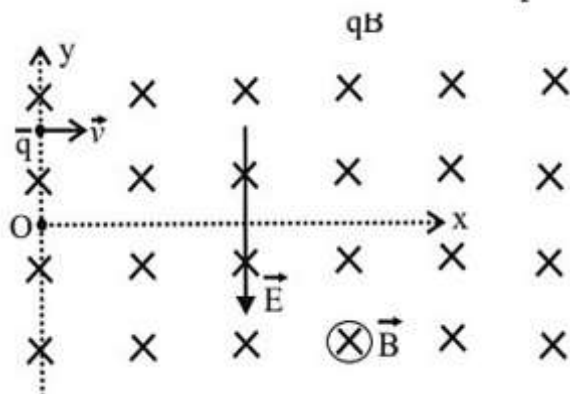


Physics

- The torque acting on a magnetic dipole placed in uniform magnetic field is zero, when the angle between the dipole axis and the magnetic field is.....  
 (a)  $60^\circ$  (b)  $90^\circ$   
 (c) Zero (d)  $45^\circ$
- The horizontal component of Earth's magnetic field at a place is  $3 \times 10^{-5}$  T. If the dip at that place is  $45^\circ$ , the resultant magnetic field at that place is  
 (a)  $\frac{3}{2}\sqrt{3} \times 10^{-5}$  T (b)  $3\sqrt{2} \times 10^{-5}$  T  
 (c)  $3 \times 10^{-5}$  T (d)  $\frac{3}{\sqrt{2}} \times 10^{-5}$  T
- A proton and an alpha-particle moving with the same velocity enter a uniform magnetic field with their velocities perpendicular to the magnetic field. The ratio of radii of their circular paths is  
 (a) 4:1 (b) 1:2  
 (c) 2:1 (d) 1:4
- A moving coil galvanometer is converted into an ammeter of range 0 to 5 mA. The galvanometer resistance is  $90\Omega$  and the shunt resistance has a value of  $10\Omega$ . If there are 50 divisions in the galvanometer-turned ammeter on either side of zero, its current sensitivity is  
 (a)  $2 \times 10^4$  A/div (b)  $1 \times 10^5$  div/A  
 (c)  $2 \times 10^4$  div/A (d)  $1 \times 10^5$  A/div
- A positively charged particle of mass  $m$  is passed through a velocity selector. It moves horizontally rightward without deviation along the line  $y = \frac{2mv}{qB}$  with a speed  $v$ . The electric field is vertically downwards and magnetic field is into the plane of the paper. Now, the electric field is switched off at  $t = 0$ . The angular momentum of the charged particle about origin  $O$  at  $t = \frac{\pi m}{qB}$  is



- Zero
- $\frac{mE^3}{qB^2}$
- $\frac{mE^2}{qB^3}$
- $\frac{2mE^2}{qB^3}$

6. The Curie temperatures of Cobalt and iron are 1400 K and 1000 K respectively. At  $T = 1600\text{K}$ , the ratio of magnetic susceptibility of Cobalt to that of iron is

- (a)  $\frac{7}{5}$  (b)  $\frac{5}{7}$   
(c)  $\frac{1}{3}$  (d) 3

7. An ideal transformer has a turns ratio of 10. When the primary is connected to 220 V, 50 Hz ac source, the power output is

- (a) Equal to power input (b) Zero  
(c) 10 times the power input (d)  $\frac{1}{10^{\text{th}}}$  the power input

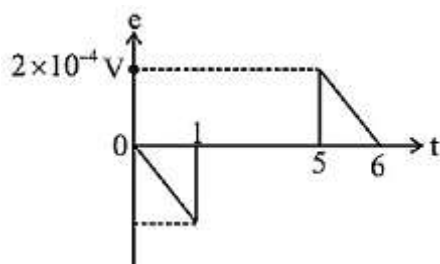
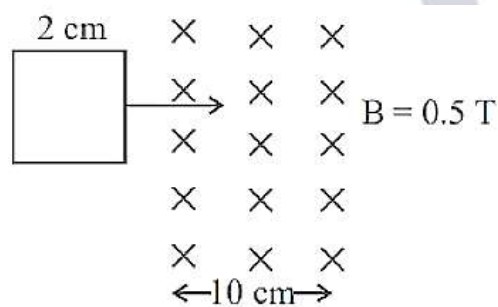
8. The current in a coil changes from 2A to 5A in 0.3 s. The magnitude of emf induced in the coil is 1.0 V. The value of self-inductance of the coil is

- (a) 0.1 mH (b) 10 mH  
(c) 1.0 mH (d) 100 mH

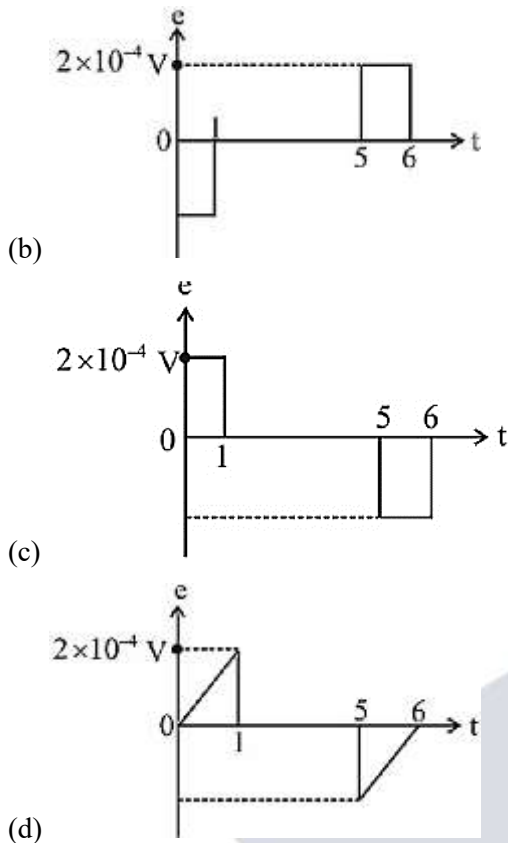
9. A metallic rod of length 1 m held along east-west direction is allowed to fall down freely. Given horizontal component of earth's magnetic field  $B_H = 3 \times 10^{-5} \text{ T}$ . The emf induced in the rod at an instant  $t = 2 \text{ s}$  after it is released is (Take  $g = 10 \text{ ms}^{-2}$ )

- (a)  $3 \times 10^{-4} \text{ V}$  (b)  $6 \times 10^{-3} \text{ V}$   
(c)  $6 \times 10^{-4} \text{ V}$  (d)  $3 \times 10^{-3} \text{ V}$

10. A square loop of side 2 cm enters a magnetic field with a constant speed of  $2 \text{ cm s}^{-1}$  as shown. The front edge enters the field at  $t = 0 \text{ s}$ . Which of the following graph correctly depicts the induced emf in the loop? (Take clockwise direction positive)



(a)



11. In series LCR circuit at resonance, the phase difference between voltage and current is

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

12. An equiconvex lens made of glass of refractive index  $\frac{3}{2}$  has focal length  $f$  in air. It is completely immersed in water of refractive index  $\frac{4}{3}$ . The percentage change in the focal length is

- (a) 400% decrease      (b) 300% increase  
 (c) 400% increase      (d) 300% decrease

13. A point object is moving at a constant speed of  $1 \text{ ms}^{-1}$  along the principal axis of a convex lens of focal length 10 cm. The speed of the image is also  $1 \text{ ms}^{-1}$ , when the object is at cm from the optic centre of the lens.

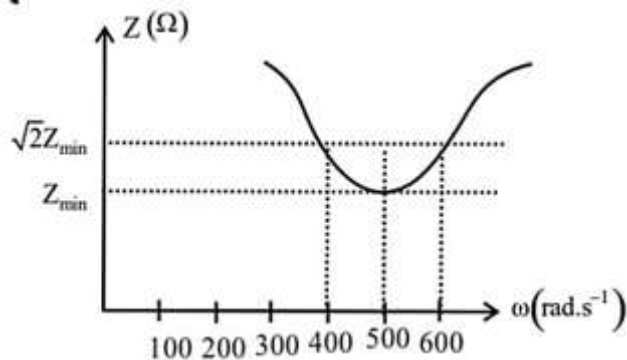
- (a) 20      (b) 5  
 (c) 10      (d) 15

14. When light propagates through a given homogeneous medium, the velocities of

- (a) Primary wave fronts are greater than or equal to those of secondary wavelets.  
 (b) Primary wave fronts and wavelets are equal  
 (c) Primary wave fronts are larger than those of secondary wavelets

(d) Primary wave fronts are lesser than those of secondary wavelets

15. Total impedance of a series LCR circuit varies with angular frequency of the AC source connected to it as shown in the graph. The quality factor  $Q$  of the series LCR circuit is



- (a) 5                      (b) 1  
(c) 0.4                      (d) 2.5

16. The ratio of the magnitudes of electric field to the magnetic field of an electromagnetic wave is of the order of

- (a)  $10^{-5} \text{ ms}^{-1}$                       (b)  $10^8 \text{ ms}^{-1}$   
(c)  $10^{-8} \text{ ms}^{-1}$                       (d)  $10^5 \text{ ms}^{-1}$

17. For a point object, which of the following always produces virtual image in air?

- (a) Convex mirror                      (b) Biconvex lens  
(c) Concave mirror                      (d) Plano-Convex lens

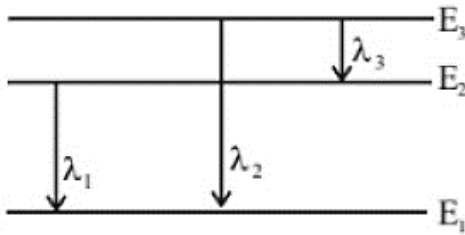
18. For a given pair of transparent media, the critical angle for which colour is maximum?

- (a) Blue                      (b) Violet  
(c) Green                      (d) Red

19. In the Rutherford's alpha scattering experiment, as the impact parameter increases, the scattering angle of the alpha particle

- (a) Decreases                      (b) Increases  
(c) Remains the same                      (d) Is always  $90^\circ$

20. Three energy levels of hydrogen atom and the corresponding wavelength of the emitted radiation due to different electron transition are as shown. Then.



- (a)  $\lambda_2 = \lambda_1 + \lambda_3$       (b)  $\lambda_2 = \frac{\lambda_1 \lambda_3}{\lambda_1 + \lambda_3}$   
 (c)  $\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$       (d)  $\lambda_1 = \frac{\lambda_2 \lambda_3}{\lambda_2 + \lambda_3}$

21. An unpolarised light of intensity  $I$  is passed through two polaroids kept one after the other with their planes parallel to each other. The intensity of light emerging from second polaroid is  $\frac{1}{4}$ . The angle between the pass axes of the polaroids is

- (a)  $60^\circ$       (b)  $30^\circ$   
 (c)  $45^\circ$       (d)  $0^\circ$

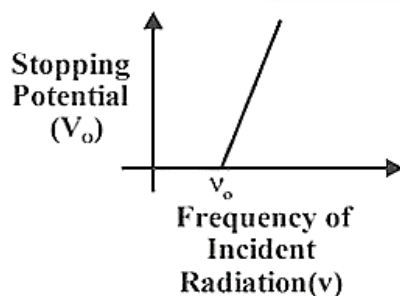
22. In the Young's double slit experiment, the intensity of light passing through each of the two double slits is  $2 \times 10^{-2} \text{ Wm}^{-2}$ . The screen-slit distance is very large in comparison with slit-slit distance. The fringe width is  $\beta$ . The distance between the central maximum and a point P on the screen is  $x = \frac{\beta}{3}$ . Then the total light intensity at that point is

- (a)  $2 \times 10^{-2} \text{ Wm}^{-2}$       (b)  $16 \times 10^{-2} \text{ Wm}^{-2}$   
 (c)  $8 \times 10^{-2} \text{ Wm}^{-2}$       (d)  $4 \times 10^{-2} \text{ Wm}^{-2}$

23. A 60 W source emits monochromatic light of wavelength 662.5 nm. The number of photons emitted per second is

- (a)  $5 \times 10^{26}$       (b)  $2 \times 10^{29}$   
 (c)  $5 \times 10^{17}$       (d)  $2 \times 10^{20}$

24. In an experiment to study photo-electric effect the observed variation of stopping potential with frequency of incident radiation is as shown in the figure. The slope and y-intercept are respectively

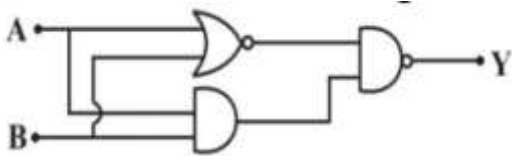


- (a)  $\frac{hv}{e}, -\frac{h}{e}$       (b)  $hv, -hv_0$   
 (c)  $\frac{h}{e}, -\frac{h\nu_0}{e}$       (d)  $\frac{hv}{e}, \nu_0$

25. A full-wave rectifier with diodes  $D_1$  and  $D_2$  is used to rectify 50 Hz alternating voltage. The diode  $D_1$  conducts ..... times in one second

- (a) 75                      (b) 50  
(c) 100                    (d) 25

26. The truth table for the given circuit is



- (a) 

| A | B | Y |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 1 |

                      (b) 

| A | B | Y |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 1 |
| 0 | 0 | 0 |
- (c) 

| A | B | Y |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 0 | 1 |
| 0 | 1 | 0 |
| 0 | 0 | 1 |

                      (d) 

| A | B | Y |
|---|---|---|
| 1 | 1 | 1 |
| 1 | 0 | 0 |
| 0 | 1 | 1 |
| 0 | 0 | 1 |

27. The energy gap of an LED is 2.4 eV. When the LED is switched 'ON', the momentum of the emitted photons is

- (a)  $1.28 \times 10^{-11} \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$                       (b)  $0.64 \times 10^{-27} \text{ kg} \cdot \text{m}^{-1}$   
(c)  $1.28 \times 10^{-27} \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$                       (d)  $2.56 \times 10^{-27} \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$

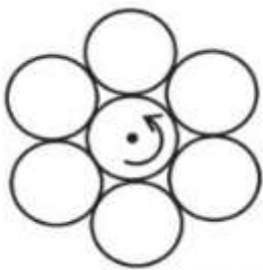
28. In the following equation representing  $\beta^-$  decay, the number of neutrons in the nucleus X is  ${}_{83}^{210}\text{Bi} \rightarrow \text{X} + e^{-1} + \bar{\nu}$

- (a) 125                      (b) 84  
(c) 126                      (d) 127

29. A nucleus with mass number 220 initially at rest emits an alpha particle. If the Q value of reaction is 5.5 MeV, calculate the value of kinetic energy of alpha particle.

- (a) 7.4 MeV                      (b) 4.5 MeV  
(c) 6.5 MeV                      (d) 5.4 MeV

30. A radioactive sample has half-life of 3 years. The time required for the activity of the sample to reduce to  $\frac{1}{5}$  th of its initial value is about
- (a) 15 years                      (b) 5 years  
(c) 10 years                      (d) 7 years
31. When a p-n junction diode is in forward bias, which type of charge carriers flows in the connective wire?
- (a) Protons                      (b) Holes  
(c) Free electrons              (d) Ions
32. A ball of mass 0.2 kg is thrown vertically down from a height of 10 m . It collides with the floor and loses 50% of its energy and then rises back to the same height. The value of its initial velocity is
- (a)  $196 \text{ ms}^{-1}$                   (b)  $20 \text{ ms}^{-1}$   
(c) Zero                          (d)  $14 \text{ ms}^{-1}$
33. The moment of inertia of a rigid body about an axis
- (a) Depends on the positions of axis of rotation  
(b) Does not depend on its size  
(c) Does not depend on its mass  
(d) Does not depend on its shape
34. Seven identical discs are arranged in a planar pattern, so as to touch each other as shown in the figure. Each disc has mass ' m ' radius R. What is the moment of inertia of system of six discs about an axis passing through the center of central disc and normal to plane of all discs?



- (a)  $55 \frac{mR^2}{2}$                       (b)  $85 \frac{mR^2}{2}$   
(c)  $27mR^2$                       (d)  $100mR^2$
35. The true length of a wire is 3.678 cm. When the length of this wire is measured using instrument A, the length of the wire is 3.5 cm. When the length of the wire is measured using instrument B, it is found to have length 3.38 cm. Then the
- (a) Measurement with B is more accurate and precise  
(b) Measurement with A is more precise while measurement with B is more accurate

- (c) Measurement with A is more accurate and precise
- (d) Measurement with A is more accurate while measurement with B is more precise

**36. A body is moving along a straight line with initial velocity  $v_0$ . Its acceleration  $a$  is constant. After  $t$  seconds, its velocity becomes  $v$ . The average velocity of the body over the given time interval is**

- (a)  $\bar{v} = \frac{v^2 + v_0^2}{at}$       (b)  $\bar{v} = \frac{v^2 - v_0^2}{2at}$
- (c)  $\bar{v} = \frac{v^2 - v_0^2}{at}$       (d)  $\bar{v} = \frac{v^2 + v_0^2}{2at}$

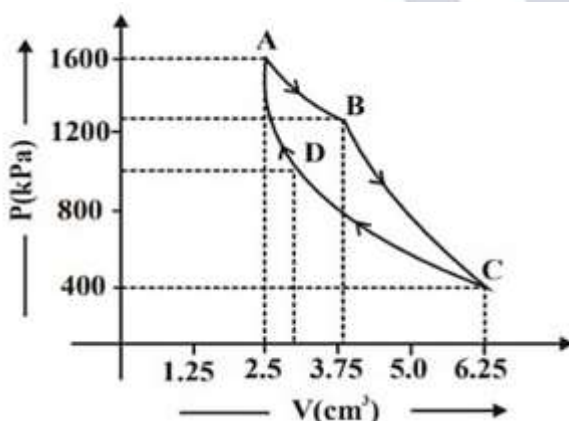
**37. A particle is in uniform circular motion. Related to one complete revolution of the particle, which among the statements is correct?**

- (a) Average speed of the particle is zero
- (b) Average velocity of the particle is zero
- (c) Average acceleration of the particle is zero
- (d) Displacement of the particle is zero

**38. A body of mass 10 kg is kept on a horizontal surface. The coefficient of kinetic friction between the body and the surface is 0.5. A horizontal force of 60 N is applied on the body. The resulting acceleration of the body is about**

- (a)  $6 \text{ ms}^{-2}$       (b) Zero
- (c)  $1 \text{ ms}^{-2}$       (d)  $5 \text{ ms}^{-2}$

**39. The P - V diagram of a Carnot's engine is shown in the graph below. The engine uses 1 mole of an ideal gas as working substance. From the graph, the area enclosed by the P - V diagram is [The heat supplied to the gas is 8000 J]**



- (a) 3000 J      (b) 1000 J
- (c) 1200 J      (d) 2000 J

**40. When a planet revolves around the Sun, in general, for the planet**

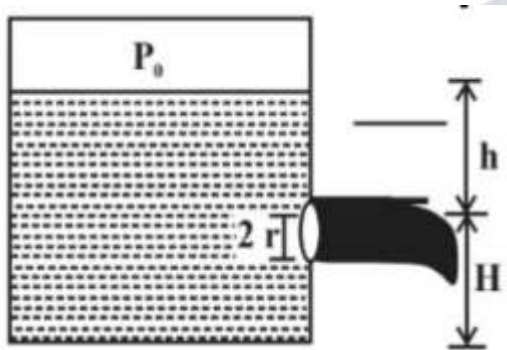
- (a) Kinetic and potential energy of the planet are constant.

- (b) Angular momentum about the Sun and aerial velocity of the planet are constant.  
 (c) Linear momentum and linear velocity are constant.  
 (d) Linear momentum and aerial velocity are constant.

41. A stretched wire of a material whose Young's modulus  $Y = 2 \times 10^{11} \text{Nm}^{-2}$  has Poisson's ratio 0.25. Its lateral strain  $\epsilon_p = 10^{-3}$ . The elastic energy density of the wire is

- (a)  $4 \times 10^5 \text{Jm}^{-3}$  (b)  $8 \times 10^5 \text{Jm}^{-3}$   
 (c)  $16 \times 10^5 \text{Jm}^{-3}$  (d)  $1 \times 10^5 \text{Jm}^{-3}$

42. A closed water tank has cross-sectional area (A) It has a small hole at a depth of h from the free surface of water. The radius of the hole is r so that  $r \ll \sqrt{\frac{A}{\pi}}$ . If  $P_o$  is the pressure inside the tank above water level, and  $P_a$  is the atmospheric pressure, the rate of flow of the water coming out of the hole is [  $\rho$  is the density of water]



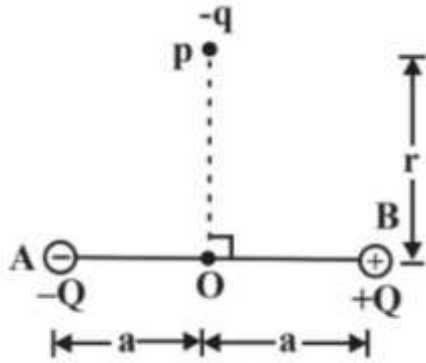
- (a)  $\pi r^2 \sqrt{2gh}$  (b)  $\pi r^2 \sqrt{gh + \frac{2(P_o - P_a)}{\rho}}$   
 (c)  $\pi r^2 \sqrt{2gh}$  (d)  $\pi r^2 \sqrt{2gh + \frac{2(P_o - P_a)}{\rho}}$

43. 100 g of ice at  $0^\circ\text{C}$  is mixed with 100 g of water at  $100^\circ\text{C}$ . The final temperature of the mixture is

[Take  $L_f = 3.36 \times 10^5 \text{Jkg}^{-1}$  and  $S_w = 4.2 \times 10^3 \text{Jkg}^{-1}\text{K}^{-1}$ ]

- (a)  $50^\circ\text{C}$  (b)  $1^\circ\text{C}$   
 (c)  $40^\circ\text{C}$  (d)  $10^\circ\text{C}$

44. In the situation shown in the diagram, magnitude of  $q \ll |Q|$  and  $r \gg a$ . The net force on the free charge  $-q$  and net torque on it about O at the instant shown are respectively [ $p = 2aQ$  is the dipole moment]



- (a)  $-\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}, -\frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}$  (b)  $\frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}, +\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}$
- (c)  $\frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}, -\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}$  (d)  $\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}, \frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}$

45. Pressure of ideal gas at constant volume is proportional to .....

- (a) Total energy of the gas
- (b) Average kinetic energy of the molecules
- (c) Force between the molecules
- (d) Average potential energy of the molecules

46. A block of mass  $m$  is connected to a light spring of force constant  $k$ . The system is placed inside a damping medium of damping constant  $b$ . The instantaneous values of displacement, acceleration and energy of the block are  $x$ ,  $a$  and  $E$  respectively. The initial amplitude of oscillation is  $A$  and  $\omega'$  is the angular frequency of oscillations. The incorrect expression related to the damped oscillation is

- (a)  $E = \frac{1}{2} k A^2 e^{-\frac{bt}{m}}$  (b)  $m \frac{d^2x}{dt^2} + b \frac{dx}{dt} + kx = 0$
- (c)  $x = A e^{-\frac{b}{m}t} \cos(\omega t + \phi)$  (d)  $\omega' = \sqrt{\frac{k}{m} - \frac{b^2}{4m^2}}$

47. The speed of sound in an ideal gas at a given temperature  $T$  is  $v$ . The rms speed of gas molecules at that temperature is  $v_{rms}$ . The ratio of the velocities  $v$  and  $v_{rms}$  for helium and oxygen gases are  $X$  and  $Y$ , respectively. Then  $\frac{X}{Y}$  is equal to

- (a)  $\sqrt{\frac{5}{21}}$  (b)  $\frac{21}{5}$
- (c)  $\frac{21}{\sqrt{5}}$  (d)  $\frac{5}{\sqrt{21}}$

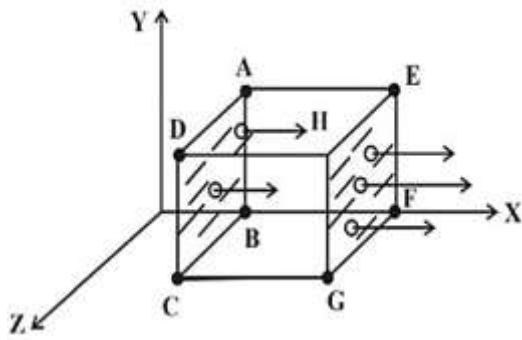
48. A positively charged glass rod is brought near uncharged metal sphere, which is mounted on an insulated stand. If the glass rod is removed, the net charge on the metal sphere is

- (a)  $1.6 \times 10^{-19} C$  (b) Positive charge
- (c) Negative charge (d) Zero

49. A parallel plate capacitor of capacitance  $C_1$  with a dielectric slab in between its plates is connected to a battery. It has a potential difference  $V_1$  across its plates. When the dielectric slab is removed, keeping the capacitor connected to the battery, the new capacitance and potential difference are  $C_2$  and  $V_2$  respectively. Then,

- (a)  $V_1 < V_2, C_1 > C_2$     (b)  $V_1 = V_2, C_1 > C_2$   
 (c)  $V_1 = V_2, C_1 < C_2$     (d)  $V_1 > V_2, C_1 > C_2$

50. A cubical Gaussian surface has side of length  $a = 10$  cm. Electric field lines are parallel to x-axis as shown. The magnitudes of electric fields through surfaces ABCD and EFGH are  $6\text{kNC}^{-1}$  and  $9\text{kNC}^{-1}$  respectively. Then the total charge enclosed by the cube is [ Take  $\epsilon_0 = 9 \times 10^{-12}\text{Fm}^{-1}$  ]

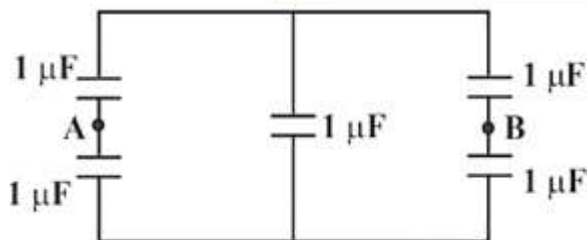


- (a)  $-1.35$  nC    (b)  $0.27$  nC  
 (c)  $-0.27$  nC    (d)  $1.35$  nC

51. Electric field at a distance ' $r$ ' from an infinitely long uniformly charged straight conductor, having linear charge density  $\lambda$  is  $E_1$ . Another uniformly charged conductor having same linear charge density  $\lambda$  is bent into a semicircle of radius ' $r$ '. The electric field at its centre is  $E_2$ . Then

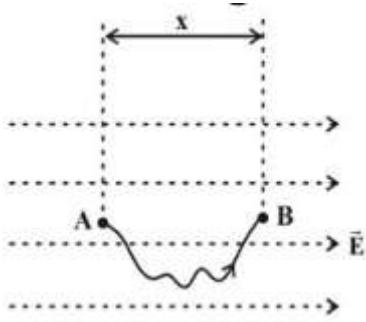
- (a)  $E_1 = E_2$     (b)  $E_1 = \pi r E_2$   
 (c)  $E_2 = \pi r E_1$     (d)  $E_2 = \frac{E_1}{r}$

52. Five capacitors each of value  $1\mu\text{F}$  are connected as shown in the figure. The equivalent capacitance between A and B is



- (a)  $2\mu\text{F}$     (b)  $5\mu\text{F}$   
 (c)  $3\mu\text{F}$     (d)  $1\mu\text{F}$

53. A uniform electric field vector  $\vec{E}$  exists along horizontal direction as shown. The electric potential at A is  $V_A$ . A small point charge  $q$  is slowly taken from A to B along the curved path as shown. The potential energy of the charge when it is at point B is

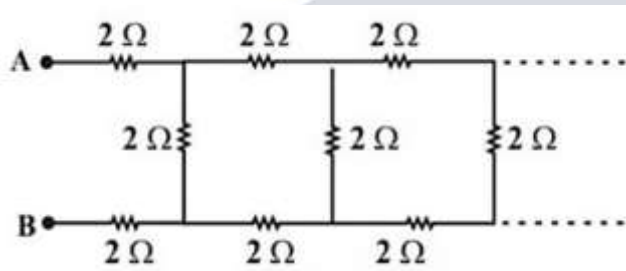


- (a)  $q[Ex - V_A]$       (b)  $qEx$   
 (c)  $q[V_A - Ex]$       (d)  $q[V_A + Ex]$

54. Ten identical cells each emf 2 V and internal resistance  $1\Omega$  are connected in series with two cells wrongly connected A resistor of  $10\Omega$  is connected to the combination. What is the current through the resistor?

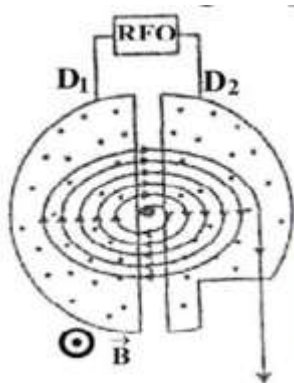
- (a) 0.6 A      (b) 1.2 A  
 (c) 1.8 A      (d) 2.4 A

55. The equivalent resistance between the points A and B in the following circuit is



- (a)  $0.05\Omega$       (b)  $5\Omega$   
 (c)  $0.5\Omega$       (d)  $5.5\Omega$

56. A charged particle is subjected to acceleration in a cyclotron as shown. The charged particle undergoes increase in its speed A charged particle is subjected to acceleration in a cyclotron as shown. The charged particle undergoes increase in its speed



- (a) Inside  $D_1$ ,  $D_2$  and the gaps  
 (b) Only inside  $D_1$   
 (c) Only in the gap between  $D_1$  and  $D_2$

(d) Only inside  $D_2$

57. The resistance of a carbon resistor is  $4.7k\Omega \pm 5\%$ . The colour of the third band is

- (a) Violet (b) Orange  
(c) Gold (d) Red

58. The four bands of a colour coded resistor are of the colours gray, red, gold and gold The value of the resistance of the resistor is

- (a)  $8.2\Omega \pm 5\%$  (b)  $82\Omega \pm 5\%$   
(c)  $5.2\Omega \pm 5\%$  (d)  $82\Omega \pm 10\%$

59. A wire of resistance  $R$  is connected across a cell of emf  $\varepsilon$  and internal resistance  $r$ . The current through the circuit is  $I$ . In time  $t$ , the work done by the battery to establish the current  $I$  is

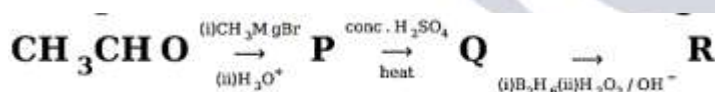
- (a)  $IRt$  (b)  $I^2Rt$   
(c)  $\varepsilon It$  (d)  $\frac{\varepsilon^2 t}{R}$

60. For a given electric current the drift velocity of conduction electrons in a copper wire is  $v$  and their mobility is  $\mu$ . When the current is increased at constant temperature

- (a)  $v_d$  decreases,  $\mu$  remains the same  
(b)  $v_d$  remains the same,  $\mu$  decreases  
(c)  $v_d$  increases,  $\mu$  remains the same  
(d)  $v_d$  remains the same,  $\mu$  increases

### Chemistry

61. Compounds  $P$  and  $R$  in the following reaction are



- (a) Metamers (b) Identical  
(c) Position isomers (d) Functional isomers

62. Aniline does not undergo

- (a) Friedel-Craft reaction (b) Bromination  
(c) Nitration (d) Sulphonation

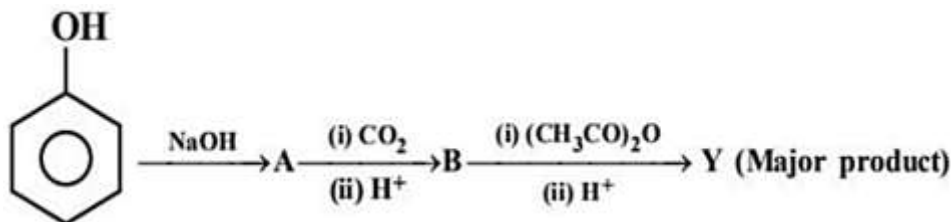
63. The heating of phenyl methyl ether with  $\text{HI}$  produces an aromatic compound  $A$  which on treatment with  $\text{con. HNO}_3$  gives  $B$ .  $A$  and  $B$  respectively are,

- (a) Iodobenzene, 1-Iodo-4-nitrobenzene  
(b) Phenol, Picric acid

(c) Methanol, Ethanoic acid

(d) Picric acid, Phenol

64.



Y in the above reaction is

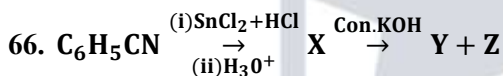
(a) Cumene (b) Picric acid

(c) Salicylaldehyde (d) Aspirin

65. A better reagent to oxidize primary alcohols into aldehyde is:

(a) Acidified  $\text{K}_2\text{Cr}_2\text{O}_7$  (b)  $\text{CrO}_3$

(c) PCC (d) Alkaline  $\text{KMnO}_4$



Formation of X, formation of Y and Z are known by

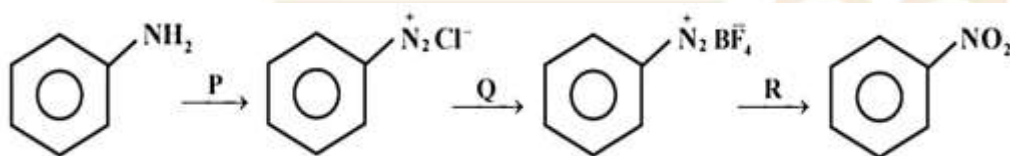
(a) Wolff-Kishner reduction, Wurtz reaction.

(b) Stephen reaction, Cannizaro reaction

(c) Rosenmund reduction, Cannizaro reaction

(d) Clemmensen reduction, Sandmeyer reaction.

67.



P, Q and R respectively are:

(a)  $\text{NaNO}_2 + \text{dil. HCl}$ ,  $\text{BF}_3$ ,  $\text{Cu} + \text{NaNO}_2$

(b)  $\text{NaNO}_3 + \text{dil. HCl}$ ,  $\text{F}_2$ ,  $\text{Cu} + \text{NaNO}_3$

(c)  $\text{NaNO}_2 + \text{dil. HCl}$ ,  $\text{HBF}_4$ ,  $\text{Cu} + \text{NaNO}_2$

(d)  $\text{NaNO}_2 + \text{con. HCl}$ ,  $\text{F}_2$ ,  $\text{Cu} + \text{NaNO}_3$

**68. Thyroxine produced in the thyroid gland is an iodinated derivative of**

- (a) Tyrosine                      (b) Tryptophan  
(c) Threonine                    (d) Lysine

**69. Sucrose is dextrorotatory but after hydrolysis the mixture show laevorotation, this is because of**

- (a) Racemic mixture is formed  
(b) Laevorotation of fructose is more than dextrorotation of glucose.  
(c) Laevorotation of glucose is more than dextrorotation of fructose.  
(d) Sucrose is a non-reducing sugar

**70. The correct order of match between column X and column Y is :**

| X              | Y                                 |
|----------------|-----------------------------------|
| I. Vitamin A   | i. Muscular weakness              |
| II. Vitamin D  | ii. Increased blood clotting time |
| III. Vitamin E | iii. Night-blindness              |
| IV. Vitamin K  | iv. Osteomalacia                  |

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

**71. Which of the following monomers form biodegradable polymers?**

- (a) Phenol and formaldehyde  
(b) 3-hydroxybutanoic acid and 3-hydroxypentanoic acid  
(c) Ethylene glycol and phthalic acid  
(d) Caprolactum and 1,3-Butadiene

**72. Match the List-I with List-II in the following**

| List-I            | List-II |
|-------------------|---------|
| 1. Caprolactum    | (a)     |
| 2. Vinyl chloride | (b)     |

|            |     |
|------------|-----|
| 3. Styrene | (c) |
| 4. Propene | (d) |

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

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

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

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

**73. Which one of the following is a non-narcotic analgesic?**

(a) Aspirin (b) Morphine

(c) Heroin (d) Codeine

**74. Receptors are proteins and crucial to body communication process. These receptors are embedded in**

(a) Endocrine gland (b) Chromosomes

(c) Cell membrane (d) Protein

**75. A gas at a pressure of 2 atm is heated from 25°C to 323°C and simultaneously compressed to  $\frac{2^{\text{rd}}}{3}$  of its original value. Then the final pressure is**

(a) 2 atm (b) 4 atm

(c) 1.33 atm (d) 6 atm

**76. Lattice enthalpy for NaCl is +788 kJ mol<sup>-1</sup> and  $\Delta H_{\text{Hyd}} = -784 \text{ kJ mol}^{-1}$ . Enthalpy of solution of NaCl is**

(a) -572 kJ mol<sup>-1</sup> (b) -4 kJ mol<sup>-1</sup>

(c) +572 kJ mol<sup>-1</sup> (d) +4 kJ mol<sup>-1</sup>

**77. At 500 K, for a reversible reaction  $A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB_{(g)}$  in a closed container,  $K_C = 2 \times 10^{-5}$ . In the presence of catalyst, the equilibrium is attaining 10 times faster. The equilibrium constant  $K_C$  in the presence of catalyst at the same temperature is**

(a)  $2 \times 10^{-10}$  (b)  $2 \times 10^{-5}$

(c)  $2 \times 10^{-4}$  (d)  $2 \times 10^{-6}$

**78. A weak acid with  $pK_a$  5.9 and weak base with  $pK_b$  5.8 are mixed in equal proportions pH of the resulting solution is**

(a) 7 (b) 7.05

(c) 7.005 (d) 7.5

**79. Temperature of 25°C in Fahrenheit and Kelvin scale respectively are**

(a) 45°F and 260.15 K (b) 47°F and 312.15 K

(c) 77°F and 298.15 K (d) 17°F and 298.15 K

80. The number of protons, neutrons and electrons in the ion  ${}_{16}^{32}\text{S}^{2-}$  respectively are

(a) 18,16,16 (b) 16,16,16

(c) 16,18,16 (d) 16,16,18

81. The correct order of first ionisation enthalpy of given elements is

(a)  $\text{C} < \text{B} < \text{Be} < \text{Li}$  (b)  $\text{Li} < \text{Be} < \text{B} < \text{C}$

(c)  $\text{Li} < \text{B} < \text{Be} < \text{C}$  (d)  $\text{Be} < \text{Li} < \text{B} < \text{C}$

82. Which of the following statement is INCORRECT?

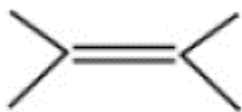
(a) Bond length of  $\text{O}_2 < \text{Bond length of } \text{O}_2^{2-}$

(b) Bond order of  $\text{O}_2 > \text{Bond order of } \text{O}_2^{2-}$

(c) Bond length of  $\text{O}_2 > \text{Bond length of } \text{O}_2^{2+}$

(d) Bond order of  $\text{O}_2^+ < \text{Bond order of } \text{O}_2^{2-}$

83. IUPAC name of the compound is



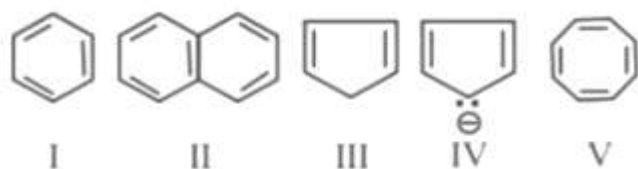
(a) 1, 1, 2, 2- tetra methylethene

(b) 2,3-dimethyl butene

(c) 2,3-dimethylbut-2-ene

(d) 2,3-dimethyl butyne

84. Among the following:



The set which represents aromatic species is

(a) II and III (b) I, II and IV

(c) I, II and III (d) III, IV and V

85. Which one of the following gases converts haemoglobin into carboxy haemoglobin?

(a) NO (b)  $\text{CO}_2$

(c) CO (d)  $\text{O}_2$

86. What is the oxidation number of S in  $\text{H}_2\text{S}_2\text{O}_8$  ?

- (a) +7 (b) +6  
(c) +5 (d) +4

87. A 30% solution of hydrogen peroxide is Options:

- (a) '50 volume' hydrogen peroxide  
(b) '100 volume' hydrogen peroxide  
(c) '30 volume' hydrogen peroxide  
(d) '10 volume' hydrogen peroxide

88. A pair of amphoteric oxides is Options:

- (a) BeO, MgO (b) BeO, ZnO  
(c)  $\text{Al}_2\text{O}_3$ ,  $\text{Li}_2\text{O}$  (d) BeO,  $\text{BO}_3$

89. The composition of water gas is

- (a)  $\text{CO}_{(g)} + \text{H}_2\text{O}_{(g)}$  (b)  $\text{CO}_{(g)} + \text{H}_{2(g)}$   
(c)  $\text{CO}_{(g)} + \text{N}_{2(g)}$  (d)  $\text{CH}_{4(k)}$

90. The swelling in feet and ankles of an aged person due to sitting continuously for long hours during travel, is reduced by soaking the feet in warm salt water. This is because of:

- (a) Edema (b) Diffusion  
(c) Reverse Osmosis (d) Osmosis

91. A sample of water is found to contain 5.85%  $\left(\frac{w}{w}\right)$  of AB (molecular mass

58.5) and 9.50%  $\left(\frac{w}{w}\right)$  XY (molecular mass 95). Assuming 80% ionisation of AB and 60% ionisation of  $\text{XY}_2$ , the freezing point of water sample is

[Given:  $K_f$  for water  $1.86\text{Kkgmol}^{-1}$ , Freezing point of pure water is 273K and A, B and Y are monovalent ions]

- (a) 280.44 K (b) 281.75 K  
(c) 264.25 K (d) 265.56 K

92. Match the column A (type of crystalline solid) with the column B (example for each type):

|    | A               |      | B                    |
|----|-----------------|------|----------------------|
| P. | Molecular Solid | i.   | SiC                  |
| Q. | Ionic Solid     | ii.  | Mg                   |
| R. | Metallic Solid  | iii. | $\text{H}_2\text{O}$ |
| S. | Network Solid   | iv.  | MgO                  |

- (a) P - ii, Q - iv, R - iii, S - I      (b) P - iii, Q - iv, R - ii, S - i  
(c) P - iii, Q - i, R - ii, S - iv      (d) P - iv, Q - iii, R - ii, S - i

**93. A metal crystallises in a body centered cubic lattice with the metallic radius  $\sqrt{3}\text{\AA}$ . The volume of the unit cell in  $\text{m}^3$  is**

- (a)  $6.4 \times 10^{-29}$       (b)  $4 \times 10^{-10}$   
(c)  $64 \times 10^{-29}$       (d)  $4 \times 10^{-29}$

**94. If 'a' stands for the edge length of the cubic systems - The ratio of radii in simple cubic, body centered cubic and face centered cubic unit cells is**

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

**95. Dimerisation of solute molecules in low dielectric constant solvent is due to:**

- (a) Co-ordinate bond      (b) Ionic bond  
(c) Hydrogen bond      (d) Covalent bond

**96. For a reaction, the value of rate constant at 300 K is  $6.0 \times 10^5 \text{ s}^{-1}$ . The value of Arrhenius factor A at infinitely high temperature is:**

- (a)  $\frac{6 \times 10^{-5}}{300}$       (b)  $6 \times 10^5$   
(c)  $6 \times 10^5 \times e^{-E_a/300R}$       (d)  $e^{-E_a/300R}$

**97. The rate constants  $k_1$  and  $k_2$  for two different reactions are**

**$10^{16} \times e^{-2000/T}$  and  $10^{15} \times e^{-1000/T}$  respectively. The temperature at which  $k_1 = k_2$  is:**

- (a)  $\frac{1000}{2.303}$  K      (b) 1000 K  
(c)  $\frac{2000}{2.303}$  K      (d) 2000 K

**98. During the electrolysis of brine, by using inert electrodes,**

- (a) Na deposits on cathode      (b)  $\text{Cl}_2$  liberates at anode  
(c)  $\text{O}_2$  liberates at anode      (d)  $\text{H}_2$  liberates at anode

**99. Consider the following 4 electrodes**

**A:  $\text{Ag}^+(0.0001\text{M})/\text{Ag}_{(s)}$ ; B:  $\text{Ag}^+(0.1\text{M})/\text{Ag}_{(s)}$**

**C:  $\text{Ag}^+(0.01\text{M})/\text{Ag}_{(s)}$ ; D:  $\text{Ag}^+(0.001\text{M})/\text{Ag}_{(s)}$ ;  $E_{\text{Ag}^+/\text{Ag}}^\circ = +0.80\text{V}$ .**

**Then reduction potential in volts of the electrodes in the order**

(a)  $A > D > C > B$       (b)  $A > B > C > D$

(c)  $B > C > D > A$       (d)  $C > D > A > B$

**100. The resistance of 0.1 M weak acid HA in a conductivity cell is**

**$2 \times 10^3 \text{ Ohm}$ . The cell constant of the cell is  $0.78 \text{ cm}^{-1}$  and  $\lambda_m^\circ$  of acid HA is  $390 \text{ Sm}^2 \text{ mol}^{-1}$ . The pH of the solution is**

(a) 5                      (b) 3

(c) 3.3                    (d) 4.2

**101. In which one of the following reactions, rate constant has the unit  $\text{mol}^{-1} \text{ s}^{-1}$ .**

(a)  $2\text{NO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{2(g)}$

(b) Decomposition of HI on the surface of Gold

(c) Acid catalysed hydrolysis of  $\text{CH}_3\text{COOCH}_3$

(d)  $\text{CHCl}_3 + \text{Cl}_2 \rightarrow \text{CCl}_4 + \text{HCl}$

**102. For the formation of which compound in Ellingham diagram  $\Delta G^\circ$  becomes more and more negative with increase in temperature?**

(a) ZnO

(b)  $\text{Cu}_2\text{O}$

(c) CO

(d) FeO

**103. Which of the following compound does not give dinitrogen on heating?**

(a)  $\text{NH}_4\text{NO}_3$

(b)  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$

(c)  $\text{Ba}(\text{N}_3)_2$

(d)  $\text{NH}_4\text{NO}_2$

**104. Aqueous solution of raw sugar when passed over beds of animal charcoal, it becomes colourless. Pick the correct set of terminologies that can be used for the above example.**

(a)

|     | Adsorbent       | Adsorbate           | Process    |
|-----|-----------------|---------------------|------------|
| (a) | Animal Charcoal | Colouring Substance | Adsorption |

(b)

|     | Adsorbent           | Adsorbate       | Process    |
|-----|---------------------|-----------------|------------|
| (b) | Colouring Substance | Animal Charcoal | Adsorption |

(c)

|  | Adsorbent | Adsorbate | Process |
|--|-----------|-----------|---------|
|--|-----------|-----------|---------|

|     |                   |                 |          |
|-----|-------------------|-----------------|----------|
| (c) | Solution of Sugar | Animal Charcoal | Sorption |
|-----|-------------------|-----------------|----------|

(d)

|     |                 |                   |            |
|-----|-----------------|-------------------|------------|
|     | Adsorbent       | Adsorbate         | Process    |
| (d) | Animal Charcoal | Solution of Sugar | Absorption |

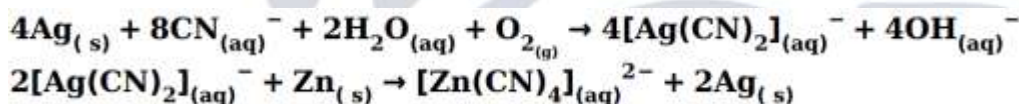
105. For Freundlich adsorption isotherm, a graph of  $\log(x/m)$  Vs.  $\log(P)$  gives a straight line. The slope of line and its Y-axis intercept respectively are

- (a)  $\log\left(\frac{1}{n}\right), \log K$  (b)  $\frac{1}{n}, K$   
 (c)  $\log\left(\frac{1}{n}\right), K$  (d)  $\frac{1}{n}, \log K$

106. When  $\text{FeCl}_3$  is added to excess of hot water gives a sol 'X'. When  $\text{FeCl}_3$  is added to  $\text{NaOH}_{(\text{aq})}$  solution, gives sol 'Y'. X and Y formed in the above processes respectively are

- (a)  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{Cl}^-$  and  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{OH}^-$   
 (b)  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{Fe}^{3+}$  and  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{OH}^-$   
 (c)  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{OH}^-$  and  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{Fe}^{3+}$   
 (d)  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{H}^+$  and  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}/\text{Na}^+$

107. The reducing agent in the given equations:



- (a)  $\text{H}_2\text{O}$  (b)  $\text{CN}^-$   
 (c)  $\text{Zn}$  (d)  $\text{O}_2$

108. Which of the following is CORRECT with respect to melting point of a transition element?

- (a)  $\text{Mn} > \text{Fe}$  (b)  $\text{Ti} > \text{V}$   
 (c)  $\text{V} > \text{Cr}$  (d)  $\text{Cr} > \text{Mn}$

109.  $a\text{MnO}_4^- + b\text{S}_2\text{O}_3^{2-} + \text{H}_2\text{O} \rightarrow x\text{MnO}_2 + y\text{SO}_4^{2-} + z\text{OH}^-$  a and y respectively are

- (a) 3; 6 (b) 8; 8  
 (c) 8; 3 (d) 8; 6

110. Which formula and name combination is INCORRECT?

- (a)  $[\text{CoCl}_2(\text{en})_2]$  Cl-Dichloridodiethylenediammine cobalt (II) chloride  
 (b)  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$  - Tetraammineaquachloridocobalt (III) chloride  
 (c)  $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$  - Potassium trioxalatoaluminate (III)

(d)  $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$  - Diamminechloridonitrito - N - platinum (II)

111. Which of the following system in an octahedral complex has maximum unpaired electrons?

- (a)  $d^4$  (low spin)      (b)  $d^7$  (high spin)  
(c)  $d^9$  (high spin)      (d)  $d^6$  (low spin)

112. The correct decreasing order of basicity of hydrides of Group - 15 elements is

- (a)  $\text{AsH}_3 > \text{SbH}_3 > \text{NH}_3 > \text{PH}_3$   
(b)  $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3 > \text{SbH}_3$   
(c)  $\text{SbH}_3 > \text{AsH}_3 > \text{PH}_3 > \text{NH}_3$   
(d)  $\text{PH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{NH}_3$

113. Which one of the following oxoacids of phosphorus can reduce  $\text{AgNO}_3$  to metallic silver?

- (a)  $\text{H}_4\text{P}_2\text{O}_6$       (b)  $\text{H}_3\text{PO}_4$   
(c)  $\text{H}_3\text{PO}_2$       (d)  $\text{H}_4\text{P}_2\text{O}_7$

114. In solid state,  $\text{PCl}_5$  is a/an

- (a) Ionic solid with  $[\text{PCl}_4]^+$  and  $[\text{PCl}_6]^-$   
(b) Covalent solid present in the form of  $\text{P}_2\text{Cl}_{10}$   
(c) Octahedral structure  
(d) Ionic solid with  $[\text{PCl}_6]^+$  and  $[\text{PCl}_4]^-$

115. In which one of the following pairs, both the elements does not have  $(n-1)d^{10}ns^2$  configuration in its elementary state?

- (a) Hg, Cn      (b) Cu, Zn  
(c) Zn, Cd      (d) None of above

116.



Hybridisation change involved at C - 1 in the above reaction

- (a)  $sp^2$  to  $sp^3$       (b)  $sp$  to  $sp^2$   
(c)  $sp^3$  to  $sp$       (d)  $sp^3$  to  $sp^2$

117. If a didentate ligand ethane - 1, 2 - diamine is progressively added in the molar ratio en : Ni: 1: 1, 2: 1, 3: 1 to  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  aq solution, following co-ordination entities are formed.

- (I)  $[\text{Ni}(\text{H}_2\text{O})_4 \text{ en}]_{(\text{aq})}^{2+}$  -pale blue  
(II)  $[\text{Ni}(\text{H}_2\text{O})_2 (\text{en})_2]_{(\text{aq})}^{2+}$  -blue/purple  
(III)  $[\text{Ni}(\text{en})_3]_{(\text{aq})}^{2+}$  -violet

The wavelength in nm of light absorbed in case of I and III are respectively

- (a) 310 nm and 500 nm
- (b) 600 nm and 535 nm
- (c) 475 nm and 310 nm
- (d) 300 nm and 475 nm

118. Which of the following is an organometallic compound?

- (a)  $(\text{CH}_3\text{COO})_2\text{Ca}$       (b)  $\text{CH}_3\text{ONa}$
- (c)  $\text{CH}_3\text{COONa}$       (d)  $\text{CH}_3\text{CH}_2\text{MgBr}$

119. A pair of compounds having the same boiling points are Options:

- (a) Benzene and naphthalene
- (b) (+) butan-2-ol and (-) butan-2-ol
- (c) cis-but-2-ene and trans-but-2-ene
- (d) n-hexane and neo-hexane

120. Identify A, B and C in the sequence:



- (a)  $\text{CH}_3\text{CH}_2\text{CN}$ ,  $\text{C}_2\text{H}_5\text{OH}$ ,  $\text{C}_2\text{H}_5\text{N}_2\text{Cl}$
- (b)  $\text{CH}_3\text{CH}_2\text{CN}$ ,  $\text{CH}_3\text{CH}_2\text{NH}_2$ ,  $\text{C}_2\text{H}_5\text{OH}$
- (c)  $\text{CH}_3\text{CH}_2\text{CN}$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- (d)  $\text{CH}_3\text{CH}_2\text{NC}$ ,  $\text{CH}_3\text{CH}_2\text{OH}$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$

### Mathematics

121. If A and B are two matrices such that  $\text{AB} = \text{B}$  and  $\text{BA} = \text{A}$  then  $\text{A}^2 + \text{B}^2$

- (a) AB      (b) 2 BA
- (c) A + B      (d) 2 AB

122. If  $\text{A} = \begin{bmatrix} 2-k & 2 \\ 1 & 3-k \end{bmatrix}$  is singular matrix, then the value of  $5k - k^2$  is equal to

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

123. The area of a triangle with vertices  $(-3, 0)$ ,  $(3, 0)$  and  $(0, k)$  is 9 sq. units, the value of k is

- (a) 6      (b) 3
- (c) 9      (d) -9

124. If  $\Delta = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$  and  $\Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ a & b & c \end{vmatrix}$  then

- (a)  $\Delta_1 \neq \Delta$  (b)  $\Delta_1 = -\Delta$   
(c)  $\Delta_1 = \Delta$  (d)  $\Delta_1 = 3\Delta$

125. If  $\sin^{-1}\left(\frac{2a}{1+a^2}\right) + \cos^{-1}\left(\frac{1-a^2}{1+a^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$  where  $a, x \in (0, 1)$  then the value of  $x$  is

- (a)  $\frac{2a}{1+a^2}$  (b)  $\frac{2a}{1-a^2}$   
(c) 0 (d)  $\frac{a}{2}$

126. The value of  $\cot^{-1} \left[ \frac{\sqrt{1-\sin x} + \sqrt{1+\sin x}}{\sqrt{1-\sin x} - \sqrt{1+\sin x}} \right]$  where  $x \in \left(0, \frac{\pi}{4}\right)$  is

- (a)  $\Pi - \frac{x}{3}$  (b)  $\Pi - \frac{x}{2}$   
(c)  $\frac{x}{2}$  (d)  $\frac{x}{2} - \Pi$

127. If  $x \begin{bmatrix} 3 \\ 2 \end{bmatrix} + y \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \begin{bmatrix} 15 \\ 5 \end{bmatrix}$  then the value of  $x$  and  $y$  are

- (a)  $x = -4, y = -3$  (b)  $x = -4, y = 3$   
(c)  $x = 4, y = 3$  (d)  $x = 4, y = -3$

128. If the function is  $f(x) = \frac{1}{x+2}$ , then the point of discontinuity of the composite function  $y = f(f(x))$  is

- (a)  $\frac{2}{5}$  (b)  $\frac{1}{2}$   
(c)  $-\frac{5}{2}$  (d)  $\frac{5}{2}$

129. If  $y = a \sin x + b \cos x$ , then  $y^2 + \left(\frac{dy}{dx}\right)^2$  is a

- (a) function of  $x$  and  $y$  (b) constant  
(c) function of  $x$  (d) function of  $y$

130. If  $f(x) = 1 + nx + \frac{n(n-1)}{2}x^2 + \frac{n(n-1)(n-2)}{6}x^3 + \dots + x^n$  then  $f''(1)$

- (a)  $n(n-1)2^n$  (b)  $2^{n-1}$   
(c)  $(n-1)2^{n-1}$  (d)  $n(n-1)2^{n-2}$

131. If  $A = \begin{bmatrix} 1 & \tan \frac{\alpha}{2} \\ -\tan \frac{\alpha}{2} & 1 \end{bmatrix}$  and  $AB = I$  then  $B =$

- (a)  $\cos^2 \frac{\alpha}{2} \cdot I$  (b)  $\sin^2 \frac{\alpha}{2} \cdot A$   
(c)  $\cos^2 \frac{\alpha}{2} \cdot A^T$  (d)  $\cos^2 \frac{\alpha}{2} \cdot A$

132. If  $u = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$  and  $v = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$  then  $\frac{du}{dv}$  is

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

133. The function  $f(x) = \cot x$  is discontinuous on every point of the set Options:

- (a)  $\left\{x = (2n+1)\frac{\pi}{2}; n \in \mathbb{Z}\right\}$  (b)  $\left\{x = \frac{n\pi}{2}; n \in \mathbb{Z}\right\}$   
(c)  $\{x = n\pi; n \in \mathbb{Z}\}$  (d)  $\{x = 2n\pi; n \in \mathbb{Z}\}$

134. A particle moves along the curve  $\frac{x^2}{16} + \frac{y^2}{4} = 1$ . When the rate of change of abscissa is 4 times that of its ordinate, then the quadrant in which the particle lies in

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

135. An enemy fighter jet is flying along the curve given by  $y = x^2 + 2$ . A soldier is placed at (3, 2) wants to shoot down the jet when it is nearest to him. Then the nearest distance is

- (a) 2 units (b)  $\sqrt{5}$  units  
(c)  $\sqrt{3}$  units (d)  $\sqrt{6}$  units

136.  $\int_2^8 \frac{5^{\sqrt{10-x}}}{5^{\sqrt{x}} + 5^{\sqrt{10-x}}} dx =$

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

137.  $\int \sqrt{\csc x - \sin x} dx =$

- (a)  $2\sqrt{\sin x} + C$  (b)  $\frac{2}{\sqrt{\sin x}} + C$   
(c)  $\sqrt{\sin x} + C$  (d)  $\frac{\sqrt{\sin x}}{2} + C$

138. If  $f(x)$  and  $g(x)$  are two functions with  $g(x) = x - \frac{1}{x}$  and  $f \circ g(x) = x^3 - \frac{1}{x^3}$  then  $f'(x) =$

- (a)  $x^2 - \frac{1}{x^2}$  (b)  $1 - \frac{1}{x^2}$   
(c)  $3x^2 + 3$  (d)  $3x^2 + \frac{3}{x^4}$

139. A circular plate of radius 5 cm is heated Due to expansion, its radius increases at the rate of 0.05 cm / sec The rate at which its area is increasing when the radius is 5.2 cm is

- (a)  $5.05\pi\text{cm}^2/\text{sec}$  (b)  $0.52\pi\text{cm}^2/\text{sec}$   
(c)  $5.2\pi\text{cm}^2/\text{sec}$  (d)  $27.4\pi\text{cm}^2/\text{sec}$

140. The distance 's' in meters travelled by a particle in 't' seconds is given by  $s = \frac{2t^3}{3} - 18t + \frac{5}{3}$ . The acceleration when the particle comes to rest is

- (a)  $12 \text{ m}^2/\text{sec}$  (b)  $18 \text{ m}^2/\text{sec}$   
(c)  $3 \text{ m}^2/\text{sec}$  (d)  $10 \text{ m}^2/\text{sec}$

141.  $\int_0^{\pi} \frac{x \tan x}{\sec x \operatorname{cosec} x} dx =$

- (a)  $\pi / 2$  (b)  $\pi^2 / 2$   
(c)  $\pi / 4$  (d)  $\pi^2 / 4$

142.  $\int \sqrt{5 - 2x + x^2} dx =$

- (a)  $\frac{x-1}{2} \sqrt{5 + 2x + x^2} + 2 \log |(x-1) + \sqrt{5 + 2x + x^2}| + C$   
(b)  $\frac{x-1}{2} \sqrt{5 - 2x + x^2} + 2 \log |(x-1) + \sqrt{5 - 2x + x^2}| + C$   
(c)  $\frac{x-1}{2} \sqrt{5 - 2x + x^2} + 2 \log |(x+1) + \sqrt{x^2 + 2x + 5}| + C$   
(d)  $\frac{x}{2} \sqrt{5 - 2x + x^2} + 4 \log |(x+1) + \sqrt{x^2 - 2x + 5}| + C$

143.  $\int \frac{1}{1+3\sin^2 x + 8\cos^2 x} dx =$

- (a)  $\frac{1}{6} \tan^{-1} \left( \frac{2 \tan x}{3} \right) + C$  (b)  $6 \tan^{-1} \left( \frac{2 \tan x}{3} \right) + C$   
(c)  $\frac{1}{6} \tan^{-1} (2 \tan x) + C$  (d)  $\tan^{-1} \left( \frac{2 \tan x}{3} \right) + C$

144.  $\int_{-2}^0 (x^3 + 3x^2 + 3x + 3 + (x+1)\cos(x+1)) dx =$

- (a) 4 (b) 1  
(c) 0 (d) 3

145. The degree of the differential equation

$$1 + \left( \frac{dy}{dx} \right)^2 + \left( \frac{d^2y}{dx^2} \right)^2 = 3 \sqrt{\frac{d^2y}{dx^2} + 1} \text{ is}$$

- (a) 1 (b) 2  
(c) 6 (d) 3

146. If  $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$  then

- (a)  $\vec{a}$  and  $\vec{b}$  are coincident  
(b) Inclined to each other at  $60^\circ$   
(c)  $\vec{a}$  and  $\vec{b}$  are perpendicular  
(d)  $\vec{a}$  and  $\vec{b}$  are parallel

147. The component of  $\hat{i}$  in the direction of the vector  $\hat{i} + \hat{j} + 2\hat{k}$  is

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

148. In the interval  $(0, \pi/2)$ , area lying between the curves  $y = \tan x$  and  $y = \cot x$  and the X-axis is

- (a)  $4\log 2$  sq. units (b)  $\log 2$  sq. units  
(c)  $3\log 2$  sq. units (d)  $2\log 2$  sq. units

149. The area of the region bounded by the line  $y = x + 1$ , and the lines  $x = 3$  and  $x = 5$  is

- (a)  $\frac{11}{2}$  sq. units (b) 7 sq. units  
(c) 10 sq. units (d)  $\frac{7}{2}$  sq. units

150. If the curve passes through the point  $(1, 1)$  and at any point  $(x, y)$  on the curve, the product of the slope of its tangent and x co-ordinate of the point is equal to the y co-ordinate of the point, then the curve also passes through the point

- (a)  $(-1, 2)$  (b)  $(\sqrt{3}, 0)$   
(c)  $(2, 2)$  (d)  $(3, 0)$

151. The length of perpendicular drawn from the point  $(3, -1, 11)$  to the line  $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$  is

- (a)  $\sqrt{33}$  (b)  $\sqrt{53}$   
(c)  $\sqrt{66}$  (d)  $\sqrt{29}$

152. The equation of the plane through the points  $(2, 1, 0)$ ,  $(3, 2, -2)$  and  $(3, 1, 7)$  is

- (a)  $6x - 3y + 2z - 7 = 0$   
(b)  $7x - 9y - z - 5 = 0$   
(c)  $3x - 2y + 6z - 27 = 0$   
(d)  $2x - 3y + 4z - 27 = 0$

153. The point of intersection of the line  $x + 1 = \frac{y+3}{3} = \frac{-z+2}{2}$  with the plane  $3x + 4y + 5z = 10$  is

- (a)  $(2, 6, -4)$  (b)  $(2, 6, 4)$   
(c)  $(-2, 6, -4)$  (d)  $(2, -6, -4)$

154. If  $(2, 3, -1)$  is the foot of the perpendicular from  $(4, 2, 1)$  to a plane, then the equation of the plane is

- (a)  $2x - y + 2z = 0$   
(b)  $2x + y + 2z - 5 = 0$   
(c)  $2x - y + 2z + 1 = 0$

(d)  $2x + y + 2z - 1 = 0$

155. If  $|a \times b|^2 + |a \cdot b|^2 = 144$  and  $|a| = 4$ , then  $|b|$  is equal to?

(a) 8 (b) 4

(c) 12 (d) 3

156. If  $\vec{a} + 2\vec{b} + 3\vec{c} = \vec{0}$  and  $(\vec{a} \times \vec{b}) + (\vec{b} \times \vec{c}) + (\vec{c} \times \vec{a}) = \lambda(\vec{b} \times \vec{c})$  then the value of  $\lambda$  is equal to

(a) 4 (b) 6

(c) 2 (d) 3

157. If a line makes an angle of  $\frac{\pi}{3}$  with each X and Y axis then the acute angle made by Z -axis is

(a)  $\frac{\pi}{2}$  (b)  $\frac{\pi}{4}$

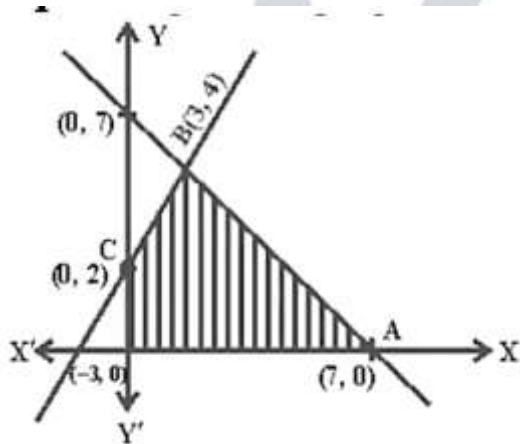
(c)  $\frac{\pi}{6}$  (d)  $\frac{\pi}{3}$

158. Let  $A = \{x, y, z, u\}$  and  $B = \{a, b\}$ . A function  $f: A \rightarrow B$  is selected randomly. The probability that the function is an onto function is

(a)  $\frac{5}{8}$  (b)  $\frac{1}{35}$

(c)  $\frac{7}{8}$  (d)  $\frac{1}{8}$

159. The shaded region in the figure given in the solution of which of the in equations?



(a)  $x + y \geq 7, 2x - 3y + 6 \geq 0, x \geq 0, y \geq 0$

(b)  $x + y \leq 7, 2x - 3y + 6 \leq 0, x \geq 0, y \geq 0$

(c)  $x + y \leq 7, 2x - 3y + 6 \geq 0, x \geq 0, y \geq 0$

(d)  $x + y \geq 7, 2x - 3y + 6 \leq 0, x \geq 0, y \geq 0$

160. If A and B are events such that  $P(A) = \frac{1}{4}$ ,  $P(A/B) = \frac{1}{2}$  and  $P(B/A) = \frac{2}{3}$  then  $P(B)$  is

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

161. A bag contains  $2n + 1$  coins. It is known that  $n$  of these coins have head on both sides whereas the other  $n + 1$  coins are fair. One coin is selected at random and tossed. If the probability that toss results in heads is  $\frac{31}{42}$ , then the value of  $n$  is

- (a) 8 (b) 10  
(c) 5 (d) 6

162. The value of  $\frac{\sin^2 14^\circ}{\tan 135^\circ} \cdot \frac{\sin^2 66^\circ}{\tan 135^\circ} \cdot \frac{\tan 135^\circ}{\sin^2 14^\circ} \cdot \frac{\tan 135^\circ}{\sin^2 66^\circ}$  is

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

163. The modulus of the complex number  $\frac{(1+i)^2(1+3i)}{(2-6i)(2-2i)}$  is

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

164. Given that  $a, b$  and  $x$  are real numbers and  $a < b, x < 0$  then

- (a)  $\frac{a}{x} < \frac{b}{x}$  (b)  $\frac{a}{x} \leq \frac{b}{x}$   
(c)  $\frac{a}{x} > \frac{b}{x}$  (d)  $\frac{a}{x} \geq \frac{b}{x}$

165. Ten chairs are numbered as 1 to 10. Three women and two men wish to occupy one chair each. First the women choose the chairs marked 1 to 6, then the men choose the chairs from the remaining. The number of possible ways is

- (a)  ${}^6C_3 \times {}^4P_2$  (b)  ${}^6P_3 \times {}^4C_2$   
(c)  ${}^6C_3 \times {}^4C_2$  (d)  ${}^6P_3 \times {}^4P_2$

166. Which of the following is an empty set?

- (a)  $\{x: x^2 - 9 = 0, x \in R\}$  (b)  $\{x: x^2 = x + 2, x \in R\}$   
(c)  $\{x: x^2 - 1 = 0, x \in R\}$  (d)  $\{x: x^2 + 1 = 0, x \in R\}$

167. If  $f(x) = ax + b$ , where  $a$  and  $b$  are integers,  $f(-1) = -5$  and  $f(3) = 3$  then  $a$  and  $b$  are respectively

- (a) 0, 2 (b) 2, 3  
(c) -3, -1 (d) 2, -3

168. The value of  $e^{\log_{10} \tan 10^\circ + \log_{80} \tan 22^\circ + \log_{10} \tan 3^\circ + \dots + \log_{10} \tan 89^\circ}$  is

- (a)  $\frac{1}{e}$  (b) 1  
(c) 0 (d) 3

169. A line passes through (2, 2) and is perpendicular to the line  $3x + y = 3$ . Its y-intercept is

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

170. The distance between the foci of a hyperbola is 16 and its eccentricity is  $\sqrt{2}$ . Its equation is

- (a)  $2x^2 - 3y^2 = 7$  (b)  $y^2 - x^2 = 32$   
(c)  $x^2 - y^2 = 32$  (d)  $\frac{x^2}{4} - \frac{y^2}{9} = 1$

171. If  $\lim_{x \rightarrow 0} \frac{\sin(2+x) - \sin(2-x)}{x} = A \cos B$ , then the values of A and B respectively are

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

172. If n is even and the middle term in the expansion of  $\left(x^2 + \frac{1}{x}\right)^n$  is  $924x^6$ , then n is equal to

- (a) 12 (b) 8  
(c) 10 (d) 14

173.  $n^{\text{th}}$  term of the series  $1 + \frac{3}{7} + \frac{5}{7^2} + \frac{1}{7^2} + \dots$  is

- (a)  $\frac{2n-1}{7^n}$  (b)  $\frac{2n+1}{7^{n-1}}$   
(c)  $\frac{2n-1}{7^{n-1}}$  (d)  $\frac{2n+1}{7^n}$

174. If  $p\left(\frac{1}{q} + \frac{1}{r}\right)$ ,  $q\left(\frac{1}{r} + \frac{1}{p}\right)$ ,  $r\left(\frac{1}{p} + \frac{1}{q}\right)$  are in AP., then p, q, r

- (a) are in AP. (b) are not in G.P.  
(c) are not in AP. (d) are in G.P.

175. Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be defined by  $f(x) = 3x^2 - 5$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$  by  $g(x) = \frac{x}{x^2+1}$  then gof is

- (a)  $\frac{3x^2}{x^4+2x^2-4}$  (b)  $\frac{3x^2}{9x^4+30x^2-2}$   
(c)  $\frac{3x^2-5}{9x^4-30x^2+26}$  (d)  $\frac{3x^2-5}{9x^4-6x^2+26}$

176. Let the relation R be defined in N by  $aRb$  if  $3a + 2b = 27$  then R is Options:

(a)  $\{(1,12), (3,9), (5,6), (7,3), (9,0)\}$

(b)  $\{(2,1), (9,3), (6,5), (3,7)\}$

(c)  $\{(1,12), (3,9), (5,6), (7,3)\}$

(d)  $\left\{\left(0, \frac{27}{2}\right), (1,12), (3,9), (5,6), (7,3)\right\}$

177. Let  $f(x) = \sin 2x + \cos 2x$  and  $g(x) = x^2 - 1$ , then  $g(f(x))$  is invertible in the domain

(a)  $x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$  (b)  $x \in \left[0, \frac{\pi}{4}\right]$

(c)  $x \in \left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$  (d)  $x \in \left[-\frac{\pi}{8}, \frac{\pi}{8}\right]$

178. The contrapositive of the statement

"If two lines do not intersect in the same plane then they are parallel." is

(a) If two lines are not parallel then they do not intersect in the same plane

(b) If two lines are parallel then they do not intersect in the same plane.

(c) If two lines are not parallel then they intersect in the same plane

(d) If two lines are parallel then they intersect in the same plane

179. The mean of 100 observations is 50 and their standard deviation is 5 . Then the sum of squares of all observations is

(a) 250000 (b) 255000

(c) 50000 (d) 252500

180.  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: [0, \infty) \rightarrow \mathbb{R}$  are defined by  $f(x) = x^2$  and  $g(x) = \sqrt{x}$ . Which one of the following is not true?

(a)  $(f \circ g)(2) = 2$  (b)  $(g \circ f)(-2) = 2$

(c)  $(g \circ f)(4) = 4$  (d)  $(f \circ g)(-4) = 4$

### Biology

181. Which of the following is abbreviated as ZIFT?

(a) Zygote Intra Fallopian Tube

(b) Zygote Intra Fallopian Transfer

(c) Zygote Inter Fallopian Tube

(d) Zygote Inter Fallopian Transfer

182. An example for hormone releasing IUD is

(a) Lippes loop (b) LNG - 20

(c) Implant (d) Multiload 375

**183. MTPs are considered relatively safe during**

- (a) 180 days of pregnancy
- (b) Second trimester
- (c) First trimester
- (d) 24 weeks of pregnancy

**184. Which of the following statements is correct?**

- (a) Sickle cell anaemia is a quantitative problem.
- (b) Thalassaemia is a qualitative problem.
- (c) Female carrier for haemophilia may transmit the disease to sons.
- (d) Change in whole set of chromosomes is called aneuploidy.

**185. 'Gene-mapping' technology was developed by**

- (a) Sturtevant
- (b) Tschermak
- (c) Mendel
- (d) Correns

**186. Find the correct statement.**

- (1) Generally, a gene regulates a trait, but sometimes one gene has effect on multiple traits.
- (2) The trait AB-blood group of man is regulated by one dominant allele and another recessive allele. Hence it is co-dominant.

- (a) Both Statements (1) and (2) are correct.
- (b) Statement (1) is correct.
- (c) Both the Statements are wrong.
- (d) Statement (2) is correct.

**187. From the following table, select the option that correctly characterizes various phases of menstrual cycle:**

(a)

|   | Menstruation phase | Follicular phase | Luteal phase                |
|---|--------------------|------------------|-----------------------------|
| A | Menses             | L.H. Surge       | Regeneration of endometrium |

(b)

|   | Menstruation phase | Follicular phase            | Luteal phase |
|---|--------------------|-----------------------------|--------------|
| B | Matured follicle   | Regression of corpus luteum | Ovulation    |

(c)

|  | Menstruation phase | Follicular phase | Luteal phase |
|--|--------------------|------------------|--------------|
|--|--------------------|------------------|--------------|

|   |                             |                            |                          |
|---|-----------------------------|----------------------------|--------------------------|
| C | Regeneration of endometrium | High level of progesterone | Developing corpus luteum |
|---|-----------------------------|----------------------------|--------------------------|

(d)

|   |                    |                          |                     |
|---|--------------------|--------------------------|---------------------|
|   | Menstruation phase | Follicular phase         | Luteal phase        |
| D | Menses             | Developing corpus luteum | Follicle maturation |

**188. In one of the hybridisation experiments, a homozygous dominant parent and a homozygous recessive parent are crossed for a trait. (Plant shows Medelian inheritance pattern)**

- (a) Dominant parent trait appears in  $F_1$  generation and recessive parent trait appears in  $F_1$  and  $F_2$  generations.
- (b) Dominant parent trait appears in  $F_1$  generation and recessive parent trait appears in  $F_2$  generation.
- (c) Dominant parent trait appears in  $F_2$  generation and recessive parent trait appears only in  $F_1$  generation
- (d) Dominant parent trait appears in both  $F_1$  &  $F_2$  generations, recessive parent trait appears in only  $F_2$  generation.

**189. Histone proteins are positively charged because they are rich in basic amino acid residues**

- (a) Arginine and Phenylalanine (b) Arginine and Alanine
- (c) Arginine and Proline (d) Arginine and Lysine

**190. Eukaryotic genes are monocistronic but they are split genes because**

- (a) Exons are interrupted by Introns.
- (b) They contain Exons only.
- (c) Introns are interrupted with Mutons.
- (d) They contain Introns only.

**191. The Lac-Operon model was elucidated by**

- (a) Hershey and Chase
- (b) Watson and Crick
- (c) Jacob and Crick
- (d) Francois Jacob and Jaques Monad

**192. Which of these is NOT an example for Adaptive radiation?**

- (a) Placental mammals (b) Darwin's finches
- (c) Long-necked Giraffe (d) Australian marsupials

**193. In a population of 800 rabbits showing Hardy-Weinberg equilibrium, the frequency of recessive individuals was 0.16. what is the frequency of heterozygous individuals?**

- (a) 0.84 (b) 0.4
- (c) 0.36 (d) 0.48

**194. In male heterogametic type of sex determination**

- (a) Male parent produces dissimilar gametes.
- (b) Male parent produces similar gametes.
- (c) Males do not produce gametes.
- (d) Female parent produces dissimilar gametes.

**195. Identify the symptoms of pneumonia**

- (a) Constipation, Abdominal pain, cramps, blood clots
- (b) Difficulty in breathing, fever, chills, cough, headache
- (c) High fever, weakness, stomach pain, loss of appetite
- (d) Nasal congestion and discharge, cough, sore throat, headache

**196. The variety of Okra, Pusa Sawani is resistant to which of the following insect pests?**

- (a) Shoot & Fruit borer                      (b) Aphids
- (c) Cereal leaf beetle                      (d) Jassids

**197. With respect to Inbreeding, which among the following is not true?**

- (a) It helps in elimination of less desirable genes.
- (b) Inbreeding decreases homozygosity.
- (c) It helps to evolve a pure line in an animal.
- (d) It helps in accumulation of superior genes.

**198. Identify from the following a pair of better yielding semi dwarf varieties of rice developed in India**

- (a) Jaya and Kalyan Sona                      (b) Jaya and Ratna
- (c) Kalyan Sona and Sonalika                      (d) Sonalika and Ratna

**199. In MoET technique fertilized eggs are transferred into surrogate mother in which of the following stage?**

- (a) 8 – 32 celled stage                      (b) 2 – 4 celled stage
- (c) 16 – 32 celled stage                      (d) 8 – 16 celled stage

**200. Roquefort cheese is ripened by**

- (a) Virus                      (b) Bacterium
- (c) Yeast                      (d) Fungi

**201. Four students were assigned a science project to find out the pollution levels of lakes in their surrounding. After analysing the quality of water samples, the BOD values were found as follows: Which among the following water samples is highly polluted?**

- (a) 6mg/L (b) 0.6mg/L  
(c) 0.16mg/L (d) 0.06mg/L

**202. The toxic substance 'haemozoin' responsible for high fever and chill, is released in which of the following diseases?**

- (a) Malaria (b) Dengue  
(c) Typhoid (d) Pneumonia

**203. Which of these is NOT a method to make host cells 'component' to take up DNA?**

- (a) Biolistics  
(b) Micro-injection  
(c) Use of disarmed pathogen vectors  
(d) Elution

**204. Select the correct statement from the following:**

- (a) The first step in PCR is heating which is used to separate both the strands of gene of interest.  
(b) Genetic engineering works only on animals and not yet successfully used on plants.  
(c) DNA from one organism will not band to DNA from other organism.  
(d) There are no risk factors associated with r-DNA technology.

**205. Choose the incorrect statement with reference to Kangaroo rat. Options:**

- (a) Uses minimal water to remove excretory products.  
(b) Found in North American desert.  
(c) Eliminates dilute urine.  
(d) Meets its water requirements through internal fat oxidation.

**206. Generally, bears avoid winter by undergoing**

- (a) Aestivation (b) Diapause  
(c) Migration (d) Hibernation

**207. Match Column - I with Column - II. Select the option with correct combination.**

| Column - I | Column - II |
|------------|-------------|
|------------|-------------|

|                    |                                                     |
|--------------------|-----------------------------------------------------|
| 1. Standing state  | p. quad Mass of living material at a given time.    |
| 2. Pioneer species | q. Amount of nutrients in the soil at a given time. |
| 3. Detritivores    | r. quad Species that invade a bare area             |
| 4. Standing crop   | s. quad Breakdown detritus into smaller particles.  |

- (a) 1 – q, 2 – r, 3 – s, 4 – p  
 (b) 1 – q, 2 – r, 3 – p, 4 – s  
 (c) 1 – p, 2 – s, 3 – r, 4 – q  
 (d) 1 – p, 2 – r, 3 – s, 4 – q

**208. PCR is used for**

- (a) DNA digestion (b) DNA isolation  
 (c) DNA amplification (d) DNA ligation

**209. The toxic heavy metals from various industries which cause water pollution, normally have a density**

- (a) more than 7.5 g/cm<sup>3</sup> (b) more than 5 g/cm<sup>3</sup>  
 (c) more than 12.5 g/cm<sup>3</sup> (d) more than 15 g/cm<sup>3</sup>

**210. Identify the correct option showing the relative contribution of different green -house gases to the total global warming.**

- (a) CFC – 6%, CO<sub>2</sub> – 60%, Methane –20%, N<sub>2</sub>O – 14%  
 (b) CFC – 14%, CO<sub>2</sub> – 60%, Methane –20%, N<sub>2</sub>O – 6%  
 (c) CFC – 14%, CO<sub>2</sub> – 60%, Methane –6%, N<sub>2</sub>O – 20%  
 (d) CFC – 20%, CO<sub>2</sub> – 60%, Methane –14%, N<sub>2</sub>O – 6%

**211. A flower has 10 stamens each having bilobed ditheous anther. If each microsporangium has 5 pollen mother cells, how many pollen grains would be produced by the flower?**

- (a) 800 (b) 200  
 (c) 1600 (d) 400

**212. During transcription the DNA stand with 3 → 5 polarity of the structural gene always acts as a template because**

- (a) Enzyme DNA dependent RNA polymerase always catalyse polymerization in biorth the directions.  
 (b) Enzyme DNA dependent RNA polymerase always catalyse the polymerisation 5' → 3' directions.  
 (c) Nucleotides of DNA strand with 5' → 3' are transferred to mRNA

(d) Enzyme DNA dependent RNA polymerase always catalyse the polymerisation 3 → 5 directions.

**213. According to David Tilman's long term ecosystem experiments, the total biomass in plots with more species shows,**

- (a) Average variation from year-to-year.
- (b) Less variation from year-to-year.
- (c) No variation from year-to-year.
- (d) High variation from year-to-year.

**214. Identify the incorrect statement regarding the flow of energy between various components of the food chain.**

- (a) Green plants capture about 10% of the solar energy that falls on leaves.
- (b) The amount of energy available at each trophic level is 10% of previous trophic level.
- (c) Each trophic level loses some energy as heat to the environment.
- (d) Energy flow is unidirectional.

**215. Find out the correct match.**

(a)

|     | Disease    | Pathogen          | Main organ affected |
|-----|------------|-------------------|---------------------|
| (A) | Filariasis | Common round worm | Smallintestine      |

(b)

|     | Disease  | Pathogen | Main organ affected |
|-----|----------|----------|---------------------|
| (B) | Ringworm | Fungus   | Skin                |

(c)

|     | Disease   | Pathogen | Main organ affected |
|-----|-----------|----------|---------------------|
| (C) | Dysentery | Protozoa | Liver               |

(d)

|     | Disease | Pathogen | Main organ affected |
|-----|---------|----------|---------------------|
| (D) | Typhoid | Bacteria | Lungs               |

**216. Match the following columns and choose the correct option:**

| Column - I                | Column - II          |
|---------------------------|----------------------|
| 1. Haemophilus influenzae | p. Malignant malaria |
| 2. Entamoeba histolytica  | q. Elephantiasis     |
| 3. Plasmodium falciparum  | r. Pneumonia         |
| 4. Wuchereria bancrofti   | s. Amoebiasis        |

(a) 1 – s, 2 – p, 3 – q, 4 – r

(b) 1 – q, 2 – r, 3 – s, 4 – p

(c) 1 – r, 2 – p, 3 – q, 4 – s

(d) 1 – r, 2 – s, 3 – p, 4 – q

**217. From the following tools / techniques of genetic engineering, identify those which are required for cloning a bacterial gene in animal cells and choose the correct**

- (I) Endonuclease (II) Ligase  
 (III) A. tumefaciens (IV) Microinjection  
 (V) Gene gun (VI) Lysozyme  
 (VII) Cellulase (VIII) Electrophoresis

(a) I, III, IV, V, VII

(b) II, III, V, VII, VIII

(c) II, III, IV, VI, VII, VIII

(d) I, II, IV, VI, VIII

**218. Match the column-I with column-II and choose the correct option from the following:**

| Column – I (Plant groups) | Column - II (Examples) |
|---------------------------|------------------------|
| 1. Bryophyta              | p. Pinus               |
| 2. Gymnosperm             | q. Adiantum            |
| 3. Algae                  | r. Sphagnum            |
| 4. Pteridophyta           | s. Ectocarpus          |

(a) 1 – q, 2 – p, 3 – s, 4 – r

(b) 1 – s, 2 – r, 3 – q, 4 – p

(c) 1 – q, 2 – s, 3 – p, 4 – r

(d) 1 – r, 2 – p, 3 – s, 4 – q

**219. Flame cells present in the members of platyhelminthes are specialized to perform,**

(a) Respiration and Excretion

- (b) Osmoregulation and Circulation  
(c) Respiration and Osmoregulation  
(d) Osmoregulation and Excretion

**220. Identify the floral formula of plant belonging to potato family.**

- (a)  $\frac{\text{♂}}{+}, P_{3+3}, A_{3+3}, G_{(3)}$  (b)  $\frac{\text{♂}}{+}, K_{(5)}, \overbrace{C_{(5)} A_5}, G_{(2)}$   
(c)  $\frac{\text{♂}}{+}, K_{(5)}, C_{(5)}, A_{(9)+1}, G_1$  (d)  $\frac{\text{♂}}{+}, K_{(5)}, C_{(5)}, A_{(9)+1}, G_1$

**221. When the vascular cambium is present between the xylem and phloem, then the vascular bundle is called**

- (a) Endarch (b) Exarch  
(c) Closed (d) Open

**222. The function of Typhlosole in earthworm is**

- (a) Transportation  
(b) Grinding of soil particles  
(c) Increasing the effective area of absorption in the intestine  
(d) Grinding of decaying leaves

**223. Select the correctly matched pair of organisms with their order. Options:**

- (a) Homo, sapiens: Poales  
(b) Triticum, aestivum : Sapindales  
(c) Mangifera, indica : Primata  
(d) Musa, domestica : Diptera

**224. Match List-I and List-II with respect to proteins and their functions and select the correct option.**

| List - I    | List - II                         |
|-------------|-----------------------------------|
| 1. Collagen | p. Fights infectious agents       |
| 2. Trypsin  | q. Hormone                        |
| 3. Insulin  | r. Enzyme                         |
| 4. Antibody | s. Intercellular ground substance |

- (a) 1 – s, 2 – r, 3 – q, 4 – p  
(b) 1 – q, 2 – r, 3 – q, 4 – s

(c)  $1 - s, 2 - p, 3 - r, 4 - p$

(d)  $1 - s, 2 - q, 3 - r, 4 - p$

**225. The complex formed by a pair of synapsed homologous chromosomes is called,**

(a) Bivalent (b) Pentavalent

(c) Univalent (d) Triad

**226. Match column-I with column-II. Select the option with correct combination.**

| Column - I     | Column - II                                                       |
|----------------|-------------------------------------------------------------------|
| 1. Hypertonic  | (p) Two molecules move in the same direction across the membrane. |
| 2. Capillarity | (q) External solution is more concentrated than cell sap.         |
| 3. Symport     | (r) Water loss in the form of droplets.                           |
| 4. Guttation   | (s) Ability of water to rise in thin tubes.                       |

(a)  $1 - q, 2 - p, 3 - s, 4 - r$

(b)  $1 - q, 2 - s, 3 - r, 4 - p$

(c)  $1 - q, 2 - s, 3 - p, 4 - r$

(d)  $1 - q, 2 - r, 3 - p, 4 - s$

**227. Toxicity of which micronutrient induces deficiency of iron, magnesium and calcium?**

(a) Manganese (b) Zinc

(c) Boron (d) Molybdenum

**228. Considering the stroke volume of an adult healthy being is 70 mL, identify the cardiac output in one hour from the following:**

(a) 302.4 Lit/ hour (b) 5.04 Lit/ hour

(c) 50.40 Lit/ hour (d) 30.24 Lit/ hour

**229. Function of contractile vacuole in Amoeba is**

(a) Osmoregulation and movements

(b) Excretion and osmoregulation

(c) Digestion and excretion

(d) Digestion and respiration

**230. Atrial Natriuretic Factor (ANF) acts as a**

- (a) Vasoconstrictor
- (b) Check on Renin-Angiotension mechanism
- (c) Hypertension inducer
- (d) Promoter on Renin-Angiotension mechanism

**231. The vibrations from the ear drum are transmitted through ear ossicles to**

- (a) Tectorial membrane
- (b) Cochlea
- (c) Auditory nerves
- (d) Oval window

**232. Bamboo species flowers**

- (a) Once in lifetime
- (b) Every year
- (c) Twice in 50 – 100 years
- (d) Once in 12 years

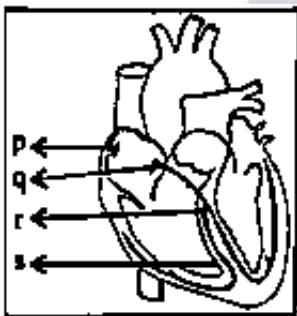
**233. In Bryophyllum, the adventitious buds arise from**

- (a) Shoot apex
- (b) Leaf axil
- (c) Leaf base
- (d) Notches in the leaf margin

**234. Primary endosperm nucleus is formed by fusion of**

- (a) One polar nucleus and male gamete
- (b) Two polar nuclei and one male gamete
- (c) Two polar nuclei and two male gamete
- (d) Ovum and male gamete

**235. Identify the option showing the correct labelling for  $p$ ,  $q$ ,  $r$  and  $s$  with reference to the conducting system of the human heart.**



- (a) p-Bundle of His, q-SAN, r-Interventricular septum, s-AVN
- (b) p-SAN, q-AV N, r-Bundle of His, s-Interventricular septum
- (c) p-Interventricular septum, q-AVN, r-Bundle of His, s-SAN
- (d) p-AVN, q-SAN, r-Interventricular septum, s-Bundle of His

**236. In the female reproductive system, a tiny finger like structure which lies at the upper junction of the two labia minora above the urethral opening is called**

- (a) Clitoris
- (b) Hymen
- (c) Vagina
- (d) Mons pubis

237. Consider the following statements with reference to female reproductive system:

**Statement 1:** The presence or absence of hymen is not a reliable indicator of virginity or sexual experience

**Statement 2:** The sex of the foetus is determined by the father and not by the mother.

Choose the correct option from the following:

- (a) Statement 1 is wrong and Statement 2 is correct
- (b) Statement 1 is correct and Statement 2 is wrong
- (c) Both Statement 1 and Statement 2 are wrong
- (d) Both Statement 1 and Statement 2 are correct

238. The male sex accessory ducts include,

- (a) Rete testis, vasa efferentia, seminal vesicle and vas deferens
- (b) Rete testis, vasa efferentia, epididymis and seminal vesicle
- (c) Rete testis, vasa efferentia, epididymis and vas deferens
- (d) Rete testis, urethra, epididymis and vas deferens

239. With reference to human sperm, match the List - I with List - II.

| List - I        | List - II                   |
|-----------------|-----------------------------|
| 1. Head         | p. Filled with enzyme       |
| 2. Acrosome     | q. Contains mitochondria    |
| 3. Middle piece | r. Sperm mobility           |
| 4. Tail         | s. Contains haploid nucleus |

Choose the correct option from the following:

- (a) 1 – q, 2 – s, 3 – r, 4 – p
- (b) 1 – s, 2 – p, 3 – q, 4 – r
- (c) 1 – r, 2 – q, 3 – s, 4 – p
- (d) 1 – s, 2 – r, 3 – p, 4 – q

240. Which pair of the following cells in the embryo sac are destined to change their ploidy after fertilization?

- (a) Central cell and antipodals
- (b) Antipodals and synergids

- (c) Egg cell and central cell
- (d) Synergids and egg cell

