SOLUTIONS

PROGRESS TEST-1

RBPA

JEE MAIN PATTERN

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PHYSICS

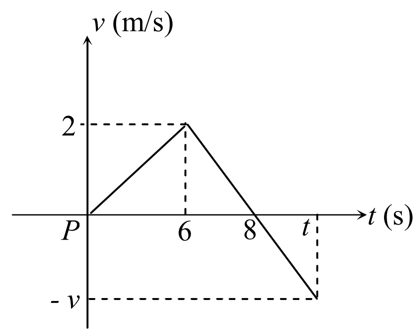
1. u = 7 m/s and a = 4 m/s^2

Distance traveled in n^{th} second = $u+\frac{a}{2}(2n-1)$

$\therefore$ Distance traveled in 5th second = $7+\frac{4}{2}[2(5)-1]$ = 25m

$\therefore$ **(A)**

2. Let after t second particle will reach at P again,



$\therefore$ area of $v-t$ curve = 0

$$\frac{1}{2}\times 2\times 8-\frac{1}{2}\times(t-8)\times(t-8)\times 1=0$$

$$(t-8)^2=16$$

$$t-8=4$$

$$t=12s$$

$\therefore$ **(C)**

3. The stopping distance $S\propto u^2$

$\therefore$ **(D)**

4. $x^2+y^2=l^2 \Rightarrow 2x\frac{dx}{dt}+2y\frac{dy}{dt}=0 \Rightarrow -xv_A+yv_B=0$

$\therefore$ $v_B=\frac{v_A}{\tan\alpha}=10\sqrt{3}=17.3$ m/s

$\therefore$ **(D)**

5. $\frac{v_T+v_B}{2}=\frac{3}{0.5}=6$ or $v_T+v_B=12$ ms^{-1}

$\therefore$ **(A)**

6. Block B again comes to rest when speed of A = speed of C

$v_A=6t^2$, $v_c=3t$, $6t^2=3t$, $t=\frac{1}{2}$s

$\therefore$ **(D)**

7. $\frac{ds}{dt} = 4\sqrt{1+s}$

$\Rightarrow \int_0^s \frac{ds}{\sqrt{1+s}} = \int_0^t 4dt \Rightarrow 2\sqrt{1+s} = 4t \Rightarrow s = 4t^2 - 1$

$\Rightarrow v = 8t$ at $t = 0, v = 0$

$\therefore$ **(A)**

8. For first projectile, $h_1 = ut - \frac{1}{2}gt^2$

For second projectile, $h_2 = u(t-T) - \frac{1}{2}g(t-T)^2$

When both meet i.e. $h_1 = h_2$

$ut - \frac{1}{2}gt^2 = u(t-T) - \frac{1}{2}g(t-T)^2 \Rightarrow uT + \frac{1}{2}gT^2 = gtT \Rightarrow t = \frac{u}{g} + \frac{T}{2}$

$\therefore$ **(B)**

9. $a = v\frac{dv}{dx} = \frac{25}{(x+2)^3}$, $\frac{v^2}{2} = 25 \times \left[-\frac{1}{2(x+2)^2}\right]_o^x$, $v^2 = 25\left[\frac{1}{4} - \frac{1}{(x+2)^2}\right]$

$v = \sqrt{25\left[\frac{1}{4} - \frac{1}{(x+2)^2}\right]}$, $v_{max} = \frac{5}{2} = 2.5$ m/s (at $x = \infty$)

$\therefore$ **(A)**

10. The graph will be parabolic and in downward motion velocity will be negative and upward motion velocity will be positive

$\therefore$ **(A)**

11. For train *B*, $-\frac{dv}{dt} = 0.3t$, $-\int_{15}^{0} dv = 0.3\int_0^t t\,dt \Rightarrow$ $t = 10$ s

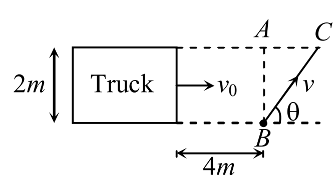
In this 10 s, the train *B* travels a distance of 100 m.

$\therefore$ Train *A* can travel a distance of 125 m before coming to rest.

$v^2 = u^2 + 2as$, $a = -2.5 m/s^2$

$\therefore$ **(B)**

12. For safe crossing, the condition is that the man must cross the road by the time the truck covers the distance 4 + *AC* or 4 + 2cot θ



$\therefore \quad \frac{4+2\cot\theta}{8} = \frac{2/\sin\theta}{v}$

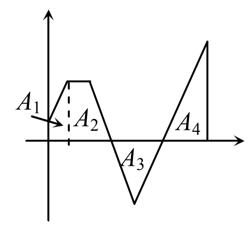
or $\quad v = \frac{8}{2\sin\theta + \cos\theta}$ ...(i)

For minimum *v*, $\frac{dv}{d\theta} = 0 \Rightarrow \tan\theta = 2$

From equation (i), $v_{min} = \frac{8}{\sqrt{5}}$ = 3.57 m/s

$\therefore$ **(C)**

13. $A_1 = \frac{1}{2}(2+4)\times 1 = 3m$



$A_2 = \frac{1}{2}(2+1)\times 4 = 6m$

$A_3 = \frac{1}{2}(2\times 4)$ = 4m

$A_4 = \frac{1}{2}(2\times 6)$ = 6m

Distance travelled in 7 s = $A_1 + A_2 + A_3 + A_4$ = 19 m

Average speed = $\frac{19}{7}$ m/s

$\therefore$ **(D)**

14. $0 - t_1 \rightarrow$ uniformly retarded motion

$t_1 - t_2 \rightarrow$ particle at rest

$t_2 - t_3 \rightarrow$ uniform negative velocity

$t_3 - t_4 \rightarrow$ particle at rest

$t_4 - t_5 \rightarrow$ uniform negative velocity

$\therefore$ **(C)**

15. (C)

Fringe visibility gives the contrast of the fringes given by

V = $\frac{2\sqrt{I_1/I_2}}{1+I_1/I_2}$

16. (C)

17. (C)

After immersing, no change in central maxima in air, separation between central maxima & 10th maxima = 5cm –2cm = 3cm = $10\frac{D\lambda}{d}$ in liquid, separation between central maxima & 10th maxima = $10\frac{D\lambda'}{d} = 10\frac{D}{d}\frac{\lambda}{\mu} = \left(\frac{10D\lambda}{d}\right)/1.5$ = $\frac{3cm}{1.5} = 2cm$. So new co-ordinate of 10th maxima = 2cm + 2cm = 4cm

18. (A)

Phase difference correspnding to y_1 = $\frac{-\pi}{2}$ and that for y_2 = + $\frac{\pi}{2}$

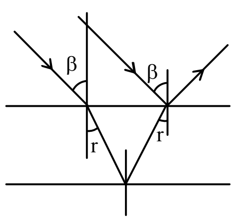
$\therefore$ Average intensity between y_1 and y_2

$= \frac{1}{\pi}\int_{-\pi/2}^{\pi/2} I_{max}\cos^2\left(\frac{\phi}{2}\right)d\phi$

$= I_{max}\frac{(\pi+2)}{2\pi}$

Hence required ratio = $\frac{1}{2}\left(1+\frac{2}{\pi}\right)$

19. (C)



$2\mu t\cos r = (2n + 1)\frac{\lambda}{2}$

$t = \frac{(2n+1)\lambda}{4\mu\cos r}$ (putting n = 0) = $\frac{\lambda}{4\mu\cos r}$

cos r = $\sqrt{1-\sin^2 r}$ = $\frac{1}{\mu}\sqrt{\mu^2-\sin^2\beta}$

Substituting all value t = 1.01×10^{-7}m

mass of soap = $\rho \times \ell \times h \times t = 6.06 \times 10^{-2}$ mg.

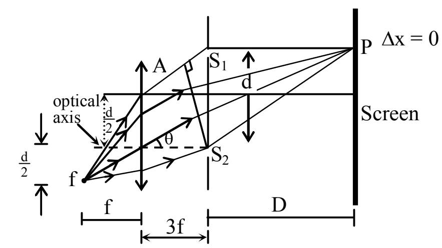
20. (A)

$\Delta x = AS_1 + S_1P - S_2P$

$= d\sin\theta - \frac{dx}{D} = 0$

$\Delta x = \frac{d\times d}{2f} - \frac{dx}{D} = 0 \qquad d <<< D$

$x = \frac{dD}{2f}$



21. (B)

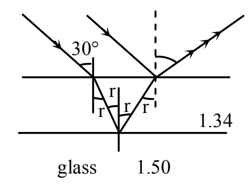
Condition for constructive interference

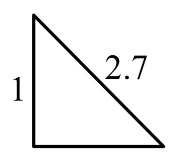
$2\mu t\cos r = n\lambda$

$\sin 30° = 1.34\sin r$

$\sin r = \frac{1}{2.68}$ or $\frac{1}{3}$

$\cos r = \sqrt{1-\sin^2 r}$





$2\mu t\cos r = n\lambda \qquad ...(1)$

$2\mu(t - \Delta t)\cos r = (n-1)\lambda \qquad ..(2)$

Equation (1) and equation (2)

By eq.(1) and eq.(2)

$2\mu\,\Delta t\cos r = \lambda$

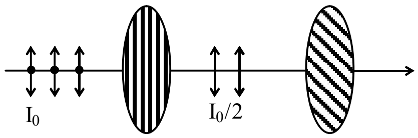
$\Delta t = \frac{\lambda}{2\mu\cos r}$

Rate of decrease = $\frac{\Delta t}{\text{time}} = 1.01\ \mu m/hr$

[Time = 15 min = $\frac{15}{60}$

22. (C)

23. (D)



$\left(\frac{I_0}{2}\right)\cos^2 60^\circ = \frac{I_0}{8}$.

24. (A)

25. (C)

$\mu = \tan i_p$

$\therefore \frac{c}{v} = \tan i_p$

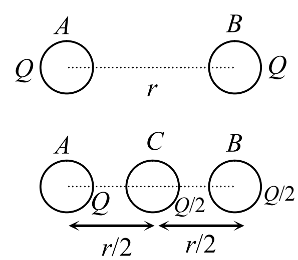
$\therefore v = \frac{3\times10^8}{\sqrt{3}} = \sqrt{3} \times 10^8$ m/s

26. For charge + q at A to come down, $F_e < mg$

$\therefore \quad \frac{q^2}{4\pi\varepsilon_0 h^2} < mg$

$\therefore$ **(C)**

27. $F = \frac{Q^2}{4\pi\varepsilon_0 r^2}$



$$F_C = \frac{Q^2/2}{4\pi\varepsilon_0\left(\frac{r}{2}\right)^2} - \frac{Q^2/4}{4\pi\varepsilon_0\left(\frac{r}{2}\right)^2} = \frac{Q^2}{4\pi\varepsilon_0 r^2} = F$$

$\therefore$ **(C)**

28. (A)

29. $\frac{K(4e)q}{(x-y)^2} = \frac{Kqe}{y^2}$, $\qquad y = \frac{x}{3}$

$\therefore$ **(C)**

30. $-\frac{2q}{4\pi\varepsilon_0(x-L)^2} + \frac{8q}{4\pi\varepsilon_0 x^2} = 0$ or $x = 2L$

$\therefore$ **(A)**

CHEMISTRY

31. (D)

$$C_xH_y \quad + \quad \left(x+\frac{y}{4}\right)O_2 \longrightarrow xCO_2 + \frac{y}{2}H_2O$$

$$A\ ml \qquad A\left(x+\frac{y}{4}\right)ml \qquad 0 \qquad 0$$

$$0 \qquad 0 \qquad Ax \qquad \frac{Ay}{2}$$

$$A + Ax + \frac{Ay}{4} = 600 \qquad \text{.....................} (1)$$

$$Ax + \frac{Ay}{2} = 700 \qquad \text{.....................} (2)$$

$$\Rightarrow \frac{x}{y} = \frac{3}{8}$$

Since, x < 5

$\Rightarrow x = 3, y = 8$

$\Rightarrow A = 100$ ml

So, the hydrocarbon is C_3H_8 and the volume taken was 100 ml

32. (C)

$$\left(P + \frac{a}{V^2}\right)(V) = RT$$

$$PV^2 - RTV + a = 0$$

$$V = \frac{+RT \pm \sqrt{(RT)^2 - 4aP}}{2P}$$

V is single valued, $(RT)^2 - 4aP = 0$; $P = \frac{R^2T^2}{4a}$

33. (B)

Permanent gas have extremely law criticl temperature & hence to liquify them, temp must be extremely law below critical temp.

34. (C)

Liquefaction of the gas depends upon pressure correction. More is the pressure correction more easily the gas can be liquefied.

35. (D)

36. (A)

High temp. has less deviation fram ideal behaviour

37. (C)

At critical dondition, inflection point exist & hence $\frac{\partial P}{\partial V_m}$ & $\frac{\partial^2 P}{\partial V_{m^2}} = 0$

38. (B)

A gas having higher value of 'a' can be easily liquefied due to strong intermolecular force of extraction.

39. (A)

Below critical temp. H_2 gas can be liquified

40. (A)

Vander Waal's equation for one mole of gas is given by

$$\left(\frac{P+a}{V^2}\right)[V - b] = RT$$

at low P, volume V is high

$$V - b \quad b$$

$$\therefore \left[P + \frac{a}{V^2}\right]V = RT$$

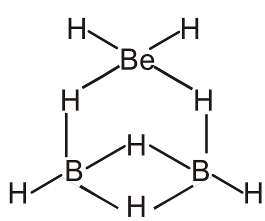
$$PV = RT - \frac{a}{V} \quad ; \quad Z = 1 - \frac{a}{RTV}$$

41. (B) **42. (B)** **43. (A)** **44. (A)**

45. (D) **46. (B)** **47. (C)** **48. (D)**

49. (B) **50. (B)** **51. (C)** **52. (B)**

53. (C)

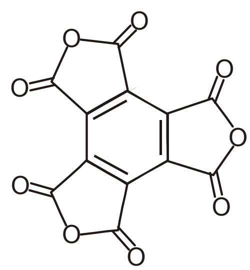


54. (A)

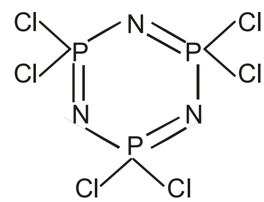
(IV) $LiClO_4 > NaClO_4 > KClO_4 > RbClO_4 > CsClO_4$

55. (A)

(iii) $C_{12}O_9$ – sp^2 ;



(iv) $N_3P_3Cl_6$ – sp^2 & sp^3 ;



56. (A)

(i) LiF > NaF > KF > RbF : Lattice energy

(iii) $Li^+ < Mg^{2+} < Al^{3+}$:Hydration energy

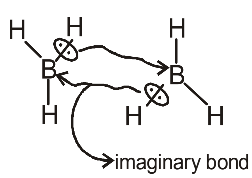
57. (A)

58. (C)

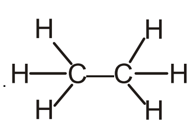
Due to size of Nitrogen is smaller than another.

59. (D) 1 & 3 have x – x bond absent.

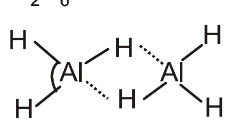
(1) B_2H_6



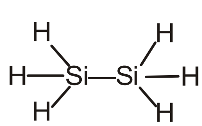
(2) C_2H_6 ....



(3) Al_2H_6



(4)



x-x bond are present

60. (C)

MATHEMATICS

61. (C)

$(\sin^{-1} x + \sin^{-1} y)(\sin^{-1} z + \sin^{-1} w) = \pi^2$ is possible only when x = y = z = w = 1

or x = y = z = w = – 1, then

$$\begin{vmatrix} x^{n_1} & y^{n_2} \\ z^{n_3} & w^{n_2} \end{vmatrix} = 0, 2 \text{ or } -2$$

62. (C)

$\sin^{-1}(\sin x) = x$ in $(0, \frac{\pi}{2}]$ $= \pi - x$ in $\left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$ $= x - 2\pi$ in $\left[\frac{3\pi}{2}, 2\pi\right]$

$= x - 2\pi$ in $\left[\frac{3\pi}{2}, 2\pi\right]$

$\cos^{-1}(\cos x) = x$ in$[0, \pi]$ $= 2\pi - x$ in $[\pi, 2\pi]$

$\therefore f(x) = 2x$ in $\left[0, \frac{\pi}{2}\right]$

$= \pi$ in $\left[\frac{\pi}{2}, \pi\right]$

$= 3\pi - 2x$ in $\left(\pi, \frac{3\pi}{2}\right)$

$= 0$ in $\left[\frac{3\pi}{2}, 2\pi\right]$

$\therefore (15) f(x)$ in increases in $\left(0, \frac{\pi}{2}\right)$

63. (D)

$\frac{1+x^2}{x} \geq 2 \qquad (\because x > 0)$

$\sin^{-1}\left(\frac{x}{1+x^2}\right) \in \left(0, \frac{\pi}{6}\right]$

$\therefore \quad \sin^{-1}\left(\frac{2y}{1+y^2}\right) \in \left(0, \frac{\pi}{2}\right]$

Range $= \left(0, \frac{2\pi}{3}\right]$

64. (D)

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

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

$$\Rightarrow\ 3x^2-2x=0 \Rightarrow x=0,\frac{2}{3}$$

But for x = 0 and $\frac{2}{3}$

$x^2 - 2x + 2 > 1$ and $4x^2 - 4x + 2 > 1$

Hence No solution

65. (D)

$x = \sin 2\theta = 2\sin\theta\cos\theta = \frac{4}{5}$ $(\theta = \tan^{-1}2)$

$$y=\sin\frac{\phi}{2};\ y>0,\ \tan\phi=\frac{4}{3}$$

$$y^2=\sin^2\frac{\phi}{2}=\frac{1-\cos\phi}{2}=\frac{1}{5}$$

66. (C)

$\sin^{-1}(x-1) \Rightarrow -1\le x-1\le 1 \Rightarrow 0\le x\le 2$

$\cos^{-1}(x-3) \Rightarrow -1\le x-3\le 1 \Rightarrow 2\le x\le 4$

$$\tan^{-1}\left(\frac{x}{2-x^2}\right) \Rightarrow x\in R,\ x\ne\sqrt{2},-\sqrt{2}$$

hence x = 2.

$$\sin^{-1}(2-1)+\cos^{-1}(2-3)+\tan^{-1}\frac{2}{2-4} = \cos^{-1}k+\pi$$

$$\Rightarrow\ \sin^{-1}1+\cos^{-1}(-1)+\tan^{-1}(-1) = \cos^{-1}k+\pi$$

$$\frac{\pi}{2}+\pi-\frac{\pi}{4} = \cos^{-1}k+\pi$$

$$\Rightarrow\ \cos^{-1}k = \frac{\pi}{4}$$

$$\Rightarrow\ k = \frac{1}{\sqrt{2}}$$

67. (B)

Given equation reduces to $(x-2)^4+\left(\tan^{-1}(y-1)-\frac{\pi}{4}\right)^2=0$

$\Rightarrow$ x = 2, y = 2 $\Rightarrow$ x + y = 4.

68. (D)

$$\cos^{-1}\sqrt{x}+\cos^{-1}\sqrt{1-x}=\cos^{-1}\sqrt{x}+\sin^{-1}\sqrt{x}=\frac{\pi}{2}$$

So given equation, $\frac{\pi}{2}+\cos^{-1}\sqrt{1-y}=\frac{3\pi}{4} \Rightarrow \cos^{-1}\sqrt{1-y}=\frac{\pi}{4} \Rightarrow y=\frac{1}{2}$.

Clearly x $\in$ [0, 1] (for domain)

69. (B)

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

$\cos^{-1}\left(\frac{1+x^2}{2x}\right)=\pi$, hence x = –1 is the only solution

70. (A)

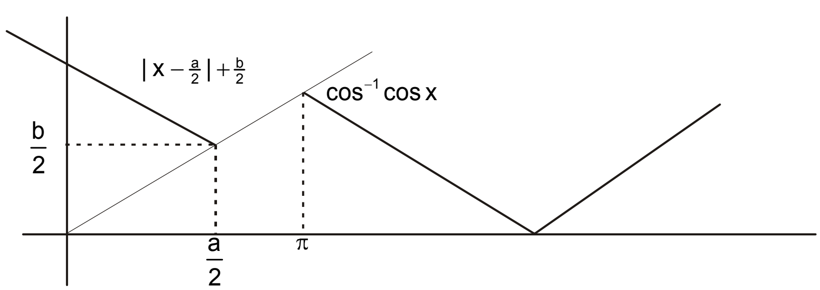
The range of $\cos^{-1}x+\cot^{-1}x-\sin^{-1}(\sin x)$ is $\left[\frac{\pi}{4}-1,\frac{7\pi}{4}+1\right]$

Then $\frac{\pi}{4}-1\le 2p-1\le\frac{7\pi}{4}+1 \Rightarrow \frac{\pi}{8}\le p\le\frac{7\pi}{8}+1$

Hence p = 1, 2, 3, four values.

71. (A)

$\frac{a}{2}\in[0,3]$



$a = 0,1,2,3,4,5,6$

Hence, 7 Pairs.

72. (B)

$\cot\left\{\cot^{-1}3 + \cot^{-1}7 + \cot^{-1}13 + \cot^{-1}21\right\}$

$= \cot\left\{\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{13} + \tan^{-1}\frac{1}{21}\right\}$

$= \cot\left\{\tan^{-1}2 - \tan^{-1}1 + \tan^{-1}3 - \tan^{-1}2 + \ldots + \tan^{-1}5 - \tan^{-1}4\right\}$

$= \cot\left[\tan^{-1}5 - \tan^{-1}1\right] = \frac{3}{2}$

73. (D)

$\cos^{-1}x \in [0, \pi]$

Thus $\cos^{-1}x + \cos^{-1}y + \cos^{-1}z \le 3\pi$

$\Rightarrow \cos^{-1}x = \cos^{-1}y = \cos^{-1}z = \pi \Rightarrow x = y = z = -1$

$\Rightarrow \frac{100x^2 + 182y^2}{47z^2} = \frac{100 + 182}{47} = 6$

74. (B)

$\tan^{-1}x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

$\Rightarrow \cos\left(\tan^{-1}x\right) \in (0,1] \quad \Rightarrow \cos^{-1}\left(\cos\left(\tan^{-1}x\right)\right) \in \left[0, \frac{\pi}{2}\right)$

$\Rightarrow \sin\left(\cos^{-1}\left(\cos\left(\tan^{-1}x\right)\right)\right) \in [0,1)$

75. (D)

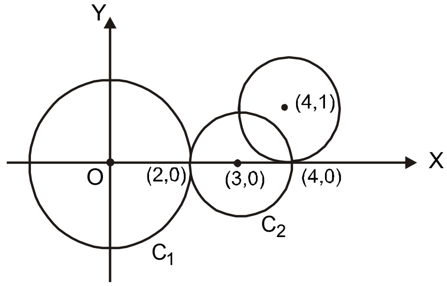
$x = 2\pi - 4 \; ; \; y = \pi - 3 \quad \Rightarrow x + y = 3\pi - 7$

76. (C)

The points on the circle with integer co-ordinates are (± 5, 0), (± 4, ± 3), (± 3, ± 4), (0, ± 5), which are 12 in number. Joining any two of them will form a chord with extremities having integral co-ordinates.

The number of the chords = $^{12}C_2 = 66$.

77. (C)



Circles C_1 and C_2 touch each other externally, so they have three common tangents.

Circles C_2 and C_3 cut each other at two points, so they have two common tangents.

Circles C_1 and C_3 are external to each other, so they have four common tangents.

No common tangent can be drawn to touch all the three circles.

So, total no. of common tangents = 3 + 2 + 4 = 9.

78. (A)

Let equation to the circle be $(x-r)^2+(y-r)^2=r^2$

If it passes through (a, b), then $a^2+b^2-2ra-2rb+r^2=0 \Rightarrow r^2-2r(a+b)+a^2+b^2=0$

$\therefore\ r_1+r_2=2(a+b)\ \&\ r_1r_2=a^2+b^2$

According to the given condition

$r_1^2+r_2^2=4r_1r_2 \Rightarrow a^2+b^2=4ab$

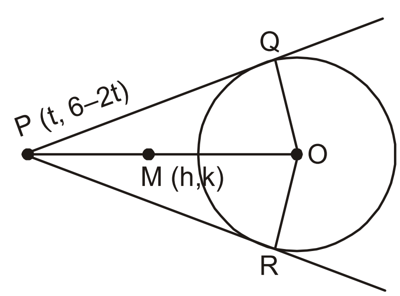
79. (A)

$\because$ PQOR is a cyclic quadrilateral with OP as diameter

Mid point of OP will be circumcentre of ΔPQR

$\Rightarrow\ h=\frac{t}{2},\ k=3-t$

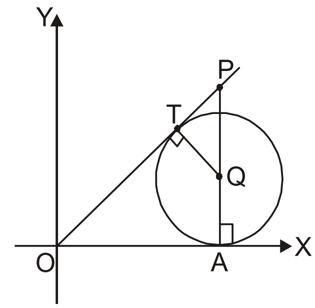
$\Rightarrow$ Locus is $y=3-2x$



80. (C)

Given QT = QA = 1

Let PQ = x, then $PT = \sqrt{x^2 - 1}$,



$\because$ $\Delta TQP \sim \Delta AOP$ $\therefore$ $\dfrac{OA}{AP} = \dfrac{QT}{TP}$

$\Rightarrow$ $OA = OT = \dfrac{x+1}{\sqrt{x^2-1}}$

perimeter of $\Delta OAP = 8$

$\Rightarrow$ $1 + x + \dfrac{2(x+1)}{\sqrt{x^2-1}} + \sqrt{x^2-1} = 8$

$\Rightarrow$ $x = \dfrac{5}{3}$

81. (B)

Let the equation be $x^2 + y^2 - 9 + \lambda(x + y - 1) = 0$

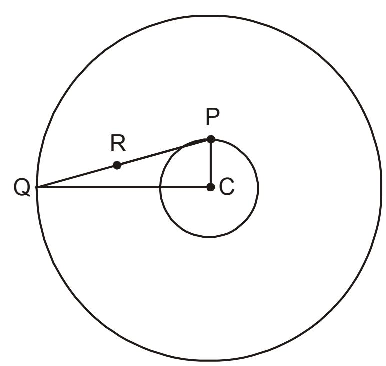
For the circle to be smallest the centre $\left(-\dfrac{\lambda}{2}, -\dfrac{\lambda}{2}\right)$ must lie on x + y = 1.

$\therefore$ $\lambda = -1$

$\therefore$ Equation is $x^2 + y^2 - x - y - 8 = 0$

82. (B)

Using Appollonious theorem,



$CP^2 + CQ^2 = 2(CR^2 + RQ^2)$

$16 + 36 = 2(CR^2 + 4)$

$26 = CR^2 + 4$

$CR = \sqrt{22}$

83. (A)

$$a \le \sin A \Rightarrow \frac{a}{\sin A} \le 1 \Rightarrow 2R \le 1 \Rightarrow R \le \frac{1}{2}$$

For any point (x, y) inside the circumcircle, $x^2 + y^2 < \frac{1}{4}$

$$\frac{x^2 + y^2}{2} \ge |xy| \Rightarrow |xy| < \frac{1}{8}$$

84. (B)

Let the equation of chord be y = mx + c ; Joint equation of OA & OB is

$$4x^2 + y^2 - x\left(\frac{y - mx}{c}\right) + 4y\left(\frac{y - mx}{c}\right) = 0$$

$$\because OA \perp OB \Rightarrow \left(4 + \frac{m}{c}\right) + \left(1 + \frac{4}{c}\right) = 0$$

$$\Rightarrow 5c + m + 4 = 0$$

$$\therefore y = mx + c \Rightarrow y + 4x + c(5x - 1) = 0$$

$\Rightarrow$ passing through the intersection of

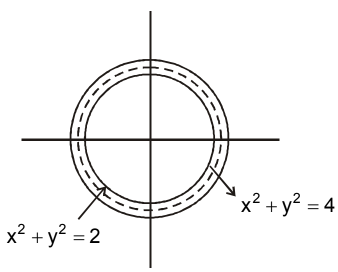
$y + 4x = 0$ and $5x - 1 = 0$

85. (B)

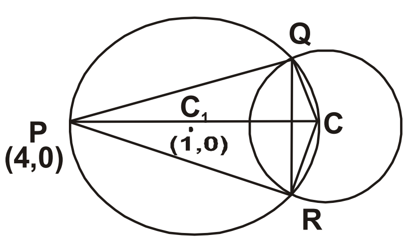
Required Area

$= \pi(4 - 2)$

$= 2\pi$



86. (C)



Let 'C' be the centre of the circle S = 0, then circumcircle of the ΔPQR will pass through C.

Hence, (1,0) centre of the circumcircle of PQR is mid-point of PC. Hence, C is (–2, 0) so equation of S = 0 is $(x+2)^2+y^2=(2\sqrt{3})^2$,

Hence, $(-5,\sqrt{3})$ will be on the circle S = 0

87. (D)

Here ax + by = 20 is a chord with (2, 3) as its mid-point.

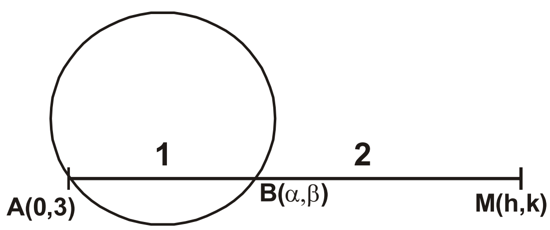
$\Rightarrow\ -\frac{a}{b}=-1 \qquad \Rightarrow a=b$

Now, $\quad 2a+3b=20$

$\Rightarrow 5a=20 \Rightarrow a=b=4$

Hence $a^{103}+b^{103}=2^{207}$

88. (D)



$\alpha=\frac{h}{3} \quad \beta=\frac{k+6}{3}$

Hence $\frac{h^2}{9}+\frac{(k+6)^2}{9}+4\times\frac{h}{3}-6\times\frac{k+6}{3}+9=0 \Rightarrow h^2+k^2+12h-6k+9=0$

$\Rightarrow\ x^2+y^2+12x-6y+9=0$

89. (C)

$P\equiv\frac{x}{\cos\frac{\pi}{4}}=\frac{y}{\sin\frac{\pi}{4}}=6\sqrt{2} \quad \Rightarrow x=6,\ y=6$

Since P(6,6) lie on circle

72 + 12 (g + f) + c = 0 ......(i)

Since y = x touches the circle, then

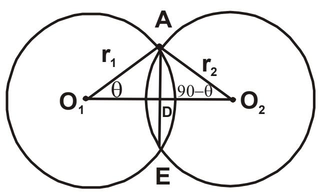
$2x^2+2x(g+f)+c=0$ has equal roots D = 0

$4(g+f)^2 = 8c \Rightarrow (g+f)^2 = 2c$ ......(ii)

From, we get

$$(12(g+f))^2 = [-(c+72)]^2 \Rightarrow 144(2c) = (c+72)^2 \Rightarrow (c-72)^2 = 0 \Rightarrow c = 72$$

90. (A)



Let O_1 and O_2 are the centre of circle with radii r_1 and r_2 respectively and $\angle AO_1O_2 = \theta$

$AD = r_1 \sin\theta$; $AD = r_2 \cos\theta$

$$AD^2\left(\frac{1}{r_1^2} + \frac{1}{r_1^2}\right) = 1 \Rightarrow AD = \frac{r_1 r_2}{\sqrt{r_1^2 + r_2^2}}$$ so hence L = 2AD