JEE Main Model Paper

Mathematics

1. It is known that $\sum_{r=1}^{\infty}\frac{1}{(2r-1)^2}=\frac{\pi^2}{8}$. Then $\sum_{r=1}^{\infty}\frac{1}{r^2}$ is equal to

1) $\frac{\pi^2}{24}$ 2) $\frac{\pi^2}{3}$ 3) $\frac{\pi^2}{6}$ 4) None

2. Two points (a, 3) and (5, b) are the opposite vertices of a rectangle. If the coordinates (x, y) of the other two vertices satisfy the relation y = 2x + c where $c^2 + 2a - b = 0$, then the value 'c' can be

1) $1\pm 2\sqrt{2}$ 2) $1\pm\sqrt{2}$ 3) $2\sqrt{2}-1$ 4) $1\pm 3\sqrt{2}$

3. The first of two samples has 100 items with mean 15 and SD 3. If the whole group has 250 items with mean 15.6 and $SD=\sqrt{13.44}$ then SD of the second group is

1) 5 2) 4 3) 6 4) 6.5226.

4. If the coefficients of x^9, x^{10}, x^{11} in the expansion of are in $(1 + x)^n$ arithmetic progression then $n^2 - 41n =$

1) 398 2) 298 3) –398 4) 198

5. $\tan\frac{\pi}{5}+2\tan\frac{2\pi}{5}+4\cot\frac{4\pi}{5}=$

1) $\cot\frac{\pi}{5}$ 2) $\cot\frac{2\pi}{5}$ 3) $\cot\frac{3\pi}{5}$ 4) $\cot\frac{4\pi}{5}$

6. Let $\bar{u},\bar{v},\bar{w}$ be such that $|\bar{u}|=1,|\bar{v}|=2,|\bar{w}|=3$ if the projection of $\bar{v}$ along $\bar{u}$ is equal to that of $\bar{w}$ along $\bar{u}$ and $\bar{v}$, $\bar{w}$ are perpendicular to each other, then $|\bar{u}-\bar{v}+\bar{w}|$ =

1) $\sqrt{14}$ 2) 2 3) 14 4) $\sqrt{7}$

7. P is the point of intersection of the diagonals of the parallelogram ABCD. If S is any point in the space and $\overline{AB}+\overline{SB}+\overline{SC}+\overline{SD}=\lambda\overline{SP}$, then λ =

1) 2 2) 4 3) 6 4) 8

8. $\lim_{n\to\infty}\pi_{r=2}^{n}\left(\frac{r^3+1}{r^3-1}\right)=$

1) 1 2) 1/2 3) 2 4) 3/2

9. Let ' f ' be a function satisfying $f(x).f(y)=f(x)+f(y)+f(xy)-2\forall x,y\in R$ and $f(2)=5$ then $\lim_{x\to 4} f(x)=$

1) 5 2) 17 3) –5 4) 21

10. The number of integral solutions of $x+y+z=0$ *with* $x\geq -5,\ y\geq -5, z\geq -5$ *is*

1) 134 2) 136 3) 138 4) 140

11. The three sides of a trapezium are equal, each being 8cm. The area of the trapezium, when it is maximum, is

1) $24\sqrt{3}$sq.cm 2) $48\sqrt{3}$sq.cm 3) $72\sqrt{3}$sq.cm 4) 9 sq.cm

12. If f(x) = $\frac{(x-a)(x-b)}{x}$ and $\frac{f(x)}{(x-y)(x-z)}+\frac{f(y)}{(y-z)(y-x)}+\frac{f(z)}{(z-x)(z-y)}=\frac{k}{xyz}$, then k =

1) a 2) b 3) ab 4) 3ab

13. If α, β are roots of the equation $x^2 - 4x + 8 = 0$ then for any $n\in N, \alpha^{2n}+\beta^{2n} =$

1) $2^{2n+1}\cos\frac{n\pi}{2}$ 2) $2^{3n}\cos\frac{n\pi}{2}$ 3) $2^{3n+1}\cos\frac{n\pi}{2}$ 4) $2^{3n}\cos\frac{n\pi}{4}$

14. If A = {1, 2, 3, 4, 5}, and relation R on A is defined by $R=\{(x,y)/x<y \text{ and } |x^2-y^2|<9\}$ then R =

1) {(1,1), (2,2), (3,3), (4,4), (5,5)} 2) {(2,1), (3,2), (3,2), (4,3), (5,4)}

3) {(1,2), (1,3), (2,3), (3,4), (4,5)} 4) {(1,2), (1,3), (2,3), (3,4)}

15. $p\wedge(q\wedge r)$ is logically equivalent to

1) $p\vee(q\wedge r)$ 2) $(p\wedge q)\wedge r$ 3) $(p\wedge q)\vee r$ 4) $p\rightarrow(q\wedge r)$

16. Tangents drawn from P (1, 8) to the circle $x^2 + y^2 - 6x + 4y - 11 = 0$ touch the circle at A and B. The equation of circumcircle of triangle PAB is

1) $x^2 + y^2 - 2x + 6y - 29 = 0$ 2) $x^2 + y^2 - 6x - 4y + 19 = 0$

3) $x^2 + y^2 + 4x - 6y + 19 = 0$ 4) $x^2 + y^2 - 4x - 10y + 19 = 0$

17. Let P (3, 2, 6) be a point in space and Q be a point on the line $\vec{r}=(\hat{i}-\hat{j}+2\hat{k})+\mu(-3\hat{i}+\hat{j}+5\hat{k})$. Then the value of μ for which $\vec{PQ}$ is parallel to the plane x - 4y + 3z = 1 is

1) $\frac{1}{8}$ 2) $-\frac{1}{8}$ 3) $\frac{1}{4}$ 4) $-\frac{1}{4}$

18. If the roots of $z^3 + iz^2 + 2i = 0$ represent the vertices of a triangle in the Argand plane, then its area is

1) $\frac{3\sqrt{7}}{2}$ 2) 4 3) 2 4) $\frac{3\sqrt{7}}{4}$

19. $\int \frac{e^x(x+5)}{(x+6)^2}dx$ =

1) $\frac{e^x}{x+5}+c$ 2) $\frac{e^x}{x+6}+c$ 3) $\frac{e^x}{(x+5)^2}+c$ 4) $\frac{e^x}{(x+6)^2}+c$

20. The in center of a triangle formed by the lines $x\cos\left(\frac{\pi}{9}\right)+y\sin\left(\frac{\pi}{9}\right)=\pi$, $x\cos\left(\frac{8\pi}{9}\right)+y\sin\left(\frac{8\pi}{9}\right)=\pi$, $x\cos\left(\frac{13\pi}{9}\right)+y\sin\left(\frac{13\pi}{9}\right)=\pi$ is

1) (π, 0) 2) (0, π) 3) (0, 0) 4) (π, π)

21. The sum of the lengths of intercepts cut by the pair of coordinate axes on the lines x + y = a, x + y = ar, x + y = ar^2 where ($a \neq 0$) and $r=\frac{1}{2}$ is

1) $\sqrt{2}a$ 2) $2\sqrt{2}a$ 3) a 4) $\frac{\sqrt{2}}{a}$

22. Let C_1 and C_2 be two curves which satisfy the differential equation $2\left(\frac{dy}{dx}\right)^2+x\left(\frac{dy}{dx}\right)-y=0$ and passes through M (1, 1). If the area enclosed by curves C_1, C_2 and positive co-ordinate axes is $\frac{m}{n}$ (where m, n are co-primes) then m + n =

1) 13 2) 9 3) 8 4) 14

23. The angle between the tangents drawn at the extremities of the chord 2x - 3y - 18 = 0 of the parabola $(x-3)^2+(y+4)^2=\frac{(3x-4y+6)^2}{25}$ is

1) 90° 2) 45° 3) 30° 4) 60°

24. If the ellipse $\frac{x^2}{4}+\frac{y^2}{1}=1$ meet the ellipse $\frac{x^2}{1}+\frac{y^2}{a^2}=1$ in four distinct points and $a = b^2 - 10b + 25$, then the value of b does not satisfy

1) $(-\infty, 4]$ 2) (4, 6) 3) $[6, \infty)$ 4) $(-\infty, 4]\cup[6, \infty)$

25. cos2x + asinx = 2a – 7 has a solution if 'a' belongs to

1) $2 \le a \le 6$ 2) $2 \le a \le 8$ 3) $(-1, 1/2)$ 4) $(1, -1/2)$

26. The coordinates of foot of perpendicular drawn from A = (1, 0, 3) to the join of point B (4, 7, 1), C (3, 5, 3)

1) $\left(\frac{5}{3},\frac{7}{3},\frac{17}{3}\right)$ 2) (5, 7, 17) 3) $\left(\frac{5}{7},\frac{7}{3},\frac{17}{3}\right)$ 4) $\left(\frac{-5}{3},\frac{7}{3},\frac{-17}{3}\right)$

27. Value of $\frac{\int_0^n [x]dx}{\int_0^n \{x\}dx}$ where [x] and {x} are integral and fractional parts of x and n∈ N, is equal to

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

28. If $f(x)=\begin{vmatrix} x+\lambda & x & x \\ x & x+\lambda & x \\ x & x & x+\lambda \end{vmatrix}$ then f(3x) – f(x) is equal to

1) $3x\lambda^2$ 2) $6x\lambda^2$ 3) $x\lambda^2$ 4) $5x\lambda^2$

29. A man throws a die until he gets a number bigger than 3. The probability that he gets 5 in the last throw is

1) 1/3 2) 1/4 3) 1/6 4) 1/36

30. α, β, γ are the roots of $x^3 - 3x^2 + 3x + 7 = 0$ (ω is cube root of unity) then $\left(\frac{\alpha-1}{\beta-1}+\frac{\beta-1}{\gamma-1}+\frac{\gamma-1}{\alpha-1}\right)$ is

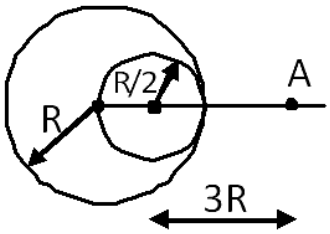
1) $3/\omega$ 2) ω^2 3) $2\omega^2$ 4) 3

Physics

31. A particle moves in the x-y plane with velocity $= \vec{v} = a\hat{i} + bt\hat{j}$. At the instant $t = \frac{a\sqrt{3}}{b}$ the magnitude of tangential, normal and total accelerations are

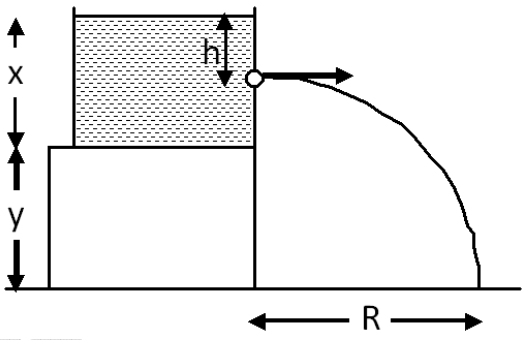
1) $\frac{\sqrt{3}}{2}b, \frac{b}{2}$ and b respectively
2) $\frac{b}{2}, \frac{b}{2}$ and b respectively
3) $\sqrt{2}b, \sqrt{2}b$ and b respectively
4) 2b, 2b and 2b respectively

32. A solid sphere of uniform density and radius R applies a gravitational force of attraction equal to F_1 on a particle placed at a distance 3R from the center of the sphere. A spherical cavity of radius R/2 is now made in the sphere as shown in the figure. The sphere with cavity now applies a gravitational force F_2 on the same particle. The ratio F_2/F_1 is



1) $\frac{9}{50}$
2) $\frac{41}{50}$
3) $\frac{3}{25}$
4) $\frac{22}{25}$

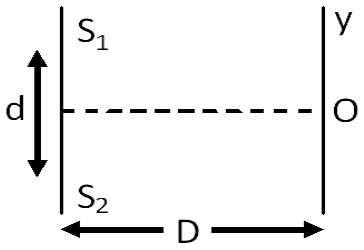
33. In the figure shown, match the following:



List – I	List – II
A) x = 2h, y = h	P) R = 2√3h
B) x = h, y = 3h	Q) R = 2√2h
C) x = 3h, y = h	R) R = 2h

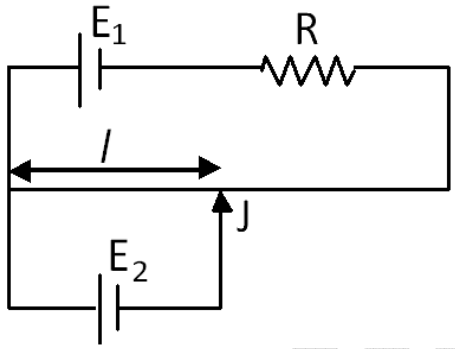
1) A – Q, B – P, C – P
2) A – Q, B – R, C – P
3) A – R, B – Q, C – P
4) A – Q, B – P, C – Q

34. Consider a usual set-up of Young's double slit experiment with slits of equal intensity as shown in figure. Take O as origin and the Y axis as indicated. If average intensity between $y_1 = -\frac{\lambda D}{4d}$ and $y_2 = +\frac{\lambda D}{4d}$ equal n times the intensity of maxima, then n equals (take average over phase difference)



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

35. In the potentiometer arrangement shown in figure, null point is obtained at length *l*. Match the following.

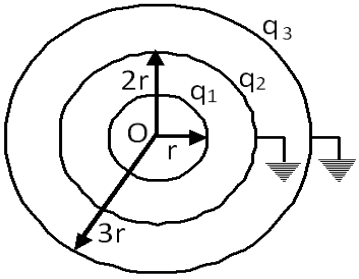


List – I	**List – II**
A) If E_1 is increased	P) *l* should increase
B) If R is increased	Q) *l* should decrease
C) If E_2 is increased	R) *l* should remain the same to again get the null point

1) A – Q, B – R, C – P 2) A – Q, B – Q, C – P

3) A – R, B – P, C – Q 4) A – Q, B – P, C – P

36. Three concentric conducting spherical shells have radii r, 2r and 3r and charges q_1, q_2 and q_3 respectively. Innermost and outermost shells are earthed as shown in figure. Select the correct alternative

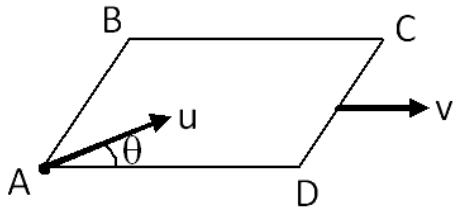


1) $q_1 + q_3 = -q_2$ 2) $q_1 = -\frac{q_2}{4}$ 3) $\frac{q_3}{q_1} = 3$ 4) All are correct

37. In an experiment refractive index of glass was observed to be 1.45, 1.56, 1.54, 1.44, 1.54 and 1.53. The mean absolute error in the experiment is

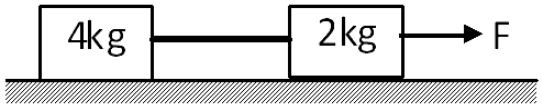
1) ±0.04 2) 0.02 3) –0.03 4) ±0.01

38. A smooth square platform ABCD is moving towards right with a uniform speed v. At what angle θ must a particle be projected from A with speed u so that it strikes the point B.



1) $\sin^{-1}\left(\frac{u}{v}\right)$ 2) $\cos^{-1}\left(\frac{v}{u}\right)$ 3) $\cos^{-1}\left(\frac{u}{v}\right)$ 4) $\sin^{-1}\left(\frac{v}{u}\right)$

39. Two blocks of mass 4 kg and 2 kg are connected by a heavy string and placed on rough horizontal plane. The 2 kg block is pulled with a constant force F. The coefficient of friction between the blocks and the ground is 0.5. What is the value of F so that tension in the string is constant throughout during the motion of the blocks: ($g = 10\ m/s^2$)

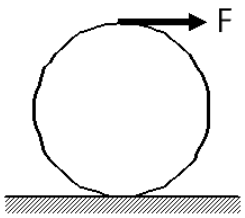


1) 40 N 2) 30 N 3) 50 N 4) 60 N

40. The potential energy of a particle of mass m is given by $U = \frac{1}{2}kx^2$ for $x < 0$ and $U = 0$ for $x \geq 0$. If total mechanical energy of the particle is E. Then its speed at $x = \sqrt{\frac{2E}{k}}$ is

1) Zero 2) $\sqrt{\frac{2E}{m}}$ 3) $\sqrt{\frac{E}{m}}$ 4) $\sqrt{\frac{E}{2m}}$

41. A force F is applied at the top of a ring of mass M and radius R placed on a rough horizontal surface as shown in figure. Friction is sufficient to prevent slipping. The friction force acting on the ring is



1) $\frac{F}{2}$ towards right 2) $\frac{F}{3}$ towards left 3) $\frac{2F}{3}$ towards right 4) Zero

42. A simple pendulum has time period T1. The point of suspension is now moved upward according to the relation $y = Kt^2$, ($K=1\ m/s^2$) where y is the vertical displacement. The time period now becomes T_2. The ratio of $\frac{T_1^2}{T_2^2}$ is ($g = 10\ m/s^2$)

1) 6/5 2) 5/6 3) 1 4) 4/5

43. **Statement 1:** Air is more elastic than iron.

Statement 2: Elasticity is directly proportional to compressibility and air is more compressible than iron.

1) If both Assertion and Reason are true and reason is correct explanation of Assertion.

2) If both Assertion and Reason are true but reason is not the correct explanation of Assertion.

3) If Assertion is true but reason is false.

4) If Assertion is false but reason is true

44. An object of specific gravity ρ is hung from a thin steel wire. The fundamental frequency for transverse standing waves in the wire is 300 Hz. The object is immersed in water, so that one half of its volume is submerged. The new fundamental frequency (in Hz) is

1) $300\left(\frac{2\rho-1}{2\rho}\right)^{1/2}$ 2) $300\left(\frac{2\rho}{2\rho-1}\right)^{1/2}$ 3) $300\left(\frac{2\rho}{2\rho-1}\right)$ 4) $300\left(\frac{2\rho-1}{2\rho}\right)$

45. Regarding speed of sound in gas match the following

List – I

A) Temperature of gas is made 4 times and pressure 2 times

B) Only pressure is made 4 times without change in temperature

C) Only temperature is changed to 4 times

D) Molecular mass of the gas is made 4 times

List – II

P) Speed becomes $2\sqrt{2}$ times

Q) Speed becomes 2 times

R) Speed remains unchanged

S) Speed remains half

1) A – Q, B – R, C – P, D – S

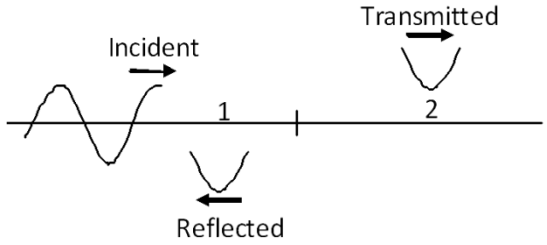
2) A – Q, B – R, C – S, D – P

3) A – Q, B – R, C – Q, D – S

4) A – Q, B – P, C – Q, D – S

Passage: [Following 2 questions]

Suppose A_i be the amplitude of incident wave, A_r of reflected wave and A_t of transmitted wave then



$$A_r = \frac{v_2 - v_1}{v_1 + v_2} A_i \; A_t = \frac{2v_2}{v_1 + v_2} A_i$$

Power of a traveling wave is given by $P = \frac{1}{2}\rho\omega^2 A^2 sv$ and intensity $I = \frac{1}{2}\rho\omega^2 A^2 v$

46. If P_i, P_r and P_t are powers of incident, reflected and transmitted waves and I_i, I_r and I_t the corresponding intensities, then

1) $P_i = P_r + P_t$

2) $I_i = I_r + I_t$

3) Both (1) and (2) are correct

4) Both (1) and (2) are wrong

47. Under what conditions 75% of incident energy is transmitted

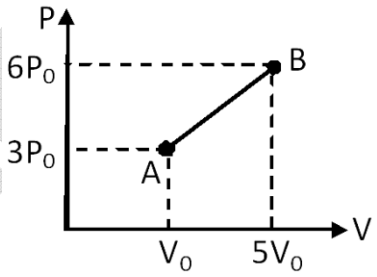
1) $\frac{v_1}{v_2} = \frac{1}{2}$

2) $\frac{v_1}{v_2} = \frac{1}{3}$

3) $\frac{v_1}{v_2} = \frac{1}{4}$

4) $\frac{v_1}{v_2} = \frac{2}{3}$

48. One mole of a monoatomic ideal gas undergoes the process A → B in the given P-V diagram. The specific heat for this process is



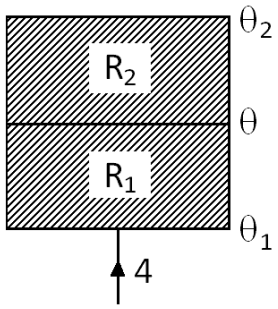
1) $\frac{3R}{2}$

2) $\frac{13R}{6}$

3) $\frac{5R}{2}$

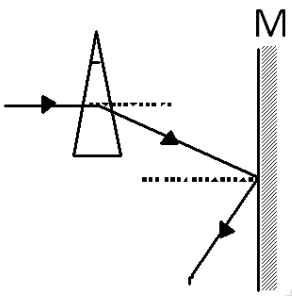
4) 2R

49. Consider the two insulating sheets with thermal resistances R_1 and R_2 as shown in figure. The temperature θ is



1) $\frac{\theta_1\theta_2R_1R_2}{(\theta_1+\theta_2)(R_1+R_2)}$ 2) $\frac{\theta_1R_1+\theta_2R_2}{R_1+R_2}$ 3) $\frac{(\theta_1+\theta_2)R_1R_2}{R_1^2+R_2^2}$ 4) $\frac{\theta_1R_2+\theta_2R_1}{R_1+R_2}$

50. A horizontal ray of light passes through a prism of $\mu = 1.5$ whose apex angle is 4° and then strikes a vertical mirror M as shown. For the ray after reflection to become horizontal, the mirror must be rotated through an angle of

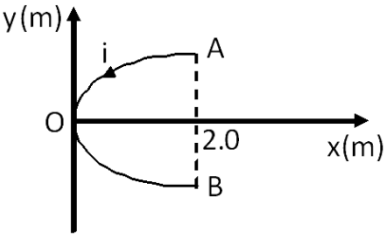


1) 2° 2) 3° 3) 4° 4) 1°

51. A cell develops the same power across two resistances R_1 and R_2 separately. The internal resistance of the cell is

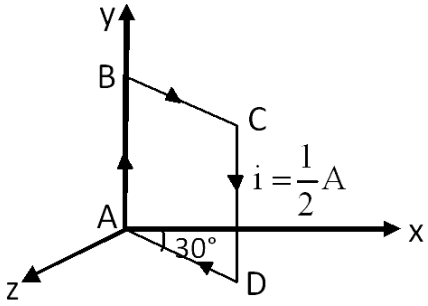
1) $R_1 + R_2$ 2) $\frac{R_1+R_2}{2}$ 3) $\sqrt{R_1R_2}$ 4) $\frac{\sqrt{R_1R_2}}{2}$

52. A conducting wire bent in the form of a parabola $y^2 = 2x$ carries a current i = 2A as shown in figure. This wire is placed in a uniform magnetic field $\vec{B} = -4\hat{k}$ tesla. The magnetic force on the wire is (in newton)



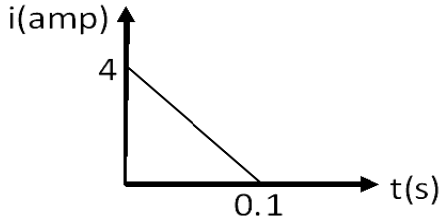
1) $-16\hat{i}$ 2) $32\hat{i}$ 3) $-32\hat{i}$ 4) $16\hat{i}$

53. Figure shows a square current carrying loop ABCD of side 2 m and current i = ½ A. The magnetic moment $\vec{M}$ of the loop is



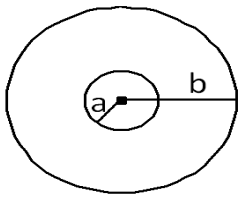
1) $(\hat{i}-\sqrt{3}\hat{k})A-m^2$ 2) $(\hat{j}-\hat{k})A-m^2$ 3) $(\sqrt{3}\hat{i}+\hat{k})A-m^2$ 4) $(\hat{i}+\hat{k})A-m^2$

54. Some magnetic flux is changed from a coil of resistance 10Ω. As a result an induced current is developed in it, which varies with time as shown in figure. The magnitude of change in flux through the coil in webers is



1) 2 2) 4 3) 6 4) 8

55. Two concentric and coplanar circuit coils have radii 'a' and 'b' (>> a) as shown in figure. Resistance of the inner coil is R. Current in the outer coil is increased from 0 to i, then the total charge circulating the inner coil is



1) $\frac{\mu_0 ia^2}{2Rb}$ 2) $\frac{\mu_0 iab}{2R}$ 3) $\frac{\mu_0 i}{2a}\frac{\pi b^2}{R}$ 4) $\frac{\mu_0 ib}{2\pi R}$

56. **Assertion:** Reactance offered by an Inductor increases with the frequency of the AC source.

Reason: The current leads the potential in a purely inductive network by π/2.

1) If both Assertion and Reason are true and reason is correct explanation of Assertion.

2) If both Assertion and Reason are true but reason is not the correct explanation of Assertion.

3) If Assertion is true but reason is false.

4) If assertion is false and reason is true.

57. A radioactive substance X decays into another radioactive substance Y. Initially only X was present. λ_x and λ_y are the disintegration constants of X and Y. N_x and N_y are the number of nuclei of X and Y at any time t. Number of nuclei N_y will be maximum when

1) $\frac{N_y}{N_x - N_y} = \frac{\lambda_y}{\lambda_x - \lambda_y}$

2) $\frac{N_x}{N_x - N_y} = \frac{\lambda_x}{\lambda_x - \lambda_y}$

3) $\lambda_y N_y = \lambda_x N_x$

4) $\lambda_y N_x = \lambda_x N_y$

58. The angular momentum of an electron in an orbit is quantized because it is a necessary condition for the compatibility with

1) The wave nature of electron

2) Particle nature of electron

3) Pauli's exclusion behaviour

4) None of the above

59. In X-ray tube when the accelerating voltage V is halved, the difference between the wavelengths of K_α line and minimum wavelength of continuous X-ray spectrum

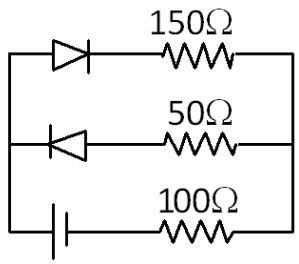
1) Remains constant

2) Becomes more than two times

3) Becomes half

4) Becomes less than two times

60. The circuit shown in the figure contains two diodes each with a forward resistance of 50Ω and with infinite backward resistance. If the battery voltage is 6 V, the current through the 100Ω resistance (in amperes) is



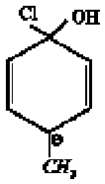
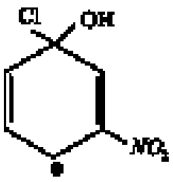
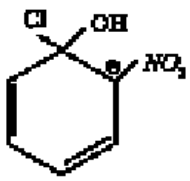
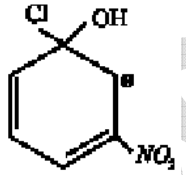
1) Zero 2) 0.02 3) 0.03 4) 0.036

Chemistry

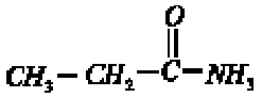
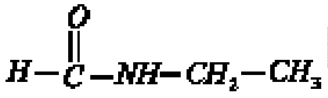
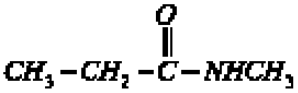
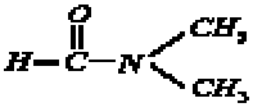
61. Among the following statements, the incorrect one is:

1) Zinc blende and pyrites are sulphides
2) Malachite and azurite are ores of copper
3) Calamine and siderite are carbonates
4) Argentite and cuprite are oxides

62. Which of the following transition state is more stable in the nucleophilic substitution?

1) 
2) 
3) 
4) 

63. An organic compound upon hydrolysis produces two compounds one product gave silver mirror test, other product reacts with Hinsberg reagent to produce an alkali insoluble product. The organic compound is

1) 
2) 
3) 
4) 

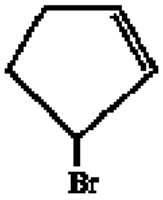
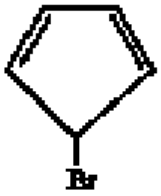
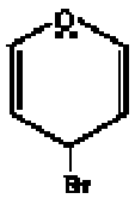
64. 100ml of a sample of hard water after passing through cation exchange resin, required 20ml of 0.05M NaOH for neutralisation. One litre of same sample of water on treatment with sufficient lime gave 200mg of $CaCO_3$. Assuming that the hardness is only due to Ca^{+2} ions. Find the degree of permanent hardness of water.

1) 100ppm
2) 200ppm
3) 300ppm
4) 150ppm

65. Calculate the pH at which $Mg(OH)_2$ begins to precipitate from solution containing 0.1 M Mg^{+2} ions. Ksp for $Mg(OH)_2$ is 1.0×10^{-11}

1) 5
2) 8
3) 4
4) 9

66. Arrange the following bromides in the increasing order of reactivity towards $AgNO_3$

A) 
B) 
C) 

1) B < A < C
2) A< B <C
3) C< A< B
4) C> A>B

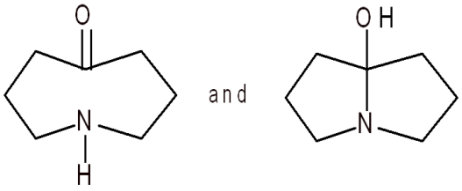
67. Shape of MnO_4^- and hybridization of Mn in MnO_4^- are respectively

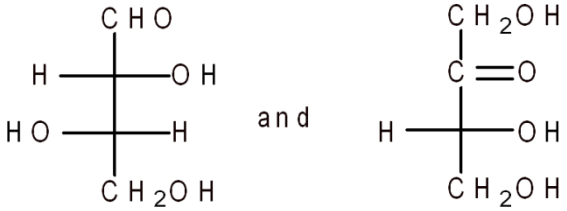
1) Sq. planar, dsp^2 2) sq. planar sp^2d 3) Tetrahedral, sp^3 4) Tetrahedral, d^3s

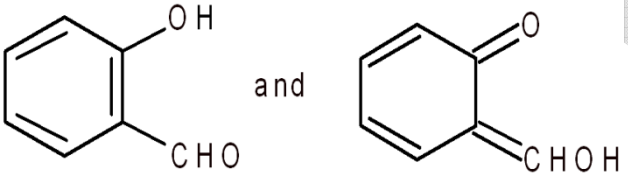
68. Bond dissociation energy of XY, X_2 and Y_2 (all diatomic molecules) are in the ratio 1:1: 0.5 and ∇ Hf of XY is –200 kJ mol^{-1}. The bond dissociation energy of X_2 will be:

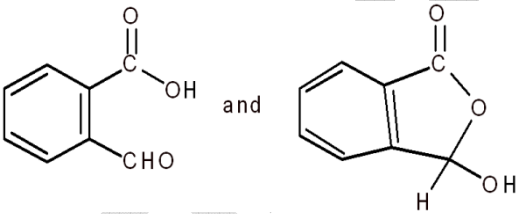
1) 300 kJ mol^{-1} 2) 400 kJ mol^{-1} 3) 800 kJ mol^{-1} 4) 200 kJ mol^{-1}

69. Which of the following pairs of structures do not represent tautomers?

1) 

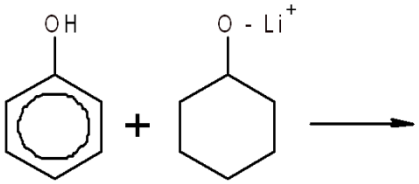
2) 

3) 

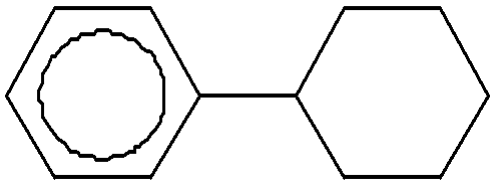
4) 

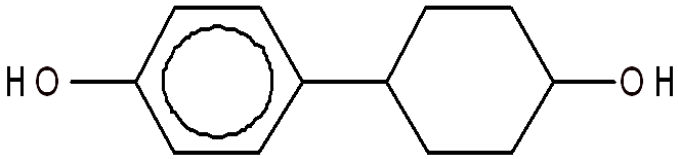
70. Consider a titration of potassium dichromate solution with acidified Mohr's salt solution using diphenylamine as indicator. The number of moles of Mohr's salt required per mole of dichromate is

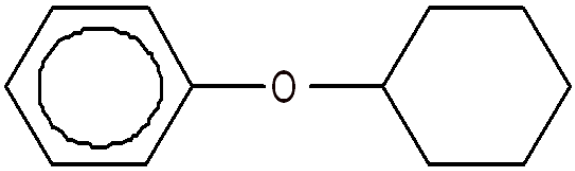
1) 5 2) 6 3) 3 4) 4

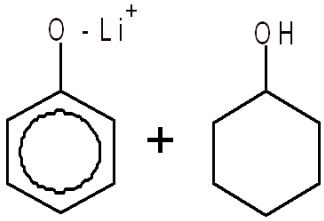
71. 

What is/are the product(s) of the above reaction?

1) 

2) 

3) 

4) 

72. Identify the correct statement of the following

a) Hypo forms super saturated solutions

b) On thermal decomposition hypo gives H_2S, SO_2 and S.

c) Dilute sodium thiosulphate, on reaction with $AgNO_3$ finally gives black ppt. of Ag_2S

d) AgB can be used in making photo graphic films.

1) A, C, D 2) A, B, C, D 3) A, B, C 4) B, C, D

73. Specify the coordination geometry around and hybridisation of N and B atoms in a 1:1 complex of BF_3 and NH_3

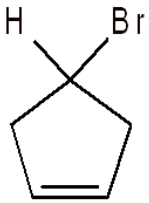
1) N-pyramidal, sp^3; B-planar, sp^2 2) N-pyramidal, sp^3; B-tetrahedral - sp^3

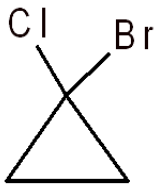
3) N: tetrahedral, sp^3; B-tetrahedral, sp^3 4) N-Pyramidal, sp^3; B-pyramidal, sp^3

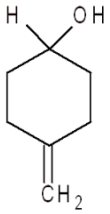
74. Two components A and B form an ideal solution. The mole fractions of A and B in ideal solution are X_A and X_B, while that of in vapour phase, these components have their mole fractions as Y_A and Y_B. Then, the slope and intercept of plot of $\frac{1}{Y_A}$ vs $\frac{1}{X_A}$ will be:

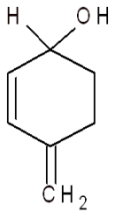
1) $\frac{P_B^0}{P_A^0}, \frac{P_B^0}{P_B^0 - P_A^0}$ 2) $P_A^0 - P_B^0, \frac{P_A^0}{P_B^0}$ 3) $\frac{P_A^0}{P_B^0}, \frac{P_B^0 - P_A^0}{P_B^0}$ 4) $\frac{P_B^0}{P_A^0}.\frac{P_A^0 - P_B^0}{P_A^0}$

75. Which of the following compounds posses a chiral centre?

1) 

2) 

3) 

4) 

76. Which of the following has the minimum heat of dissociation?

1) $[(CH_3)_3N \rightarrow B(CH_3)2F]$

2) $[(CH_3)_3N \rightarrow B(CH_3)_3]$

3) $[(CH_3)_3N \rightarrow BF_3]$

4) $[(CH_3)_3N \rightarrow B(CH_3)F_2]$

77. Which among the following is most soluble in water?

1) $LiClO_4$ 2) $KClO_4$ 3) $CsClO_4$ 4) $NaClO_4$

78. For Adiabatic free expansion (Pext = 0) of an ideal gas

1) $\Delta S_{surrounding} > 0$ 2) $\Delta S_{system} = 0$ 3) $\Delta S_{surrounding} = 0$ 4) $\Delta S_{surrounding} < 0$

79. $C_6H_5 - CO - CH_2 - CH_2 - CH_2 - COOH \rightarrow C_6H_5 - CO - CH_2 - CH_2 - CH_2 - CD_2OH$. This conversion is done by

1) $(CH_2OH)_2$ followed by $LiAlD_4/ H_3O^+$

2) $DMgBr/H_3O^+$

3) $NaBH_4/H_3O^+$ followed by $LiAlD_4/H_2O$

4) $LiAlD_4/H_2O$ followed by $NaBH_4/H_3O^+$

80. On heating potassium ferrocyanide with conc. H_2SO_4 produces a neutral gas 'A'. The gas 'A' on treatment with caustic soda under high pressure produced 'B', what are 'A' and 'B' respectively.

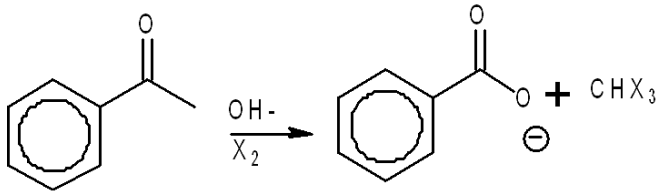
1) CO, HCOONa 2) NO_2, $NaNO_3$ 3) CO_2, Na_2CO_3 4) SO_2, Na_2SO_4

81. The compound insoluble in acetic acid is

1) Calcium oxalate 2) Calcium hydroxide

3) Calcium oxide 4) Calcium carbonate

82.



Which of the following is correct comparison of rate of haloform reaction with various halogens?

1) $rBr_2 > rCl_2 > rI_2$ 2) $rCl_2 \approx rBr_2 \approx rI_2$

3) $rCl_2 > rBr_2 > rI_2$ 4) $rI_2 > rBr_2 > rCl_2$

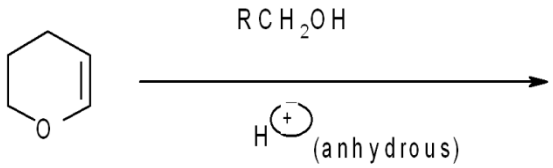
83. A complex of certain metal has the magnetic moment of 4.91 BM whereas another complex of the same metal with same oxidation state has zero magnetic moment. The metal ion could be…… and if that metal ion forms a complex with EDTA, then its EAN would be……

1) Fe^{2+}, 36 2) Ag^{+}, 36 3) Co^{2+}, 36 4) Mn^{2+}, 38

84. Of the following metals, which one cannot be obtained by electrolysis of the aqueous solution of its salt is

1) Cu 2) Au 3) Ag 4) Mg

85. The major product of the following reaction is



1) An ether 2) An ester 3) A hemiacetal 4) An acetal

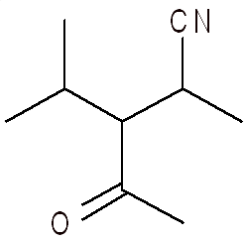
86. The compressibility of a gas is less than unity at STP. Therefore,

1) $V_m = 22.4L$ 2) $V_m = 44.8L$ 3) $V_m > 22.4L$ 4) $V_m < 22.4L$

87. Nitrogen dioxide cannot be obtained by heating

1) $Cu(NO_3)_2$ 2) $AgNO_3$ 3) KNO_3 4) $Pb(NO_3)_2$

88. The IUPAC name of



is

1) 3 – acetyl – 2 – cyano – 4 – methylpentane

2) 3 – ethanoyl – 2 – methyl – 3 – (1– methylethyl) pentanenitrile

3) 2 – methyl – 3 – (1 – methylethyl) – 4 – oxopentanenitrile

4) 4 – cyano – 3 – (1– methylethyl) – 2– pentanone

89. For the electrochemical cell, M $|M^+||$ $X^-|$ X, E (M+|M) = 0.44V and E° (X/X^-) = 0.33V. From this data one can deduce that

1) E_{cell} = 0.77 V

2) E_{cell} = –0.77V

3) M + X → M+ + X^- is the spontaneous reaction

4) M+ + X^- → M + X is the spontaneous reaction

90. The exhausted permutit is generally regenerated by percolating through it a solution of:

1) Magnesium chloride 2) Potassium chloride 3) Sodium chloride 4) Calcium chloride

KEY

1) 3	2) 1	3) 2	4) 3	5) 1
6) 1	7) 2	8) 4	9) 2	10) 2
11) 2	12) 3	13) 3	14) 4	15) 2
16) 4	17) 3	18) 3	19) 2	20) 3
21) 2	22) 2	23) 1	24) 2	25) 1
26) 1	27) 2	28) 2	29) 1	30) 1
31) 1	32) 2	33) 1	34) 1	35) 4
36) 4	37) 1	38) 2	39) 2	40) 2
41) 4	42) 1	43) 4	44) 1	45) 3
46) 1	47) 2	48) 2	49) 4	50) 1
51) 3	52) 2	53) 1	54) 1	55) 1
56) 3	57) 3	58) 1	59) 4	60) 2
61) 4	62) 3	63) 4	64) 3	65) 4
66) 1	67) 4	68) 2	69) 2	70) 2
71) 4	72) 2	73) 3	74) 4	75) 4
76) 2	77) 1	78) 3	79) 1	80) 1
81) 1	82) 2	83) 1	84) 4	85) 4
86) 4	87) 3	88) 3	89) 4	90) 3