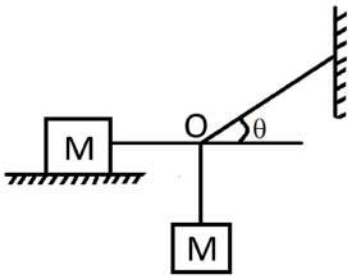
KCET-2025

PAPER WITH ANSWER KEY

(HELD ON WEDNESDAY 16TH APRIL 2025)

PHYSICS

1. 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 co-efficient of static friction between the block on the floor with the floor itself is



(1) $\mu = \cot\theta$ (2) $\mu = \sin\theta$ (3) $\mu = \tan\theta$ (4) $\mu = \cos\theta$

Ans. 1

Solution:

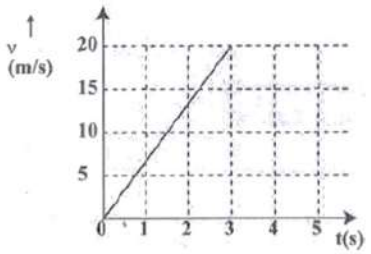
$T\sin\theta = Mg \quad .....(i)$

$T\cos\theta = \mu Mg \quad .....(ii)$

(ii) – (i) given

$$\mu = \frac{\cos\theta}{\sin\theta} = \cot\theta$$

2. 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 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 $g \simeq 10\,ms^{-2}$)



(1) 4.4 kg (2) 1.2 kg (3) 1.0 kg (4) 2.2 kg

Ans. 4

Solution:

Friction must be kinetic

$$a = \frac{v-u}{t} = \frac{20-0}{3} = \frac{20}{3}\,m/s^2$$

$F - f_k = ma$

$$20 - 0.25m \times 10 = m \times \frac{20}{3}$$

$m = 2.2$ kg

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

(1) 8 J (2) 16 J (3) 32 J (4) 4 J

Ans. 4

Solution:

$$W_{net} = \Delta KE$$

$$= \frac{1}{2}mv^2 - \frac{1}{2}mu^2$$

$$= \frac{1}{2} \times 0.25\left(k(2)^{3/2}\right)^2 - 0$$

$$= \frac{1}{2} \times 0.25 \times 2^2 \times 2^3$$

$$= 4J$$

4. 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.

(1) II and III only (2) I and III only (3) I, II and III (4) I and II only

Ans. 3

Solution:

I. Final total kinetic energy equals initial

II. Linear momentum is always conserved

III. During collision kinetic energy gets parthy converted to potential energy

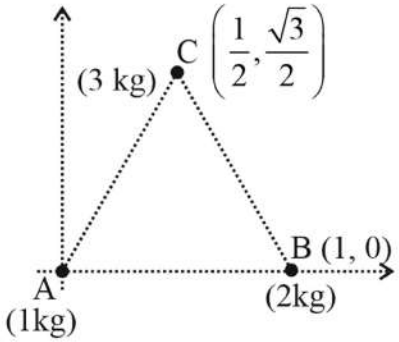
$\therefore$ All statements are correct

5. 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 centre of mass of the system from vertex A (located at origin) is

(1) $\left(\frac{7}{12}, \frac{3\sqrt{3}}{12}\right)$ (2) $\left(\frac{9}{12}, \frac{3\sqrt{3}}{12}\right)$ (3) $\left(\frac{7}{12}, \frac{6+3\sqrt{3}}{12}\right)$ (4) (0, 0)

Ans. 1

Solution:



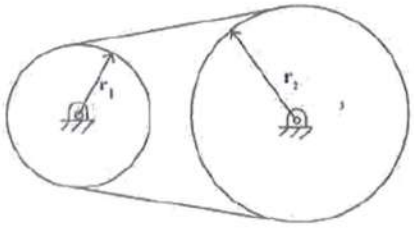
$$x_{cm} = \frac{\sum mixi}{\sum mi}$$

$$= \frac{1\times 0 + 2\times 1 + 3\times \frac{1}{2}}{6} = \frac{7}{12}$$

$$y_{cm} = \frac{\sum miyi}{\sum mi} = \frac{1\times 0 + 2\times 0 + 3\times \frac{\sqrt{3}}{2}}{6} = \frac{3\sqrt{3}}{12}$$

6. Two fly wheels are connected by a non-slipping belt as shown in the figure. $I_1 = 4\,kg\,m^2, r_1 = 20\,cm$, $I_2 = 20\,kg\,m^2$ and $r_2 = 30\,cm$. 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)	$\frac{5}{2}$



(1) a – ii, b – iii, c – i (2) a – iii, b – i, c – ii (3) a – ii, b – i, c – iii (4) a – iii, b – ii, c – i

Ans. 4

Solution:

$T_1 = I_1\alpha_1$ $\alpha_2 H_2 = \alpha_1 H_1$

$10 = \alpha_1 \times 4$ $\alpha_2 \times 0.3 = \frac{5}{2}\times 0.2$

$\therefore \alpha_1 = \frac{5}{2}SI$ $\alpha_2 = \frac{5}{3}SI$

$\therefore T_2 = I_2\alpha_2 = 20\times\frac{5}{3} = \frac{100}{3}SI$

7. 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

(1) $r_p > r_a, v_p > v_a, L_a > L_p$ (2) $r_p < r_a, v_p > v_a, L_a = L_p$

(3) $r_p > r_a, v_p < v_a, L_a = L_p$ (4) $r_p < r_a, v_p < v_a, L_a < L_p$

Ans. 2

Solution:

Angular momentum is conserved

$\therefore L_p = L_a$

Perihelion is point closet to the sun.

$\therefore r_p < r_a$

Also, $mv_p r_p = mv_a r_a$

$\therefore v_p > v_a$

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

(1) $-\frac{1}{(R+h)}$ (2) $\frac{1}{(R+h)^2}$ (3) $-\frac{1}{(R+h)^2}$ (4) $\frac{1}{(R+h)}$

Ans. 1

Solution:

$$E_{tot} = -\frac{GMm}{2(Rth)}$$

9. 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

(1) 3 : 4 (2) 2 : 3 (3) 3 : 2 (4) 4 : 3

Ans. 4

Solution:

$$\frac{F}{A} = y\frac{\Delta\ell}{\ell} \Rightarrow \Delta\ell = \frac{F\ell}{AY} = \frac{F\ell}{\pi r^2 y}$$

$$\therefore \frac{\Delta\ell_1}{\Delta\ell_2} = \left(\frac{\ell_1}{\ell_2}\right) \times \left(\frac{r_2}{r_1}\right)^2$$

$$= \frac{1}{3} \times \left(\frac{2}{1}\right)^2 = \frac{4}{3} \text{ or } 4:3$$

10. 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}]

(1) 300 Pa (2) 400 Pa (3) 500 Pa (4) 200 Pa

Ans. 3

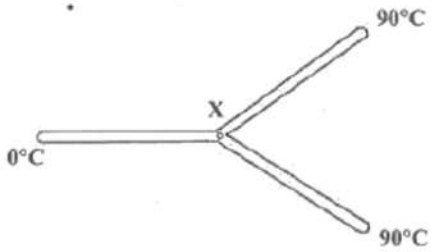
Solution:

$$A_2V_2 = A_1V_1 \qquad \therefore V_2 = \frac{A_1V_1}{A_2} = \frac{10\times1}{5} = 2m/s$$

$$P_2 + \frac{1}{2}PV_2^2 = P_1 + \frac{1}{2}PV_1^2$$

$$P_2 = 2000 + \frac{1}{2}\times1000\times\left(1^2 - 2^2\right) = 500Pa$$

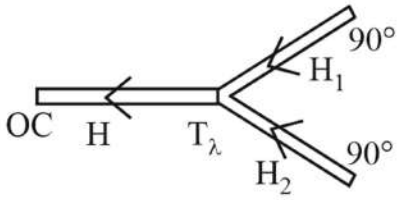
11. Three metal rods of the same material and identical in all respects are joined as shown in the figure. The temperatures at the ends of these rods are maintained as indicated. Assuming no heat energy loss occurs through the curved surfaces of the rods, the temperature at the junction x is



(1) 60° C (2) 30° C (3) 20° C (4) 45° C

Ans. 1

Solution:



Thermal let resistance of each rod be R & temperature of junction = T_x

$H = H_1 + H_2$

$$\frac{T_x - 0}{R} = \frac{90 - T_x}{R} + \frac{90 - T_x}{R}$$

$3T_x = 180$

$T_x = 60°C$

12. 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

(1) $W_1 = W_2$ (2) $Q_1 - W_1 = Q_2 - W_2$

(3) $Q_1 + W_1 = Q_2 + W_2$ (4) $Q_1 = Q_2$

Ans. 2

Solution:

$\Delta U = Q - W$ (By Ist law of thermodynamics)

$\Delta U_1 = \Delta U_2$

$Q_1 - W_1 = Q_2 - W_2$

13. 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

(1) $\frac{E_1}{\sqrt{2}}$ (2) $\sqrt{2}E_1$ (3) $2E_1$ (4) $\frac{E_1}{2}$

Ans. 3

Solution:

KE mean $\propto$ T. (T→temperature in kelris)

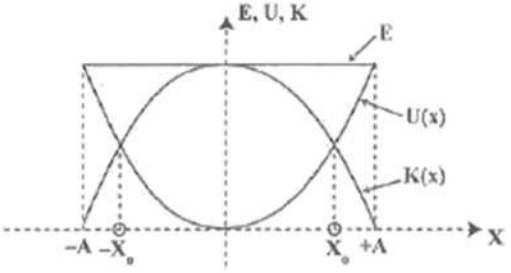
$$\frac{E_1}{E_2} = \frac{T_1}{T_2}$$

$$E_2 = E_1 \frac{T_2}{T_1}$$

$$= E_1 \left(\frac{327 + 273}{27 + 273} \right)$$

$$= E_1 \left(\frac{600}{300} \right) = 2E_1$$

14. 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



(1) 2A (2) $\frac{A}{\sqrt{2}}$ (3) $\sqrt{2}\,A$ (4) $\frac{A}{2}$

Ans. 2

Solution:

At X_0

KE = PE

$$\frac{1}{2} m w^2 \left(A^2 - x^2 \right) = \frac{1}{2} m w^2 x^2$$

$$2x^2 = A^2$$

$$x = \frac{A}{\sqrt{2}} \qquad \boxed{x_0 = \frac{A}{\sqrt{2}}}$$

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

(1) $\frac{\pi}{4}$ radian (2) $\frac{\pi}{2}$ radian (3) π radian (4) Zero radian

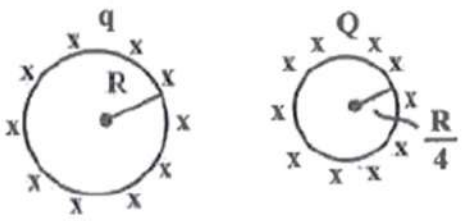
Ans. 2

Solution:

In transverse wave particle oscillates perpendicular to direction of propagation of wave.

Hence angle is $\frac{\pi}{2}$ radian .

16. 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 ?



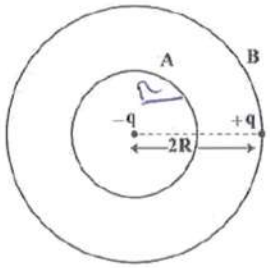
(1) $\frac{Q}{\varepsilon_0}-\frac{q}{\varepsilon_0}$ (2) Zero (3) $\frac{q}{\varepsilon_0}-\frac{Q}{\varepsilon_0}$ (4) $\frac{Q}{\varepsilon_0}$

Ans. 2

Solution:

Since spheres are electrostatically shielded from each other, $\phi = 0$.

17. 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



(1) q/ε_0 (2) Zero (3) $2q/\varepsilon_0$ (4) $-q/\varepsilon_0$

Ans. 4

Solution:

$$\phi_{\text{sphere}} A = \frac{\text{charge enclosed}}{\varepsilon_0} (\text{By gauss law})$$

$$= \frac{-q}{\varepsilon_0}$$

18. A potential at a point A is – 3 V and that at another point B is 5V. What is the work done in carrying a charge of 5m C from B to A ?

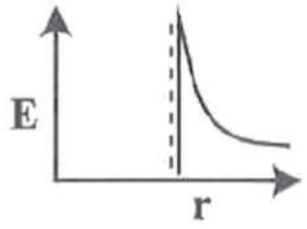
(1) – 0.04 J (2) – 0.4 J (3) – 4 J (4) – 40 J

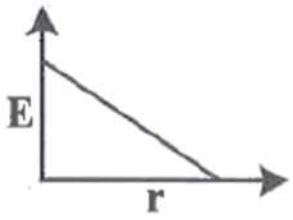
Ans. 1

Solution:

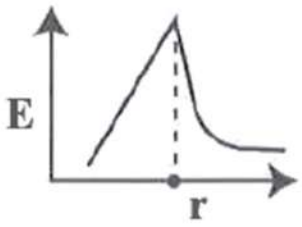
$$W_{ext} = q\Delta V$$
$$= q(V_f - V_i)$$
$$= 5\times10^{-3}(V_A - V_B)$$
$$= 5\times10^{-3}(-3,-5)$$
$$= -8\times5\times10^{-3}\,J$$
$$= -40\times10^{-3}\,J$$
$$= -0.04J$$

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

(1) 

(2) 

(3) 

(4) 

Ans. 1

Solution:

For conducting sphere

$E = 0$ for $r < R$

$E = \frac{kQ}{r^2}$ for $r \geq R$

So graph must be (1)

20. 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° b) 120° c) 90°	i) –pE ii) pE iii) $\frac{1}{2}$ pE iv) Zero

(1) a – i, b – ii, c – iii (2) a – ii, b – iii, c – i (3) a – ii, b – i, c – iv (4) a – ii, b – iii, c – iv

Ans. 4

Solution:

PE of dipole $= -\vec{p}.\vec{E} = -pE\cos\theta$

(a) $\theta = 180°$ $PE = -pE\cos 180° = pE \rightarrow (ii)$

(b) $\theta = 120°$ $PE = -pE\cos 120° = -pE\left(\frac{-1}{2}\right) = \frac{pE}{2} \rightarrow (iii)$

(c) $\theta = 90°$ $PE = -pE\cos 90° = 0 \rightarrow (iv)$

a → (ii), b → (iii), c → (iv)

21. Which of the following statements is not true?

(1) Work done to move a charge on an equipotential surface is not zero

(2) Equipotential surfaces are the surfaces where the potential is constant

(3) Equipotential surfaces for a uniform electric field are parallel and equidistant from each other

(4) Electric field is always perpendicular to an equipotential surfaces.

Ans. 1

Solution:

Equipotential surface is having same potential at every point so work done in moving a charge from one point to other is O.

22. Which of the following is a correct statement?

(1) Gauss's law is true for any open surface

(2) Gauss's law is not applicable when charges are not symmetrically distributed over a closed surface.

(3) Gauss's law does not hold good for a charge situated outside the Gaussian surface.

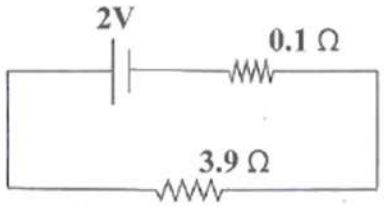
(4) Gauss's law is true for any closed surface

Ans. 4

Solution:

Gauss law is valid only for closed surface and charge should be enclosed inside the closed surface to get flux through the closed surface.

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



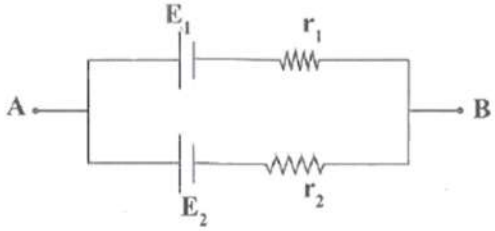
(1) 1.68 V (2) 1.95 V (3) 2.71 V (4) 0.52 V

Ans. 2

Solution:

$$i = \frac{2}{4} = \frac{1}{2}A \rightarrow \text{Terminal voltage} = 2 - \frac{1}{2} \times 0.1 = 1.95V$$

24. 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



(1) $E_1 < E_{eq} < E_2$ and E_{eq} is nearer E_2

(2) $E_{eq} > E_2$

(3) $E_{eq} < E_1$

(4) $E_1 < E_{eq} < E_2$ and E_{eq} is nearer E_1

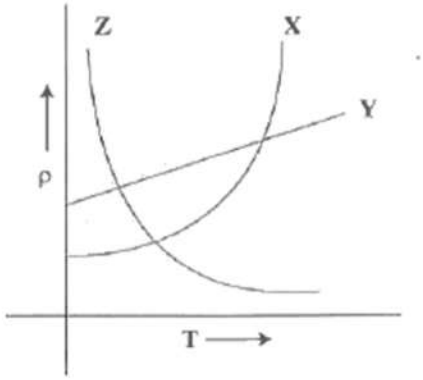
Ans. 4

Solution:

$$\varepsilon eq = \frac{\frac{\varepsilon 1}{r_1} + \frac{\varepsilon_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}} = \frac{\varepsilon_1 r_2 + \varepsilon_2 r_1}{r_1 + r_2}$$

Between E_1 & E_2.

25. 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.



(1) X – copper, Y – semiconductor, Z – nichrome

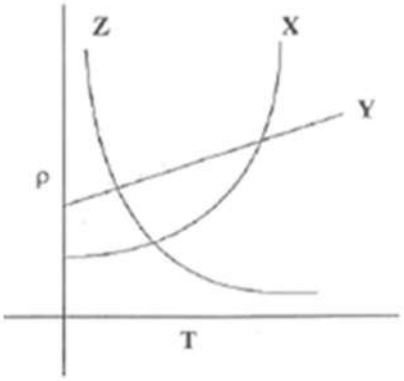
(2) X – semiconductor, Y – nichrome, Z – copper

(3) X – nichrome, Y – copper, Z – semiconductor

(4) X – copper, Y – nichrome, Z - semiconductor

Ans. 4

Solution:



X is copper, Y is nichrome, Z is semiconductor

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

(1) Drift speed

(2) Current and drift sped

(3) Current only

(4) Current, electric field and drift speed

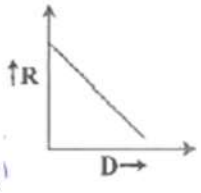
Ans. 3

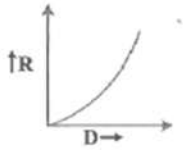
Solution:

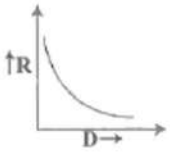
Current only

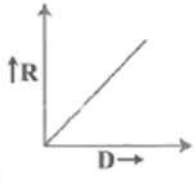
Current is every cross section is same irrespective of area of cross section

27. 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

(1) 

(2) 

(3) 

(4) 

Ans. 3

Solution:

$$R = \frac{\rho\ell}{A} = \frac{\rho\ell}{\pi r^2} \quad R\ \alpha \frac{1}{r^2}$$

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

(1) Attract each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r}$

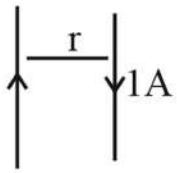
(2) Repel each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r}$

(3) Repel each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r^2}$

(4) Attract each other with a force per unit length of $\frac{\mu_0 I^2}{2\pi r^2}$

Ans. 2

Solution:



$$\frac{f}{\ell} = \frac{\mu_0 i, i_2}{t\pi r}$$

If they carry opposite currently they repeat each other

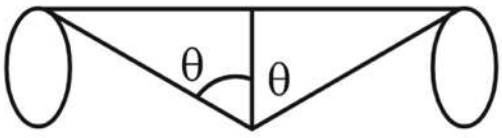
29. A solenoid is 1m long and 4 cm in diameter. It has five layers of windings of 1000 turns each and carries a current of 7A. The magnetic field at the centre of the solenoid is

(1) 0.4396×10^{-5} T (2) 4.396×10^{-2} T (3) 43.96×10^{-2} T (4) 439.6 T

Ans. 2

Solution:

$\ell = 1\text{m}$; $r = 2\text{cm}$; $N = 5000$; $t = 7\text{A}$; $\sin\theta \approx 1$



$$B = \frac{\mu_0 Ni}{\ell}\sin\theta$$

$$B = \frac{4\pi \times 10^{-7} \times 5000 \times 7 \times 1}{1}$$

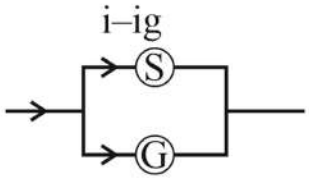
$$B = 4.396 \times 10^{-2} T$$

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

(1) Zero (2) More (3) Less (4) Equal

Ans. 3

Solution:



$$(i - i_g)s = i_g G$$

$$is = ig(h + s)$$

$$i = ig\left(\frac{g}{s} + 1\right)$$

More 'S', less i

So milliammeter will have more shunt resistance.

31. Which of the following statements is true in respect of diamagnetic susbtances?

(1) They are feebly attracted by magnets

(2) Permeability is greater than 1000

(3) Susceptibility decreases with temperature.

(4) Susceptibility is small and negative

Ans. 4

Solution:

Susceptibility of diamagnetic substance is small & negative

32. Identify the correct statement

(1) A current carrying conductor produces an electric field around it.

(2) A straight current carrying conductor has circular magnetic field lines around it.

(3) The direction of magnetic field due to a current element is given by Flemings Left Hand Rule

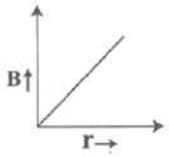
(4) The magnetic field inside a solenoid is non-uniform

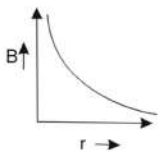
Ans. 2

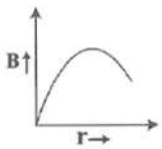
Solution:

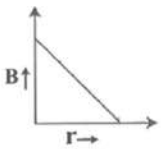
For a straight current carrying wire magnetic field lines forms circular loop around it.

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

(1) 

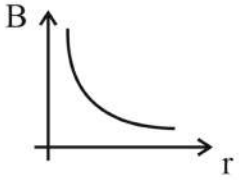
(2) 

(3) 

(4) 

Ans. 2

Solution:



$B = \frac{\mu_0 i}{2\pi r}$

$B\alpha\frac{1}{r}$ $\therefore$ Graph is rectangular hyperbola.

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

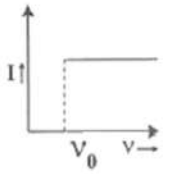
(1) Angular momentum (2) Energy (3) Velocity (4) Momentum

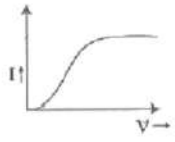
Ans. 4

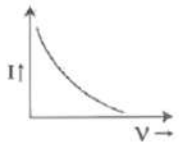
Solution:

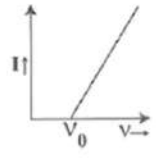
$\lambda = \frac{h}{p}$ if λ same then P i.e., momentum is same.

35. 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 v of incident light is

(1) 

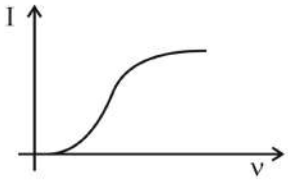
(2) 

(3) 

(4) 

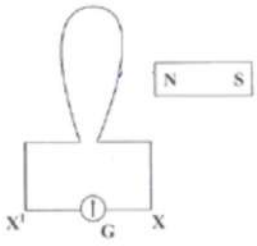
Ans. 1

Solution:



theoretical

36. 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



(1) Deflects towards X^1 (2) Does not deflect (3) Oscillates (4) Deflects towards X

Ans. 1

Solution:

According to lenz law should oppose the charge in flux. $\therefore$ deflects towards X'.

37. A square loop of side 2m lies in the Y-Z plane in a region having a magnetic field $\vec{B}=\left(5\hat{i}+3\hat{j}-4\hat{k}\right)T$. The magnitude of magnetic flux through the square loop is

(1) 20 Wb (2) 12 Wb (3) 16 Wb (4) 10 Wb

Ans. 1

Solution:

$\overline{A}=(2\times 2)\hat{i}$ [as loop is in y-z plane]

$=4\hat{i}$

$\overline{B}=5\hat{i}+3\hat{j}-4\hat{k}T$

$\therefore \phi=\overline{B}.\overline{A}=\left(5\hat{i}+3\hat{j}-4\hat{k}\right).4\hat{i}$

$=20Wb$

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

(1) AC voltage and DC current

(2) DC voltage and DC current

(3) DC voltage and AC current

(4) AC voltage and AC current

Ans. 4

Solution:

Domestic supply is AC voltage & AC current.

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

(1) 200V, 50 Hz (2) 220 V, 100 Hz (3) 220 V, 50 Hz (4) 200V, 100 Hz

Ans. 3

Solution:

$V = 311 \sin 314t$ $\quad V_{rms}=\frac{V_0}{\sqrt{2}}=\frac{311}{\sqrt{2}}=220V$

$W=2\pi f$

$314=2\pi f \Rightarrow f=50Hz$ [For sinusoidal AC]

40. A series LCR circuit containing an AC source of 100V has an inductor and a capacitor of reactances 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

(1) 80 V (2) 400 V (3) 8 V (4) 40 V

Ans. 1

Solution:

$X_C=24\Omega$

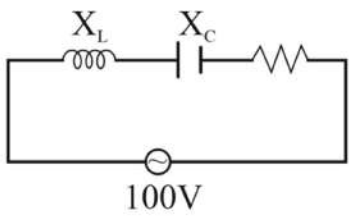
$X_L=16\Omega$

$R=6\Omega$

$Z=\sqrt{R^2+(X_C-X_L)^2}$

$=\sqrt{6^2+8^2}$

$=\sqrt{100}=10\Omega$



$$i = \frac{V}{Z} = \frac{100}{10} = 10A$$

Net voltage across capacitor and inductor

$$= i(X_C - X_L)$$

$$= 10(24 - 16)$$

$$= 10(8)$$

$$= 80V$$

41. 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. 1nm to 10^{-3} nm
iii. Ultraviolet	c. 0.1m to 1mm
iv. X-rays	d. 400 nm to 1 nm

(1) i-c, ii-a,iii-d, iv-b (2) i-d, ii-b, iii-c, iv-a (3) i-b, ii-c, iii-a, iv-d (4) i-a, ii-d, iii-b, iv-c

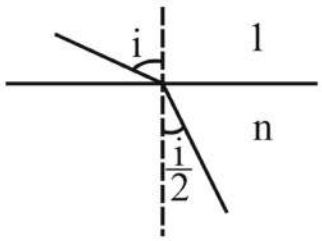
Ans. 1

42. A ray of light passes from vaccum 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

(1) $\text{Sin}^{-1}\left(\frac{n}{2}\right)$ (2) $2\text{Cos}^{-1}\left(\frac{n}{2}\right)$ (3) $2\text{Sin}^{-1}\left(\frac{n}{2}\right)$ (4) $\text{Cos}^{-1}\left(\frac{n}{2}\right)$

Ans. 2

Solution:



$$1 \times \sin i = n \sin\frac{i}{2}$$

$$2\sin\frac{i}{2}\cos\frac{i}{2} = n\sin\frac{i}{2}$$

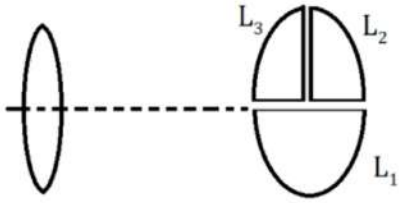
$$2\cos\frac{i}{2} = n$$

$$\cos\frac{i}{2} = \frac{n}{2}$$

$$\frac{i}{2} = \cos^{-1}\left(\frac{n}{2}\right)$$

$$i = 2\cos^{-1}\left(\frac{n}{2}\right)$$

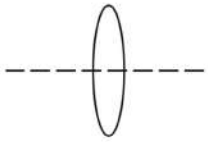
43. A convex lens has power P. It is cut into two halves along its principal axis. Further one piece (out of two halves) is cut into two halves perpendicular to the principal axis as shown in figure. Choose the incorrect option for the reported lens pieces



(1) Power of L_2 is $\frac{P}{2}$ (2) Power of L_3 is $\frac{P}{2}$ (3) Power of L_1 is P (4) Power of L_1 is $\frac{P}{2}$

Ans. 4

Solution:



$$P_2\frac{1}{F}=(\mu-1)\frac{2}{R}$$

Power of L1 $\nabla \rightarrow P_{L_1}=(\mu-1)\frac{2}{R}=P$

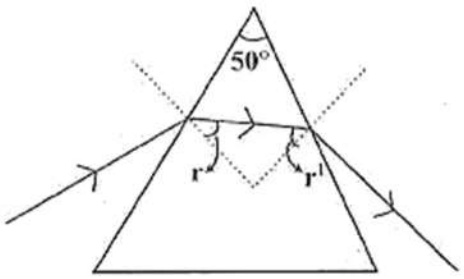
44. The image formed by an objective lens of a compound microscope is

(1) Real and diminished (2) Real and enlarged

(3) Virtual and enlarged (4) Virtual and diminished

Ans. 2

45. If r and r^1 denotes 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 the time r^1 will vary with time as



(1) $40^\circ+t^2$ (2) $50^\circ-t^2$ (3) $50^\circ+t^2$ (4) $40^\circ-t^2$

Ans. 4

Solution:

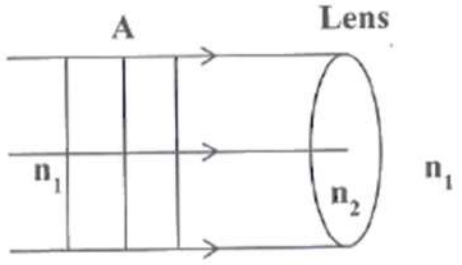
$r=r^1=50^\circ$

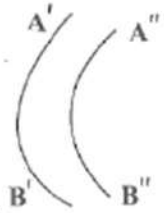
$10+t^2+r^1=50$

$r^1=50-10-t^2$

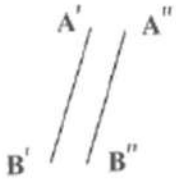
$=40-t^2$

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



(1) 

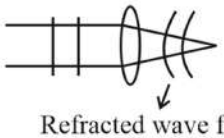
(2) 

(3) 

(4) 

Ans. 1

Solution:



Refracted wave front

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

(1) remains same

(2) increases

(3) either increases or decreases depending upon angle of incidence

(4) decreases

Ans. 1

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

(1) 8r (2) 4r (3) $2\sqrt{2}r$ (4) 2r

Ans. 2

Solution:

$$r\alpha\frac{n^2}{7}$$

$N = 2$; $r_2 = 2^2 r = 4r$

49. Match the following types of nuclei with examples shown

Column-I	Column-II
A. Isotopes	i. Li^7, Be^7
B. Isobars	ii. $_8O^{18}$, $_9F^{19}$
C. Isotopes	iii. $_1H^1$, $_1H^2$

(1) A-ii, B-iii, C-i (2) A-i, B-iii, C-ii (3) A-iii, B-ii, C-i (4) A-iii, B-i, C-ii

Ans. 4

Solution:

Isotopes : ${}_1H^1$, ${}_1H^2$ (Same Z)

Isobars : ${}_3Li^7$, ${}_4Be^7$ (Same A)

Isotone : ${}_8O^{18}$, ${}_9O^{19}$ Same (A – Z)

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

(1) Nuclear force becomes attractive for nucleon distances larger than 0.8 fm

(2) Nuclear force becomes repulsive for nucleon distances less then 0.8fm

(3) Nuclear force is always attractive

(4) Potential energy is minimum, if the separation between the nucleons is 0.8 fm

Ans. 3

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

(1) $\rho \to 10^{-5} - 10^{-6}\Omega m$, $\sigma \to 10^{5} - 10^{-6} Sm^{-1}$

(2) $\rho \to 10^{11} - 10^{19}\Omega m$, $\sigma \to 10^{-11} - 10^{-19} Sm^{-1}$

(3) $\rho \to 10^{2} - 10^{8}\Omega m$, $\sigma \to 10^{-2} - 10^{-8} Sm^{-1}$

(4) $\rho \to 10^{-2} - 10^{-8}\Omega m$, $\sigma \to 10^{2} - 10^{8} Sm^{-1}$

Ans. 4

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

(1) The donor energy level lies closely above the top of the valance band

(2) The donor energy level lies at the half way mark of forbidden energy gap

(3) The donor energy level does not exist

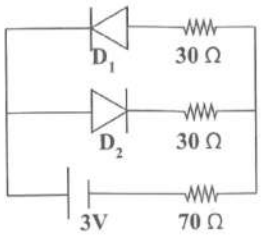
(4) The donor energy level lies just the bottom of the conduction band

Ans. 4

Solution:

In an n-type semiconductor, donor impurities contribute electron energy levels high in the semiconductor band gap, allowing electrons to be easivy excited into the conduction b and. This donar level is located closed to, and just below, the bottom of the conduction band.

53. The circuit shown in 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



(1) 0.01 (2) 0.02 (3) 0.03 (4) 0

Ans. 3

Solution:

$D_1 \Rightarrow$ revere biased, $\Rightarrow$ act as open circuit

$D_2 \Rightarrow$ Forward biased

$R_{eq} = 30 + 70 = 100\Omega$

$$I \Rightarrow \frac{V}{R_{eq}} = \frac{3}{100} = 0.03A$$

54. 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

(1) 1.500 (2) 1.601 (3) 1.399 (4) 1.390

Ans. 1

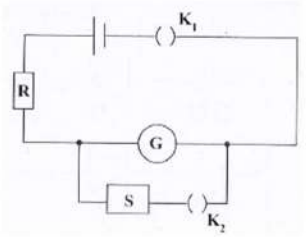
Solution:

Real depth = (8.123 – 5.123) = 3cm

Apparent depth = 8.123 – 6.123 = 2cm

$$n = \frac{R.D}{A.D} = 1.5$$

55. 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 between 13 div. The resistance of galvanometer is nearly

(1) 45.0 Ω (2) 103.0 Ω (3) 91.6 Ω (4) 116.0 Ω

Ans. 3

Solution:

$$G = \frac{S'}{\frac{Q_1}{Q_2} - 1}$$

$$G = \frac{90}{\frac{26}{13} - 1}$$

$$\boxed{G = 90\Omega} \approx 91.6\Omega$$

56. While determining the coefficient of viscosity of the given liquid, a spherical steel ball sinks by a distance $h = 0.9m$. The radius of the ball $r = \sqrt{3} \times 10^{-3} m$. The time taken by the ball to sink in three trails 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 = 10ms^{-2}, then the coefficient of viscosity of the given liquid at room temperature is

(1) 0.14 Pa.s (2) 0.14×10^{-3} Pa. s (3) 14 Pa.s (4) 0.28 Pa.s

Ans. 1

Solution:

$$t_{avg} = \frac{2.75 + 2.65 + 2.70}{3} = 2.7 \sec$$

$$\text{Terminal velocity} = \frac{h}{t_{avg}}$$

$$V_t = \frac{1}{3} m/s$$

$$n = \frac{2}{9} \frac{\pi^2 g\left(S_{stell} - S_{liquid}\right)}{V_t}$$

$$n = 0.14 \, Pa.S$$

57. Which of the following expression can be deduced on the basis of dimensional analysis? (All symbols have their usual meanings)

(1) $x = A\cos\omega t$ (2) $N = N_0 e^{-\lambda t}$ (3) $F = 6\pi\eta r v$ (4) $s = ut + \frac{1}{2}at^2$

Ans. 3

58. 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

(1) $\frac{H}{\Delta t} + \frac{\Delta t}{2g}$ (2) $\frac{H}{g\Delta t} - \frac{\Delta t}{2}$ (3) $\frac{H}{g\Delta t} + \frac{\Delta t}{2}$ (4) $\frac{H}{g\Delta t}$

Ans. 3

Solution:

$$S_1 = \frac{1}{2} g \, t_0^{\,2}$$

$$S_2 = \frac{1}{2} g \left(t_0 - 4t\right)^2$$

$$H = S_1 - S_2$$

$$= \frac{1}{2} g t_0^{\,2} - \frac{1}{2} g \left(t_0 - 4t\right)^2$$

$$H = gt_0 4t - \frac{1}{2} g 4t^2$$

$$t_0 = \frac{H}{g\Delta t} = \frac{1}{2}\Delta t$$

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

(1) Average velocity between any two points on the path

(2) Horizontal component of velocity

(3) Angle between the instantaneous velocity with the horizontal

(4) Vertical component of the velocity of the projectile

Ans. 2

60. 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 $2ms^{-1}$, when the particle attains the lowest 'y' co-ordinate, the acceleration of the particle is (in ms^{-2})

(1) $0.4\hat{j}$ (2) $0.8\hat{i}$ (3) $0.8\hat{j}$ (4) $0.4\hat{i}$

Ans. 3

Solution:

$$(x-2)^2 + y^2 = 25$$

Equation of circle center ⇒ (2, 0)

$$r^2 = 25$$

$$r = 5$$

$$a_c = \frac{v^2}{R} = \frac{2^2}{5}$$

$$= 0.8\,m/s^2$$

$$\vec{a_e} = 0.8\hat{i}\ m/s^2$$

KCET-2025

PAPER WITH ANSWER KEY

(HELD ON WEDNESDAY 16TH APRIL 2025)

CHEMISTRY

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

List-I (Molecule / ion)	List-II (Bond order)
1. NO	i. 15
2. CO	ii. 2.0
3. O_2^-	iii. 2.5
4. O_2	iv. 3.0

(1) a-iii, b-iv, c-i, d-ii (2) a-i, b-iv, c-iii, d-ii (3) a-ii, b-iii, c-iv, d-i (4) a-iv, b-iii, c-ii, d-i

Ans. 1

Solution :

Bond order = $\frac{1}{2}$ [no. of bonding – no. of bonding electrons]

For NO molecule

BO = (8-3)/2 = 2.5

$CO - \frac{1}{2}[10-4] = 3.0$

$O_2^{-1} - \frac{1}{2}[6-3] = 1.5$

$O_2 - \frac{1}{2}[6-2] = 2.0$

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

X: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

Y: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

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

(1) X_3Y, ionic bond (2) X_2Y_3, coordinate bond

(3) XY_3, covalent bond (4) X_2Y, covalent bond

Ans. 3

Solution :

$x : 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3 \Rightarrow p$

$y : 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6 \Rightarrow Cl$

Valency of p = 3 or 5

Valency of Cl = 1

Possible molecules are PCl_3 or PCl_5

Both are covalent

3. Match List-I with List-II

List-I (Types of redox reactions)	List-II (Examples)
a. Combination reaction	i. $Cl_{2(g)} + 2Br^-_{(aq)} \rightarrow 2Cl^-_{(aq)} + Br_{2(l)}$
b. Decomposition reaction	ii. $2H_2O_{2(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)}$
c. Displacement reaction	iii. $CH_{4(g)} + 2O_{2(g)} \xrightarrow{\Delta} CO_{2(g)} + 2H_2O_{(l)}$
d. Disproportionation reaction	iv. $2H_2O_{(l)} \xrightarrow{\Delta} 2H_{2(g)} + O_{2(g)}$

Choose the correct answer from the options given below.

(1) a-iv, b-iii, c-i, d-ii (2) a-ii, b-i, c-iv, d-iii (3) a-iii, b-iv, c-i, d-ii (4) a-iii, b-ii, c-i, d-iv

Ans. 3

Solution :

Combination reaction – no example given

Decomposition reaction - $H_2O_{2(aq)} \rightarrow H_2O_{(\ell)} + O_{2(g)}$

$$H_2O_{(\ell)} \xrightarrow{\Delta} 2H_{2(g)} + O_{2(g)}$$

Displacement reaction - $Cl_{2(g)} + 2Br^-_{(aq)} \rightarrow 2Cl^-_{(aq)} + Br_{2(g)}$

Disproportionation reaction - $2H_2O_{2(aq)} \rightarrow 2H_2O_{(\ell)} + O_{2(g)}$

4. In the following pairs, the one in which both transition metal ions are colourless is

(1) Sc^{3+}, Zn^{2+} (2) V^{2+}, Ti^{3+} (3) Zn^{2+}, Mn^{2+} (4) Ti^{4+}, Cu^{2+}

Ans. 1

Solution :

Ions with d^o and d^{10} donot show d.d transitions, hence colorless

$Sc^{+3} - [Ar]3d^o\ 45^o$

$Zn^{+2} - [Ar]3d^{10}\ 45^o$

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

(1) H_2S is reduced to S, MnO_4^- is oxidised to Mn^{2+}

(2) H_2S is oxidised to SO_2, MnO_4^- is reduced to MnO_2

(3) H_2S is reduced to SO_2, MnO_4^- is oxidised to Mn^{2+}

(4) H_2S is oxidised to S, MnO_4^- is reduced to Mn^{2+}

Ans. 4

Solution :

$H_2S + MnO_4^- + H^+ \rightarrow S + Mn^{+2} + H_2O$

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

(1) Samarium (2) Europium (3) Erbium (4) Cerium

Ans. 4

Solution :

$Ce : [Xe]4f^1 5d^1 6s^2$

$Ce^{+4}:[Xe]4f^{\circ}5d^{\circ}6s^{\circ}$

Since Ce^{+4} has stable noble gas configuration, it is well known to show +4 oxidation sate.

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

(1) Cu, Zn (2) Zn, Cd (3) Cd, Hg (4) Ag, Cu

Ans. 4

Solution :

$Cu:[Ar]3d^{10}4s^1$

$Zn:[Ar]3d^{10}4s^2$

$Cd:[Kr]4d^{10}5s^2$

$Hg:[Xe]4f^{14}5d^{10}6s^2$

$Ag:[Kr]4d^{10}5s^1$

8. 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 _____

(1) Chelate ligand (2) Unidentate ligand (3) Polydentate ligand (4) Ambidentate ligand

Ans. 4

Solution :

Any ligand which has two different donor atoms and only one atom can ligate with metal is ambidentate ligand

9. Which of the following statements are true about $[NiCl_4]^{2-}$?

(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

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

Ans. 1

Solution :

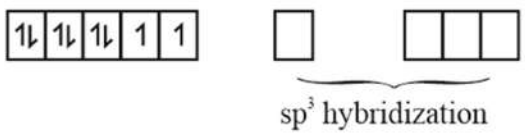
$[Ni\,Cl_4]^{-2}$

O – S of Ni – +2

Coordination no. of Ni^{+2} – 4

Cl^- is weak field ligand, pairing does not take place

$Ni^{+2}-[Ar]3d^8$ $4s^{\circ}$ $4p^{\circ}$



$[NiCl_4]^{-2}$ is paramagnetic

10. Which formula and its name combination is incorrect?

(1) $K_3\left[Cr(C_2O_4)_3\right]$, Potassium trioxalatochromate (III)

(2) $\left[CoCl_2(en)_2\right]Cl$, Dichloridobis (ethane – 1,2 – dimine) cobalt (III) chloride

(3) $\left[Co(NH_3)_5(CO_3)\right]Cl$, Pentaamine carbonylcobalt (III) chloride

(4) $\left[Pt(NH_3)_2Cl(NO_2)\right]$ Diamine chloridonitrito – N – Platinum (II)

Ans. 3

Solution :

$\left[CO(NH_3)_5(CO_3)\right]Cl$

Penta ammine carbonate cobalt (III) chloride.

11. In the complex ion $\left[Fe(C_2O_4)_3\right]^{3-}$, the co-ordination number of Fe is

(1) 4 (2) 5 (3) 6 (4) 3

Ans. 3

Solution :

The coordination no. of Fe is 6

3 as it is forming 6 bonds with the legand.

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

$Glucose \xrightarrow{Reagent} Product \longrightarrow Structural\ prediction$

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 group
d. Hydrogen cyanide	iv. Glucose has a carbonyl group

Choose the correct answer from the options given below.

(1) a-iv, b-iii, c-ii, d-i (2) a-iii, b-i, c-ii, d-iv (3) a-i, b-ii, c-iii, d-iv (4) a-iii, b-ii, c-i, d-iv

Ans. 2

Solution :

a – iii

b – i

c – ii

d – iv

13. The correct sequence of α – amino acids, hormone, vitamin, carbohydrates respectively is

(1) Thiamine, Thyroxine, Vitamin A, Glucose

(2) Glutamine, Insulin, Aspartic acid, Fructose

(3) Arginine, Testosterone, Glutamic acid, Fructose

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

Ans. 4

Solution :

Aspartic acid $\rightarrow$ α – amino acid

Insulin $\rightarrow$ hormone

Ascorbic acid (Vitamin C) $\rightarrow$ Vitamin

Rhamnose (deoxy sugar) $\rightarrow$ Carbohydrate

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

(1) Maltose and Lactose (2) Amylose and Amylopectin

(3) Cellulose and Glycogen (4) Glucose and Fructose

Ans. 2

Solution :

α – links over found in the structure of starch which consists of any lose and amylopectin.

15. 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

(1) It is difficult to identify the end point (2) Nitric acid doesn't act as an indicator

(3) Nitric acid itself is an oxidizing agent (4) Nitric acid is a weak acid than sulphuric acid

Ans. 3

Solution :

Nitric acid is not used in the redox titration because it is a strong OA itself.

16. The group reagent $NH_4Cl(s)$ and aqueous NH_3 will precipitate which of the following ion?

(1) NH_4^+ (2) Al^{3+} (3) Ba^{2+} (4) Ca^{2+}

Ans. 2

Solution :

Nylon in presence of NaCl is used for detection of group III cations which are $Al^{3+}, Fe^{3+}, Cr^{3+}$

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

(1) Convert the organic compound into vapour state

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

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

(4) Decrease the melting point of the compound

Ans. 2

Solution :

The purpose of sodium fusion extract is to convert the element in the organic compound into ionic compound so that the detection could become easier.

18. The sodium fusion extract is boiled with concentrated nitric acid while testing for halogens. By doing so, it

(1) helps in precipitation of AgCl (2) increases the solubility of AgCl

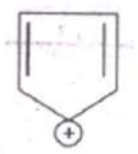
(3) increases the concentration of NO_3^- ion (4) decomposes Na_2S and NaCN, if formed

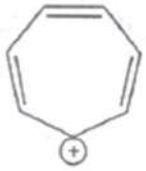
Ans. 4

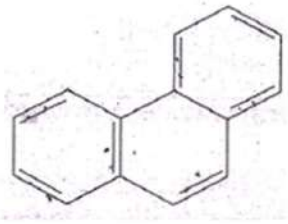
Solution :

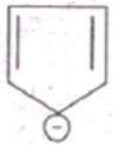
It is done so that if there is any Na_2s or NaCN, it can be decomposed.

19. Which of the following is not an aromatic compound

(1) 

(2) 

(3) 

(4) 

Ans. 1

Solution :

1 is antiaromatic as it has $4\pi\, e^-$.

20. The IUPAC name of the given organic compound is

$HC \equiv C - CH = CH - CH = CH_2$

(1) Hexa – 1 – yn – 3,5 – diene

(2) Hexa – 5 – yn – 1,3 – diene

(3) Hexa -1,3 – dien – 5 – yne

(4) Hexa – 3,5 – dien – 1 – yne

Ans. 3

Solution :

$\overset{6}{HC} \equiv \overset{5}{C} - \overset{4}{CH} = \overset{3}{CH} - \overset{2}{CH} = \overset{1}{CH_2}$

Double bond is given preference over triple bond.

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

(1) $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - CH_2 - CH_3$

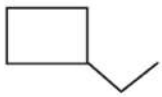
(2) $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

(3) 

(4) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - CH_2 - CH_2 - CH_3$

Ans. 3

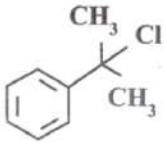
Solution :



MF : C_6H_2

MF : C_6H_{14}

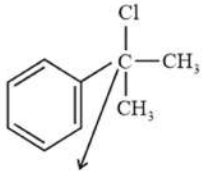
$\therefore$ above compounds are not isomers

22. The organic compound  can be classified as _____

(1) Allylic halide (2) Benzyl halide (3) Aryl halide (4) Alkyl halide

Ans. 2

Solution :



Benzyllic Position

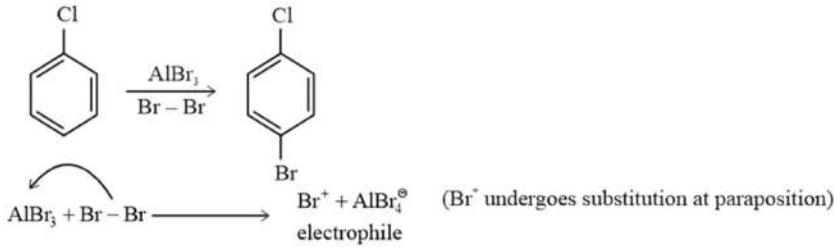
23. Chlorobenzene reacts with bromine gas in the presence of Anhyd $AlBr_3$ to yield p-Bromochlorobenzene. This reaction is classified as _____

(1) Elimination reaction (2) Nucleophilic substitution reaction

(3) Electrophilic substitution reaction (4) Addition reaction

Ans. 3

Solution :

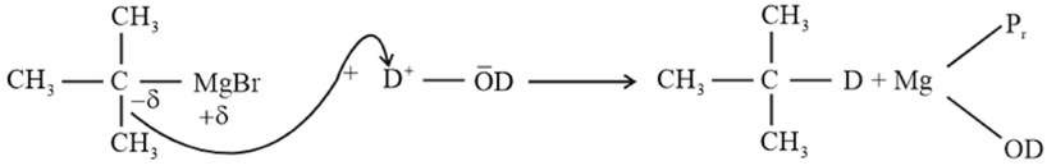


24. The organometallic compound $(CH_3)_3$ CMgBr on reaction with D_2O produces _____

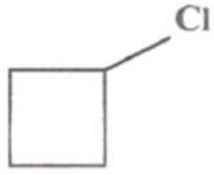
(1) $(CH_3)_3$ COD (2) $(CD_3)_3$ CD (3) $(CD_3)_3$ COD (4) $(CH_3)_3$ CD

Ans. 4

Solution :

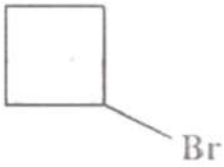


25. The major product formed when 1 – Bromo – 3 – Chlorocyclobutane reacts with metallic sodium in dry ether is

(1) 

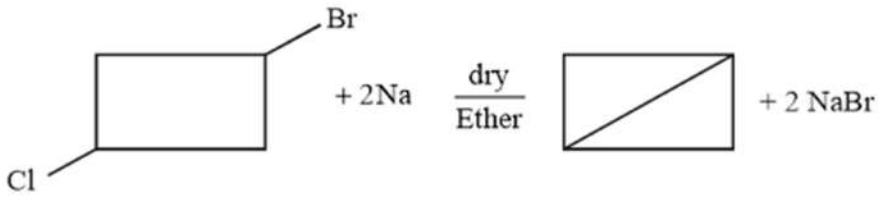
(2) 

(3) 

(4) 

Ans. 3

Solution :

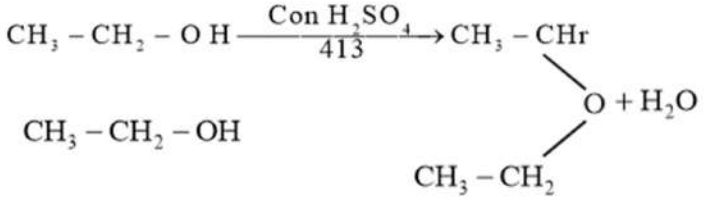


26. Ethyl alcohol is heated with concentrated sulphuric acid at 413 K. The major product

(1) $C_2H_5 - O - C_2H_5$ (2) $CH_3 - O - C_3H_7$ (3) $CH_2 = CH_2$ (4) $CH_3COOC_2H_5$

Ans. 1

Solution :

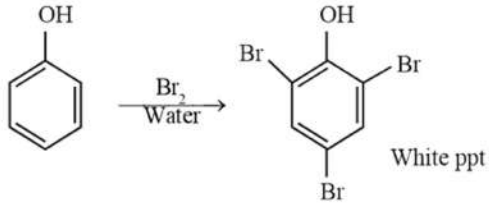


27. Phenol can be distinguished from propanol by using the reagent

(1) Bromine water (2) Iron metal (3) Iodine in alcohol (4) Sodium metal

Ans. 1

Solution :



Where as propand Cannot form white ppt with Br_2 water

28. Match the following with their pKa values

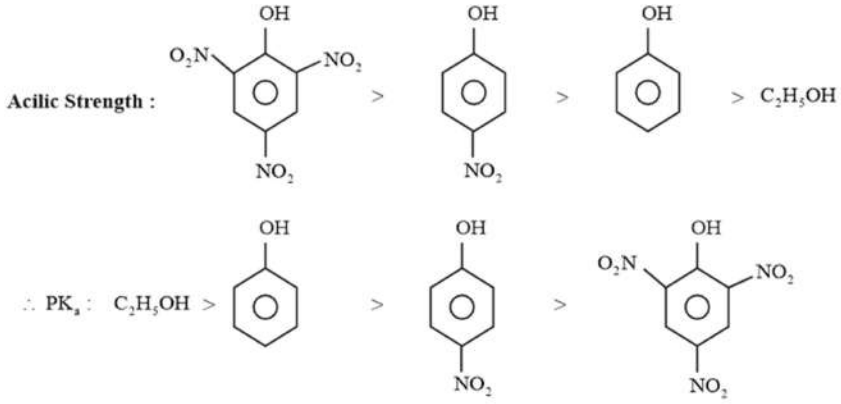
Acid	pKa
(I) Phenol	(a) 16
(II) p-Nitrophenol	(b) 0.78
(III) Ethyl alcohol	(c) 10
(IV) Picric acid	(d) 7.1

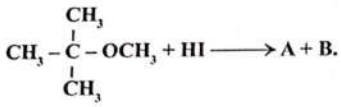
(1) I – c, II – d, III – a, IV – b (2) I – a, II – d, III – c, IV – b

(3) I – a, II – b, III – c, IV – d (4) I – b, II – a, III – d, IV – c

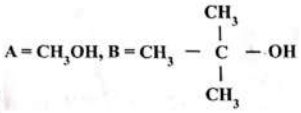
Ans. 1

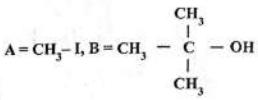
Solution :

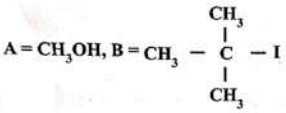


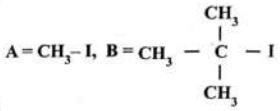
29. 

A and B respectively are

(1) 

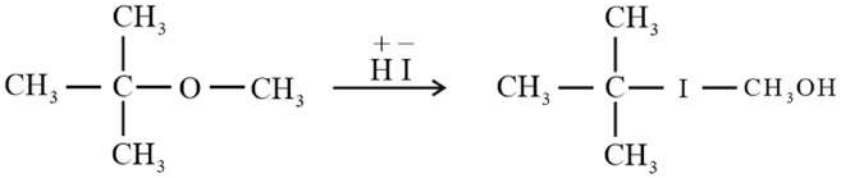
(2) 

(3) 

(4) 

Ans. 3

Solution :

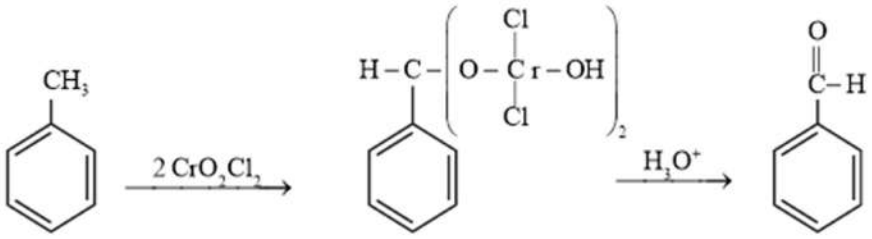


30. Oxidation of Toluene with chromyl chloride followed by hydrolysis gives Benzaldehyde. This reaction is known as _____

(1) Etard Reaction (2) Kolbe reaction (3) Stephen reaction (4) Cannizzaro Reaction

Ans. 1

Solution :



31. **Statement – I :** Reduction of ester by DIABL-H followed by hydrolysis gives aldehyde.

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

Among the above statements, identify the correct statement.

(1) Both statements – I and II are false

(2) Statement – I is true but statement – II is false

(3) Statement – I is false but statement – II is true

(4) Both statements – I and II are true.

Ans. 2

Solution :

Esters reduced to aldehyde with DIBAL-H. Benzyl alcohol oxidized to form Benzoic acid.

32. Arrange the following compounds in their decreasing order of reactivity towards Nucleop addition reaction.

$CH_3COCH_3, CH_3COC_2H_5, CH_3CHO$

(1) $CH_3CHO > CH_3COCH_3 > CH_3COC_2H_5$

(2) $CH_3COCH_3 > CH_3CHO > CH_3COC_2H_5$

(3) $CH_3COC_2H_5 > CH_3COCH_3 > CH_3CHO$

(4) $CH_3CHO > CH_3COC_2H_5 > CH_3COCH_3$

Ans. 1

Solution :

$$\text{NAR reactivity} \times \frac{\text{Positive charge Nucleophilic centre}}{\text{Steric hindrance at Nucleophilic centre}}$$

33. Which of the following has most acidic Hydrogen ?

(1) Propanoic acid (2) Dichloroacetic acid

(3) Trichloroacetic acid (4) Chloroacetic acid

Ans. 3

Solution :

Acidic nature $\times$ no. of – I groups

34. Which of the following reagents are suitable to differentiate Aniline and N-methylaniline chemical

(1) Acetic anhydride

(2) Br_2 water

(3) Conc. Hydrochloric acid and anhydrous zinc chloride

(4) Chloroform and Alcoholic potassium hydroxide

Ans. 4

Solution :

Only i Amines undergo Carbyl amine test

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

I. $R-X + \underset{(alc)}{NH_3} \xrightarrow[\Delta]{}$

II. $R-C\equiv N \xrightarrow[Na(Hg)/C_2H_5OH]{H_2/Ni}$

III. $R-C\equiv N + H_2O \xrightarrow{H^+}$

IV. $R-\overset{O}{\overset{\|}{C}}-NH_2 + 4\,[H] \xrightarrow[ii)\ H_3O^+]{i)\ LiAlH_4}$

(1) Both I and III (2) Only II (3) Only III (4) Both II and IV

Ans. 3

Solution :

Cyanides on hydrolysis gives Carboxylic acids, where as rest all 3 cases amines can be prepared.

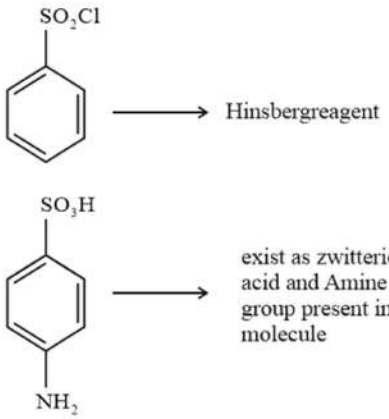
36. Match the compounds given in List – I with the items given in List – II.

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

(1) I – c, II – b, III – a, IV – d
(2) I – a, II – c, III – b, IV – d
(3) I – c, II – a, III – d, IV – b
(4) I – b, II – a, III – d, IV – c

Ans. 4

Solution :



Alkyl diazonium Salts → Convert to alcohols as Carbocation intermediate formed is unstable.

Aryl diazonium Salts → Participate in dye test

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

(1) 16
(2) 32
(3) 3
(4) 4

Ans. 1

Solution :

Maximum number of orbitals in a shell = n^2

Given $n = 4$ $\quad \therefore n^2 = 16$

38. According to the Heisenberg's Uncertainty principle, the value of $\Delta b.\Delta x$ for an object whose mass is 10^{-6} kg is $\left(h = 6.626 \times 10^{-34} Js\right)$

(1) $3.0 \times 10^{-24} m^{-2}s^{-1}$
(2) $4.0 \times 10^{-26} m^{-2}s^{-1}$
(3) $3.5 \times 10^{-25} m^{-2}s^{-1}$
(4) $5.2 \times 10^{-29} m^{-2}s^{-1}$

Ans. 4

Solution :

$$\Delta v.\Delta x = \frac{h}{4\pi m}$$

$$= \frac{6.625 \times 10^{-34}}{4 \times 3.14 \times 10^{-6}} \qquad = 5.2 \times 10^{-29}$$

39. 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.

(1) Both statements – I and Statement – II are false

(2) Statement – I is true but statement – II is false

(3) Statement – I is false but statement – II is true

(4) Both statements – I and Statement – II are true.

Ans. 4

Solution :

S–I : In adiabatic process $\Delta U = W$ and work done on the system is positive there fore internal energy increses.

S–II : When external pressure is zero, work done is zero

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

(1) $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$

(2) $C_6H_6(l) + \frac{15}{2}O_2(g) \longrightarrow 6CO_2(g) + 3H_2O(l)$

(3) $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$

(4) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

Ans. 3

Solution :

$\Delta H = \Delta U + \Delta ng\ RT$

For $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$

$\Delta ng = 0$

$\therefore\ \Delta H = \Delta U$

41. 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 ΔrH° 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

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

Ans. 2

Solution :

(a) Fusion is endothermic $\rightarrow$ correct

(b) It depends $\rightarrow$ Incorrect

(c) Correct

(d) Incorrect

(e) Incorrect

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

(a) Equilibrium is possible only in a closed system of 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.

(1) Only b (2) Only c (3) a, b and c (4) Only a

Ans. 3

Solution :

(a) True
(b) True
(c) True

43. 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

(1) a and c (2) b and d

(3) a and d (4) a and b

Ans. 1

Solution :

(a) True
(b) False
(c) True
(d) False

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

(1) 0.182 (2) 1.818 (3) 1.182 (4) 0.818

Ans. 2

Solution :

$$\begin{array}{ccccccc} A & + & B & \rightleftharpoons & C & + & D \\ 1-x & & 1-x & & 1+x & & 1+x \end{array}$$

$$100=\frac{(1+x)(1+x)}{(1-x)(1-x)}$$

$$\Rightarrow \quad \frac{1+x}{1-x}=10$$

$$\Rightarrow \quad 1+x=10-10x$$

$$\Rightarrow \quad 11x=9$$

$$x=\frac{9}{11}=0.818$$

(D) $1 + x = 1 + 0.818 = 1.818$

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

(1) Aluminium chloride (2) Aluminmium sulphate

(3) Potassium sulphate (4) Sodium chloride

Ans. 4

Solution :

$\Delta T_b \propto i$

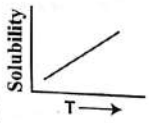
(1) $AlCl_3$ $i = 4$

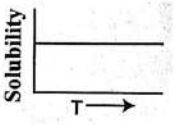
(2) $Al_2(SO_4)_3$ $i = 5$

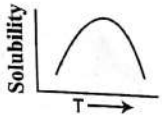
(3) K_2SO_4 $i = 3$

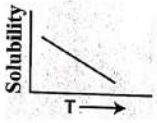
(4) NaCl $i = 2$ (Lowest Boiling)

46. Variation of solubility with temperature t for a gas in liquid is shown by the following graphs. The correct representation is

(1) 

(2) 

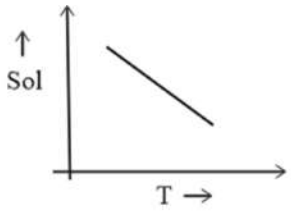
(3) 

(4) 

Ans. 4

Solution :

Henry law solubility $\propto \frac{1}{\text{Temp}}$



47. 180g of glucose, $C_6H_{12}O_6$, is dissolved in 1 kg of water in a vessel. The temperature at which water boils at 1.013 bar is _____ (given, K_b for water is 052K kg mol^{-1}. Boiling point for pure water is 373.15K)

(1) 373.67 K (2) 373015 K (3) 373.0 K (4) 373.202 K

Ans. 1

Solution :

$\Delta T_b = i\, K_b\, m$ (i = 1) glowse

$$T_b - 373.15 = 1 \times 0.52 \times \frac{180}{180 \times 1}$$

$$T_b = 0.52 + 373.15 = 373.67K$$

48. If N_2 gas is bubbled through water at 293 K, how many moles of N_2 gas would dissolve in 1 litre 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]

(1) 0.716×10^{-3} (2) 7.16×10^{-5} (3) 7.16×10^{-4} (4) 7.16×10^{-3}

Ans. 3

Solution :

Henry law :- $P = K_H X$

$$XN_2 = \frac{PN_2}{K_4} = \frac{0.987}{76.48 \times 10^3} = 1.29 \times 10^{-5}$$

$$n_{H_2O} = \frac{1000}{18} = 55.5$$

$$XN_2 = \frac{n_{N_2}}{n_{N_2} + n_{H_2O}}$$

$$1.29 \times 10^{-5} = \frac{n}{n + 55.5} = \frac{n}{55.5}$$

$$n = 1.29 \times 10^{-5} \times 55.5$$

$$n_{N_2} = 7.16 \times 10^{-4}$$

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

(a) Current flows from cathode to anode

(b) Anode is positive terminal

(c) If $E_{cell} < 0$, then it is spontaneous reaction

(d) Cathode is positive terminal

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

Ans. 3

Solution :

(a) Correct	Galvanic Cell Left | Oxidation anodel negative
(b) Incorrect	
(c) Incorrect	
(d) Correct	

50. The electronic conductance depends on

(1) Nature of electrolyte added (2) The number of valence electrons per atom

(3) Concentration of the electrolyte (4) Size of the ions

Ans. 2

Solution :

(2) Electronic conductance $\propto \frac{\text{no. of } e^- \text{ per atom}}{\text{Temperature}}$

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

(1) Decrease (2) No change (3) First increase then decrease (4) Increase

Ans. 4

Solution : $Al^{3+} + 3e^- \rightarrow Al(s)$

$$E_{Red} = E^{\circ}_{Red} - \frac{0.0591}{3} \log \frac{[Al(s)]}{[Al^{3+}]}$$

$$E_{Red} = E^{\circ}_{Red} - \frac{0.0591}{4} \log \frac{1}{[Al^{3+}]} [\text{Since active mass of solid} = 1]$$

$$E_{Red} = E^{\circ}_{Red} + \frac{0.0591}{3} \log [Al^{3+}]$$

So $E_{Red} \propto [Al^{3+}] \propto \text{conc}^{n}$ of Al^{3+}

52. Match the following select the correct option for the quantity of electricity, in $Cmol^{-1}$ required to deposit various metals at cathode

	List – I		List- II
a	Ag^{+}	i	$386000 Cmol^{-1}$
b	Mg^{2+}	ii	$289500 Cmol^{-1}$
c	Al^{3+}	iii	$96500 Cmol^{-1}$
d	Ti^{4+}	iv	$193000 Cmol^{-1}$

(1) $a-ii, b-i, c-iv, d-iii$ (2) $a-iii, b-iv, c-ii, d-i$

(3) $a-iv, b-iii, c-i, d-ii$ (4) $a-i, b-ii, c-iii, d-iv$

Ans. 2

Solution :

$1F = 96500C$

$$\underset{1F}{Ag^{+} + e^{-}} \rightarrow Ag\left[\frac{C}{mol} = 1 \times 96500C = 96500C\right]$$

$$\underset{2F}{Mg^{2+} + 2e^{-}} \rightarrow Mg\left[\frac{C}{mol} = 2 \times 96500C = 193000\right]$$

$$\underset{3F}{Al^{3+} + 3e^{-}} \rightarrow Al\left[\frac{C}{mol} = 3 \times 96500C = 289500\right]$$

$$\underset{4F}{Ti^{4+} + 4e^{-}} \rightarrow Ti\left[\frac{C}{mol} = 4 \times 96500C = 386000\right]$$

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

(1) Increases the activation energy of the reaction

(2) Decreases the activation energy of the reaction

(3) Brings about improper orientation of reactant molecules

(4) Increases the potential energy barrier

Ans. 2

Solution :

Positive catalyst decreases the activation energy to increase rate of reaction.

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

(1) 0.1 M (2) 0.05 M (3) 0.0125 M (4) 0.2 M

Ans. 3

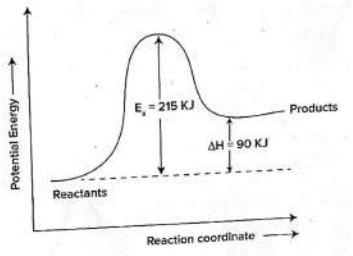
Solution :

$$\text{no. of Half lives} = \frac{t}{t_{\frac{1}{2}}} = \frac{80}{20} = 4$$

$$[A_t]=[A_o]\left(\frac{1}{2}\right)^n$$

$$[A_t]=0.2\times\left(\frac{1}{2}\right)^4=0.0125$$

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



(1) 125 KJ (2) 215 KJ (3) 90 KJ (4) 305 KJ

Ans. 1

Solution :

$$\Delta H=(E_a)_f-(E_a)_b$$

$$90=215-(E_a)_b$$

$$(E_a)_b=215-90=125\text{ KJ}$$

56. For the reaction $2N_2O_{5_{(g)}}\rightarrow 4NO_{2_{(g)}}+O_{2_{(g)}}$ initial concentration of N_2O_5 is $2.0\text{mol}L^{-1}$ and after 300 min, it is reduced to $1.4\text{mol}L^{-1}$. The rate of production of NO_2 (in $\text{mol}L^{-1}\text{min}^{-1}$) is

(1) 2.5×10^{-4} (2) 4×10^{-4} (3) 2.5×10^{-3} (4) 4×10^{-3}

Ans. 4

Solution :

Rate of formation of $NO_2=2\times$ rate of disappearance of N_2O_5

$$=2\times\left[\frac{-(1.4-2)}{300}\right]$$

$$=4\times10^{-3}$$

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

(1) Mole fraction and Mass percent (W/W) (2) Molality and Mole fraction

(3) Mass percent (W/W) and Molality (4) Molality and Molarity

Ans. 1

Solution :

Mole fraction and mass percent (W/w) are unitless

58. 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

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

Ans. 1

Solution :

Facts

59. Given below and the atomic masses of the elements:

Element:	Li	Na	Cl	K	Ca	Br	Sr	I	Ba
Atomic Mas $\left(g\,mol^{-1}\right)$:	7	23	35.5	39	40	80	88	127	137

Which of the following doesn't form triad?

(1) Ba, Sr, Ca (2) Cl, Br, I (3) Cl, K, Ca (4) Li, Na, K

Ans. 3

Solution :

Elements in triad should have similar properties K, Ca are metals

Cl is non metals

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

$AlCl_3 + Cl^- \rightarrow AlCl_4^-$

(1) No change in the hybridization state (2) sp^2 to sp^3

(3) sp^3 to sp^3d (4) sp^3 to sp^2

Ans. 2

Solution :

$$\underset{sp^2}{AlCl_3} + Cl^- \rightarrow \underset{sp^3}{AlCl_4^-}$$

$(3\sigma \text{ bonds})$ $(4\sigma \text{ bonds})$

KCET-2025

PAPER WITH ANSWER KEY

(HELD ON THURSDAY 17TH APRIL 2025)

MATHEMATICS

1. If A = {x : x is an integer and $x^2 - 9 = 0$ }
   B = {x : x is a natural number and $2 \le x < 5$ }
   C = {x : x is a prime number ≤ 4 }
   Then $(B - C) \cup A$ is,
   (1) {-3,3,4} (2) {2,3,4} (3) {3,4,5} (4) {2,3,5}

Ans. 1

Sol. A = {x : x is an integer and $x^2 - 9 = 0$ }
$x^2 = 9 \Rightarrow x = \pm 3 = \{-3,3\}$
B = {x : x is a natural number and $2 \le x < 5$ }
= {2,3,4}
C = {x : x is a prime number ≤ 4 }
= {2,3}
$(B - C) \cup A = \{4\} \cup \{-3,3\} = \{-3,3,4\}$

2. A and B are two sets having 3 and 6 elements respectively.
   Consider the following statements.
   Statement (I): Minimum number of elements in AUB is 3
   Statement (II): Maximum number of elements in AB is 3
   Which of the following is correct?
   (1) Statement (I) is true, statement (II) is false
   (2) Statement (1) is false, statement (II) is true
   (3) Both statements (1) and (II) are true
   (4) Both statements (I) and (II) are false

Ans. 2

Sol. $|A| = 3$
$|B| = 6$
$|A \cup B| = |A| + |B| - |A \cap B|$
$\min|A \cup B| = |A| + |B| - \max|A \cap B|$
$= 3 + 6 - 3 = 6$
$|A \cap B| = |A| + |B| - |A \cup B|$
$\max|A \cap B| = |A| + |B| - \min|A \cup B|$
$= 3 + 6 - 6 = 3$

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

(1) $(-\infty,2]\cup[5,\infty)$ (2) $(-\infty,2)\cup(5,\infty)$

(3) $(-\infty,3)\cup[5,\infty)$ (4) $(-\infty,3]\cup(5,\infty)$

Ans. 2

Sol. $f(x)=\frac{1}{\sqrt{(x-2)(x-5)}}$

$\Rightarrow (x-2)(x-5)>0$

$\Rightarrow x\in(-\infty,2)\cup(5,\infty)$

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

(1) f(0) = 0 (2) $f\left(\frac{\pi}{2}\right)=1$ (3) $f\left(\frac{\pi}{4}\right)=1+\frac{1}{\sqrt{2}}$ (4) $f(\pi)=-1$

Ans. 4

Sol. $f(x)=\sin\left[\pi^2\right]x-\sin\left[-\pi^2\right]x$

$=\sin 9x-\sin(-10)x$

$=\sin 9x+\sin 10x$

$f(\pi)=\sin 9\pi+\sin 10\pi=0$

5. Which of the following is not correct?

(1) $\cos 5\pi=\cos 4\pi$ (2) $\sin 2\pi=\sin(-2\pi)$

(3) $\sin 4\pi=\sin 6\pi$ (4) $\tan 45^\circ=\tan(-315^\circ)$

Ans. 1

Sol. $\cos 5\pi\neq\cos 4\pi$

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

(1) –1 (2)1 (3)0 (4) 2

Ans. 2

Sol. $\cos x+\cos^2 x=1$

$\Rightarrow 1-\cos^2 x=\cos x \quad \Rightarrow \sin^2 x=\cos x$

$\Rightarrow \sin^2 x+\sin^4 x$

$\Rightarrow \cos x+(\cos x)^2=1$

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

(1)10 (2)3 (3)8.5 (4) 4.03

Ans. 2

Sol. Mean derivation about mean $\mu=\frac{4+7+8+9+10+12+13+17}{8}$

$\frac{1}{N}\sum(x_i-\mu) \quad =\frac{80}{8}=10$

$=\frac{1}{8}(6+3+2+1+2+3+7) \quad =\frac{24}{8}=3$

8. 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_3, 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

(1) $\frac{2}{3}$ (2) $\frac{1}{3}$ (3) $\frac{1}{6}$ (4) $\frac{1}{12}$

Ans. 1

Sol. $p(w_1)=\frac{1}{6}$

$p(w_2)=a \quad \Rightarrow \frac{1}{6}+a+b+x+\frac{1}{12}=1$

$p(w_3)=b \quad \Rightarrow 12(a+b+x)=9$

$p(w_4)=c \quad \Rightarrow a+b+x=\frac{3}{4}$

$p(w_5)=\frac{1}{12} \quad \Rightarrow \frac{1}{12}+x=\frac{3}{4} \Rightarrow x=\frac{2}{3}$

9. A die has two face 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 or 3) is

(1) $\frac{2}{3}$ (2) $\frac{1}{2}$ (3) $\frac{1}{3}$ (4) $\frac{1}{6}$

Ans. 2

Sol. $p(1)=\frac{2}{6} \quad \Rightarrow p(1 \cup 3)=p(1)+p(3)$

$p(2)=\frac{3}{6} \quad =\frac{2}{6}+\frac{1}{6}$

$p(3)=\frac{1}{6} \quad =\frac{1}{2}$

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

(1)1 (2)3 (3)2 (4) 4

Ans. 3

Sol. A = {a, b, c}

R = {(b, c), (a, a), (b, b), (c, c), (c, b)}

R = {(a,a) (b,b) (c,c) (a,b) (b,a) (a,c) (c,a) (b,c) (c,b)}

Total (2) equivalence relations possible

11. Let the functions "f" and "g" be $f:\left[0,\frac{\pi}{2}\right]\to R$ given by $f(x)=\sin x$ and $g:\left[0,\frac{\pi}{2}\right]\to R$ given by $g(x)=\cos x$, where 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?

(1) Statement (I) is true, statement (II) is false

(2) Statement (I) is false, statement (II) is true

(3) Both statements (I) and (I) are true

(4) Both statements (I) and (II) are false

Ans. 1

Sol.

$f:\text{one}-\text{one}\left[0,\frac{\pi}{2}\right]\to R.f(x)=\sin x$

$g:\text{one}-\text{one}\left[0,\frac{\pi}{2}\right]\to R.f(x)=\cos x$

Statement I is true

$(f+g):\left[0,\frac{\pi}{2}\right]\to R$

$f+g(x)=\sin x+\cos x$

$\left.\begin{matrix}(f+g)(0)=0\\(f+g)(\pi/2)=0\end{matrix}\right\}\Rightarrow f+g \text{ is not one}-\text{one}$

12. $\sec^2\left(\tan^{-1}2\right)+\text{cosec}^2\left(\cot^{-1}3\right)=$

(1) 1 (2) 5 (3) 15 (4) 10

Ans. 3

Sol. $=1+\tan^2\left(\tan^{-1}2\right)+1+\cot^2\left(\cot^{-1}3\right)$

$=1+4+1+9=15$

13. $2\cos^{-1}x=\sin^{-1}\left(2x\sqrt{1-x^2}\right)$ is valid for all values of 'x' satisfying

(1) $0\le x\le\frac{1}{\sqrt{2}}$ (2) $-1\le x\le 1$ (3) $0\le x\le 1$ (4) $\frac{1}{\sqrt{2}}\le x\le 1$

Ans. 4

Sol. $2\cos^{-1}x=\sin^{-1}\left(2x\sqrt{1-x^2}\right)$

$x=\cos\theta\Rightarrow\theta=\cos^{-1}x$

$\sin^{-1}\left(2\cos\theta\sin\theta\right)=\sin^{-1}\left(\sin 2\theta\right)=2\theta\in[0,2\pi]$

$=2\cos^{-1}x \text{ when } \theta\in[0,\pi/4]$

$\Rightarrow 2\cos^{-1}x \text{ when } \cos^{-1}x\in[0,\pi/4]$

$\Rightarrow 2\cos^{-1} x$ when $x \in \left[\frac{1}{\sqrt{2}}, 1\right]$

14. Consider the following statements:

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

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

Which of the following is correct?

(1) Statement (I) is true, Statement (II) is true

(2) Statement (I) is true, Statement (II) is false

(3) Both Statements (I) and (II) are false

(4) Statement (I) is false, Statement (II) is true

Ans. 1

Sol.

15. 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

(1) 130 (2) 120 (3) 140 (4) 40

Ans. 3

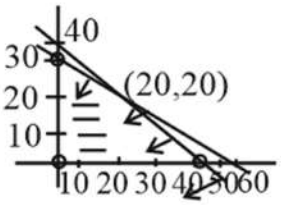
Sol. $z = 3x + 4y$

$x + y \leq 40$

$x + 2y \leq 60$

$y = 20$

$x = 20$



Z	(40,0)	(0,30)	(20,20)
3x+4y	120	120	140

16. 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?

(1) Statement (I) is true and statement (II) is false

(2) Statement (I) is false and statement (II) is true

(3) Both the statements are true

(4) Both the statements are false

Ans. 3

Sol. E and F are two independent events, then E' and F' are also independent. Statement I true

$A \cap B = \phi \Rightarrow P(A \cap B) = 0$ ..(1)

$P(A) \neq 0$ ...(2)

$P(B) \neq 0$ ....(3)

From eq(1), (2) and (3)

$P(A \cap B) \neq P(A).P(B)$ Statement II is true

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

(1) $A \subset B$ but $A \neq B$ (2) A=B (3) $A \cap B = \phi$ (4) P(A) = P(B)

Ans. 4

Sol. A and B are non mutually exclusive

$$P(A|B)=P(B|A)$$

$$\Rightarrow \frac{P(A \cap B)}{P(B)}=\frac{P(A \cap B)}{P(A)}$$

$$\Rightarrow P(B)=P(A) \quad [\because P(A \cap B) \neq 0]$$

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

(1) $P(A|B)=\frac{P(B)}{P(A)}$ (2) $P(A|B)<P(A)$ (3) $P(A|B) \geq P(A)$ (4) P(A) = P(B)

Ans. 3

Sol. $A \subset B \Rightarrow A \cap B = A$

$$P(A|B)=\frac{P(A \cap B)}{P(B)}$$

$$=\frac{P(A)}{P(B)}$$

$$\Rightarrow P(A|B)P(B)=P(A) \Rightarrow P(A) \geq P(A|B)$$

$$[\because P(B) \neq 0]$$

19. 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

(1) $\frac{7}{16}$ (2) $\frac{5}{16}$ (3) $\frac{3}{16}$ (4) $\frac{9}{16}$

Ans. 4

Sol. $P(A)=\frac{2}{5}$ F: The events of meera meets her friend.

$$P(F/A)=\frac{1}{3}$$

$$P(F/B)=\frac{2}{7}$$

$$P(B)=1-P(A)$$

$$=1-\frac{2}{5}$$

$$=\frac{3}{5}$$

The probability she meet her at temple B

$$P(B/F)=\frac{P(F\cap B)}{P(F)}$$

$$=\frac{P(B)\times P(B/F)}{P(A)P(F/A)+P(B)P(B/F)}$$

$$=\frac{3/5\times 2/7}{(2/5\times 1/3)+(3/5\times 5/7)}=\frac{9}{16}$$

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

(1) $\overline{Z_1+Z_2}=\overline{Z}_1+\overline{Z}_2$ (2) $|Z_1Z_2|=|Z_1|.|Z_2|$ (3) $\overline{Z_1Z_2}=\overline{Z}_1.\overline{Z}_2$ (4) $|Z_1+Z_2|\geq|Z_1|+|Z_2|$

Ans. 4

Sol. $|Z_1+Z_2|\leq|Z_1|+|Z_2|$

21. Consider the following statements :

Statement(I) : The set of all solutions 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 solutions of linear inequalities $3x + 8 < 17$ and $2x+8\geq 12$ is (2, 3)

Which of the following is true?

(1)Statement (I) is true but statement (II) is false

(2)Statement (I) is false but statement (II) is true

(3)Both the statements are true

(4) Both the statements are false

Ans. 1

Sol. $3x+8<17\Rightarrow 3x<9\Rightarrow x<3$

$2x+8\geq 12\Rightarrow 2x\geq 4\Rightarrow x\geq 2$

Statement I is correct.

The common set of solution $\Rightarrow\{2\}$

$\rightarrow$ Statement II is false

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

(1)6 (2)10 (3)4 (4)12

Ans. 2

Sol.
$$\left.\begin{array}{lll} ----\ 0 & \rightarrow 3! \\ 1---\ 2 & \rightarrow 2! \\ 3---\ 2 & \rightarrow 2! \end{array}\right\} 6+2+2=10$$

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

(1)15 (2)20 (3)28 (4) 30

Ans. 2

Sol. A octagon has 8 sides.

$\rightarrow$ The number of diagonals in a polygon is $\frac{n(n-3)}{2}$,

Where n is the number of sides.

$\rightarrow$ $\frac{8(8-3)}{2}=4.5=20$

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

(1)8 (2)6 (3)7 (4)9

Ans. 3

Sol. $(2x+3)^{3n} \rightarrow 3n+1=22 \rightarrow n=7$

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

(1) $z=\sqrt{xy}$ (2) $y=\sqrt{xz}$ (3) $x=\sqrt{yz}$ (4) $y=\frac{x+z}{2}$

Ans. 2

Sol. $x=ar^3$

$y=ar^9$ $xz=a^2x^{18}=\left(ar^9\right)^2$

$z=ar^{15}$ $\Rightarrow y^2=xz \Rightarrow y=\sqrt{xz}$

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

(1) $I-A$ (2) $A-I$ (3) $I+A$ (4) $-I-A$

Ans. 1

Sol. $A^2=A.$ $(I-A)^3=(I-A)\left(I-2A+A^2\right)$

$=(I-A)(I-2A+A)$

$=(I-A)(I+A)$

$=I-A^2=I-A$

27. 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

(1) 3×4 (2) 3×3 (3) 4×3 (4) 4×4

Ans. 3

Sol. $AB=I$

$A_{4\times3}B_{3\times4} \rightarrow I_{4\times4}$

$\rightarrow$ The order of matrix A is 4×3

28. Which of the following statements is not correct?

(1)A row matrix has only one row

(2)A diagonal matrix has all diagonal elements equal to zero

(3)A symmetric matrix A is a square matrix satisfying $A'=A$.

(4) A skew symmetric matrix has all diagonal elements equal to zero

Ans. 2

Sol. A diagonal matrix need not be contains only zero as it diagonal element.

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

(1)32 (2)1 (3) $\frac{1}{32}$ (4)6

Ans. 1

Sol. $A=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$

$$A^2=\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}=\begin{bmatrix}2 & 2\\ 2 & 2\end{bmatrix}$$

$$A^3=\begin{bmatrix}2 & 2\\ 2 & 2\end{bmatrix}\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}=\begin{bmatrix}4 & 4\\ 4 & 4\end{bmatrix}=\begin{bmatrix}2^2 & 2^2\\ 2^2 & 2^2\end{bmatrix}$$

$$A^4=\begin{bmatrix}8 & 8\\ 8 & 8\end{bmatrix}=\begin{bmatrix}2^3 & 2^3\\ 2^3 & 2^3\end{bmatrix}$$

$$A^6=\begin{bmatrix}2^5 & 2^5\\ 2^5 & 2^5\end{bmatrix}=2^5\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}\Rightarrow 2^5=32$$

$\therefore k=32$

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

(1) ± 2 (2) ± 3 (3) -5 (4) -4

Ans. 2

Sol. $A=\begin{bmatrix}k & 2\\ 2 & k\end{bmatrix}$

$|A|=k^2-4$

$|A|^3=|A|.|A|.|A|=125$, given

$\Rightarrow (k^2-4)^3=125$

$\Rightarrow k^2-4=5\Rightarrow k^2=9$

$\Rightarrow k=\pm 3$

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

(1) $\frac{1}{7}(5I-A)$ (2) $\frac{1}{7}(A-5I)$ (3) $7(5I-A)$ (4) $\frac{1}{5}(7I-A)$

Ans. 1

Sol. Given

$A^2-5A+7I=0$ $(\because$ Multiply by A^{-1} both sides $|A|\neq 0)$

$A-5I+7A^{-1}=0$

$A^{-1}=\frac{(5I-A)}{7}$

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

(1) $\frac{1}{3}$ (2) 3 (3) 27 (4) 9

Ans. 4

Sol. $|3A^{-1}|=3^3\frac{1}{3}=9$

33. 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

(1) 4 (2) 5 (3) 2 (4) 3

Ans. 2

Sol. $\alpha-3=2, \alpha=5$

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

(1) No solution (2) Infinitely many solutions

(3) A unique solution (4) Only two solutions

Ans. 2

Sol. $\frac{1}{2}=\frac{1}{2}=\frac{1}{2}$

35. 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

(1) 1 (2) ±1 (3) –1 (4) 0

Ans. 3

Sol. $\left(\vec{a}+\lambda\vec{b}\right)\perp c$

$\left(\vec{a}+\lambda\vec{b}\right)\cdot\vec{c}=0$

$\lambda+1+2+\lambda+4\lambda+1=0, \lambda+1\Rightarrow\lambda=-1$

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

(1) 5 (2) 10 (3) 14 (4) 16

Ans. 4

Sol. $\frac{|\vec{a}\times\vec{b}|}{|\vec{a}||\vec{b}|}=\frac{4}{5}$

$|\vec{a}\times\vec{b}|=\frac{4}{5}\times20=16$

37. 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 a is perpendicular to b.

Which of the following is correct ?

(1) Statement (I) is false but Statement (II) is false

(2) Statement (I) is false but Statement (II) is true

(3) Both Statement (I) and Statement (II) is true

(4) Both Statement (I) and Statement (II) is false

Ans. 1

Sol. Statement (I) is true

Statement (II) is false

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

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{4}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{2}$

Ans. 1

Sol. $\ell^2 + m^2 + n^2 = 1$

$n^2 = 1 - \frac{1}{4} \Rightarrow n = \frac{\sqrt{3}}{2}$

39. 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

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

Ans. 2

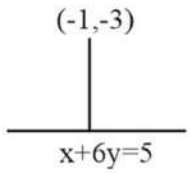
Sol. $a_1a_2 + b_1b_2 + c_1c_2 = 0$

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

(1) $\frac{1}{2}$ (2) $-\frac{1}{2}$ (3) –2 (4) 2

Ans. 2

Sol.



y +3 = 6 (x+1)

x intercept y = 0

$x = \frac{-1}{2}$

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

(1) $\frac{2}{3}$ units (2) $\frac{1}{3}$ units (3) $\frac{4}{\sqrt{3}}$ units (4) 24 units

Ans. 3

Sol. $\frac{x^2}{12} + \frac{y^2}{4} = 1$

$L.R = \frac{2b^2}{a} = \frac{\cancel{2} \times 4}{\cancel{2}\sqrt{3}} = \frac{4}{\sqrt{3}}$

42. $\lim\limits_{x \to 1} \frac{x^4 - \sqrt{x}}{\sqrt{x} - 1}$ is

(1) 0 (2) 7 (3) Does not exist (4) $\frac{1}{2}$

Ans. 2

$$\lim_{x\to 1}\frac{x^4-\sqrt{x}}{\sqrt{x}-1}=\lim_{x\to 1}\frac{4x^3-\frac{1}{2\sqrt{x}}}{\frac{1}{2\sqrt{x}}}=\lim_{x\to 1}\frac{\frac{8x^3\sqrt{x}-1}{2\sqrt{x}}}{\frac{1}{2\sqrt{x}}}$$

Sol.

$$= 7$$

43. 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) $\frac{dy}{dx}=\frac{1}{2}\sec^2\left(\frac{\pi}{4}-\frac{x}{2}\right)$

(1) Only b is correct (2) Only a is correct

(3) Both a and c are correct (4) Both b and d are correct

Ans. 3

Sol. $y=\frac{\cos x}{1+\sin x}$

$$y'=\frac{-\sin x(1+\sin x)-\cos x(\cos x)}{(1+\sin x)^2}=\frac{-(1+\sin x)}{(1+\sin x)^2}$$

$$y'=\frac{-1}{\left(\cos\frac{x}{2}+\sin\frac{x}{2}\right)^2}=\frac{-1}{1+\sin x}$$

$$=\frac{-1}{2.\left(\frac{1}{\sqrt{2}}.\cos\frac{x}{2}+\frac{1}{\sqrt{2}}\sin\frac{x}{2}\right)^2}=\frac{-1}{2.\cos^2\left(\frac{\pi}{4}-\frac{x}{2}\right)}$$

$$=\frac{-1}{2}.\sec^2\left(\frac{\pi}{4}-\frac{x}{2}\right)$$

44. 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)

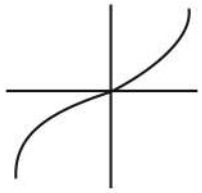
(1) a – i, b – ii, c – iv, d – iii (2) a – iv, b – iii, c – i, d – ii

(3) a – ii, b – iv, c – iii, d – i (4) a – iii, b – ii, c – iv, d – i

Ans. 3

Sol. (a) $x|x|$

$$f(x)=\begin{cases}x^2, & x\geq 0\\ -x^2 & x<0\end{cases}$$ differentiable in (–1, 1)



(b) $\sqrt{|x|}=\begin{cases}\sqrt{x}, & x\geq 0\\ \sqrt{-x}, & x<0\end{cases}$ Not differentiable at x = 0

(c) $x+[x]$ strictly increasing in (–1, 1)

(d) $|x-1|+|x+1|=\begin{cases}-x+1-x-1 & x<-1\\ -x+1+x+1 & -1<x<1\\ x-1+x-1 & x>1\end{cases}$

Continuous $(-1,1)=\begin{cases}-2x & , \quad x<-1\\ 2 & , \quad -1<x<1\\ 2x & , \quad x>1\end{cases}$

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

(1) a = 1, b = 1 (2) a = 3, b = 1 (3) a = –3, b = 1 (4) a = 3, b = –1

Ans. 3

Sol. $f(x)=\begin{cases}e^x+ax & , \quad x<0\\ b(x-1)^2 & , \quad x\geq 0\end{cases}$

Continuity LHL = 1

RHL = b $\Rightarrow$ b = 1

Differentiability LHD = 1 + a

RHD = –2b

1 + a = –2b

a = –3

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

(1) continuous at x = 0 (2) not continuous at x = 0

(3) differentiable at x = 0 (4) differentiable at x = 0, but not continuous at x = 0

Ans. 2

Sol. $f(x)=\begin{cases}\frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1} & , \quad x\neq 0\\ 0 & , \quad x=0\end{cases}$

LHL = –1, RHL = 1, Not continuous.

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

(1) -1 (2) $\frac{1}{\sqrt{3}}$ (3) $-\sqrt{3}$ (4) 1

Ans. 4

Sol. $y = a\sin^3 t, x = a\cos^3 t$

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{3a\sin^2 t\cos t}{3a\cos^2 t(-\sin t)} = -\tan t$$

$$t = \frac{3\pi}{4} = 1$$

48. The derivative of sin x with respect to log x is

(1) cos x (2) x cos x (3) $\frac{\cos x}{\log x}$ (4) $\frac{\cos x}{x}$

Ans. 2

Sol. $f(x) = \sin x$, $g(x) = \log x$

$$\frac{d(\sin x)}{d(\log x)} = \frac{\cos x}{\frac{1}{x}}$$

$$= x\cos x$$

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

(1) 0 (2) -1 (3) 1 (4) 2

Ans. 1

Sol. $f(x) = 1 - \sin x$

$-1 \le \sin x \le 1$

$f_{min} = 0$

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

(1) always increases (2) always decreases

(3) never increases (4) neither increases nor decreases

Ans. 1

Sol. $f(x) = \tan x - x$

$f'(x) = \sec^2 x - 1 = \tan^2 x \ge 0$

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

(1) $\log\left|\frac{x-1}{x+2}\right| + c$ (2) $\log\left|\frac{x-1}{x-2}\right| + c$ (3) $\log\left|\frac{x+2}{x+1}\right| + c$ (4) $\log\left|\frac{x+1}{x+2}\right| + c$

Ans. 4

Sol. $$\int \frac{dx}{(x+1)(x+2)} = \int \frac{(x+2)-(x+1)}{(x+1)(x+2)}dx$$

$$= \int \frac{1}{x+1}dx - \int \frac{1}{x+2}dx$$

$$= \log\left|\frac{x+1}{x+2}\right| + c$$

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

(1) $-\pi/2$ (2) π (3) $\pi/2$ (4) 0

Ans. 4

Sol. $\int_{-1}^{1} \sin^5 x \cos^4 x \, dx = 0$

Since it is odd function.

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

(1) 8 (2) 4 (3) 2 (4) 0

Ans. 1

Sol. $\int_0^{2\pi} \sqrt{1+\sin\frac{x}{2}}$

$$\int_0^{2\pi} \left|\cos\frac{x}{4} + \sin\frac{x}{4}\right| = \left[4\sin\frac{x}{4} - 4\cos\frac{x}{4}\right]_0^{2\pi}$$

$$= \left(4(1) - 0(0-4)\right.$$

$$= 8$$

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

(1) $\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}} + c$ (2) $\left(x^4+1\right)^{\frac{1}{4}} + c$ (3) $-\left(x^4+1\right)^{\frac{1}{4}} + c$ (4) $-\left(\frac{x^4+1}{x^4}\right)^{\frac{1}{4}} + c$

Ans. 4

Sol. $\int \frac{dx}{x^2\left(x^4+1\right)^{3/4}}$

$$= \int \frac{dx}{x^5\left(1+\frac{1}{X^4}\right)^{3/4}} \qquad 1+\frac{1}{x^4} = T$$

$$-4x^{-5}dx = dt$$

$$= -\frac{1}{4}\int t^{-3/4}dt = -\frac{1}{\cancel{4}}\frac{t^{1/4}}{\frac{1}{\cancel{4}}} + c = -\left(1+\frac{1}{x^4}\right)^{1/4}$$

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

(1) 1 (2) 0 (3) $\log_e 2$ (4) $\log_e\left(\frac{1}{2}\right)$

Ans. 2

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

$I = \int_0^1 \log\left(\frac{1}{1+0-x}-1\right) = \int_0^1 \log\left(\frac{1}{1-x}-1\right)dx$

$I = \int_0^1 \log\left(\frac{1-1+x}{1-x}\right)dx = \int_0^1 \log\left(\frac{x}{1-x}\right)dx$

$2I = \int_0^1 \left(\log\left(\frac{1-x}{x}\right)+\log\left(\frac{x}{1-x}\right)\right)dx$

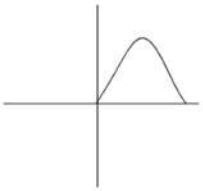
$2I = 0 \quad \Rightarrow I = 0.$

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

(1) 9 sq. units (2) $\frac{1}{3}$ sq. units (3) 6 sq. units (4) 3 sq. units

Ans. 3

Sol. $\int_0^{3\pi} \sin\left(\frac{x}{3}\right)dx$



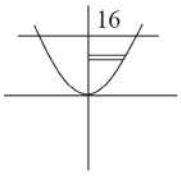
$\left(-3.\cos\frac{x}{3}\right)_0^{3\pi} = \left(-3(-1)\right)-\left(-3(1)\right) = 6$

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

(1) $\frac{32}{3}$ sq. units (2) $\frac{256}{3}$ sq. units (3) $\frac{64}{3}$ sq. units (4) $\frac{128}{3}$ sq. units

Ans. 2

Sol. $y = x^2, y = 16$



$2\int_0^{16} \sqrt{y}dy = 2\frac{y^{3/2}}{3/2}$

$= \frac{4}{3}\left(4^3\right) = \frac{256}{3}$

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

(1) $y \sec x = \tan x + c$ (2) $y \tan x = \sec x + c$

(3) $co \sec x = y \tan x + c$ (4) $x \sec x = \tan y + c$

Ans. 1

Sol. $\frac{dy}{dx} + (\tan x)y = \sec x$

$I.F = e^{(-)\int -\frac{\sin x}{\cos x}dx} = e^{-\log_e \cos x} = \sec x.$

$\therefore \quad y.\sec x = \int \sec^2 x dx$

$y \sec x = \tan x + c$

59. 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 = _____

(1) 1 (2) 2 (3) –1 (4) 0

Ans. 4

Sol. a = order = 2

b = degree = 2

a – b = 0

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

(1) 4 units (2) 5 units (3) –3 units (4) 3 units

Ans. 4

Sol. 3 units

KCET-2025

PAPER WITH ANSWER KEY

(HELD ON THURSDAY 17TH APRIL 2025)

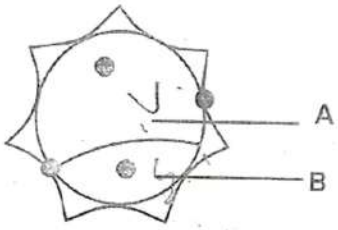
BIOLOGY

1. When pollen grains of a flower of a plant pollinate the stigma of flower of another plant, it is called
   (1) Autogamy (2) Dichogamy (3) Geitonogamy (4) Xenogamy

Ans. 4

2. Fusion of a male gamete with the central cell in the embryo sac of an angiosperm is called ……
   (1) Triple fusion (2) Syngamy (3) Apomixis (4) Double fertilization

Ans. 1

3. 

Which of these options is true in the context of the above diagram of pollen grain ?

(1) 'A' is a vegetative cell which gives rise to male gametes and 'B' is a generative cell which produces pollen tube
(2) 'A' is a generative cell which gives rise to pollen tube and 'B' is a vegetative cell which form male gametes
(3) 'A' is a vegetative cell with abundant food reserve and 'B' is a generative cell which form male gametes
(4) 'A' is a generative cell which forms male gametes and 'B' is a vegetative cell which produces pollen tube

Ans. 3

4. 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

(1) a-iii, b-I, c-iv, d-ii (2) a-iv, b-i, c-ii, d-iii (3) a-i, b-ii, c-iv, d-iii (4) a-ii, b-iii, c-iv, d-i

Ans. 4

5. Choose the correct sequence of sperm transport during ejaculation

(1) Seminiferous tubules→ rete testis → epididymis → vasa efferentia → vas deferens → ejaculatory duct

(2) Seminiferous tubules → vasa efferentia → rete testis → epididymis → vas deferens → ejaculatory duct

(3) Seminiferous tubules → rete testis → epididymis → vas deferens → vasa efferentia → ejaculatory duct

(4) Seminiferous tubules → rete testis → vasa efferentia → epididymis → vas deferens → ejaculatory duct

Ans. 4

6. Select the mismatched pair :

(1) First month of pregnancy – Formation of heart

(2) Second month of pregnancy – Movement of foetus

(3) Third month of pregnancy – Formation of most of the major organ systems

(4) Six month of pregnancy – Eye lids separate and eye lashes are found

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

Ans. 1

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

(1) Implants (2) Lactational amenorrhea

(3) Periodic abstinence (4) Coitus interruptus

Ans. 1

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

(1) 16 blastomeres (2) 8 blastomeres (3) 32 blastomeres (4) 2 blastomeres

Ans. 2

9. Read the following ststements :

Statement I : MTP is to get rid off wanted pregnancies due to a causal unprotected intercourse or failure of contraceptives used during coitus or rapes

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

Choose the correct answer from the options given below :

(1) Statements I and II are incorrect

(2) Statement I is correct but Statement II is incorrect

(3) Statement I is incorrect but Statement II is correct

(4) Statements I and II are correct

Ans. 3

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

(1) 4 (2) 8 (3) 12 (4) 6

Ans. 2

11. When a single gene exhibits multiple phenotypic expression, the phenomenon is called ____

(1) Incomplete dominance (2) Pleiotropy

(3) Co-dominance (4) Polygenic inheritance

Ans. 2

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

(1) 50% (2) 75% (3) 100% (4) 25%

Ans. 1

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

Option	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 X-chromosome

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

Ans. 2

14. RNA polymerase II is responsible for the transcription of ___

(1) rRNA (2) hnRNA (3) snRNA (4) tRNA

Ans. 2

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

(1) Permease (2) Transacetylase (3) Amylase (4) β-galactosidase

Ans. 1

16. 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

(1) Only b, c and e are correct (2) Only a, d and e are correct

(3) Only a, b and c are correct (4) Only a, b and d are correct

Ans. 1

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

(1) Gene migration (2) Genetic recombination

(3) Genetic drift (4) Founder effect

Ans. 3

18. Darwin's finches represent one of the best examples of ____

(1) Adaptive radiation (2) Chemical evolution

(3) Genetic equilibrium (4) Seasonal migration

Ans. 1

19. Choose the correct statements 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.

(1) a, c and e are correct (2) a, b and d are correct

(3) a, c and d are correct (4) a, b and e are correct

Ans. 2

20. In which of the following, HIV replicates and produces its progeny viruses?
(1) Memory T-lymphocytes (2) Killer T-lymphocytes
(3) Suppressor T-lymphocytes (4) Helper T-lymphocytes

Ans. 4

21. 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
(1)a and c (2)b and c (3)b and d (4) a and b

Ans. 4

22. Malignant malaria is caused by
(1)*Plasmodium vivax* (2)*Plasmodium falciparum*
(3)*Plasmodium rubrum* (4)*Plasmodium malariae*

Ans. 2

23. The drug prescribed to the patients who have undergone organ transplant is _____ and is produced by _____.
(1)Stain, Monascus purpureus (2)Cyclosporin-A, Trichoderma polysporum
(3)Statin, Trichoderma polysporum (4)Cyclosporin-A, Monascus purpureus

Ans. 2

24. 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
(1)Both statement I and statement II are incorrect
(2)Statement I is incorrect but statement II is correct
(3)Both statement I and statement II are correct
(4) Statement I is correct and statement II is incorrect

Ans. 3

25. 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. Clot buster
(c) Methanogens	iii. Source of antibiotic
(d) Anabaena	iv. Biogas production

(1)a – ii, b – iv, c – iii, d - i (2)a – iv, b – iii, c – I, d – ii
(3)a – iv, b – I, c – iii, d – ii (4) a – ii, b – iii, c – iv, d - i

Ans. 4

26. 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 potien
(d) PCR	iv. Involves separation and purification.

Choose the correct option from the following
(1)a –iv, b – ii, c – iii, d – i (2)a – i, b – ii, c – iv, d – iii
(3)a – ii, b – i, c – iii, d – iv (4)a – ii, b – iv, c – i, d - iii

Ans. 4

27. The part of plasmid that codes for proteins involved in the replication of the P^{BR322} plasmid is

(1)Selectable marker (2)"rop" (3)Cloning site (4)Ori site

Ans. 2

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

(1)Lysozyme, Proteases and Ribonuclease

(2)Chitinase, Lysozyme and Cellulase

(3)Cellulase, Protease and Lysozyme

(4) Lysozyme, Cellulase and Chitinase

Ans. 2

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

(1)B-peptide (2)C-peptide (3)A and B peptides (4)A-peptide

Ans. 2

30. 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 cells

Choose the correct option from the following.

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

Ans. 1

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

(1) Armyworm (2) Cotton bollworm (3) Tapeworm (4) Tobacco budworm

Ans. 3

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

(1) Mortality and Emmigration (2) Natality and Emmigration

(3) Mortality and Immigration (4) Natality and Immigration

Ans. 4

33. 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

(1) 0.001 individual/time interval (2) 0.1 individual/time interval

(3) 1 individual/time interval (4) 0.01 individual/time interval

Ans. 2

34. Choose the correct sequence of steps involved in decomposition

(1) Fragmentation → Leaching → Catabolism → Mineralisation → Humification

(2) Fragmentation → Mineralisation → Humification → Leaching → Catabolism

(3) Fragmentation → Leaching → Catabolism → Humification → Mineralisation.

(4) Fragmentation → Catabolism → Leaching → Humification → Mineralisation

Ans. 3

35. 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.

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

Ans. 3

36. The 'Sixth Extinction' of species, presently in progress, is_____times faster than the previous five episodes of mass extinctions.

(1) 100 to 1000 (2) 1000 to 10000 (3) 1 to 10 (4) 10 to 100

Ans. 1

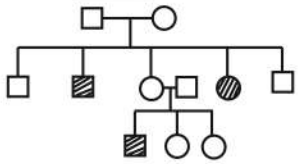
37. Species diversity _____, as we move away from the _____towards____

(1) Decreases, Equator, Poles (2) Decreases, Poles, Equator

(3) Stable, Equator, Poles (4) Increases, Equator, Poles

Ans. 1

38. In a practical examination, the following pedigree chart was given as a spotter for identification. The students identify the given pedigree chart as_____



(1) Autosomal recessive (2) Sex-linked document

(3) Sex-linked recessive (4) Autosomal dominant

Ans. 1

39. 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.

(1) Dicot Stem (2) Monocot Root (3) Monocot Stem (4) Dicot Root

Ans. 1

40. 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?

(1) Anaphase (2) Metaphase (3) Telophase (4) Prophase

Ans. 1

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

(1) Biological names are generally in Latin or Latinised irrespective of their origin

(2) Biological names are underlined separately when hanwritten

(3) Biological names are printed in Italics to indicate their non-Latin origin

(4) The first word represents the genus while second component denotes the specific epithet

Ans. 3

42. 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

(1) a-iii, b-i, c-iv, d-ii (2) a-iii, b-ii, c-iv, d-i (3) a-iv, b-iii, c-ii, d-i (4) a-iv, b-i, c-ii, d-iii

Ans. 1

43. 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

(1) Statement I is true but Statement II is false

(2) Statement I is false but Statement II is true

(3) Both Statement I and Statement II are false

(4) Both Statement I and Statement II are false

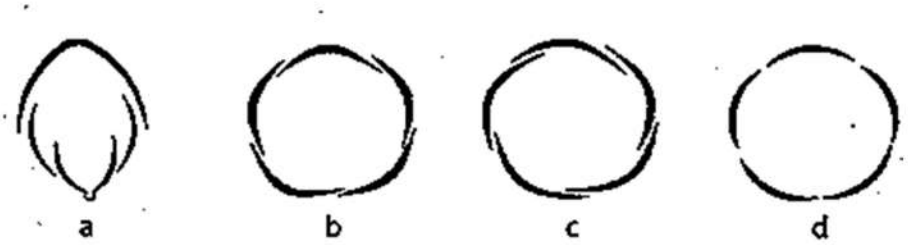
Ans. 2

44. 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 truck. The organism may be ……..

(1) *Ophiura* (2) *Pterophyllum* (3) *Trygon* (4) *Balanoglossus*

Ans. 4

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



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

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

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

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

Ans.2

46. 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 pitch without cambial ring	iii. T.S of dicot stem
d. Conjoint, closed with sclerenchymatous bundle sheath	iv. T.S of dicot stem

(1) a-ii, b-iii, c-iv, d-i (2) a-ii, b-iv, c-iii, d-i (3) a-iii, b-iv, c-i, d-ii (4) a-i, b-ii, c-iii,d-iv

Ans. 2

47. 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 male Frogs

(c) Sound producing vocal sacs are present in male Frogs

(d) Cloaca is present male Frog only.

Choose the most appropriate answer from the options given below :

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

Ans. 2

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

(1) Inclusion bodies (2) Exclusion and inclusion bodies

(3) Fat bodies (4) Exclusion bodies

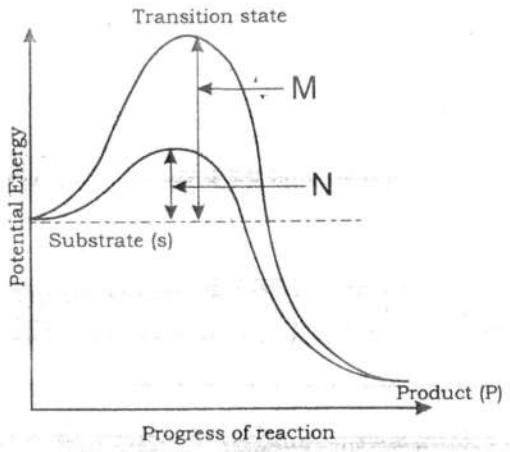
Ans. 1

49. The cell wall less prokaryote among the following is

(1) Blue-Green Algae (2) Cyanobacteria (3) Mycoplasma (4) Bacteria

Ans. 3

50. 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.

(1) M-Activation energy with enzyme, N-Activation energy without enzyme

(2) M-High temperature, High activation energy, N-Low temperature, Low activation energy

(3) M-High substrate, High activation energy, N-Low substrate, Low activation energy

(4) M-Activation energy without enzyme, N-Activation energy with enzyme

Ans. 4

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

	Column - I		Column - I
(a)	Leptotene	(i)	Exchange of genetic materials between non-sister 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

(1) a – v, b – iv, c – i, d – iii, e - ii
(2) a – iv, b – i, c – ii, d – iii, e - v
(3) a – ii, b – iv, c – i, d – iii, e - v
(4) a – i, b – ii, c – iii, d – iv, e - v

Ans. 3

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

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

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

(1) Statement I is true but Statement II is false
(2) Statement I is false but Statement II is true
(2) Both Statement I and Statement I are false
(4) Both Statement I and Statement ll are true

Ans. 3

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

(1) Citric acid
(2) α – Ketoglutaric acid
(3) Succinic acid
(4) Oxaloacetic acid

Ans. 4

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

	Column - I		Column - I
(a)	Abscisic acid	(i)	Adenine derivative
(b)	Gibberellins	(ii)	Indole acetic acid
(c)	Kinetin	(iii)	Carotenoid derivative
(d)	Auxin	(iv)	Terpens

(1) a – iii, b – i, c – iv, d – ii
(2) a – iii, b – iv, c – i, d – ii
(3) a – iii, b – i, c – ii, d – iv
(4) a – i, b – ii, c – iii, d – iv

Ans. 2

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

(1) Chemosensitive area in the medulla
(2) Both Pneumotaxic and Chemosensitive areas of pons and medulla oblongata
(3) Corpus callosum of brain
(4) Pneumotaxic center in the pons

Ans. 4

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

(1) Tunica intima (2) Tunica externa

(3) Both tunica media and tunica externa (4) Tunica media

Ans. 4

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

(1) Henle's loop and glomerulus (2) Vasa Recta and collecting duct

(3) Ascending limb and collecting duct (4) Henle's loop and Vasa Recta

Ans. 4

58. In the mechanism-of musele-eontraction or shortening of muscle, the _____ get reduced whereas the ____ retain the length.

(1) I bands, A bands (2) Z line, I bands (3) A bands, Z line (4) A bands, I bands

Ans. 1

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

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

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

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

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

Ans. 4

60. Identify the statement/s given below that does note correspond to the functions of cortisol

(i) Maintains cardiovascular system and kidney functions

(ii) Produces anti-inflammatory reactions

(iii) Maintains electrolyte balance, osmosis and blood pressure

(iv) Suppresses immune response

(v) Stimulates RBC production

(1) (iii) and (v) only (2) (ii) only (3) (iv) only (4) (i) and (ii) only

Ans. 2