SOLUTIONS

PHASE TEST-1

RBA, RB-1808-1809, RBK-1804

JEE MAIN PATTERN

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PHYSICS

1. (A)

$(\vec{A}_1 + 2\vec{A}_2) . (3\vec{A}_1 - 4\vec{A}_2)$

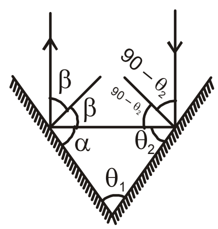
$= 3|\vec{A}_1|^2 + 2|\vec{A}_1||\vec{A}_2|\cos\theta - 8|\vec{A}_2|^2$

$= (|\vec{A}_1|^2 + 2|A_1||\vec{A}_2|\cos\theta + |\vec{A}_2|^2) + 2|\vec{A}_1|^2 - 9|\vec{A}_2|^2$

$= 3^2 + 2 \times 2^2 - 9 \times 3^2$ $= 9 + 8 - 81 = -64$

2. (C)

$\alpha = \pi - (\theta_1 + \theta_2)$



$\Rightarrow \beta = \theta_1 + \theta_2 - \dfrac{\pi}{2}$

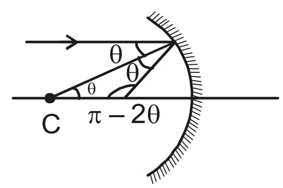
Now,

$\pi - 2\theta_2 + 2\theta_1 + 2\theta_2 - \pi = \pi$

$\Rightarrow \theta_1 = \dfrac{\pi}{2} = 90^\circ$

3. (C)

$\cos(\pi - 2\theta) = \dfrac{d^2 + d^2 - R^2}{2d^2} = 1 - \dfrac{R^2}{2d^2}$



$\Rightarrow -\cos 2\theta = 1 - \dfrac{R^2}{2d^2}$

$\Rightarrow \dfrac{R^2}{2d^2} = 1 + \cos 2\theta = 2\cos^2\theta$

$\Rightarrow d = \dfrac{R}{2\cos\theta}$

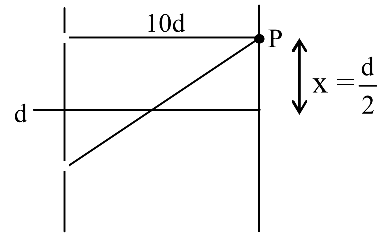
4. (B)

5. (A)

6. (A)

Δx at P = $\dfrac{dx}{D}$ = $\dfrac{d^2}{2D}$ = $\dfrac{(5\lambda)^2}{2 \times 10 \times d}$

Δx = $\dfrac{(5\lambda)^2}{2 \times 10 \times 5\lambda}$ = $\dfrac{\lambda}{4}$



$\Delta\phi = \frac{2\pi}{\lambda} \times \Delta x = \frac{\pi}{2}$

$I_0 = 4I \Rightarrow I = \frac{I_0}{4}$

$I_{net} = I + I + 2\sqrt{I}\sqrt{I}\cos\frac{\pi}{2} = 2I = \frac{I_0}{2}$

7. **(C)** **8.** **(D)**

9. **(C)**

$\Delta = (n + 4)\lambda - n\lambda = 4\lambda$

at Y point, forms $\boxed{\text{Fourth Bright Fringe}}$

10. **(D)**

$f_o = 1.5$ cm, $f_e = 6.25$ cm, $u_o = -2$ cm, $v_e = -D = -25$cm

By objective lens $\frac{1}{f_o} = \frac{1}{v_o} - \frac{1}{u_o}$

$\frac{1}{1.5} = \frac{1}{v_o} - \frac{1}{-2} \Rightarrow \frac{1}{v_o} = \frac{1}{1.5} - \frac{1}{2}$ or $v_o = 6$ cm

By eye piece $\frac{1}{f_e} = \frac{1}{v_e} - \frac{1}{u_e}$

$\frac{1}{6.25} = \frac{1}{-25} - \frac{1}{-u_e} \Rightarrow \frac{1}{u_e} = \frac{1}{6.25} + \frac{1}{25} = \frac{4}{25} + \frac{1}{25} = \frac{1}{5}$

$u_e = 5$ cm, Length of tube = $L = v_o + u_e = 6.0$ cm + 5.0 cm, $L = 11$ cm

11. **(C)** **12.** **(A)** **13.** **(C)**

14. **(C)**

$H = \frac{1}{2}g(2t)^2 = 2gt^2$ .... (1)

$h = H - \frac{1}{2}gt^2$ .... (2)

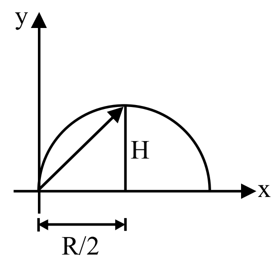
By (1) and (2)

$h = H - \frac{H}{4} = \frac{3H}{4}$

15. **(B)**

16. **(C)**

Average velocity = $\frac{\text{displacement}}{\text{time}}$



$v_{av} = \frac{\sqrt{H^2 + \frac{R^2}{4}}}{T/2}$ … (1)

Here, H = maximum height = $\frac{v^2 \sin^2\theta}{2g}$

R = range = $\frac{v^2 \sin 2\theta}{g}$

and T = time of flight = $\frac{2v \sin\theta}{g}$

Substituting in Eq. (1) we get

$v_{av} = \frac{v}{2}\sqrt{1 + 3\cos^2\theta}$

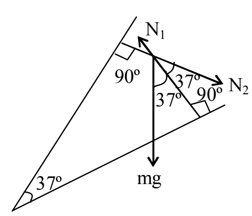
17. **(D)**

18. **(A)**

$2kx \cos 30^\circ = \left(\frac{4m_1m_2}{m_1 + m_2}\right)g$

19. **(A)**

Using lami's theorem

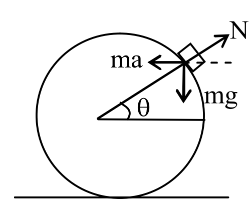


$\frac{mg}{\sin(180^\circ - 37^\circ)} = \frac{N_2}{\sin(180^\circ - 37^\circ)}$

$\therefore$ N_2 = mg

20. **(C)**

By F.B.D of m



N sinθ = mg and N cosθ = ma

$\therefore$ $\tan\theta = \frac{g}{a} \Rightarrow a = g \cot\theta$

$\therefore$ F = (m + M)g cot θ

21. (A)

As there is no friction, horizontal force on B is therefore F = 100 N

$\therefore$ a = $\frac{100}{20}$ = 5m/s^2

but no horizontal force on A acts therefore T = 0

22. (A)

23. (C)

$T = m(g - a) \Rightarrow 360 = 60(10 - a) \Rightarrow a = 4 m/s^2$

24. (C)

When all are pulling

$\vec{F}_{net} = 100 \times 3\hat{i}$ ......(1)

When 'A' stops

$\vec{F}_{net} - \vec{F}_A = 100 \times 1(-\hat{i})$ ......(2)

When 'B' stops

$\vec{F}_{net} - \vec{F}_B = 100 \times 24\hat{j}$

from these three get

$\vec{F}_A + \vec{F}_B$ and solve

25. (A)

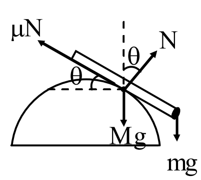
$\frac{3}{4}$ th energy is lost i.e., $\frac{1}{4}$ th kinetic energy is left. Hence, its velocity becomes $\frac{v_0}{2}$ under a retardation of μg in time t_0.

$\therefore \frac{v_0}{2} = v_0 - \mu g\, t_0$

or $\mu g\, t_0 = \frac{v_0}{2}$ or $\mu = \frac{v_0}{2g\, t_0}$

26. (D)

27. (A)



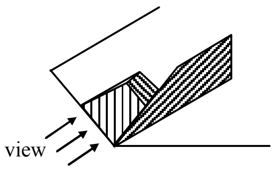
$\mu N \cos\theta = N \sin\theta$

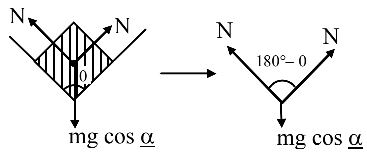
$\mu = \tan\theta$

28. (B)

29. (B)

Force diagram of block for the view shown





$\Rightarrow$ N = $\frac{mg\cos\alpha}{2\sin(\theta/2)}$

$\therefore$ Net friction up the plane = 2 μN

= μmg $\frac{\cos\alpha}{\sin(\theta/2)}$

$\therefore$ a = g $\left\{\sin\alpha - \mu\frac{\cos\alpha}{\sin(\theta/2)}\right\}$

30. (C)

Net force on m_3 = $\sqrt{(30)^2+(40)^2}$ = 50 N

and limiting friction on m_3 = $\mu m_3 g$ = 60N

$\therefore$ System remain in equilibrium and friction on m_3 = 50 N

CHEMISTRY

31. (D)

4 mole $C_2H_4O_2$ =16 mole H–atoms

= 16g hydrogen

32. (D)

Mass of 1 molecule of water = 18 amu

= 18 × 1.66 × 10^{-24} g

Volume of 1 molecule = $\frac{\text{mass}}{\text{density}}$

$= 29.88 \times 10^{-24} = 2.988 \times 10^{-23}$ mL

33. (D)

M.M. of X_2

$$= \frac{WRT}{PV} = \frac{40 \times 10^{-3} \times 0.0821 \times 300}{1 \times 4.92 \times 10^{-3}} = 200$$

Atomic mass of X = 100.

34. (B)

$$Ti \quad + \quad O_2 \longrightarrow Ti_{1.44}O$$

$\frac{1.44}{48}$ mole $\qquad \frac{x}{48(1.44)+16}$ mole

$\therefore \quad \frac{1.44}{48} = \frac{1.44x}{48(1.44)+16}$ [By POAC on Ti]

x = 1.77 g

35. (A)

Equivalents of KOH used by oil

= [25 × 0.40 – 8.5 × 0.28 × 2] × 10^{-3}

$\Rightarrow$ Mass of KOH used in milligrams

$\Rightarrow$ 5.24 × 10^{-3} × 56 × 1000 = 223.44

$\therefore$ Saponification number = $\frac{223.44}{2}$

= 146.72

36. (D)

As R.A

$$\overset{+3}{KHC_2O_4}\cdot \overset{+3}{H_2C_2O_4}\cdot 4H_2 \longrightarrow \overset{+4}{CO_2}$$

$n_f = 1\times 4 = 4 \qquad E = \frac{M}{4}$

37. (A)

$$[C_2O_4^{2-} + MnO_4^- \xrightarrow{H^+} Mn^{2+} + CO_2]$$

v.f = 2   v.f. = 5

$$1000\times\frac{W}{24+64}\times 2 = 90\times\frac{1}{100}\times 5;$$

W = 0.198 g

% of oxalate ion in a given sample

$$=\frac{0.198}{0.3}\times 100 = 66$$

38. (B)

% Relative humidity

$$=\frac{\text{Partial pressure of } H_2O(g)}{\text{Vapour pressure of } H_2O}\times 100 \quad = \frac{P}{P_s}\times 100$$

at constant temperature

39. (B)

$P_{gas} = P_{dry\ gas} + P_{moisture}$ at TK

or $P_{dry} = 830 - 30 = 800$

Now at $T_2 = 0.99\ T_1$;

at constant volume $\frac{p_1}{T_1} = \frac{p_2}{T_2}$

$$p_{dry} = \frac{800\times 0.99T}{T} = 792\text{ mm}$$

$\therefore \quad p_{gas} = p_{dry} + p_{moisture}$

$= 792 + 25 = 817$ mm

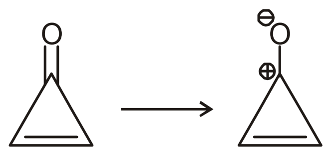
40. (B)

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$\frac{p \times 0.1}{T} = \frac{1.5P \times V_2}{\frac{4T}{3}} \quad \Rightarrow V_2 = \frac{0.8}{9}\,\text{lit} = 88.9\,\text{cc}$$

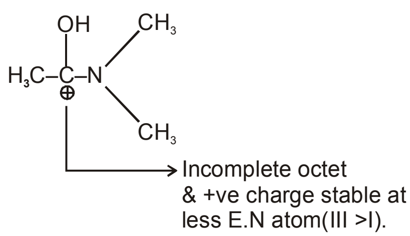
41. (C)

42. (C)



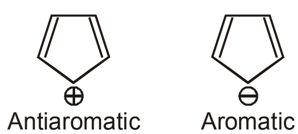
(Ring becomes aromatic)

43. (B)



44. (C)

45. (B)

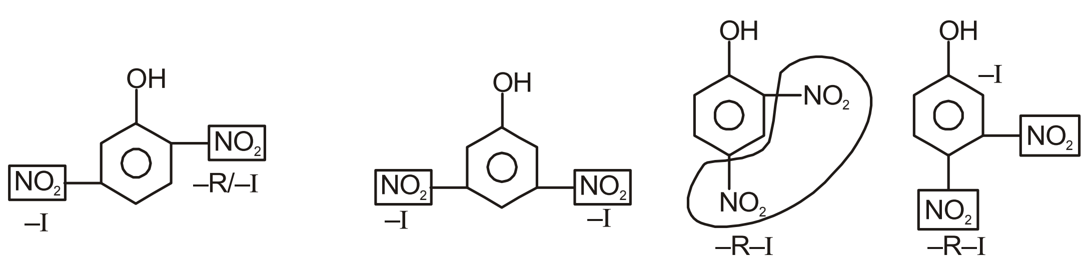


46. (A)

$$A \rightarrow \ B.S\,\alpha\,k_b\,\alpha\,\frac{1}{P_{kb}}.$$

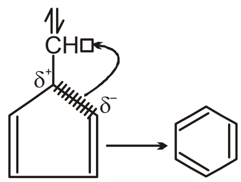
$$\rightarrow B.S\ \alpha\,\frac{1}{\%S - \text{character}}$$

47. (C)

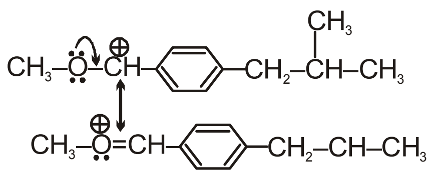


Acidic strength $\alpha \frac{E_{wg}}{E_{Dg}}$

48. (A)



49. (D)



after resonance having complete octet.

50. (D)

$D \rightarrow B.S \ \alpha \frac{1}{E_N}$

51. (D)

H_2O_2 and S_2Cl_2 have same structures

52. (A)

AsF_3Cl_2 molecule is trigonal bi pyramidal

53. (B)

54. (C)

Due to back bonding

55. (A)

S-S bond is non polar

56. (A)

$SOCl_2F_2$ molecule is trigonal bi pyramidal, where F occupy axial position

57. (B)

58. (A)

As(33) has 3 unpaired electron in p-orbital

59. (B)

60. (C)

MATHEMATICS

61. (D)

The point Q is (–b, –a) and the point R is (–a, –b)

$\therefore$ mid point of PR is (0, 0)

62. (A)

Circumcentre O $\equiv \left(-\frac{1}{3},\frac{2}{3}\right)$ and orthocentre H $\equiv \left(\frac{11}{3},\frac{4}{3}\right)$

$\therefore$ coordinate of centroid G is $\left(1,\frac{8}{9}\right)$

A(1, 10), G $\left(1,\frac{8}{9}\right)$

AG : GD = 2 : 1

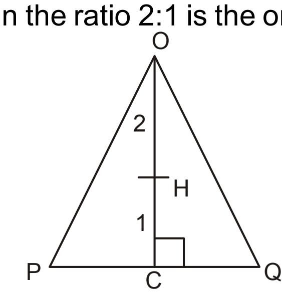
$\therefore$ D = $\left(1,-\frac{11}{3}\right)$

$\therefore$ coordinate of the mid point of BC is $\left(1,-\frac{11}{3}\right)$

63. (A)

In an equilateral triangle the orthocentre and the centroid are the same. OPQ is the equilateral triangle in which $OC \perp PQ$.

Clearly, the point H which divides OC internally in the ratio 2:1 is the orthocentre.



Clearly, $OC = \frac{1}{\sqrt{2}}$. So, $OH = \frac{2}{3} \times \frac{1}{\sqrt{2}}$

$\therefore$ $H = \left(\frac{2}{3\sqrt{2}}\cos 45°, \frac{2}{3\sqrt{2}}\sin 45°\right)$

64. (B)

Let the pair of straight lines cut the x-axis at $(x_1, 0)$ and $(x_2, 0)$ and y-axis at $(0, y_1)$ and $(0, y_2)$

$x^2 + \alpha xy + 3y^2 - 5x - 9y + \beta = 0$

Putting y = 0, $x^2 - 5x + \beta = 0$

$\therefore$ $(x_2 - x_1)^2 = (x_1 + x_2)^2 - 4x_1x_2 = \left(\frac{5}{1}\right)^2 - 4\beta = 25 - 4\beta$

Again putting x = 0, $3y^2 - 9y + \beta = 0$

$\therefore \quad (y_2 - y_1)^2 = \left(\frac{9}{3}\right)^2 - 4\frac{\beta}{3} = 9 - \frac{4\beta}{3}$

Now, $(x_2 - x_1)^2 = (y_2 - y_1)^2 \Rightarrow 25 - 4\beta = 9 - \frac{4\beta}{3} \Rightarrow \beta = 6$.

Also, $\Delta = 0 \Rightarrow 3\beta + \frac{45}{4}\alpha - \frac{81}{4} - \frac{75}{4} - \frac{\beta.\alpha^2}{4} = 0 \Rightarrow \alpha = \frac{7}{2}$ or 4

65. (D)

Bisectors of the lines in both the cases will remain unchanged

$\therefore$ Required equation is $\frac{x^2 - y^2}{1-(-1)} = \frac{xy}{-p} \Rightarrow px^2 + 2xy - py^2 = 0$.

66. (A)

$\tan\left\{\underbrace{\text{arc}\tan(2)}_{A} + \underbrace{\text{arc}\tan(20k)}_{B}\right\} = k$; $\frac{\tan A + \tan B}{1 - \tan A \tan B} = k$; $\frac{2 + 20k}{1-(2)(20k)} = k$

or $40k^2 + 19k + 2 = 0$

$\therefore$ sum of solutions, $k_1 + k_2 = -\frac{19}{40}$ Ans.]

67. (B)

$T_n = \cot^{-1}\left(n^2 + \frac{3}{4}\right) = \tan^{-1}\left(\frac{1}{n^2 + (3/4)}\right) = \tan^{-1}\left(\frac{1}{1 + n^2 - (1/4)}\right)$

$= \tan^{-1}\left(\frac{1}{1 + \left(n - \frac{1}{2}\right)\left(n + \frac{1}{2}\right)}\right) = \tan^{-1}\left(\frac{\left(n + \frac{1}{2}\right) - \left(n - \frac{1}{2}\right)}{1 + \left(n + \frac{1}{2}\right)\left(n - \frac{1}{2}\right)}\right)$

68. (B)

$f'(x) = -\frac{2}{\sqrt{1-x^2}} \cdot \frac{x}{|x|}$

$\Rightarrow$ not differentiable at x = 0, now $f'(x) = \begin{cases} -\frac{2}{\sqrt{1-x^2}} & \text{for } x > 0 \\ \frac{2}{\sqrt{1-x^2}} & \text{for } x < 0 \end{cases}$

$f''(x) = (1 - x)^{-3/2} \cdot (-2x) < 0$. Also not differentiable at x = 0 $\Rightarrow$ (B)

69. (A)

$2\tan^{-1}(1/2) + \tan^{-1}(4/3)$

$$= \tan^{-1}\frac{2.\frac{1}{2}}{1-\frac{1}{4}} + \tan^{-1}\frac{4}{3} = 2\tan^{-1}\frac{4}{3} > \frac{\pi}{2}$$

but $\operatorname{cosec}^{-1} x \in \left[-\frac{\pi}{2}, 0\right) \cup \left(0, \frac{\pi}{2}\right]$ $\Rightarrow$ no solution

70. (A)

$$\tan\beta = 2\sin\alpha.\sin\gamma.\operatorname{cosec}(\alpha+\gamma) = \frac{2\sin\alpha\sin\gamma}{\sin(\alpha+\gamma)}$$

$$\cot\beta = \frac{\sin(\alpha+\gamma)}{2\sin\alpha\sin\gamma}$$

$$\text{i.e. } 2\cot\beta = \frac{\sin\alpha\cos\gamma+\cos\alpha\sin\gamma}{\sin\alpha\sin\gamma} = \cot\alpha + \cot y$$

71. (C)

$\cos^2 10° - \cos 10° \cos 50 + \cos^2 50° =$

$$= \frac{1}{2}\,[1 + \cos 20° - (\cos 60° + \cos 40°) + (1 + \cos 100°)]$$

$$= \frac{1}{2}\,[1 + \cos 20° - \frac{1}{2} - \cos 40° + 1 - \cos 80°] = \frac{1}{2}\left[\frac{3}{2} + \cos 20° - (2\cos 60° \cos 20°)\right] = \frac{3}{4}$$

72. (A)

The given condition can be written

$(\cos^2\alpha + \sin^2\alpha)^3 - 3\sin^2\alpha\cos^2\alpha(\cos^2\alpha + \sin^2\alpha) + k\sin^2 2\alpha = 1.$

$\Rightarrow$ $(-3/4)\sin^2\alpha + k\sin^2 2\alpha = 0$

showing that k = 3/4.

73. (C)

We have $\tan\theta = -1$ and $\cos\theta = 1/\sqrt{2}$

The value of θ lying between $3\pi/2$ and 2π and satisfying these two is $7\pi/4$. Therefore the most general solution is $\theta = 2n\pi + 7\pi/4$ where $n \in Z$.

74. (A) $1 + |\cos x| + \cos^2 x$ ....

$$= \frac{1}{1-|\cos x|} \qquad \Rightarrow \qquad \frac{1}{8^{1-|\cos x|}} = 4^3$$

$\Rightarrow \quad \dfrac{3}{2^{1-|\cos x|}} = 2^6 \qquad \Rightarrow \quad \dfrac{3}{1-|\cos x|} = 6 \qquad \Rightarrow \quad 1-|\cos x| = \dfrac{1}{2}$

$|\cos x| = \dfrac{1}{2} \qquad \Rightarrow \quad \cos x = \pm \dfrac{1}{2}$

$\cos x = \dfrac{1}{2}$ will give least positive value of x

$x = \dfrac{\pi}{3}$ **Ans.**

75. (B)

Case-I : If base > 1 i.e. $(2x - 3) > 1 \Rightarrow x > 2$

Now, $(3x - 4) > 1 \Rightarrow x > \dfrac{5}{3}$

Hence, $x \in (2, \infty)$ ......(1)

Case-II: When 0 < base < 1 i.e. $0 < 2x - 3 < 1 \Rightarrow \dfrac{3}{2} < x < 2$

Now, $0 < 3x - 4 < 1 \Rightarrow \dfrac{4}{3} < x < \dfrac{5}{3}$

Hence, $x \in \left(\dfrac{3}{2}, \dfrac{5}{3}\right)$ ......(2)

$\therefore$ Case I $\cup$ case II

$\Rightarrow x \in \left(\dfrac{3}{2}, \dfrac{5}{3}\right) \cup (2, \infty)$. **Ans.**]

76. (B)

For $x \le -5$, $f(x) = 2x^2 - 10x$, $f(-5) = 100$; $\lim_{x\to\infty} f(x) \to \infty$

For $-5 < x < 3$, $f(x) = x^2 - 5$; $f(0) = -5$; $f(3^-) = 4$; $f(-5^+) = 20$

For $x \ge 3$, $f(x) = x^2 + 1$; $f(3) = 10$; $\lim_{x\to\infty} f(x) \to \infty$.

Hence, range $[-5, \infty)$.

77. (D)

$f(x+y) = f\left(\dfrac{xy}{4}\right)$ ....(i)

$y = 0$

$f(x) = f(0)$ .... (ii)

put $x = -4,\ f(-4) = f(0)$

putting x = 2016 in equation (ii)

$f(2016) = f(0) = -4$

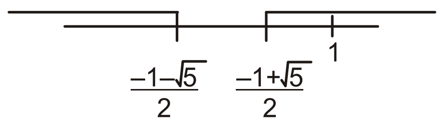
78. **(A)**

from analysis x > 0 & 1 – x > 0

x < 1

$x^2 + x > 1$

$x^2 + x - 1 > 0$



Solution of inequation is $\left(\frac{-1+\sqrt{5}}{2}, 1\right)$, $2a + b = -1 + \sqrt{5} + 1 = \sqrt{5}$.

79. **(A)**

$f(x) = \frac{x}{x-1}$

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

$fofof(x) = f(x) = \frac{x}{x-1}$

$\underbrace{(\text{fo fo fo.....of})}_{21\text{ times}} = f(x) = \frac{x}{x-1}$

80. **(C)**

Clearly $g(x) = \sin x$, & $h(x) = \log_{10}\left(x + \sqrt{x^2+1}\right)$ both ore odd function. Therefore $f(x) = goh(x)$ is also an odd function.

81. **(D)**

$f(-x) = -f(x)$ & $f(x+2) = f(x) \quad \forall x \in R$

$\Rightarrow f(-x)+f(x)=0 \;\&\; f(x+2)=f(x) \quad \forall x\in R$

$\Rightarrow 2f(0)=0 \qquad \& \qquad f(2)=(f(0)) \quad \forall x\in R$

$f(0)=0 \qquad \& \qquad f(2)=0$

Since $f(x+2)=f(x) \quad \forall x\in R$

$f(4)=f(2)=0$

82. (C)

$$\sqrt{1+x^2}\left[\left\{x\cos\cos^{-}\left(\frac{x}{\sqrt{1+x^2}}\right)+\sin\sin^{-1}\left(\frac{1}{\sqrt{1+x^2}}\right)\right\}^2-1\right]^{½}$$

$$= \sqrt{1+x^2}\left[\left\{\frac{x^2}{\sqrt{1+x^2}}+\frac{1}{\sqrt{1+x^2}}\right\}^2-1\right]^{½}$$

$$= \sqrt{1+x^2}\left[1+x^2-1\right]^{½}$$

$$= x\sqrt{1+x^2}$$

83. (B)

$$\sin^{-1}\left(\frac{3\sin 2\theta}{5+4\cos 2\theta}\right)=\frac{\pi}{2}$$

$$\frac{3\sin 2\theta}{5+4\cos 2\theta}=1$$

$$3\left(\frac{2\tan\theta}{1+\tan^2\theta}\right)=5+4\left(\frac{1-\tan^2\theta}{1+\tan^2\theta}\right)$$

$$6\tan\theta=9+\tan^2\theta$$

$$\Rightarrow \tan^2\theta-6\tan\theta+9=0$$

$$\tan\theta=3$$

84. (D)

$$\cos^{-1}x>\sin^{-1}x$$

$$\cos^{-1}>\frac{\pi}{2}-\cos^{-1}x$$

$$\cos^{-1} x > \frac{\pi}{4}$$

$$x \in \left[-1, \frac{1}{\sqrt{2}}\right)$$

85. **(D)**

Lines $5x + 3y - 2 + \lambda_1(3x - y - 4) = 0$ are concurrent at (1, – 1) and lines $x - y + 1 + \lambda_2(2x - y - 2) = 0$ are concurrent at (3, 4). Thus equation of line common to both family is,

$$y - 4 = \frac{-1-4}{1-3}(x - 3) \quad \text{i.e.,} \quad 5x - 2y - 7 = 0.$$

86. **(D)**

Desired equation of the circle is

$(x - 2)^2 + (y - 3)^2 + \lambda(x + y - 5) = 0$

$1 + 1 + \lambda(1 + 2 - 5) = 0 \Rightarrow \lambda = 1$

$x^2 - 4x + 4 + y^2 - 6y + 9 + x + y - 5 = 0 \Rightarrow x^2 + y^2 - 3x - 5y + 8 = 0$

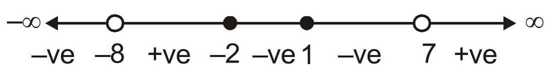
$$\left(x^2 + \frac{3}{2}\right)^2 + \left(y - \frac{5}{2}\right)^2 = = -8 + \frac{25}{4} + \frac{9}{4} = \frac{2}{4} = \frac{1}{2}$$

87. **(D)**

The equation of the common chord of the circles $x^2 + y^2 - 4x - 4y = 0$ and $x^2 + y^2 = 16$ is $x + y = 4$ which meets the circle $x^2 + y^2 = 16$ at points A(4, 0) and B(0, 4). Obviously $OA \perp OB$. Hence the common chord AB makes a right angle at the centre of the circle $x^2 + y^2 = 16$.

88. **(B)**

Using wavy curve method :



$\therefore \quad x \in (-\infty, 8) \cup [-2, 1] \cup (1, 7)$

i.e., $x \in (-\infty, 8) \cup [-2, 7)$

89. **(A)**

$||x - 8| - 13| \le 5 \Rightarrow \quad -5 \le |x - 8| - 13 \le 5 \Rightarrow \quad 8 \le |x - 8| \le 18$

(i) $|x - 8| \ge 8$

$\Rightarrow \quad x - 8 \le -8 \quad$ or $\quad x - 8 \ge 8$

$\Rightarrow \quad x \le 0 \quad$ or $\quad x \ge 16$

$x \in (-\infty, 0] \cup [16, \infty)$

and

(ii) $|x - 8| \le 18$

$\Rightarrow \quad -18 \le x - 8 \le 18 \quad \Rightarrow \quad -10 \le x \le 26$

From (i) and (ii)

$x \in [-10, 0] \cup [16, 26]$

90. **(C)**

$x^2 - x < 0 \Rightarrow \quad x(x - 1) < 0 \quad \Rightarrow \quad 0 < x < 1$