I is false but statement-II is true
- (b) Both the statements are true
- (c) Both the statements are false
- (d) Statement-I is true but statement-II is false

122. The number of four digit even number that can be formed using the digits 0, 1, 2 and 3 without repetition is

- (a) 10
- (b) 4
- (c) 12
- (d) 6

123. The number of diagonals that can be drawn in an octagon is.

- (a) 20
- (b) 28
- (c) 30
- (d) 15

124. If the number of terms in the binomial expansion of $(2x + 3)^{3n}$ is 22, then the value of n is.

- (a) 6
- (b) 7
- (c) 9
- (d) 8

125. If 4^{th} , 10^{th} and 16^{th} terms of a G.P. are x, y and z respectively, then

- (a) $y = \sqrt{xz}$
- (b) $x = \sqrt{yz}$
- (c) $y = \frac{x+z}{2}$
- (d) $z = \sqrt{xy}$

126. If A is a square matrix such that $A^2 = A$, then $(I - A)^3$ is

- (a) $A - I$
- (b) $I + A$
- (c) $-I - A$
- (d) $I - A$

127. If A and B are two matrices such that AB is an identity matrix and the order of matrix B is 3×4 then the order of matrix A is.

- (a) 3×3
- (b) 4×3
- (c) 4×4
- (d) 3×4

128. Which of the following statements is not correct?

- (a) A diagonal matrix has all diagonal elements equal to zero
- (b) A symmetric matrix A is a square matrix satisfying $A' = A$.
- (c) A skew symmetric matrix has all diagonal elements equal to zero
- (d) A row matrix has only one row

129. If a matrix $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ satisfies $A^6 = kA'$, then the value of k is.

- (a) 1
- (b) $\frac{1}{32}$
- (c) 6
- (d) 32

130. If $A = \begin{bmatrix} k & 2 \\ 2 & k \end{bmatrix}$ and $|A^3| = 125$, then the value of k is.

- (a) ± 3
- (b) -5
- (c) -4
- (d) ± 2

131. If A is a square matrix satisfying the equation $A^2 - 5A + 7I = 0$, where I is the identity matrix and 0 is null matrix of same order, then $A^{-1} =$

- (a) $\frac{1}{7}(A - 5I)$
- (b) $7(5I - A)$
- (c) $\frac{1}{5}(7I - A)$
- (d) $\frac{1}{7}(5I - A)$

132. If A is a square matrix of order 3×3 , $\det A = 3$ then the value of $\det(3A^{-1})$ is

- (a) 3
- (b) 27
- (c) 9
- (d) $\frac{1}{3}$

133. If $B = \begin{bmatrix} 1 & 3 \\ 1 & \alpha \end{bmatrix}$ be the adjoint of a matrix A and $|A| = 2$, then the value of α is.

- (a) 5 (b) 2
(c) 3 (d) 4

134. The system of equations $4x + 6y = 5$ and $8x + 12y = 10$ has.

- (a) Infinitely many solutions.
(b) A unique solution
(c) Only two solutions
(d) No solution

135. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} - \hat{j} + 4\hat{k}$ and $\vec{c} = \hat{i} + \hat{j} + \hat{k}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then the value of λ is.

- (a) ± 1 (b) -1
(c) 0 (d) 1

136. If $|\vec{a}| = 10$, $|\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 12$, then the value of $|\vec{a} \times \vec{b}|$ is.

- (a) 10 (b) 14
(c) 16 (d) 5

137. Consider the following statements:

Statement (I): If either $|\vec{a}| = 0$ or $|\vec{b}| = 0$, then $\vec{a} \cdot \vec{b} = 0$.

Statement (II): If $\vec{a} \times \vec{b} = \vec{0}$, then $\vec{a}$ is perpendicular to $\vec{b}$.

Which of the following is correct?

- (a) Statement (I) is false but Statement (II) is true
(b) Both Statement (I) and Statement (II) are true
(c) Both Statement (I) and Statement (II) are false
(d) Statement (I) is true but Statement (II) is false

138. If a line makes angles 90° , 60° and θ with x , y and z axes respectively, where θ is acute, then value of θ is.

- (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{3}$
(c) $\frac{\pi}{2}$ (d) $\frac{\pi}{6}$

139. The equation of the line through the point $(0, 1, 2)$ and perpendicular to the line $\frac{x-1}{2} =$

$\frac{y+1}{3} = \frac{z-1}{-2}$ is.

- (a) $\frac{x}{-3} = \frac{y-1}{4} = \frac{z-2}{3}$ (b) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{3}$
(c) $\frac{x}{3} = \frac{y-1}{-4} = \frac{z-2}{3}$ (d) $\frac{x}{3} = \frac{y-1}{4} = \frac{z-2}{-3}$

140. A line passes through $(-1, -3)$ and perpendicular to $x + 6y = 5$. Its x intercept is.

- (a) $-\frac{1}{2}$ (b) -2
(c) 2 (d) $\frac{1}{2}$

141. The length of the latus rectum of $x^2 + 3y^2 = 12$ is

- (a) $\frac{1}{3}$ units (b) $\frac{4}{\sqrt{3}}$ units
(c) 24 units (d) $\frac{2}{3}$ units

142. $\lim_{x \rightarrow 1} \frac{x^4 - \sqrt{x}}{\sqrt{x} - 1}$ is.

- (a) 7 (b) does not exist
(c) $\frac{1}{2}$ (d) 0

143. If $y = \frac{\cos x}{1 + \sin x}$, then.

- (a) $\frac{dy}{dx} = \frac{-1}{1 + \sin x}$
(b) $\frac{dy}{dx} = \frac{1}{1 + \sin x}$
(c) $\frac{dy}{dx} = -\frac{1}{2} \sec^2 \left(\frac{\pi}{4} - \frac{x}{2} \right)$
(d) $\frac{dy}{dx} = \frac{1}{2} \sec^2 \left(\frac{\pi}{4} - \frac{x}{2} \right)$

- (a) Only a is correct
 (b) Both a and c are correct
 (c) Both b and d are correct
 (d) Only b is correct

144. Match the following:

In the following, $[x]$ denotes the greatest integer less than or equal to x .

	Column - I		Column - II
(a)	$x x $	(i)	continuous in $(-1,1)$
(b)	$\sqrt{ x }$	(ii)	differentiable in $(-1,1)$
(c)	$x + [x]$	(iii)	strictly increasing in $(-1,1)$
(d)	$ x - 1 + x + 1 $	(iv)	not differentiable at, at least one point in $(-1,1)$

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

145. The function $f(x) = \begin{cases} e^x + ax & , x < 0 \\ b(x-1)^2 & , x \geq 0 \end{cases}$ is differentiable at $x = 0$. Then.

- (a) $a = 3, b = 1$ (b) $a = -3, b = 1$
 (c) $a = 3, b = -1$ (d) $a = 1, b = 1$

146. A function $f(x) = \begin{cases} \frac{e^x - 1}{e^x + 1}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0 \end{cases}$ is.

- (a) not continuous at $x = 0$
 (b) differentiable at $x = 0$
 (c) differentiable at $x = 0$, but not continuous at $x = 0$
 (d) continuous at $x = 0$

147. If $y = a \sin^3 t, x = a \cos^3 t$, then $\frac{dy}{dx}$ at $t = \frac{3\pi}{4}$ is.

- (a) $\frac{1}{\sqrt{3}}$ (b) $-\sqrt{3}$
 (c) 1 (d) -1

148. The derivative of $\sin x$ with respect to $\log x$ is.

- (a) $x \cos x$ (b) $\frac{\cos x}{\log x}$
 (c) $\frac{\cos x}{x}$ (d) $\cos x$

149. The minimum value of $1 - \sin x$ is.

- (a) -1 (b) 1
 (c) 2 (d) 0

150. The function $f(x) = \tan x - x$.

- (a) always decreases
 (b) never increases
 (c) neither increases nor decreases
 (d) always increases

151. The value of $\int \frac{dx}{(x+1)(x+2)}$ is.

- (a) $\log \left| \frac{x-1}{x-2} \right| + c$ (b) $\log \left| \frac{x+2}{x+1} \right| + c$
 (c) $\log \left| \frac{x+1}{x+2} \right| + c$ (d) $\log \left| \frac{x-1}{x+2} \right| + c$

152. The value of $\int_{-1}^1 \sin^5 x \cos^4 x dx$ is

- (a) π (b) $\pi/2$
 (c) 0 (d) $-\pi/2$

153. The value of $\int_0^{2\pi} \sqrt{1 + \sin \left(\frac{x}{2} \right)} dx$ is.

- (a) 4 (b) 2
 (c) 0 (d) 8

154. $\int \frac{dx}{x^2(x^4+1)^{3/4}}$ equals.

- (a) $(x^4 + 1)^{\frac{1}{4}} + c$ (b) $-(x^4 + 1)^{\frac{1}{4}} + c$
 (c) $-\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}} + c$ (d) $\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}} + c$

155. $\int_0^1 \log \left(\frac{1}{x} - 1 \right) dx$ is.

- (a) 0 (b) $\log_e 2$
 (c) $\log_e \left(\frac{1}{2} \right)$ (d) 1

156. The area bounded by the curve $y = \sin \left(\frac{x}{3} \right)$, x axis, the lines $x = 0$ and $x = 3\pi$ is.

- (a) $\frac{1}{3}$ sq. units (b) sq. units
 (c) sq. units (d) sq. units

157. The area of the region bounded by the curve $y = x^2$ and the line $y = 16$ is.

- (a) $\frac{256}{3}$ sq. units (b) $\frac{64}{3}$ sq. units
 (c) $\frac{128}{3}$ sq. units (d) $\frac{32}{3}$ sq. units

158. General solution of the differential equation $\frac{dy}{dx} + y \tan x = \sec x$ is.

- (a) $y \tan x = \sec x + c$
 (b) $\operatorname{cosec} x = y \tan x + c$
 (c) $x \sec x = \tan y + c$
 (d) $y \sec x = \tan x + c$

159. If 'a' and 'b' are the order and degree respectively of the differentiable equation $\left(\frac{d^2y}{dx^2} \right)^2 + \left(\frac{dy}{dx} \right)^3 + x^4 = 0$, then $a - b =$ _____

- (a) 2 (b) -1
 (c) 0 (d) 1

160. The distance of the point P(-3, 4, 5) from yz plane is.

- (a) 5 units (b) -3 units
 (c) 3 units (d) 4 units

161. If $A = \{x: x \text{ is an integer and } x^2 - 9 = 0\}$

$B = \{x: x \text{ is a natural number and } 2 \leq x < 5\}$

$C = \{x: x \text{ is a prime number } \leq 4\}$

Then $(B - C) \cup A$ is,

- (a) $\{2, 3, 4\}$ (b) $\{3, 4, 5\}$
 (c) $\{2, 3, 5\}$ (d) $\{-3, 3, 4\}$

162. A and B are two sets having 3 and 6 elements respectively.

Consider the following statements.

Statement (I): Minimum number of elements in $A \cup B$ is 3

Statement (II): Maximum number of elements in $A \cap B$ is 3

Which of the following is correct?

- (a) Statement (I) is false, statement (II) is true
- (b) Both statements (I) and (II) are true
- (c) Both statements (I) and (II) are false
- (d) Statement (I) is true, statement (II) is false

163. Domain of the function f , given by $f(x) = \frac{1}{\sqrt{(x-2)(x-5)}}$ is.

- (a) $(-\infty, 2) \cup (5, \infty)$
- (b) $(-\infty, 3) \cup [5, \infty)$
- (c) $(-\infty, 3] \cup (5, \infty)$
- (d) $(-\infty, 2] \cup [5, \infty)$

164. If $f(x) = \sin[\pi^2]x - \sin[-\pi^2]x$, where $[x]$ = greatest integer $\leq x$, then which of the following not true?

- (a) $f\left(\frac{\pi}{2}\right) = 1$
- (b) $f\left(\frac{\pi}{4}\right) = 1 + \frac{1}{\sqrt{2}}$
- (c) $f(\pi) = -1$
- (d) $f(0) = 0$

165. Which of the following is not correct?

- (a) $\sin 2\pi = \sin(-2\pi)$
- (b) $\sin 4\pi = \sin 6\pi$
- (c) $\tan 45^\circ = \tan(-315^\circ)$
- (d) $\cos 5\pi = \cos 4\pi$

166. If $\cos x + \cos^2 x = 1$, then the value of $\sin^2 x + \sin^4 x$ is

- (a) 1
- (b) 0
- (c) 2
- (d) -1

167. The mean deviation about the mean for the data 4, 7, 8, 9, 10, 12, 13, 17 is.

- (a) 3
- (b) 8.5
- (c) 4.03
- (d) 10

168. A random experiment has five outcomes w_1, w_2, w_3, w_4 and w_5 . The probabilities of the occurrence of the outcomes w_1, w_2, w_4 and w_5 are respectively $\frac{1}{6}, a, b$ and $\frac{1}{12}$ such that $12a + 12b - 1 = 0$.

Then the probabilities of occurrence of the outcome w_3 is

- (a) $\frac{1}{3}$
- (b) $\frac{1}{6}$
- (c) $\frac{1}{12}$
- (d) $\frac{2}{3}$

169. A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If the die is rolled once, then $P(1 \text{ or } 3)$ is.

- (a) $\frac{1}{2}$
- (b) $\frac{1}{3}$
- (c) $\frac{1}{6}$
- (d) $\frac{2}{3}$

170. Let $A = \{a, b, c\}$, then the number of equivalence relations on A containing (b, c) is.

- (a) 3
- (b) 2
- (c) 4
- (d) 1

171. Let the functions "f" and "g" be $f: \left[0, \frac{\pi}{2}\right] \rightarrow \mathbb{R}$ given by $f(x) = \sin x$ and given $g(x) =$

$\cos x$, where $\mathbb{R}$ is the set of real numbers. Consider the following statements:

Statement (I): f and g are one-one

Statement (II): $f + g$ is one-one

Which of the following is correct?

- (a) Statement (I) is false, statement (II) is true
- (b) Both statements (I) and (II) are true
- (c) Both statements (I) and (II) are false
- (d) Statement (I) is true, statement (II) is false

172. $\sec^2(\tan^{-1} 2) + \operatorname{cosec}^2(\cot^{-1} 3) =$

- (a) 5
- (b) 15

(c) 10 (d) 1

173. $2\cos^{-1}x = \sin^{-1}(2x\sqrt{1-x^2})$ is valid for all values of 'x' satisfying.

- (a) $-1 \leq x \leq 1$ (b) $0 \leq x \leq 1$
(c) $\frac{1}{\sqrt{2}} \leq x \leq 1$ (d) $0 \leq x \leq \frac{1}{\sqrt{2}}$

174. Consider the following statements:

Statement (I): In a LPP, the objective function is always linear.

Statement (II): In a LPP, the linear inequalities on variables are called constraints.

Which of the following is correct?

- (a) Statement (I) is true, Statement (II) is false
(b) Both Statements (I) and (II) are false
(c) Statement (I) is false, Statement (II) is true
(d) Statement (I) is true, Statement (II) is true

175. The maximum value of $z = 3x + 4y$, subject to the constraints $x + y \leq 40, x + 2y \leq 60$ and $x, y \geq 0$ is.

- (a) 120 (b) 140
(c) 40 (d) 130

176. Consider the following statements.

Statement (I): If E and F are two independent events, then E' and F' are also independent.

Statement (II): Two mutually exclusive events with non-zero probabilities of occurrence cannot be independent.

Which of the following is correct?

- (a) Statement (I) is false and statement (II) is true
(b) Both the statements are true
(c) Both the statements are false
(d) Statement (I) is true and statement (II) is false

177. If A and B are two non-mutually exclusive events such that $P(A | B) = P(B | A)$, then.

- (a) $A = B$ (b) $A \cap B = \phi$
(c) $P(A) = P(B)$ (d) $A \subset B$ but $A \neq B$

178. If A and B are two events such that $A \subset B$ and $P(B) \neq 0$, then which of the following is correct?

- (a) $P(A | B) < P(A)$ (b) $P(A | B) \geq P(A)$
(c) $P(A) = P(B)$ (d) $P(A | B) = \frac{P(B)}{P(A)}$

179. Meera visits only one of the two temples A and B in her locality. Probability that she visits temple A is $\frac{2}{5}$. If she visits temple A, $\frac{1}{3}$ is the probability that she meets her friend, whereas it is $\frac{2}{7}$ if she visits temple B. Meera met her friend at one of the two temples. The probability that she met her at temple B is.

- (a) $\frac{5}{16}$ (b) $\frac{3}{16}$
(c) $\frac{9}{16}$ (d) $\frac{7}{16}$

180. If Z_1 and Z_2 are two non-zero complex numbers, then which of the following is not true?

- (a) $|Z_1 Z_2| = |Z_1| \cdot |Z_2|$
(b) $\overline{Z_1 Z_2} = \overline{Z_1} \cdot \overline{Z_2}$
(c) $|Z_1 + Z_2| \geq |Z_1| + |Z_2|$
(d) $\overline{Z_1 + Z_2} = \overline{Z_1} + \overline{Z_2}$

Biology

181. Which of the following are the techniques for detection of cancer of internal organs?

- (a) Radiography, MRI
(b) MRI, computed tomography
(c) Widal test, radiography
(d) MRI, widal test

- (a) b and c (b) b and d
(c) a and b (d) a and c

182. Malignant malaria is caused by

- (a) Plasmodium falciparum

- (b) Plasmodium rubrum
(c) Plasmodium malariae
(d) Plasmodium vivax

183. The drug prescribed to the patients who have undergone organ transplant is and is produced by .

- (a) Cyclosporin-A, Trichoderma polysporum
(b) Stain, Trichoderma polysporum
(c) Cyclosporin-A, Monascus purpureus
(d) Stain, Monascus purpureus

184. Read the following statements and select the correct option.

Statement-I: Biocontrol refers to the use of biological methods for controlling plant diseases and pests.

Statement-II: Trichoderma species are effective biocontrol agents for several plant pathogens.

- (a) Statement-I is incorrect but statement-II is correct
(b) Both statement-I and statement-II are correct
(c) Statement-I and statement-II is incorrect
(d) Both statement-I and statement-II are incorrect

185. Match the column-I with column-II. Choose the correct option given below.

Column-I	Column-II
(a) Streptococcus	(i) Free living nitrogen fixing bacteria
(b) Penicillium	(ii) Colt buster
(c) Methanogens	(iii) Source of antibiotic
(d) Anabaena	(iv) Biogas production

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

186. Match the contents of List-I with List-II

List-I	List-II
(a) Bioreactors	(i) Insulin produced by rDNA technology
(b) Downstream processing	(ii) Vessels which convert raw material into specific product
(c) Recombinant protein	(iii) Detect mutated genes in suspected cancer patient
(d) PCR	(iv) Involves separation and purification

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

187. The part of plasmid that codes for proteins involved in the replication of the pBR³²² Plasmid is.

- (a) "rop" (b) cloning site
(c) Ori site (d) Selectable marker

188. To isolate DNA from fungal cells, bacterial cells and plant cells, the enzymes required are respectively

- (a) Chitinase, Lysozyme and Cellulase

- (b) Cellulase, Protease and Lysozyme
- (c) Lysozyme, Cellulase and Chitinase
- (d) Lysozyme, Proteases and Ribonuclease

189. In mature insulin, which of the peptide is not present?

- (a) C-peptide
- (b) A and B peptides
- (c) A-peptide
- (d) B-peptide

190. A scientist wants to produce virus-free plant in tissue culture. Which part of the plant will he use as an explant?

- (a) mature stem
- (b) axillary meristem
- (c) apical meristem
- (d) mesophyll cell

Choose the correct option from the following.

- (a) b only
- (b) c and d
- (c) a only
- (d) b and c

191. Some strains of *Bacillus thuringiensis* produce proteins that kill insects. Which one of the following is not killed by proteins of *Bacillus thuringiensis*?

- (a) Cotton bollworm
- (b) Tapeworm
- (c) Tobacco budworm
- (d) Armyworm

192. Which one of the following population attributes, contributes to increase in population density?

- (a) Natality and Emigration
- (b) Mortality and Immigration
- (c) Natality and Immigration
- (d) Mortality and Emigration

193. If 8 individuals in a laboratory population of 80 fruit flies died during a specified time interval, the death rate in the population during that period is.

- (a) 0.1 individual/time interval
- (b) 1 individual/time interval
- (c) 0.01 individual/time interval
- (d) 0.001 individual/time interval

194. Choose the correct sequence of steps involved in decomposition.

- (a) Fragmentation → Mineralisation → Humification → Leaching → Catabolism
- (b) Fragmentation → Leaching → Catabolism → Humification → Mineralisation.
- (c) Fragmentation → Catabolism → Leaching → Humification → Mineralisation
- (d) Fragmentation → Leaching → Catabolism → Mineralisation → Humification

195. With respect to limitation of Ecological pyramids, which of the following statements are correct?

- (a) It does not take into account the same species belonging to two or more trophic levels.
- (b) It assumes a simple food chain, something that almost never existed in nature.
- (c) It accommodates saprophytes.
- (d) It does not accommodate a food web.

Choose the correct answer from the options given below.

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

196. The 'Sixth Extinction' of species, presently in progress, is times faster than the previous five episodes of mass extinctions.

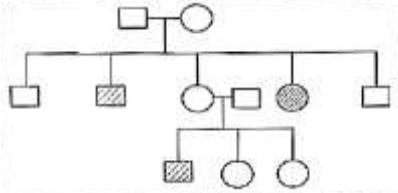
- (a) 1000 to 10000
- (b) 1 to 10
- (c) 10 to 100
- (d) 100 to 1000

197. Species diversity as we move away from the towards.

- (a) Decreases, Poles, Equator
- (b) Stable, Equator, Poles
- (c) Increases, Equator, Poles
- (d) Decreases, Equator, Poles

198. In a practical examination, the following pedigree chart was given as a spotter for

identification. The students identify the given pedigree chart as



- (a) Sex-linked dominant
- (b) Sex-linked recessive
- (c) Autosomal dominant
- (d) Autosomal recessive

199. A student observed the T.S. of a plant organ slide under microscope. He observed the vascular bundles in the stelar region as conjoint collateral and open. Based on these features of vascular bundle, identify the correct option from below.

- (a) Monocot Root
- (b) Monocot Stem
- (c) Dicot Root
- (d) Dicot Stem

200. A student observed the slide of mitosis under the microscope and observed that the chromosomes were placed at the opposite poles. Which stage was the student observing?

- (a) Metaphase
- (b) Telophase
- (c) Prophase
- (d) Anaphase

201. Identify the incorrect statement with respect to the rules of Binomial Nomenclature.

- (a) Biological names are underlined separately when handwritten
- (b) Biological names are printed in Italics to indicate their non-Latin origin.
- (c) The first word represents the genus while second component denotes the specific epithet
- (d) Biological names are generally in Latin or Latinized irrespective of their origin

202. Match Column-I with Column-II and choose the correct option given below:

	Column-I (Bacteria)		Column-II (Shape)
(a)	Coccus	(i)	Rod-shaped
(b)	Bacillus	(ii)	Spiral
(c)	Vibrium	(iii)	Spherical
(d)	Spirillum	(iv)	Comma-shaped

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

203. Read the given statements and choose the correct option:

Statement I: Gemmae are green unicellular sexual buds which develop in receptacles called gemma cups.

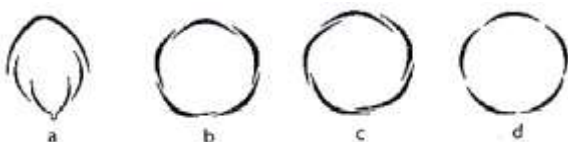
Statement II: Protonema develops directly from a spore

- (a) Statement I is false but Statement II is true
- (b) Both Statement I and Statement II are false
- (c) Both Statement I and Statement II are true
- (d) Statement I is true but Statement II is false

204. During a field trip a student observed a marine organism with worm-like body. The cylindrical body was divisible into proboscis, collar and a long trunk. The organism may be.

- (a) Pterophyllum
- (b) Trygon
- (c) Balanoglossus
- (d) Ophiura

205. Identify the types of aestivation in corolla labelled as 'a', 'b', 'c' and 'd'



- (a) a-Vexillary, b-Imbricate, c-Twisted, d-Valvate
 (b) a-Vexillary, b-Imbricate, c-Valvate, d-Twisted
 (c) a-Vexillary, b -Twisted, c-Imbricate, d-Valvate
 (d) a-Imbricate, b-Valvate, c-Vexillary, d - Twisted

206. Match the Column-I with Column-II and choose the correct option:

	Column-I (characteristics of vascular bundle)		Column-II (Transverse section)
a)	Radial, tetrarch, cambial ring between xylem and phloem at later stages	i)	T.S of monocot stem
b)	Conjoint, open and endarch	ii)	T.S of dicot root
c)	Radial, Polyarch, large pith without cambial ring	iii)	T.S of monocot toot
d)	Conjoint, closed with sclerenchymatous bundle sheath	iv)	T.S of dicot stem

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

207. Which of the following statements are correct with respect to Frogs?

- (a) Bidder's canals are present in male Frogs
 (b) Copulatory pads are present in female Frogs
 (c) Sound producing vocal sacs are present in male Frogs
 (d) Cloaca is present in male Frog only

Choose the most appropriate answer from the options given below:

- (a) a and c (b) b and d
 (c) a and d (d) a and b

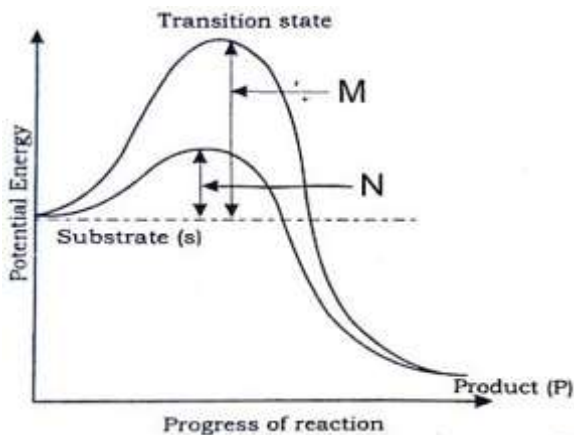
208. The reserve material in prokaryotic cells are stored in the cytoplasm in the form of

- (a) Exclusion and inclusion bodies
 (b) Fat bodies
 (c) Exclusion bodies
 (d) Inclusion bodies

209. The cell wall less prokaryote among the following is.

- (a) Cyanobacteria (b) Mycoplasma
 (c) Bacteria (d) Blue-Green Algae

210. The graph showing the concept of activation energy of enzyme is given below:



Observe the graph and choose the correct option for M and N .

- (a) M-High temperature, High activation energy, N-Low temperature, Low activation energy
 (b) M-High substrate, High activation energy, N-Low substrate, Low activation energy
 (c) M-Activation energy without enzyme, N -Activation energy with enzyme
 (d) M-Activation energy with enzyme, N -Activation energy without enzyme

211. Match the stages of prophase I given in Column-I with their features in Column-II and choose the correct options from the choices given below:

Column-I	Column-II
a) Leptotene	i) Exchange of genetic materials between nonsister chromatids of the homologous chromosomes
b) Zygotene	ii) Chromosomes visible under light microscope
c) Pachytene	iii) Dissolution of synaptonemal complex
d) Diplotene	iv) Chromosomes start pairing together
e) Diakinesis	v) Terminalisation of chiasmata

- (a) a-iv, b-i, c-ii, d-iii, e-v
 (b) a-ii, b-iv, c-i, d-iii, e-v
 (c) a-i, b-ii, c-iii, d-iv, e-v
 (d) a-v, b-iv, c-i, d-iii, e-ii

212. Read the given statements and choose the correct option:

Statement-I: In Calvin cycle, Carboxylation is catalyzed by PEP Carboxylase

Statement-II: In Hatch-Slack pathway, Carboxylation is catalyzed by RuBP Carboxylase.

- (a) Statement I is false but Statement II is true
 (b) Both Statement I and Statement II are false
 (c) Both Statement I and Statement II are true
 (d) Statement I is true but Statement II is false

213. The TCA cycle starts with the condensation of acetyl group with

- (a) α -Ketoglutaric acid (b) Succinic acid
 (c) Oxaloacetic acid (d) Citric acid

214. Match the plant growth hormones of Column I with suitable chemical derivatives present in Column-II and choose the correct option given below:

Column-I	Column-II
a) Abscissic acid	i) Adenine derivative

b) Gibberellins	ii) Indole acetic acid
c) Kinetin	iii) Carotenoid derivative
d) Auxin	iv) Terpenes

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

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

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

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

215. The respiratory mechanism controlled by medulla oblongata can be altered by

(a) Both Pneumotaxic and Chemosensitive areas of pons and medulla oblongata

(b) Corpus callosum of brain

(c) Pneumotaxic center in the pons

(d) Chemosensitive area in the medulla

216. Which among the three layers of blood vessel wall-Tunica intima, Tunica media and Tunica Externa is comparatively thin in the veins?

(a) Tunica externa

(b) Both tunica media and tunica externa

(c) Tunica media

(d) Tunica intima

217. In nephron, transport of substances like sodium chloride and urea is facilitated by the special arrangement called counter current mechanism that comprises of

(a) Vasa Recta and collecting duct

(b) Ascending limb and collecting duct

(c) Henle's loop and Vasa Recta

(d) Henle's loop and glomerulus

218. In the mechanism of muscle contraction or shortening of muscle, the _____ get reduced whereas the _____ retain the length.

(a) Z line, I bands (b) A bands, Z line

(c) A bands, I bands (d) I bands, A bands

219. Identify the correct sequence of action potential as it arrives at the axon terminal from the choices given below:

(a) Axon terminal → Post-synaptic membrane
→ Synaptic cleft → Synaptic vesicles Postsynaptic neuron

(b) Axon terminal → Synaptic vesicles → Postsynaptic membrane → Synaptic cleft → Post-synaptic neuron

(c) Axon terminal → Synaptic vesicles → Synaptic cleft → Post-synaptic membrane → Post-synaptic neuron

(d) Axon terminal → Synaptic cleft → Synaptic vesicles → Post-synaptic neuron → Post-synaptic membrane

220. Identify the statement/s given below that does not correspond to the functions of cortisol

i) Maintains cardiovascular system and kidney functions

iii) Produces anti-inflammatory reactions

iii) Maintains electrolyte balance, osmosis and blood pressure

iv) Suppresses immune response

v) Stimulates RBC production

(a) iii only (b) iv only

(c) i and ii only (d) iii and iv only

221. When pollen grains of a flower of plant pollinate the stigma flower of another plant, it is called.

(a) Dichogamy

(b) Geitonogamy

(c) Xenogamy

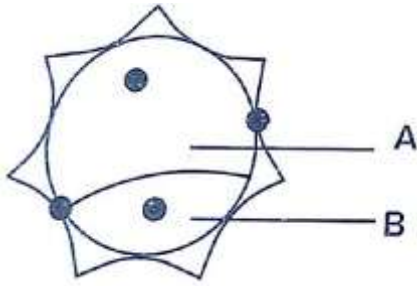
(d) Autogamy

222. Fusion of a male gamete with the central cell in the embryo sac of an angiosperm is called.

(a) Syngamy (b) Apomixis

(c) Double fertilization (d) Triple fusion

223. Which of these options is true in the context of the below diagram of pollen grain?



- (a) 'A' is a generative cell which gives rise to pollen tube and 'B' is a vegetative cell which forms male gametes
 (b) 'A' is a vegetative cell with abundant food reserve and 'B' is a generative cell which forms male gametes
 (c) 'A' is a generative cell which forms male gametes and 'B' is a vegetative cell which produces pollen tube
 (d) 'A' is a vegetative cell which gives rise to male gametes and 'B' is a generative cell which produces pollen tube

224. Match the hormone with its site of production:

Hormone	Site of production
a) hCG and hPL	i) Ovary
b) Progesterone	ii) Placenta
c) Androgens	iii) Corpus luteum
d) Relaxin	iv) Leydig cells

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

225. Choose the correct sequence of sperm transport during ejaculation.

- (a) Seminiferous tubules → vasa efferentia → rete testis → epididymis → vas deferens → ejaculatory duct
 (b) Seminiferous tubules → rete testis → epididymis → vas deferens → vasa efferentia → ejaculatory duct
 (c) Seminiferous tubules → rete testis → vasa efferentia → epididymis → vas deferens → ejaculatory duct
 (d) Seminiferous tubules → rete testis → epididymis → vasa efferentia → vas deferens → ejaculatory duct

226. Select the mismatched pair:

- (a) First month of pregnancy-Formation of heart
 (b) Second month of pregnancy-Movement of fetus
 (c) Third month of pregnancy- Formation of most of the major organ systems
 (d) Sixth month of pregnancy -Eye lids separate and eye lashes are formed
 (a) c (b) d
 (c) a (d) b

227. Out of the following options, identify which one is NOT a natural method of contraception?

- (a) Lactational amenorrhea
 (b) Periodic abstinence
 (c) Coitus interruptus
 (d) Implants

228. In zygote intrafallopian tube transfer, the embryo upto stage is transferred into the fallopian tube.

- (a) 8 blastomeres (b) 32 blastomeres
 (c) 2 blastomeres (d) 16 blastomeres

229. Read the following statements:

Statements -I : MTP is to get rid off unwanted pregnancies due to causal unprotected intercourse or failure of contraceptives used during coitus or rapes

Statements -II: MTPs are performed legally by qualified doctors by giving proper medical justification

Choose the correct answer from the options given below:

- (a) Statements -I is correct but Statements -II is incorrect
 (b) Statements -I is incorrect but Statements II is correct

(c) Statements -I and II are correct

(d) Statements -I and II are incorrect

230. How many types of gametes will be formed by a parent with genotype 'AaBbCc'?

(a) 8 (b) 12

(c) 6 (d) 4

231. When single gene exhibits multiple phenotypic expression, the phenomenon is called

(a) Pleiotropy

(b) Co-dominance

(c) Polygenic inheritance

(d) Incomplete dominance

232. A colourblind man marries a carrier woman. The percentage of their colourblind progeny in the next generation will be

(a) 75% (b) 100%

(c) 25% (d) 50%

233. Identify which one of the given pair of options is correct with respect to Down's syndrome and Turner's syndrome

	Down's syndrome symptoms	Turner's syndrome symptoms
a)	Short -statured individual	Gynaecomastia in man
b)	Round head, partially open mouth	Overall masculine development
c)	Broad palm, physical and mental development retarded	Sterile females with rudimentary ovaries
d)	Additional copy of an X-chromosome	Absence of an Xchromosome

(a) c (b) d

(c) a (d) b

234. RNA polymerase II is responsible for the transcription of

(a) hnRNA (b) snRNA

(c) tRNA (d) rRNA

235. Which of the following enzymes increases the permeability of the bacterial cell to lactose?

(a) Transacetylase (b) Amylase

(c) β -galactosidase (d) Permease

236. Which of the following statements are correct with reference to prokaryotic genome?

a) Monocistronic structural genes

b) Introns absent in structural genes

c) Transcription and translation are coupled processes

d) Primary transcript undergoes splicing

e) Only one RNA polymerase is present

(a) Only a, d and e are correct

(b) Only a, d and e are correct

(c) Only a, b and d are correct

(d) Only b, c and e are correct

237. When a change in the gene frequency of population occurs by chance, it is called .

(a) Genetic recombination

- (b) Genetic drift
- (c) Founder effect
- (d) Gene migration

238. Darwin's finches represent one of the best examples of

- (a) Chemical evolution
- (b) Genetic equilibrium
- (c) Seasonal migration
- (d) Adaptive radiation

239. Choose the correct statement from the following:

- a) Charles Darwin travelled around the world in a ship called HMS Beagle
- b) There has been gradual evolution of life forms
- c) According to Darwin, fitness refers to physical fitness only
- d) Fossils are remains of hard parts of life forms found in rocks
- e) Hugo De Vries, a naturalist worked in Malay Archipelago.

- (a) a, b and d are correct
- (b) a, c and d are correct
- (c) a, b and e are correct
- (d) a, c and e are correct

240. In which of the following, HIV replicates and produces its progeny viruses?

- (a) Killer T-lymphocytes
- (b) Suppressor T-lymphocytes
- (c) Helper T-lymphocytes
- (d) Memory T-lymphocytes

