JEE MAINS MODEL PAPER - 2017

No. of Questions: 90 **Maximum Marks: 360** **Time: 3 hours**

PHYSICS

1. Distance of the centre of mass of a solid uniform cone from its vertex is z_0. If the radius of its base is R and its height is h then z_0 is equal to:

1) $\frac{5h}{8}$ 2) $\frac{3h^2}{8R}$ 3) $\frac{h^2}{4R}$ 4) $\frac{3h}{4}$

2. A red LED emits light at 0.1 watt uniformly around it. The amplitude of the electric field of the light at a distance of 1 m from the diode is:

1) 5.48 V/m 2) 7.75 V/m 3) 1.73 V/m 4) 2.45 V/m

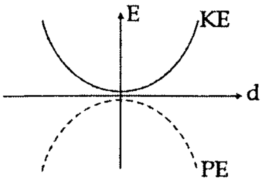
3. A pendulum made of uniform wire of cross sectional area 'A' has time period T. When an addition mass 'M' is added to its bob, the time period changes to TM. If the Young's modules of the material of the wire is Y then $\frac{1}{Y}$ is equal to: (g = gravitational acceleration)

1) $\left[1-\left(\frac{TM}{T}\right)^2\right]\frac{A}{Mg}$ 2) $\left[1-\left(\frac{T}{TM}\right)^2\right]\frac{A}{Mg}$

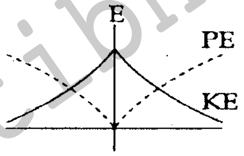
3) $\left[\left(\frac{TM}{T}\right)^2-1\right]\frac{A}{Mg}$ 4) $\left[\left(\frac{TM}{T}\right)^2-1\right]\frac{Mg}{A}$

4. For a simple pendulum, a graph is plotted between its kinetic energy (KE) and potential energy (PE) against its displacement d. Which one of the following represents these correctly? (Graphs are schematic and not drawn to scale)

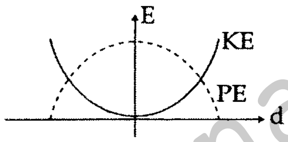
1)



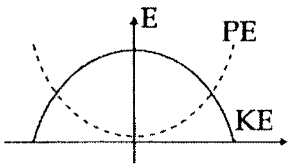
2)



3)



4)



5. A train is moving on a straight track with speed 20 ms^{-1}. It is blowing its whistle at the frequency of 1000 Hz. The percentage change in the frequency heard by a person standing near the track as the train passes him is (speed of sound = 320 ms^{-1}) close to:

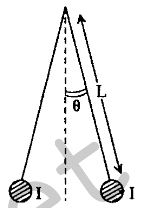
1) 18% 2) 24% 3) 6% 4) 12%

6. When 5V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is 2.5×10^{-4} ms^{-1}. If the electron density in the wire is 8×10^{28} m^{-3}, the resistivity of the material is close to :

1) 1.6×10^{-6} Ωm 2) 1.6×10^{-5} Ωm

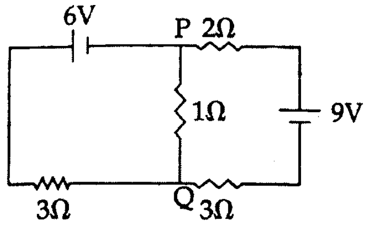
3) 1.6×10^{-8} Ωm 4) 1.6×10^{-7} Ωm

7. Two long current carrying thin wires, both with current I, are held by insulating threads of length L and are in equilibrium as shown in the figure, with threads making an angle 'θ' with the vertical. If wires have mass λ per unit length then the value of I is: (g = gravitational acceleration)



1) $2\sqrt{\frac{\Pi g L}{\mu_0}}\tan\theta$ 2) $\sqrt{\frac{\Pi \lambda g L}{\mu_0}}\tan\theta$ 3) $\sin\theta\sqrt{\frac{\Pi \lambda g L}{\mu_0 \cos\theta}}$ 4) $2\sin\theta\sqrt{\frac{\Pi \lambda g L}{\mu_0 \cos\theta}}$

8.



In the circuit shown, the current in the 1Ω resistor is:

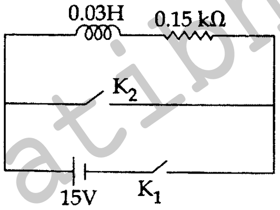
1) 0.13 A, from Q to P
2) 0.13 A, from P to Q
3) 1.3 A, from P to Q
4) 0 A

9. The excess pressure across a soap bubble of radius r is p = 4σ/r, where σ is the surface tension of soap solution. What is the excess pressure across an air bubble of the same radius r formed inside a container of soap solution?

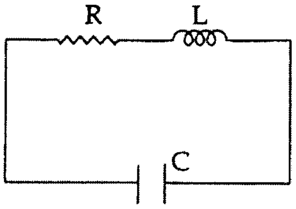
1) $\frac{\sigma}{r}$ 2) $\frac{2\sigma}{r}$ 3) $\frac{4\sigma}{r}$ 4) None

10. An inductor (L = 0.03 H) and a resistor (R = 0.15 kΩ) are connected in series to a battery of 15 V EMF in a circuit shown below. The key K_1 has been kept closed for a long time. Then at t = 0, K_1 is opened and key K_2 is closed simultaneously. At t = 1 ms, the current in the circuit will be: ($e^5 \approx 150$)

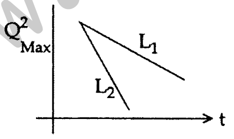
1) 6.7 mA
2) 0.67 mA
3) 100 mA
4) 67 mA

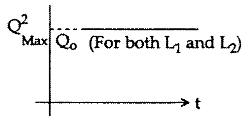


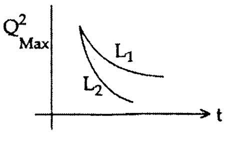
11. An LCR circuit is equivalent to a damped pendulum. In an LCR circuit the capacitor is charged to Q_0 and then connected to the L and R as shown below:

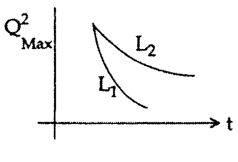


If a student plots graphs of the square of maximum charge (Q^2max) on the capacitor with time (t) for two different values L_1 and L_2 ($L_1 > L_2$) of L then which of the following represents this graph correctly? (plots are schematic and not drawn to scale)

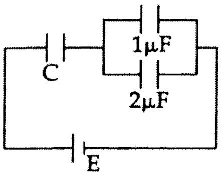
1)


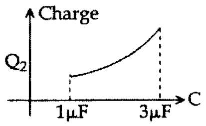
2)


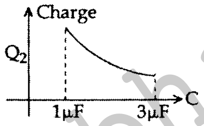
3)


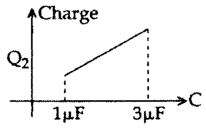
4)


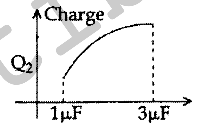
12. In the given circuit, charge Q_2 on the 2μF capacitor changes as C is varied from 1μF to 3μF. Q_2 as a function of 'C' is given properly by: (figures are drawn schematically and are not to scale)



1) 

2) 

3) 

4) 

13. From a solid sphere of mass M and radius R a cube of maximum possible volume is cut. Moment of inertia of cube about an axis passing through its centre and perpendicular to one of its faces is:

1) $\frac{4MR^2}{9\sqrt{3}\,\pi}$ 2) $\frac{4MR^2}{3\sqrt{3}\,\pi}$ 3) $\frac{MR^2}{32\sqrt{2}\,\pi}$ 4) $\frac{MR^2}{16\sqrt{2}\,\pi}$

14. The period of oscillation of a simple pendulum is $T = 2\pi\sqrt{\frac{L}{g}}$. Measured value of L is 20.0 cm known to 1 mm accuracy and time for 100 oscillations of the pendulum is found to be 90 s using a wrist watch of 1s resolution. The accuracy in the determination of g is:

1) 1% 2) 5% 3) 2% 4) 3%

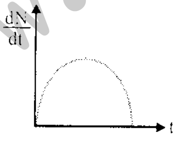
15. On a hot summer night, the refractive index of air is smallest near the ground and increase with height from the ground. When a light beam is directed horizontally, the Huygens' principle leads us to conclude that as its travels, the light beam:

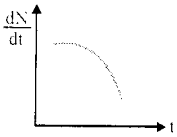
1) bends downwards
2) bends upwards
3) becomes narrower
4) goes horizontally without any deflection

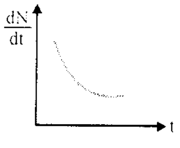
16. A signal of 5 kHz frequency is amplitude modulated on a carrier wave of frequency 2 MHz. The frequencies of the resultant signal is / are:

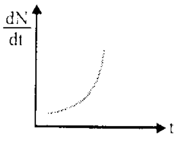
1) 200 kHz, 2000 kHz and 1995 kHz
2) 2000 kHz and 1995 kHz
3) 2 MHz only
4) 2005 kHz, and 1995 kHz

17. Radioactive element decays to form a stable nuclide, then the rate of decay of reactant $\left(\frac{dN}{dt}\right)$ will vary with time (t) as shown in figure

1) 

2) 

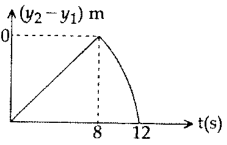
3) 

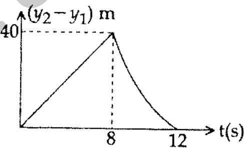
4) 

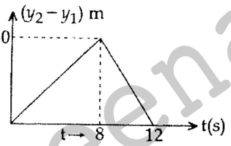
18. Consider a spherical shell of radius R at temperature T. The black body radiation inside it can be considered as an ideal gas of photons with internal energy per unit volume $u = \frac{U}{V} \propto T^4$ and pressure $P = \frac{1}{3}\left(\frac{U}{V}\right)$. If the shell now undergoes an adiabatic expansion the relation between T and R is:

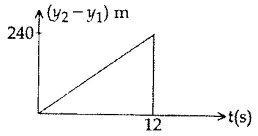
1) $T \propto \frac{1}{R}$
2) $T \propto \frac{1}{R^3}$
3) $T \propto e^{-R}$
4) $T \propto e^{-3R}$

19. Two stones are thrown up simultaneously from the edge of a cliff 240 m high with initial speed of 10 m/s and 40 m/s respectively. Which of the following graph best represents the time variation of relative position of the second stone with respect to the first? (Assume stones do not rebound after hitting the ground and neglect air resistance, take $g = 10\ m/s^2$). (The figures are schematic and not drawn to scale)

1)


2)


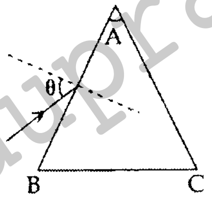
3)


4)


20. A uniformly charged solid sphere or radius R has potential V_0 (measured with respect to ∞) on its surface. For this sphere the equipotential surfaces with potentials $\frac{3V_0}{2}, \frac{5V_0}{4}, \frac{3V_0}{4}$, and $\frac{V_0}{4}$, have radius R_1, R_2, R_3 and R_4 respectively. Then

1) $R_1 = 0$ and $R_2 < (R_4 - R_3)$
2) $R_1 \neq 0$ and $(R_2 - R_1) > (R_4 - R_3)$
3) $R_1 = 0$ and $R_2 > (R_4 - R_3)$
4) None of these

21. Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray, incident at an angle θ, on the face AB would get transmitted through the face AC of the prism provided:



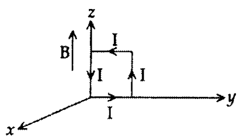
1) $\theta > \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

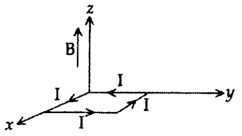
2) $\theta < \cos^{-1}\left[\mu \sin\left(A + \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

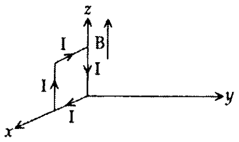
3) $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

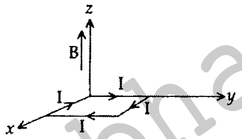
4) $\theta < \sin^{-1}\left[\mu \sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right)\right]$

22. A rectangular loop of sides 10 cm and 5 cm carrying a current I of 12 A is placed in different orientations as shown in the figures below :

1) 

2) 

3) 

4) 

If there is a uniform magnetic field of 0.3 T in the positive z direction, in which orientations the loop would be in (i) stable equilibrium and (ii) unstable equilibrium?

1) (2) and (4), respectively
2) (2) and (3), respectively
3) (1) and (2), respectively
4) (1) and (3), respectively

23. Two coaxial solenoids of different radii carry current I in the same direction. Let $\vec{F_1}$ be the magnetic force on the inner solenoid due to the outer one and $\vec{F_2}$ be the magnetic force on the outer solenoid due to the inner one. Then:

1) $\vec{F_1}$ is radially inwards and $\vec{F_2} = 0$
2) $\vec{F_1}$ is radially outwards and $\vec{F_2} = 0$
3) $\vec{F_1} = \vec{F_2} = 0$
4) $\vec{F_1}$ is radially inwards and $\vec{F_2}$ is radially outwards

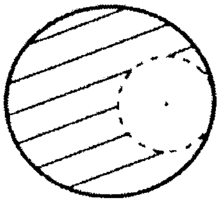
24. A particle of mass m moving in the x direction with speed 2v is hit by another particle of mass 2m moving in the y direction with speed v. If the collision is perfectly inelastic, the percentage loss in the energy during the collision is close to:

1) 56%
2) 62%
3) 44%
4) 50%

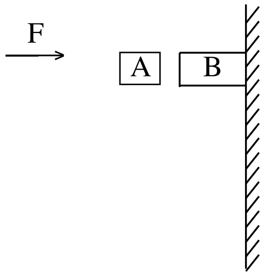
25. Consider an ideal gas confined in an isolated closed chamber. As the gas undergoes an adiabatic expansion, the average time of collision between molecules increases as V^q, where V is the volume of the gas. The value of q is: $\left(\gamma = \frac{Cp}{Cv}\right)$

1) $\frac{\gamma + 1}{2}$
2) $\frac{\gamma - 1}{2}$
3) $\frac{3\gamma + 5}{6}$
4) $\frac{3\gamma - 5}{6}$

26. From a solid sphere of mass M and radius R, a spherical portion of radius $\frac{R}{2}$ is removed, as shown in the figure. Taking gravitational potential V = 0 at r = ∞, the potential at the centre of the gravity thus formed is (G = gravitational constant)



1) $\frac{-2GM}{3R}$
2) $\frac{-2GM}{R}$
3) $\frac{-GM}{2R}$
4) $\frac{-GM}{R}$

27. 

Given in the figure are two blocks A and B of weight 20 N and 100 N, respectively. These are being pressed against a wall by a force F as shown.

If the coefficient of friction between the blocks is 0.1 and between block B and the wall is 0.15, the frictional force applied by the wall on block B is:

1) 120 N 2) 150 N 3) 100 N 4) 80 N

28. A particle is performing S.H.M. along X-axis with amplitude 4 cm and time period 1.2 sec. The minimum time taken by the particle to move from x = + 2 cm to x = + 4 cm and back again is given by

1) 0.6 s 2) 0.4 s 3) 0.3 s 4) 0.2 s

29. As an electron makes a transition from an exited state to the ground state of a hydrogen like atom/ ion:

1) Kinetic energy decreases, potential energy increase but total energy remains same

2) Kinetic energy and total energy decrease but potential energy increases

3) Its kinetic energy increases but potential energy and total energy decrease

4) Kinetic energy, potential energy and total energy decrease

30. Match List – I (Fundamental Experiment) with List – II (its conclusion) and select the correct option from the choices given below the list:

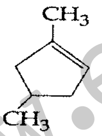
List – I		**List – II**	
1)	Franck – Hertz Experiment.	(i)	Particle nature of light
2)	Photo – electric experiment.	(ii)	Discrete energy levels of atom
3)	Davison – Germer Experiment.	(iii)	Wave nature of electron
		(iv)	Structure of atom

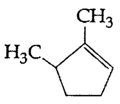
1) (1) – (ii), (2) – (i), (3) – (iii) 2) (1) – (iv), (2) – (iii), (3) – (ii)

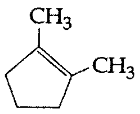
3) (1) – (i), (2) – (iv), (3) – (iii) 4) (1) – (ii), (2) – (iv), (3) – (iii)

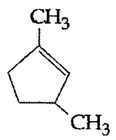
CHEMISTRY

31. Which compound would give 5 – keto – 2 – methyl hexanal upon ozonolysis?

1) 

2) 

3) 

4) 

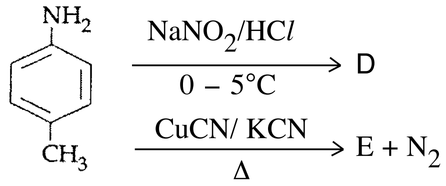
32. Which of the vitamins given below is water soluble?

1) Vitamin E 2) Vitamin K 3) Vitamin C 4) Vitamin D

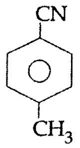
33. Which one of the following alkaline earth metal sulphates has its hydration enthalpy greater than its lattice enthalpy?

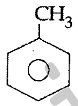
1) $BaSO_4$ 2) $SrSO_4$ 3) $CaSO_4$ 4) $BeSO_4$

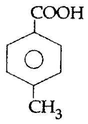
34. In the reaction

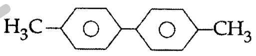


the product E is.

1) 

2) 

3) 

4) 

35. Sodium metal crystallizes in a body centred cubic lattice with a unit cell edge of 4.29 Å The radius of sodium atom is approximately:

1) 5.72 Å
2) 0.93 Å
3) 1.86 Å
4) 3.22 Å

36. The percent loss in weight after heating a pure sample of potassium chlorate (mol. wt. = 122.5) will be

1) 12.25
2) 24.50
3) 39.18
4) 49.0

37. Which of the following is the energy of a possible excited state of hydrogen ?

1) – 3.4 eV
2) + 6.8 eV
3) +13.6 eV
4) – 6.8 eV

38. Which has the highest pH ?

1) CH_3COONH_4
2) Na_2CO_3
3) NH_4Cl
4) $NaNO_3$

39. The ionic radii (in Å) of N^{3-}, O^{2-} and F^- are respectively :

1) 1.71, 1.40 and 1.36
2) 1.71, 1.36 and 1.40
3) 1.36, 1.40 and 1.71
4) 1.36, 1.71 and 1.40

40. In the context of the Hall - Heroult process for the extraction of Al, which of the following statements are false ?

1) Al^{3+} is reduced at the cathode to form Al
2) Na_3AlF_6 serves as the electrolyte
3) CO and CO_2 are produced in this process
4) Al_2O_3 is mixed with CaF_2 which lowers the melting point of the mixture and brings conductivity

41. In the following sequence of reactions:

$$\text{Toluene} \xrightarrow{KMnO_4} A \xrightarrow{SOCl_2} B \xrightarrow[BaSO_4]{H_2/Pd} C$$

the product C is :

1) $C_6H_5CH_2OH$
2) C_6H_5CHO
3) C_6H_5COOH
4) $C_6H_5CH_3$

42. Higher order (>3) reactions are rare due to:

1) shifting of equilibrium towards reactants due to elastic collisions

2) loss of active species on collision

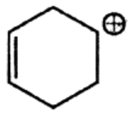
3) low probability of simultaneous collision of all the reacting species

4) increase in entropy and activation energy as more molecules are involved

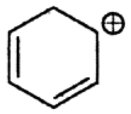
43. Which of the following compounds will exhibit geometrical isomerism?

1) 2 – Phenyl – 1 – butene
2) 1, 1 – Diphenyl – 1 – propane
3) 1 – Phenyl – 2 – butene
4) 3 – Phenyl – 1 – butene

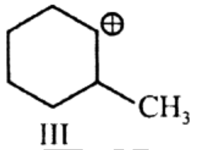
44.



I



II



III

Among these cations, which of the following orders is correct for their no-bond-resonance energy?

1) I > II > II
2) III > II > I
3) I > III > II
3) III > I > II

45. The intermolecular interaction that is dependent on the inverse cube of distance between the molecules is:

1) London force
2) hydrogen bond
3) ion - ion interaction
4) ion - dipole interaction

46. The molecular formula of a commercial resin used for exchanging ions in water softening is $C_8H_7SO_3Na$ (Mol. wt. 206). What would be the maximum uptake of Ca^{2+} ions by the resin when expressed in mole per gram resin?

1) $\frac{2}{309}$
2) $\frac{1}{412}$
3) $\frac{1}{103}$
4) $\frac{1}{206}$

47. Two Faraday of electricity is passed through a solution of $CuSO_4$. The mass of copper deposited at the cathode is :

(at. mass of Cu = 63.5 amu)

1) 2 g
2) 127 g
3) 0 g
4) 63.5 g

48. The number of geometric isomers that can exist for square planar $[Pt\ (Cl)\ (py)\ (NH_3)\ (NH_2OH)]^+$ is (py = pyridine) :

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

49. In Carius method of estimation of halogens, 250 mg of an organic compound gave 141 mg of AgBr. The percentage of bromine in the compound is : (at. mass Ag = 108; Br = 80)

1) 48
2) 60
3) 24
4) 36

50. The color of $KMnO_4$ is due to:

1) L → M charge transfer transition

2) $\sigma - \sigma*$ transition

3) M → L charge transfer transition

4) d – d transition

51. The synthesis of alkyl fluorides is best accomplished by:

1) Finkelstein reaction
2) Swarts reaction
3) Free radical fluorination
4) Sandmeyer's reaction

52. 3 g of activated charcoal was added to 50 mL of acetic acid solution (0.06 N) in a flask. After an hour it was filtered and the strength of the filtrate was found to be 0.042 N. The amount of acetic acid adsorbed (per gram of charcoal) is:

1) 42 mg
2) 54 mg
3) 18 mg
4) 36 mg

53. The vapour pressure of acetone at 20°C is 185 torr. When 1.2 g of a non-volatile substance was dissolved in 100 g of acetone at 20°C, its vapour pressure was 183 torr. The molar mass (g mol^{-1}) of the substance is:

1) 128
2) 488
3) 32
4) 64

54. Which among the following is the most reactive?

1) I_2
2) ICl
3) Cl_2
4) Br_2

55. The standard Gibbs energy change at 300 K for the reaction 2A $\rightleftharpoons$ B + C is 2494.2 J. At a given time, the composition of the reaction mixture is $[A] = \frac{1}{2}$, [B] = 2 and $[C] = \frac{1}{2}$.

The reaction proceeds in the:

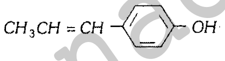
[R = 8.314 J/K/mol, e = 2.718]

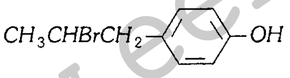
1) forward direction because $Q < K_C$
2) reverse direction because $Q < K_C$
3) forward direction because $Q > K_C$
4) reverse direction because $Q > K_C$

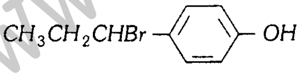
56. **Assertion:** Nitrogen and Oxygen are the main components in the atmosphere but these do not react to form oxides of nitrogen.

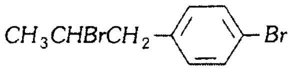
Reason: The reaction between nitrogen and oxygen requires high temperature.

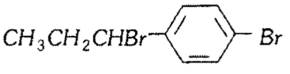
1) The assertion is incorrect, but the reason is correct
2) Both the assertion and reason are incorrect
3) Both assertion and reason are correct, and the reason is the correct explanation for the assertion
4) Both assertion and reason are correct, but the reason is not the correct explanation for the assertion

57. The reaction of  with HBr gives

1) 

2) 

3) 

4) 

58. Which of the following is not a natural polymer

1) Cellulose
2) Protein
3) PVC
4) Nucleic acid

59. The following reaction is performed at 298 K.

$$2\,NO(g) + O_2(g) \rightleftharpoons 2\,NO_2(g)$$

The standard free energy of formation of NO(g) is 86.6 kj/mol at 298 K. What is the standard free energy of formation of $NO_2(g)$ at 298 K? ($Kp = 1.6 \times 10^{12}$)

1) $86600 - \dfrac{ln(1.6 \times 10^{12})}{R(298)}$
2) $0.5\,[2 \times 86{,}600 - R(298)\,ln(1.6 \times 10^{12})]$
3) $R(298)\,ln(1.6 \times 10^{12}) - 86600$
4) $86600 + R(298)\,ln(1.6 \times 10^{12})$

60. The Vander Waal's constant 'a' for the gases O_2, N_2, NH_3 and CH_4 are 1.3, 1.390, 4.170 and 2.253 L^2 atm mol^{-2} respectively. The gas which can be most easily liquefied is

1) O_2
2) N_2
3) NH_3
4) CH_4

MATHEMATICS

61. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three non-zero vectors such that no two of them are collinear and $(\vec{a} \times \vec{b}) \times \vec{c} = \frac{1}{3}\,|\vec{b}|\,|\vec{c}|\,\vec{a}$. If θ is the angle between vector $\vec{b}$ and $\vec{c}$, then a value of sin θ is**:**

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

62. Let O be the vertex and Q be any point on the parabola, $x^2 = 8y$. If the point P divides the line segment OQ internally in the ratio 1 : 3, then the locus of P is:

1) $y^2 = 2x$
2) $x^2 = 2y$
3) $x^2 = y$
4) $y^2 = x$

63. If the angles of elevation of the top of a tower from three collinear points A, B and C on a line leading to the foot of the tower, are 30°, 45° and 60° respectively, then the ratio AB **:** BC, is:

1) $1 : \sqrt{3}$
2) $2 : 3$
3) $\sqrt{3} : 1$
4) $\sqrt{3} : \sqrt{2}$

64. The number of points, having both co-ordinates as integers, that lie in the interior of the triangle with vertices (0, 0), (0, 41) and (41, 0), is:

1) 820
2) 780
3) 901
4) 861

65. The equation of the plane containing the line $2x - 5y + z = 3$; $x + y + 4z = 5$, and parallel to the plane $x + 3y + 6z = 1$, is:

1) $x + 3y + 6z = 7$
2) $2x + 6y + 12z = -13$
3) $2x + 6y + 12z = 13$
4) $x + 3y + 6z = -7$

66. Let A and B be two sets containing four and two elements respectively. Then the number of subsets of the set A × B, each having at least three elements is:

1) 275
2) 510
3) 219
4) 256

67. Locus of the image of the point (2, 3) in the line $(2x - 3y + 4) + k(x - 2y + 3) = 0$, $k \in R$, is a:

1) Circle of radius $\sqrt{2}$.
2) Circle of radius $\sqrt{3}$
3) Straight line parallel to x – axis.
4) Straight line parallel to y – axis.

68. $\lim\limits_{x \to 0} \dfrac{(1 - \cos 2x)(3 + \cos x)}{x \tan 4x}$ is equal to:

1) 2 2) $\dfrac{1}{2}$ 3) 4 4) 3

69. The distance of the point (1, 0, 2) from the point of intersection of the line $\dfrac{x-2}{3} = \dfrac{y+1}{4} = \dfrac{z-2}{12}$ and the plane $x - y + z = 16$, is:

1) $3\sqrt{21}$ 2) 13 3) $2\sqrt{14}$ 4) 8

70. The sum of coefficients of integral powers of x in the binomial expansion of $(1 - 2\sqrt{x})^{50}$ is:

1) $\dfrac{1}{2}(3^{50} - 1)$ 2) $\dfrac{1}{2}(2^{50} + 1)$ 3) $\dfrac{1}{2}(3^{50} + 1)$ 4) $\dfrac{1}{2}(3^{50})$

71. The sum of first 9 terms of the series $\dfrac{1^3}{1} + \dfrac{1^3 + 2^3}{1 + 3} + \dfrac{1^3 + 2^3 + 3^3}{1 + 3 + 5} + \ldots\ldots\ldots$ is

1) 142 2) 192 3) 71 4) 96

72. The area (in sq. units) of the region described by

$\{(x, y): y^2 \leq 2x \text{ and } y \geq 4x - 1\}$ is:

1) $\dfrac{15}{64}$ 2) $\dfrac{9}{32}$ 3) $\dfrac{7}{32}$ 4) $\dfrac{5}{64}$

73. The set of all values of λ for which the system of linear equations:

$2x_1 - 2x_2 + x_3 = \lambda x_1$

$2x_1 - 3x_2 + 2x_3 = \lambda x_2$

$-x_1 + 2x_2 = \lambda x_3$

has a non-trivial solution,

1) contains two elements 2) contains more than two elements.

3) is an empty set. 4) is a singleton.

74. A complex number z is said to be unimodular if $|z| = 1$. Suppose z_1 and z_2 are complex numbers such that $\dfrac{z_1 - 2z_2}{2 - z_1 \overline{z}_2}$ is unimodular and z_2 is not unimodular. Then the point z_1 lies on a:

1) circle of radius 2 2) circle of radius $\sqrt{2}$

3) straight line parallel to x-axis 4) straight line parallel to y-axis

75. The number of common tangents to the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$, is:

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

76. The number of integers greater than 6,000 that can be formed, using the digits 3, 5, 6, 7 and 8, without repetition, is:

1) 120 2) 72 3) 216 4) 192

77. Let y(x) be the solution of the differential equation $(x \log x)\dfrac{dy}{dx} + y = 2x \log x, (x \geq 1)$.

Then y(e) is equal to:

1) 2 2) 2e 3) e 4) 0

78. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying the equation $AA^T = 9I$, where I is 3 × 3 identity matrix, then the ordered pair (a, b) is equal to:

1) (2, 1) 2) (−2, −1) 3) (2, −1) 4) (−2, 1)

79. If m is the A.M. of two distinct real numbers l and n (l, n > 1) and G_1, G_2 and G_3 are three geometric means between l and n, then $G_1^4 + 2G_2^4 + G_3^4$ equals.

1) $4\,lmn^2$ 2) $4\,l^2m^2n^2$ 3) $4\,l^2mn$ 4) $4\,lm^2n$

80. The negation of ~ s V (~ r ^ s) is equivalent to:

1) s V (r V ~ s) 2) s ^ r 3) s ^ ~ r 4) s ^ (r ^ ~s)

81. The integral $\int \frac{dx}{x^2\ (x^4+1)^{3/4}}$ equals:

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

82. The normal to the curve, $x^2 + 2xy - 3y^2 = 0$, at (1, 1):

1) meets the curve again in the third quadrant.

2) meets the curve again in the fourth quadrant.

3) does not meet the curve again.

4) meets the curve again in the second quadrant.

83. Let $\tan^{-1} y = \tan^{-1} x + \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, where $|\,x\,| < \frac{1}{\sqrt{3}}$. Then a value of y is:

1) $\frac{3x - x^3}{1 + 3x^2}$ 2) $\frac{3x + x^3}{1 + 3x^2}$ 3) $\frac{3x - x^3}{1 - 3x^2}$ 4) $\frac{3x + x^3}{1 - 3x^2}$

84. If the function $g(x) = \begin{cases} k\sqrt{x} + 1, & 0 \le x \le 3 \\ mx + 2, & 3 < x \le 5 \end{cases}$ is differentiable, then the value of k + m is:

1) $\frac{10}{3}$ 2) 4 3) 2 4) $\frac{16}{5}$

85. The mean of the data set comprising of 16 observations is 16. If one of the observation valued 16 is deleted and three new observations valued 3, 4 and 5 are added to the data, then the mean of the resultant data, is:

1) 15.8 2) 14.0 3) 16.8 4) 16.0

86. The integral $\int_2^4 \frac{\log x^2}{\log x^2 + \log(36 - 12x + x^2)}\,dx$ is equal to:

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

87. Let α and β be the roots of equation $x^2 - 6x - 2 = 0$. If $a_n = \alpha^n - \beta^n$, for n ≥ 1, then the value of $\frac{a_{10} - 2a_8}{2a_9}$ is equal to:

1) 3 2) −3 3) 6 4) −6

88. Let f(x) be a polynomial of degree four having extreme values at x = 1 and x = 2. If

$\lim_{x \to 0} \left(1 + \frac{f(x)}{x^2}\right) = 3$, then f(2) is equal to:

1) 0 2) 4 3) –8 4) –4

89. The area (in sq. units) of the quadrilateral formed by the tangents at the end points of the latera recta to the ellipse $\frac{x^2}{9} + \frac{y^2}{5} = 1$, is:

1) $\frac{27}{2}$ 2) 27 3) $\frac{27}{4}$ 4) 18

90. A signal which can be green or red with probability $\frac{4}{5}$ and $\frac{1}{5}$ respectively, is received by station A and then transmitted to station B. The probability of each station receiving the signal correctly is $\frac{3}{4}$.

If the signal received at station B is green, then the probability that the original signal was green is

1) $\frac{3}{5}$ 2) $\frac{6}{7}$ 3) $\frac{20}{23}$ 4) $\frac{9}{20}$

KEY

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

SOLUTIONS

2. $I = \frac{p}{4\Pi r^2}$

$U_{ar} = \frac{1}{2} \subset oE^2 \Rightarrow I = \mu c$

$$\frac{p}{4\Pi r^2} = \frac{1}{2} FoE^2C$$

$$E = \sqrt{\frac{2p}{4\Pi r^2 C}}$$

3. $T = 2\Pi\sqrt{\frac{\lambda}{g}}$

$$T_m = 2\Pi\sqrt{\frac{l + Bl}{g}}$$

$$Y = \frac{Mg/A}{\Delta l / l}$$

$$\frac{\Delta l}{l} = \frac{\text{Mg}}{\Delta y}$$

So $\frac{\text{Tm}}{\text{T}} = \sqrt{\frac{l + \text{B}l}{l}}$

On solving Wesel

4. P.E. is max at exteremepts and K.E. is max at Mean position

5. $f_1 = \frac{\text{V}}{\text{V} - \text{V}_5} \times f \qquad f_2 = \frac{\text{V}}{\text{V} + \text{V}_5} \times f$

percentage $= \frac{f_2 - f_1}{f} \times 100$

6. $\text{R} = \frac{\text{p}l}{\text{A}} \Rightarrow \frac{\text{V}}{\text{i}} = \frac{\text{p}l}{\text{A}}$

$$\frac{\text{V}}{\text{nqAV}l} = \frac{\text{p}l}{\text{A}}$$

$$\text{p} = \frac{\text{V}}{\text{nqAVs}\lambda}$$

7. $\text{F} = \frac{\mu 0}{2\Pi} \frac{l^2 l}{[2\text{L} \sin\theta]}$

$$\text{T} \sin\theta = \frac{\mu 0}{2\Pi} \frac{\text{c}^2 l}{[2\text{L} \sin\theta]}$$

8. On solving

$6 = 3\text{c}_1 + \text{c}_1 - \text{c}_2$; $9 = 2\text{c}_2 - \text{c}_1 + \text{c}_2 + 3\text{c}_2$

$6 = 4\text{c}_1 - \text{c}_2 \qquad 9 = 6\text{c}_2 - \text{c}_1$

On solving $\text{c}_1 = \frac{45}{23}\text{A}$

$$\text{c}_2 = \frac{42}{23}\text{A}$$

10. i = 0.1 A after K_1 is closed

After $\text{K}_2 = \text{i} = 0.1\ \text{e}^{\frac{-\text{R}}{\text{L}}\text{t}}$

$$= \frac{-0.15 \times 10^3}{0.0^3} \times 1 \times 10^{-3}$$

$= 0.1$ e

i = 0.67 mA

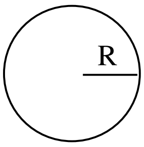
14. Using $\frac{\Delta \text{G}}{\text{s}} \times 100 + \frac{\Delta \text{L}}{\text{L}} \times 100 + 2\frac{\Delta \text{T}}{\text{T}} \times 100$

16. Side b and frequencies are

$2\ \text{MH}_2 + 5\ \text{KH}_2$ and $2\ \text{MH}_2 - 5\ \text{KH}_2$

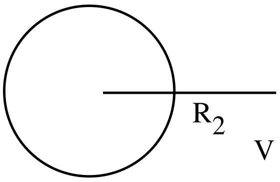
17. The Nucleui decays on exponential manner

20. Using I on the surface



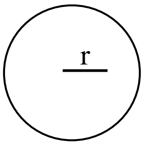
$$V = \frac{1}{4\Pi E_0}/\frac{Q}{R_1}$$

Outside



$$V = \frac{1}{4\Pi E_0}/\frac{Q}{R_2}$$

Inside



$$V = \frac{Q}{4\Pi E_0} R = \frac{3}{2}V_0$$

$$V = \frac{Q}{4\Pi E_0}R^3\left[\frac{3}{2}R^2 - \frac{1}{2}x^2\right]$$

At Centre $V = \frac{3}{2}\frac{Q}{4\Pi E_0}R = \frac{3}{2}V_0\ t$

21. $\Delta = r_1 + r_2$

$r_1 = \Delta - r_1$

$r_2 < C$

$r_2 < \sin^{-1}\left(\frac{1}{\mu}\right)$

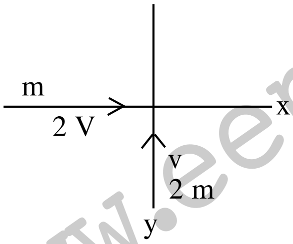
$A = \sin^{-1}\left[\frac{\sin\theta}{\mu}\right] < \sin^{-1}\left[\frac{1}{\mu}\right]$

On solving

$\theta > \sin^{-1}\left[\mu\sin\left(A - \sin^{-1}\left(\frac{1}{\mu}\right)\right]$

24. According to conservation of momentum

$m(2V)i + 2mV\hat{j} = (m + 2m)\vec{V}^1$



$\vec{V}^1 = \frac{2V}{3}\left(\hat{C} + \hat{j}\right)$

$|\bar{N}| = \frac{2\sqrt{2}}{3}V$

$E_1 = \frac{1}{2}m(2V)^2 + \frac{1}{2} = m(V^2)$

$= 2mV^2 = 3mV^2$

$E_f = \frac{1}{2}(3m)V^{12}$

$\frac{E_i - E_f}{E_i} \times 100$

25. $\hat{i} = \frac{\lambda}{\overline{V}} = \frac{1}{\left(\sqrt{2}\,\Pi d^2 \frac{N}{V}\right)} \frac{\sqrt{8k_BT}}{M\Pi}$

$T \propto \frac{V^2}{\hat{1}^2}$

$T_V r^{-1} = k$

$\frac{V^2}{\hat{1}^2}.V^{r-1} = k$

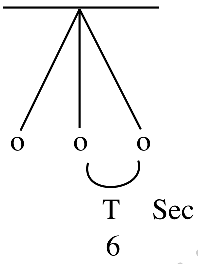
$\hat{1} \propto V \frac{r+1}{2}$

$V = \frac{r+1}{2}$

26. Using $\frac{GM}{R^3}\left[\frac{3}{2}R^2 - \frac{1}{2}r^2\right]$ relation

28. $\overline{-2 \quad 0 \quad 2 \quad 4 \quad 6}$

$\underset{\frac{T}{6}}{\longleftrightarrow}$

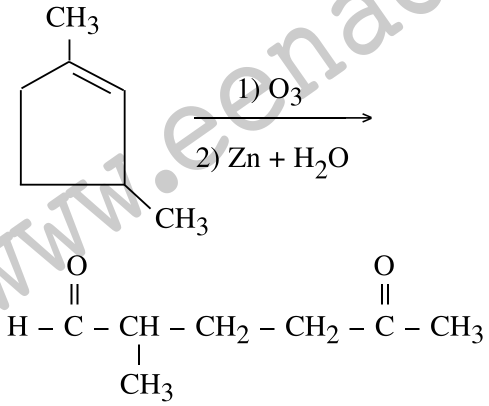


$\frac{T}{6} + \frac{T}{6} = \frac{2T}{6}$ sec

$\frac{2 \times 1.2}{6} = 0.4$ sec

CHEMISTRY

31.

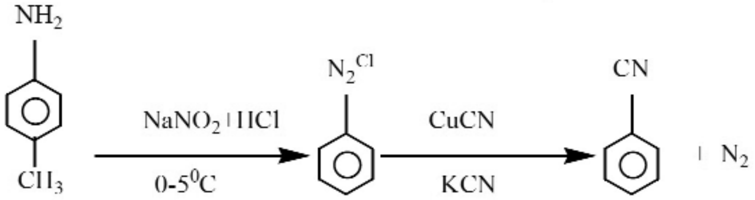


$H - \overset{\overset{O}{\|}}{C} - \underset{\underset{CH_3}{|}}{CH} - CH_2 - CH_2 - \overset{\overset{O}{\|}}{C} - CH_3$

32. Vitamin 'C'

33. due to small size (Be^{+2}), Heat of hydration $\propto \frac{1}{\text{size of cation}}$

34.



35. For body centred cubic lattice $4r = a\sqrt{3}$

36. $\underset{(S)}{KClO_3} \longrightarrow \underset{(S)}{KCl} + \frac{3}{2}O_2$ loss in weight is due to liberation of oxygen gas Loss in weight

$$= \frac{\text{weight of oxygen released}}{W_{KClO_3}} \times 100$$

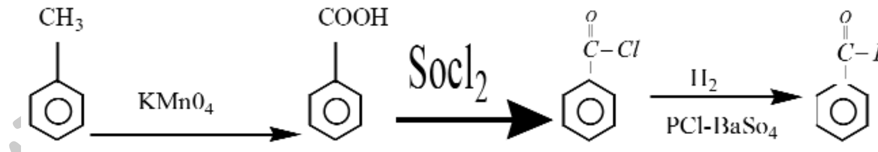
37. $E = \frac{-13.6}{n^2}$ ev atom^{-1}

38. Salt of strong base and weak acid has highest pH

39. Size of anion $\propto$ magnitude of charge

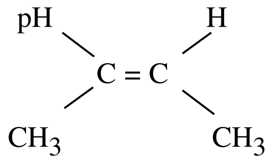
40. Al_2O_3 is the electrolyte

41.

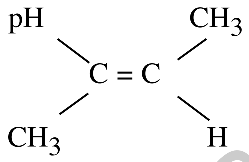


42. Low probability of simultaneous collision of all the reacting species

43.

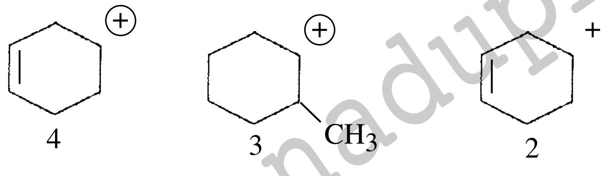


Cis



Trans

44. Hyper conjugation (or) no bond resonance depend upon – no. of 'α' Hydrogens



45. For ion-dipole interaction $\alpha \frac{1}{r^3}$ No of α hydrogens

46. 1 mole Ca^{+2} exchange ions present in 2 mole resin, 1 mole Ca^{+2} exchange 2 × 206 grams of resin

$\therefore$ 1 gram resin is exchanged by

$$= \frac{1}{2 \times 206} \text{ mole}$$

$$= \frac{1}{412} \text{ mole per gram.}$$

47. $Cu^{+2} + 2e \rightarrow Cu$

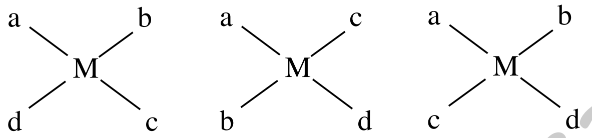
1 Faraday deposits = 1 equivalent weight

$$= 1 \times \frac{63.5}{2}$$

$$\therefore \text{ 2 Faradays deposits } = 2 \times 1 \times \frac{63.5}{2}$$

$$= 63.5$$

48. Given compound is like M_{abcd}. possible isomers



49. In Carius method

$$\% \text{ Br } = \frac{80}{\text{M (AgBr)}} \times \frac{\text{WAgBr}}{\text{W org}} \times 100$$

50. L → M charge transfer transition

51. Swarts reaction

$CH_3\,Cl + AgF \rightarrow CH_3 - F + AgCl$

52. No. of moles of acetic acid adsorbed

$= (N_1V_1 - N_2V_2) \times n - \text{factor}$

$$= \left(.06 \times \frac{50}{1000} - .042 \times \frac{50}{1000}\right) 1$$

$= .018 \times 50 \times 10^{-3}$ mole

$$= .018 \times \frac{100}{2} \times 10^{-3} \text{ mole}$$

$= 0.9 \times 10^{-3}$ mole

$\therefore$ wt of acetic acid adsorbed

$= 0.9 \times \text{gmw} \times 10^{-3}$

$= 0.9 \times 60$ milli grams

$= 54$ mg

$\therefore$ For 3 grams charcoal = 54 g acetic acid

$$\therefore \text{ for 1 gram mg ? } = \frac{1 \times 54}{3} \text{ mg}$$

$$= 18 \text{ milli grams}$$

53. $$\frac{p^o - p_s}{p^o} = \frac{W_1}{M_1} \times \frac{M_2}{W_2}$$

54. Interhalogens are more reactive due to weaker bond energy

55. $$Q = \frac{[B]\,[C]}{[A]} = 4$$

$$\log k \; - \; \frac{\Delta G^\circ}{-2.303\ RT} = -0.43 \Rightarrow k$$

$$= 0.5 \text{ nearly}$$

$\therefore Q > kc$

57. Follows Markownikow's rule

59. $2\ NO_{(g)} + O_2 \rightarrow 2\ NO_{2(g)}$

$\Delta r\ G^\circ = \Delta G^\circ\ (p) - \Delta G^\circ(R)$

$\Rightarrow -\ 2.303\ RT \log k_p = 2x - 2\ (86.6) \times 1000$

$\Rightarrow 2\ x = 2 \times 86600 - 2.303\ R\ (298) \log k_p$

$\therefore\ x = 0.5\ \{2 \times 86600 - 2.303\ R\ (298) \log k_p$

60. Liquification α Vanderwaal constant 'a'

$$\alpha\ \frac{1}{\text{Vanderwaal constant 'b'}}$$

MATHEMATICS

61. $(\overline{a}\,.\,\overline{c}\,)\,\overline{b} - (\,\overline{b}\,.\,\overline{c}\,)\,\overline{a} = \frac{1}{3}\,|\,\overline{b}\,|\,|\,\overline{c}\,|\,\overline{a}$

$\Rightarrow \overline{b}\,.\,\overline{c} = \frac{-1}{3}\,|\,\overline{b}\,|\,|\,\overline{c}\,| \Rightarrow \cos q = \frac{-1}{3}$

$\therefore\ \sin\theta = \frac{2\sqrt{2}}{3}$

62. $O = (0, 0);\ Q = (4t, 2t^2)$

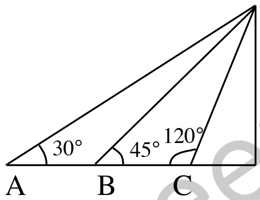
$\therefore$ ratio is 1 : 3

$P(x_1, y_1) = \left(\frac{4t}{4}, \frac{2t^2}{4}\right) \Rightarrow x_1^2 = 2y_1$

63. By m – n rule

BC.cot 30° – AB cot 120°

= (AB + BC)



$\Rightarrow BC\left(\sqrt{3}\right) + AB\left(\frac{1}{\sqrt{3}}\right) = (AB + BC)$

$BC\left(\sqrt{3} - 1\right) = AB\left(\frac{\sqrt{3} - 1}{BC}\right)$

$\Rightarrow \frac{AB}{BC} = \frac{\sqrt{3}}{1}$

64. $x + y = 41$

$\Rightarrow 39 + 38 + 37 + \ldots\ldots\ldots\ldots + 1$

$= \frac{39 \times 40}{2} = 280$

65. Put $z = 0 \Rightarrow 2x - 5y = 3$, $x + y = 5$ solving $= x = 4$, $y = 1$

eq. Of the plane parallel to given plane is $x + 3y + 6z + k = 0$

Passing through (4, 1, 0). $(k = -7) \Rightarrow x + y + 3y + 6z - 7 = 0$

66. $2^{m\,n}$ – (zero) – (one element) – (2element subsets)

$= 2^8 - 1 - 8 - 8c_2 = 219$

67. $2x - 3y + 4 = 0$, $x - 2y + 3 = 0$ are concurrent at (1, 2) by concurrency of triangle

The Locus is the circle with radius

$\sqrt{(2 + 1)^2 + (3 - 2)^2} = \sqrt{2}$

68. $\lim_{x \to 0} \left(\frac{1 - \cos 2x}{x^2}\right) \left[\frac{3 + \cos x}{\left(\frac{\tan 4x}{x}\right)}\right]$

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

69. Any point on the line is

$(2 + 3t, -1 + 4t, 2 + 12t)$

For P.O.I, the pt lies on the plane t = 1 pt is

q(5, 3, 14) & p = (1, 0, 2)

$\therefore$ pq = 13

70. Sum of the integral powers of x = sum of even binomial, coeff.

$= \frac{f(1) + f(-1)}{2} = \frac{3^{50} + 1}{2}$

71. $T_n = \frac{1^3 + 2^3 + \ldots. + n^3}{1 + 3 + \ldots.. (2n - 1)} = \frac{(n + 1)^2}{4}$

$S_9 = \sum_{n=1}^{q} \frac{(n + 1)^2}{4} = \frac{1}{4}[2^2 + \ldots.. + 10^2] = 96$

72. P.O.I of

$y^2 = 2x$, $y = 4x - 1$ is $\left(\frac{1}{2}, 1\right)$ & $\left(\frac{1}{8}, -\frac{1}{2}\right)$

R .A. $= \int_{-1/2}^{1} \left(\frac{y + 1}{4} - \frac{y^2}{2}\right) dx = \frac{9}{32}$

73. non-trivial

$$\begin{vmatrix} 2-\lambda & -2 & 1 \\ 2 & -(3+\lambda) & 2 \\ -1 & 2 & -\lambda \end{vmatrix} = 0$$

$\Rightarrow (2-\lambda)(\lambda^2 + 3\lambda - 4) - 5\lambda + 5 = 0$

$= (\lambda - 1)(3 - \lambda^2 - 2\lambda) = 0$

$\lambda = 1$ or $\lambda = -3$

74. $|\overline{z}|^2 = 1 \Rightarrow z\,\overline{z} = 1$

$$\left(\frac{z_1 - 2z_2}{2 - z_1 z_2}\right)\left(\frac{\overline{z}_1 - 2\overline{z}_2}{2 - \overline{z}_1\overline{z}_2}\right) = 1$$

$\Rightarrow |z_1|^2 - 2z_1\overline{z}_2 - 2\,\overline{z}_1 z_2 + 4|z_2|^2$

$= 4 - 2z_1\overline{z}_2 - 2\,\overline{z}_1 z_2 + 4|z_1|^2|z_2|^2$

$\Rightarrow \left(|z_1|^2 - 4\right)\left(|z_2|^2 - 1\right) = 0$

$|z_1|^2 = 4 \qquad (\because |z^2| \neq 1)$

75. $C_1 = (2, 3)\ r_1 = \sqrt{4 + 9 + 12} = 5$

$C_2 = (-3, -9)\ r_2 = \sqrt{9 + 81 - 26} = 8$

$C_1C_2 = r_1 + r_2$

76. $6 - - - = 4P_3$

$7 - - - = 4P_3$

$8 - - - = 4P_3$

and five digit no = 5!

req = $5! + 3(4P_3)$

$= 192$

77. $\frac{dy}{dx} + \frac{1}{x \log x}(y) = 2$

I.F. $\int_{e} = \frac{1}{x \log x} dx = \log x$

$y.\log x = 2 \int \log x\, dx = 2x(\log x - 1) + c$

when $x = 1 \Rightarrow c = 2$

$x = e \Rightarrow y = 2$

78. $A\,A^T = 9I$

$$\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}\begin{bmatrix} 1 & 2 & 9 \\ 2 & 1 & 2 \\ 2 & -2 & b \end{bmatrix}\begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$$

$a + 4 + 2b = 0$ by verification

$(a, b) = (-2, -1)$

79. $2m = l + n, G_1 = l\left(\frac{n}{l}\right)^{1/4}, \; G_2 = l\left(\frac{n}{l}\right)^{1/2}, G_3 = l\left(\frac{n}{l}\right)^{3/4}$

$\Rightarrow 4m^2 = (l + n)^2$ also $G_4 + 2G_2^4 + G_3^4$

$= l^4\left[\frac{n}{l} + 2\left(\frac{n}{l}\right)^2 + \left(\frac{n}{l}\right)^3\right]$

$= l\left[l^2n + 2n^2l + n^3\right]$

$= ln\left[\, l^2 + 2ln + n^2\right] = ln(l + n)^2$

$= ln\,(4m^2)$

80. $\approx (\approx S_v (\approx r\Lambda S) = \approx (\approx S)\Lambda \approx (\approx r\Lambda S)$

$= S\Lambda(rV \approx S) = (S\Lambda r)V(S\Lambda \approx S)$

$= S\Lambda r$

81. $I = \int \frac{dx}{x^5\left(1 + \frac{1}{x^4}\right)}$

$= \int \frac{1}{t^{3/4}} \cdot \frac{dt}{4} = -\frac{1}{4} \cdot \frac{t^{1/4}}{(1/4)} + c$

$= -\frac{(x^4 + 1)^{1/4}}{x} + c$

82. $\frac{dy}{dx} = \frac{\left(\frac{\partial f}{\partial x}\right)}{\left(\frac{\partial f}{\partial y}\right)_{(1,1)}} = \frac{-(2x + 2y - 0)}{0 + 2x - 6y} = 1$

eq of normal is $y = 2 - x$

Solving curve and line

$\Rightarrow x^2 + 2x(2 - x) - 3(2 - x)^2 = 0$

$\Rightarrow x^2 - 4x + 3 = 0$

$x = 1, x = 3$

$y = 1, y = -1 \Rightarrow$ pts are $(1, 1)$ $(3, -1)$

83. $\tan^{-1} y = \tan^{-1}(x) + 2\tan^{-1}x$

$\left(\text{for } |x| < {}^1\!/\!\sqrt{3} \; \tan^{-1}\left(\frac{2x}{1 - x^2}\right) = 2\tan^{-1}x\right)$

$= \tan^{-1}\left(\frac{3x - x^3}{1 - 3x^2}\right)$

84. $g'(x) = \frac{k}{2\sqrt{x + 1}} \;\; 0 \le x \le 3, g'(x) = m, 3 < x \le 5$

$g'(3^-) = \frac{k}{2\sqrt{4}} = \frac{k}{4}, g'(3^+) = m$

differentiable $\Rightarrow \frac{k}{4} = m$

Also g(x) in continuous $\lim\limits_{x \to 3^+} g(x) = 3m + 2$

$\lim\limits_{x \to 3^-} g(x) = 2k \Rightarrow 2k = 3m + 2$

$\Rightarrow k = 8/5,\ m = 2/5$

85. $\sum \frac{x_i}{16} = 16 \Rightarrow \sum x_i = 256$

$$\frac{\sum x_i - 16 + 3 + 4 + 5}{18} = \frac{252}{18}$$

$$= 14$$

86. $I = \int_2^4 \frac{\log x^2}{\log x^2 + \log (6 - x)^2} dx$

Also

f (a + b − x) = f(x)

$\Rightarrow I = \int_2^4 \frac{\log (6 - x)^2}{\log x^2 + \log (6 - x)^2} dx$

$2I = \int_2^4 1\, dx \Rightarrow I = 1$

87. $\frac{a_{10} - 2a_8}{2a_9} = \frac{\alpha^{10} - \beta^{10} + \alpha\beta\,(\alpha^8 - \beta^8)}{2\,(\alpha^9 - \beta^9)}$

$= \frac{(\alpha + \beta)\,(\alpha^9 - \beta^9)}{2\,(\alpha^9 - \beta^9)} = 3$

88. x = 1, x = 2 are extreme values

$\Rightarrow f^{'}(1) = f^{'}(2) = 0$

$\lim\limits_{x \to 0} \left(1 + \frac{f^{'}(x)}{2x}\right) = 3,\ f(2) = 8,$

$f^{'}(x) = a(x)(x - 1)(x - 2)$

$f(0) = 0 \Rightarrow f(x) = 2\left(\frac{x^4}{4} - x^3 + x^2\right) \Rightarrow f(2) = 0$

89. $a = 3,\ b = \sqrt{5}, \Rightarrow \frac{b^2}{a} = 5/3$

One end of latus − rectum = (2, 5/3)

Eqn.of the tangent at (2, 5/3) is

$\frac{2x}{9} + \frac{y}{3} = 1$

Area of rhombus $= \frac{1}{2} \cdot \frac{9}{2.3.4} = 27$

90. Given G = original signal is green

E_1 = A receives the signal correct

E_2 = B receives the signal correct

E = signal received by B is green

$\therefore$ P (signal received by B is green)

$= P\left(GE_1 E_2\right) + P\left(G\overline{E}_1\overline{E}_2\right) + P\left(\overline{G}E_1\overline{E}_2\right) + P\left(\overline{G}\overline{E}_1 E_2\right)$

$\Rightarrow P(E) = \frac{46}{80} \Rightarrow P(G/E) = \frac{20}{23}$

(ఈ నమూనా ప్రశ్నపత్రాన్ని శ్రీగాయత్రి విద్యాసంస్థలకు చెందిన నిపుణులు రూపొందించారు)