JEE MAINS SAMPLE PAPER
PHYSICS

1. a	2. c	3. b	4. d	5. b	6. c	7. b	8. d	9. b	10. c
11. d	12. c	13. c	14. b	15. c	16. d	17. d	18. b	19. c	20. c
21. b	22. d	23. a	24. b	25. d	26. d	27. d	28. c	29. c	30. a

1. We have

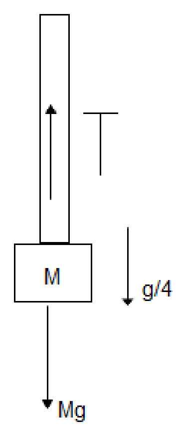
$K_i + U_i + W_{NC} = K_f + U_f$

$\frac{1}{2}mv^2 + 0 + 0 = \frac{1}{2}m\left(\frac{v}{2}\right)^2 + \frac{1}{2}kx^2$

$\Rightarrow \frac{3}{8}mv^2 = \frac{1}{2}kx^2$

$\Rightarrow k = \frac{3mv^2}{4x^2}$

2. Work is done by the tension in the chord.



$T - Mg = \frac{-Mg}{4}$

$T = \frac{3Mg}{4}$

T is upwards and displacement is downwards.

Thus,

$W = T\,d\cos 180°$

$= -T\,d$

$= \frac{-3Mg}{4}d$

3. Change in kinetic energy (Δk) is nothing but workdone (w)

We have, $P = 3t^2 - 2t + 1$

$\frac{dw}{dt} = 3t^2 - 2t + 1$

$\int dw = 3\int_2^4 t^2\,dt - 2\int_2^4 t\,dt + \int_2^4 dt$

$W = 3\left.\frac{t^3}{3}\right|_2^4 - 2\left.\frac{t^2}{2}\right|_2^4 + t|_2^4$

$W = (64 - 8) - (16 - 4) + (4 - 2)$

$W = 46$ J

4. The two bodies will exchange velocities. Thus option (d) is not possible.

5. Given $m_1v_1 = m_2v_2$. Let $m_1 > m_2 \Rightarrow v_2 > v_1$

$a_1 = \frac{F}{m_1}$ and $a_2 = \frac{F}{m_2}$, where F is the applied force.

we have,

$O = v_1 - a_1t_1 \Rightarrow t_1 = \frac{v_1}{a_1} = \frac{m_1v_1}{f}$

$O = v_2 - a_2t_2 \Rightarrow t_2 = \frac{v_2}{a_2} = \frac{m_2v_2}{f}$

$\Rightarrow t_1 = t_2$

Also, $O = v_1^2 - 2\,a_1s_1 \Rightarrow s_1 = \frac{v_1^2}{2a_1} = \left(\frac{m_1v_1}{2F}\right)v_1$

$O = v_2^2 - 2\,a_2s_2 \Rightarrow s_2 = \frac{v_2^2}{2a_2} = \left(\frac{m_2v_2}{2F}\right)v_2$

$s_2 > s_1$ since $v_2 > v_1$

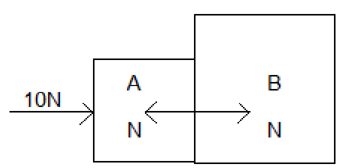
6. From the graph

$x = -\sin t$

$v = \frac{dx}{dt}$

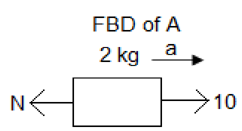
$= -\cos t$

7.



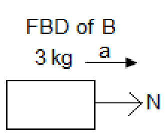
N is the force exerted by B on A

FBD of A



10 - N = 2a __ (1)

FBD of B



N = 3a __ (2)

From (1) and (2) $a = 2\ \text{ms}^{-1} \Rightarrow N = 6N$

8. w.r.t the horizontal the angles of projection are θ and $90 - \theta$. Thus, the range will be the same. If T_1, T_2 and H_1, H_2 are the times of flight and maximum heights reached, then

$T_1 = \frac{2u\sin\theta}{g}$

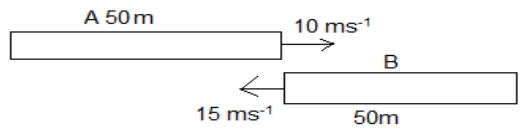
$T_2 = \frac{2u\cos\theta}{g}$

$H_1 = \frac{u^2\sin^2\theta}{2g}$

$H_2 = \frac{u^2\cos^2\theta}{2g}$

If θ= 45°, then $T_1 = T_2$ and $H_1 = H_2$ because sin θ = cos θ. ∴ their times of flight may be the same and maximum heights may be the same.

9. $V_{AB} = 10 - (-15) = 25\ \mathrm{ms}^{-1}$



To cross B entirely A has to travel a distance 100m with a speed $25\mathrm{ms}^{-1}$ w.r.t B. Therefore,

$t = \frac{100}{25} = 4s$

10. $a_x = 6\ \mathrm{ms}^{-1} \Rightarrow x = 0 + \frac{1}{2} \times 6 \times 4^2 = 48m$

$a_y = 8\ \mathrm{ms}^{-1} \Rightarrow y = 0 + \frac{1}{2} \times 8 \times 4^2 = 64m$

The distance from the origin is

$r = \sqrt{x^2 + y^2}$, $= \sqrt{48^2 + 64^2}$ = 80m

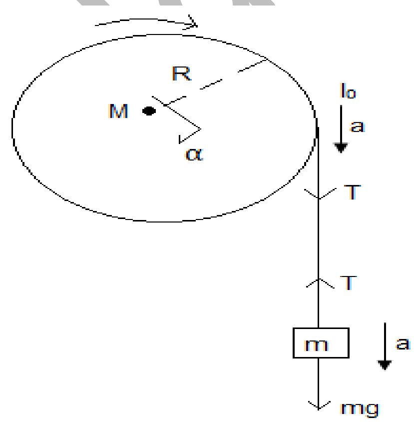
11. We have mg – T = ma ___ (1)

Where,

$s = ut + \frac{1}{2}at^2$

$5 = 0 + \frac{1}{2} \times a \times 4$

$a = \frac{5}{2}\mathrm{ms}^{-2}$ ____ (2)



(2) in (1) gives,

20 – T = 5 ⇒ T = 15N

For the wheel,

$TR = I_0\alpha$

Where a = Rα

Therefore,

$T = \frac{I_0\alpha}{R^2} \Rightarrow I_0 = \frac{TR^2}{a}$

$\therefore I_0 = \frac{15\times(0.5)^2}{\frac{5}{2}}$

$= 1.5\ \mathrm{kg\ m}^2$

12. During vaporization the body absorbs heat from 20s to 30s i.e., for 10s. Total energy absorbed is

$E = 42\times10^3\times10 = 420\times10^3$ J, for 5kg mass.

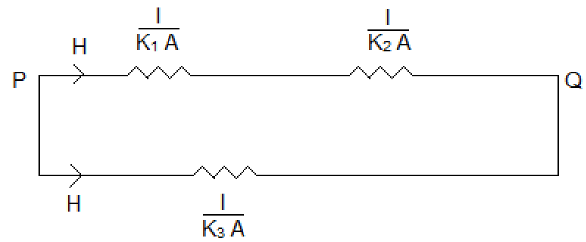
For 1 kg

$L = \frac{E}{5} = \frac{420}{5} \times 10^3$ J = 84 kJ kg^{-1}

13. Length (l) and area (A) of all rods are the same. Rods with conductivities k_1 and k_2 are in series and their combination is in parallel with rod of conductivity k_3. Since heat flow rate (H) are the same.

$$\frac{l}{k_3 A} = \frac{l}{k_1 A} + \frac{l}{k_2 A}$$

$$\Rightarrow k_3 = \frac{k_1 k_2}{k_1 + k_2}$$



14. We have from I law of thermodynamics,

$d\theta = dU + dW$

$d\theta = dU + P\,dv$ ____ (1)

But according to the problem

$d\theta = -\,dU$ ____ (2)

From (1) and (2)

$-\,2\,dU = P\,dv$

Using $dV = n_{C_V}\,dT$ and $Pv = n\,R\,T$ we have

$-\,2\,n_{C_V}\,dT = \frac{nRT}{V}\,dV$ $\quad \left(C_V = \frac{5}{2}R \text{ for distomic gas}\right)$

We have, $-\,5\,\frac{dT}{T} = \frac{dV}{V}$

On integrating

$-\,5 \ln(T) = \ln(V) + \ln(K)$ (K: constant)

Or $\ln\left(\frac{VT^5}{K}\right) = \ln(1)$

$\Rightarrow VT^5 = R$ or $TV^{\frac{1}{5}} = k'$

$\therefore n = \frac{1}{5}$

15. Excess pressure is $\Delta P = \frac{4T}{R}$ for the bubble. The pressure inside the bubble having smaller radius will be more, thus air flows from smaller to the bigger bubble.

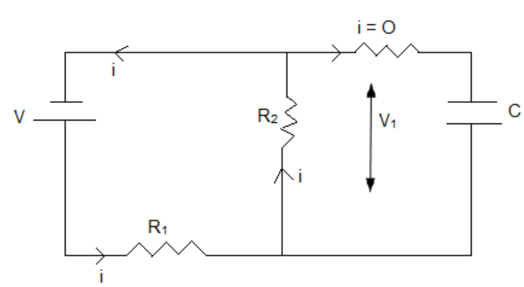
16. During steady state the current through the capacitor is zero. We have,

Therefore, $i = \frac{V}{R_1 + R_2}$

V_1 is the voltage across R_2 and also across the capacitor.

$V_1 = i\,R_2$

$= \frac{VR_2}{R_1 + R_2}$



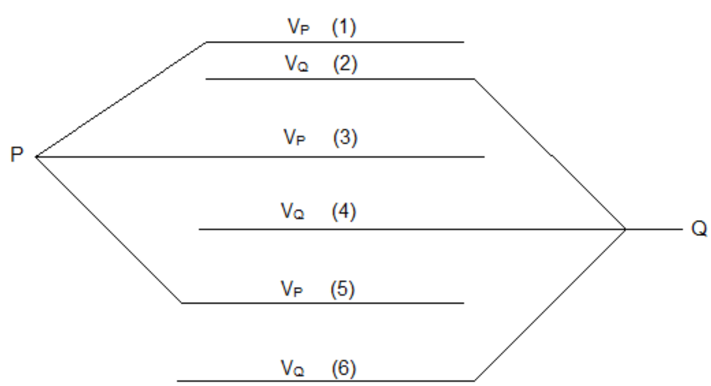
17. Given $X_L = R$

The phase difference is given by

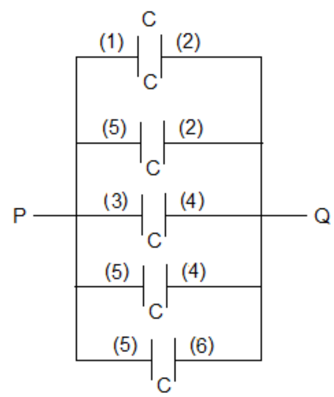
$\tan \phi = \frac{X_L}{R} = \frac{R}{R} = 1$

$\Rightarrow \phi = \frac{\pi}{4}$

18. Applying the potential method,



$\equiv$



$C_{eff} = 5C = \frac{5\epsilon_0 A}{d}$

19. In a magnetic field the particle performs uniform circular motion. $\vec{v}$ and $\vec{a}$ are perpendicular to each other.Thus,

$\vec{v} \cdot \vec{a} = 0$

$6(2) + (3)(-2x) = 0$

$6x = 12$

$x = 2$

20. The magnetic field due to a loop is $B = \frac{\mu_0 n i}{R}$.

We have

$B_1 = \frac{\mu_0 i}{R}$

$B_2 = \frac{\mu_0 (2) i}{R^1}$

Where $(2\pi R^1)2 = 2\pi R \Rightarrow R^1 = \frac{R}{2}$

Therefore $B_2 = \frac{4\mu_0 i}{R} = 4\, B_1$.

21. The entire image will be formed, but the light from the lower part will be missing. Thus intensity of the image reduces.

22. 2μF gets charged to a potential V. When connected to the 8μF capacitor, the common potential is

$$V_{COM} = \frac{C_1V_1+C_2V_2}{C_1+C_2} = \frac{2V+8(0)}{10} = \frac{V}{5}$$

$$U_i = \frac{1}{2} \times 2 \times 10^{-6} \times v^2 = v^2 \times 10^{-6}$$

$$U_f = \frac{1}{2} \times 10 \times 10^{-6} \times \frac{v^2}{25} = 0.2\, v^2 \times 10^{-6}$$

Thus 80% of the energy is dissipated.

23. We have $\in_{ind} = -\frac{d}{dt}\phi$. The flux lines are coming out of the plane of the loop (using right hand rule) and hence ϕ is + ve as the current is increasing $\frac{d}{dt}$ is also + ve. Thus

$\in_{ind} = -(+)(+) = -$

Since $\in_{ind}$ is – ve the induced current is clockwise.

24. $E_x = 5\times10^5\times\cos 37° = 4\times10^5 NC^{-1}$

$E_y = 5\times10^5\times\cos 37° = 3\times10^5 NC^{-1}$

We have,

$$V = \int E_x\, dx \quad \int E_y\, dx$$

$$= 4\times10^5 \int_0^{6cm} dx \quad 3\times10^5 \int_0^{4cm} dy$$

$$\therefore \quad = 36kV.$$

25. The path difference at a point above the centre of the screen is

$$\Delta x = (SS_2 - SS_1) + \frac{yd}{D}$$

For maxima,

$$(SS_2 - SS_1) + \frac{yd}{D} = n\lambda$$

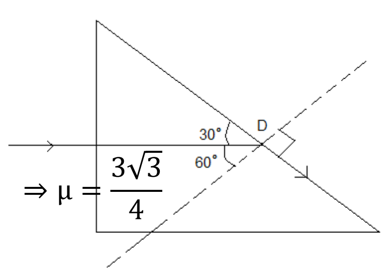
For central maxima n = 0

$$\therefore y = -\frac{D}{d}(SS_2 - SS_1)$$

y is negative since $SS_2 - SS_1$ is positive. Thus the fringe pattern shifts downwards, whereas the fringe width remains the same.

26. At D we have,

$$\frac{3}{2}\sin 60° = \mu \sin 90°$$

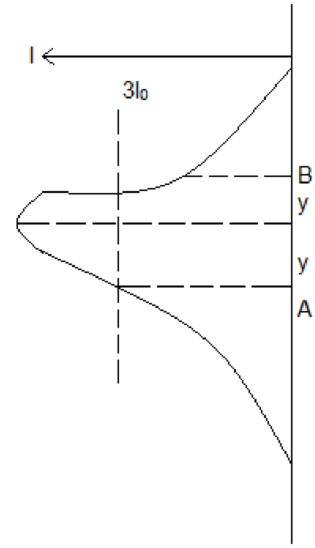


$$\Rightarrow \mu = \frac{3\sqrt{3}}{4}$$

27. The intensity at a point on the screen is

$$I = 4I_0 \cos^2\left(\frac{\pi y}{\beta}\right)$$

A and B are consecutive points which have 75% of $4I_0$ i.e., $3I_0$



$\therefore 3I_0 = 4I_0\cos^2\left(\frac{\pi y}{\beta}\right)$

$\Rightarrow \cos\left(\frac{\pi y}{\beta}\right) = \frac{\sqrt{3}}{2}$

$\Rightarrow \cos\frac{\pi y}{\beta} = \frac{\pi}{6}$

$\Rightarrow y = \frac{\beta}{6}$

Distance between A and B is $2y = \frac{\beta}{3} = \frac{\lambda D}{3d}$

$$2y = \frac{6\times10^{-7}\times1}{3\times10^{-3}}$$

$$= 2\times10^{-4}\text{ m}$$

$$= 0.2\text{ mm}$$

28. As the point source moves away, the intensity decreases but the frequency remains the same. Thus the stopping potential does not change.

29. We have

$N = \frac{N_0}{(2)^{t/T}}$ where t is the elapsed time and T is the half life. Therefore,

$N_1 = \frac{N_0}{(2)^{2/2}}$

$= \frac{N_0}{2}$

$N_2 = \frac{N_0}{(2)^{2/4}} = \frac{N_0}{\sqrt{2}}$

Also,

$\frac{dN_1}{dt} = -\lambda_1 N_1$

$= \frac{0.693}{2}\frac{N_0}{2}$

$\frac{dN_2}{dt} = -\lambda_2 N_2$

$= \frac{0.693}{4}\frac{N_0}{\sqrt{2}}$

$\frac{dN_1}{dt} : \frac{dN_2}{dt} = \frac{1}{4} : \frac{1}{4\sqrt{2}} = \sqrt{2} : 1$

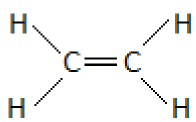
30. Ground state has the least P.E and Total energy but maximum K.E.

PART – B
CHEMISTRY

31. b	**32. d**	**33. b**	**34. c**	**35. b**	**36. a**	**37. b**	**38. c**	**39. d**	**40. c**
41. a	**42. d**	**43. b**	**44. c**	**45. b**	**46. c**	**47. d**	**48. b**	**49. b**	**50. c**
51. c	**52. d**	**53. c**	**54.c**	**55. c**	**56. b**	**57. b**	**58. d**	**59. c**	**60. d**

31. (b)
Sol: Homologous series

32. (d)
Sol:



C – H	4	$Sp^3 - s$	σ bonds
C = C	1	$Sp^2 - sp^2$	σ bond
	1	$P_x - P_y$	π bond

33.(b)
Sol: $-NO_2$ group is meta directing group

34. (c)
Sol: 1°R – X > 2°R – X > 3°R – X

35. (b) B α β
Sol:

$$\underset{\substack{| \\ Br}}{CH_3 - CH} - CH_2 - CH_3 \xrightarrow{alc.KOH} CH_3 - CH = CH - CH_3$$

β – H – elimination according to "saytzeff's rule".

36. (a)
Sol: $R - O - R \xrightarrow{H_2O} 2R - OH$

37. (b)
Sol: Aldehydes containing no α-hydrogen atom gives cannizaro's reaction

38. (c)
Sol: $CH_3CN + 2H \rightarrow \underset{X}{CH_3CH = NH} \xrightarrow[\text{Boiling}]{H_2O} \underset{Y}{CH_3CHO} + NH_3$

39. (d)
Sol: $R - C \equiv N \xrightarrow[2(H)]{Sncl_2/HCl} R - CH = NH.HCl \xrightarrow{H_2O} R - CHO + NH_4Cl$

40. Ans: (c)
Solution: Conceptual

41. Ans: (a)
Solution: 1 mole of Nacl is doped with $GacI_3 = \frac{10^{-3}}{100} = 10^{-5}\ mol$

Concentration of cation vacancy = $2 \times 10^{-5} \times 6.023 \times 10^{23} mole^{-1}$

= $1.2046 \times 10^{-19} mole^{-1}$

42. (d)

Sol: Cp = $\left(\frac{dH}{dT}\right)_p$ since at constant T, dT=0

$\therefore$Cp=∞

43. Ans: (b)

Solution: $4e^- + BrO_3^{\ominus} \longrightarrow BrO^{\ominus}$

X – 6 = – 1 x – 2 = - 1

X = + 5 x = + 1

The reaction undergoes reduction, i.e it acts as oxidising agent so it requires a reducing agent.

44. (c)

Sol: $E_{ox} = E^0_{ox} — \frac{0.0591}{n} \log \frac{[H^+]}{p_{H_2}}$

$= 0 — \frac{0.0591}{1} \log \frac{[10^{-10}]}{1} =$ 0.59v

45. Ans (b)

Sol: Due to chloroxylenol

46. (c)

Sol: $\frac{h}{\sqrt{2Em}}$ Where E = Kinetic energy.

47. (d)

Sol: Correct option:

48. (b)

Sol: Z=$\frac{Vreal}{Videal}$ It Z<1 then $V_{real} < V_{ideal}$ (i.e., 22.4L at STP)

49. Ans: (b)

Solution:

$X_A = \frac{2}{5}, X_B = \frac{3}{5}$

$P_{Total} = P_A^{\circ} X_A + P_B^{\circ} X_B$

= $100\left(\frac{2}{5}\right) + 150\left(\frac{3}{5}\right)$

= 40 + 90

= 130 mm

50. Ans(c)

Sol: conceptual

51. Ans(c)
Sol: conceptual

52. Ans(d)
Sol: conceptual

53. Ans(c)
Sol: conceptual

54. Ans(c)
Sol:$H_4P_2O_6$ contains P-P bond but not P-O-P bond

55. Ans:(c)
Sol: conceptual

56. Ans(b)
Solution: conceptual

57. Ans: (b)
Sol:$\mathrm{N_2O, O_3, N_2O_5, NH_4^+, HNO_3, B_3N_3H_6}$ have dative bonds.

58. Ans(d)
Sol. Due to low charge on the cation

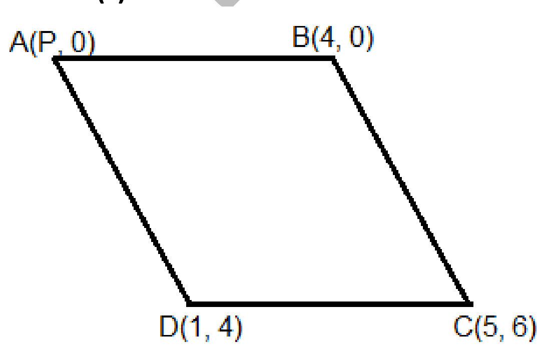
59. (c)
Sol. 6.3 gr

60. Ans (d)
Sol: All statements are connect

PART – C
MATHEMATICS

61. c	**62. a**	**63. a**	**64. c**	**65. a**	**66. a**	**67. b**	**68. c**	**69. a**	**70. d**
71. c	**72. b**	**73. c**	**74. a**	**75. c**	**76. d**	**77. b**	**78. c**	**79. a**	**80. c**
81. c	**82. d**	**83. a**	**84. a**	**85. a**	**86. c**	**87. b**	**88. c**	**89. d**	**90. d**

61. **Sol: (c)**



$$\cos \angle ADC = \frac{(AD)^2 + (CD)^2 - (AC)^2}{2AD \cdot CD} < 0$$

$\Rightarrow (P - 1)^2 + 4^2 + (5 - 1)^2 + (6 - 4)^2 < (P - 5)^2 + 6^2$

$\Rightarrow 8P < 24 \qquad \Rightarrow P < 3 \quad \Rightarrow P = 2$

62. **Sol: (a)**

Equation of the common chord of the given circles is

$4x + 4y + k + 15 = 0 \qquad \qquad . . . .(1)$

Since $x^2 + y^2 + 6x - 2y + k = 0$ bisects the circumference of $x^2 + y^2 + 2x - 6y = 15$

$\therefore$(1) is the diameter of $x^2 + y^2 + 2x - 6y = 15$

$\Rightarrow 4(-1) + 4(3) + k + 15 = 0 \qquad \Rightarrow k = -23$

63. **Sol: (a)**

$y^2 - 6y + 4x + 9 = 0 \qquad \Rightarrow (y - 3)^2 = -4(x - 0)$

$\therefore$Focus is $(-1, 3)$ and equation of directrix is $x - 1 = 0$

But the chord of contact of tangents drawn from any point on the directrix always passes through the focus.

$\therefore$required pt is $(-1, 3)$

64. **Sol: (c)**

Mode = 3(Median) – 2 (Mean)

18 = 3(Median) – 2(24) $\Rightarrow$ Median = 22

65. **Sol: (a)**

$$\left(x - \frac{1}{2}\right)^2 + \left(y - \frac{1}{5}\right)^2 = \frac{9}{4}\left(\frac{3x + 4y - 7}{5}\right)^2$$

$\therefore$focus at $\left(\frac{1}{2}, \frac{1}{5}\right)$, directrix is $\frac{3x + 4y - 7}{5} = 0$

$\therefore$Equation of latus rectum is $y - \frac{1}{5} = -\frac{3}{4}\left(x - \frac{1}{2}\right)$

66. **Sol: (a)**

negation of $P \to (\sim p \vee q)$

$\Rightarrow \sim[p \to (\sim p \vee q)] \equiv p \wedge \sim (\sim p \vee q)$

$\equiv p \wedge (p \wedge \sim q)$

$\equiv (p \wedge \sim q)$

67. diff $\Rightarrow$ cont.

$\therefore a + 1 = 1 + a + b$

$b = 0$

$2a = a + 2$

$\Rightarrow a = 2$

68. g(f(x)) = x

g'(f(x)) · f'(x) = 1

$\therefore g'(f(c)) = \frac{1}{f'(c)}$

69. $\frac{dy}{dx} = \frac{\sin\theta}{\cos\theta}$

Normal is : x cosθ + y sinθ = a

Dist. from (0, 0) = $|a|$

70. Area = 2ab = 2(4)(3) = 24

71. $f'(c) = \frac{f(5)-f(2)}{5-2} = \frac{\frac{1}{2}-\frac{1}{5}}{3} = \frac{3}{10\cdot 3} = \frac{1}{10}$

72. $\int \cos 2x\, dx = \frac{1}{2}\sin 2x + c \Rightarrow k = \frac{1}{2}$

73. $\underset{x\to 0}{Lt} \frac{\sin^2 x \cos x}{3x^2} = \frac{1}{3}$

74. $A = 4\int_0^{1/2} x\, dx = 2x^2\Big|_0^{1/2} = \frac{1}{2}$

75. $\frac{dy}{y} = \frac{2x\, dx}{1+x^2}$

$\Rightarrow y = c(1 + x^2)$

x = 0, y = 1

$\Rightarrow$ c = 1

x = 1 $\Rightarrow$ y = 2

76. **Sol: (d)**

Let $\overline{OP} = \bar{a} + \bar{b}$, $\overline{OQ} = \bar{a} - \bar{b}$, $\overline{OR} = \bar{a} + \lambda\bar{b}$

$\overline{PQ} = -2\bar{b}$, $\overline{PR} = (\lambda - 1)\bar{b} \Rightarrow$ many values of λ

77. **Sol: (b)**

Let A be the origin. $\overline{AB} = \bar{b}$, $\overline{AC} = \bar{c}$

Area of ΔABC = $\frac{1}{2}(\bar{b}\times\bar{c})$

$\overline{AF} = \frac{\bar{b}}{2}$, $\overline{AE} = \frac{\bar{c}}{2} \Rightarrow \overline{FE} = \frac{\bar{c}}{2} - \frac{\bar{b}}{2}$, $\overline{FC} = \bar{c} - \frac{\bar{b}}{2}$

area of $\Delta FCE = \frac{1}{2}\left(\frac{\bar{c}}{2}-\frac{\bar{b}}{2}\right)\times\left(\bar{c}-\frac{\bar{b}}{2}\right) = \frac{1}{8}\left|\bar{b}\times\bar{c}\right| = \frac{1}{4}\cdot\Delta ABC$

78. **Sol: (c)**

$\bar{n}_1 = 2i - k + k$, $\bar{n}_2 = i + \lambda j + 2k$

$\cos\frac{\pi}{3} = \frac{\bar{n}_1\cdot\bar{n}_2}{|\bar{n}_1||\bar{n}_2|}$ $\Rightarrow \lambda^2 + 16\lambda - 17 = 0$ $\Rightarrow \lambda = -17, 1$

79. **Sol: (a)**

Any point on L1 = $(\lambda, \lambda-1, \lambda)$,any point on L2 = $(2\mu-1, \mu, \mu)$

$\therefore \frac{2\mu-1-\lambda}{2} = \frac{\mu-\lambda+1}{1} = \frac{\mu-\lambda}{2} \Rightarrow \lambda = 3, \mu = 1$

$\therefore$A = (3, 2, 3), B = (1, 1, 1), AB = 3

80. **Sol: (c)**

Equation of a line through p(2, 3, 4) and parallel to the given line is

$\frac{x-2}{3} = \frac{y-3}{6} = \frac{z-4}{2}\lambda$(say)

Let Q $(3\lambda + 2, 6\lambda + 3, 2\lambda + 4)$ is the point of intersection with the plane.

$\therefore$Q lies in the plane $\Rightarrow \lambda = -1$ $\Rightarrow$ Q = (–1, –3, 2)

$\therefore$ PQ = 7

81. **Sol: (c)**

n(s) = 90

n(E) = n{6,6, 4 or 5, 5, 6} = 6

$P(E) = \frac{6}{90} = \frac{1}{15}$

82. **Sol: (d)**

Let X be no. of heads.

$P(X \geq 1) = 1 - P(X = 0) = 1 - {}^nC_0\left(\frac{1}{2}\right)^n = 1 - \left(\frac{1}{2}\right)^n$

Given that $1 - \frac{1}{2^n} \geq 0.8$ $\Rightarrow 2^n \geq 5$

$\therefore$ Least value of n is 3

83. Ans: (a)

Sol. Required Coefficient

$= {}^{2n}C_0 + {}^{2n}C_2 + {}^{2n}C_4 + \ldots\ldots\ldots + {}^{2n}C_{2n} = \frac{2^{2n}}{2} = 2^{2n-1}$

84. Ans. (a)

Sol: z=x +i y

$\text{Re}\left(\frac{iz+1}{iz-1}\right)=2$
$\Rightarrow x^2+y^2+4y+3=0$
Radies$=\sqrt{2^2-3}=1$

85. **Ans. (a)**
Sol. $\Delta=-(a^3+b^3+c^3-3abc)$
$= -(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$
$=-\frac{1}{2}(a+b+c)[(a-b)^2+(b-c)^2+(c-a)^2]$,
which is clearly negative because of the given conditions

86. **Sol:(c)**
No. of ways A and B together = n – $2_{C_{10}}$ No. of 7 ways C, D, E together = n – $3_{C_{10}}$

$\Longrightarrow \text{n}-2_{C_{10}}=3\left(\text{n}-3_{C_9}\right)\Longrightarrow n=32$

87. **Sol: (b)**
$x^2+(1-2\lambda)x+(\lambda^2-\lambda-2)=0------(1)$
a = 1 of $\propto, \beta$ $are\ roots\ of\ (1)$,
if$\propto<3<\beta\Longrightarrow a.f(3)<0$
$\Longrightarrow f(3)<0$
$\Longrightarrow 9+(1-2\lambda)3+\lambda^2-\lambda-2<0$
$\Longrightarrow \lambda\in(2,5)$

88. **Sol: (c)**If $A+B=45°\Rightarrow(1+\tan A)(1+\tan B)=2$
$\therefore(1+\tan1°)(1+\tan2°)......(1+\tan45°)=2^{23}$

89. **Sol: (d)**
Apply $R_1\rightarrow R_1-R_2$, $R_2\rightarrow R_2-R_3$
$\Delta=2+\text{Cos}2x\Rightarrow1\le2+\text{Cos}2x\le3\ \therefore\alpha=3,\ \beta=1$

90. **Sol: (d)**
x y z = 24 & 24 = $2^3\times3^1\ (prime\ factors)$
Xyz $=2^3\times3^1$
No. 7 the division are$\left(3_{C_1}+2.3_{C_2}+3_{C_3}\right)\left(3_{C_1}\right)$
= (3 + 6 + 1) (3) = 30