# SOLUTIONS

# PHASE TEST-1

## RB-1813-1815, RBK-1806

## RBS-1803-1804

## JEE MAIN PATTERN

## Test Date: 25-11-2017

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# PHYSICS

**1.** **(B)**

**2.** **(A)**

**3.** **(B)**

We have

$$|m| = \frac{\ell}{0} = \frac{v}{u} = \frac{50}{25} = 2$$

There are two possibilities

(i) If the image is inverted (i.e., real)

$$m = \frac{v}{u} = -2 \qquad \text{or,} \quad v = -2u$$

Let x be the object distance in this case

We have

$$u = -x; v = +2x; f = +30\,\text{cm}$$

Using lens formula, we have

$$\frac{1}{2x} - \frac{1}{-x} = \frac{1}{30} \qquad \text{or,} \quad x = 45 \text{ cm}$$

Hence, the distance between the object and the image = 45 + 90 = 135 cm.

(ii) If the image is erect (i.e., virtual)

$$m = \frac{v}{u} = +2$$

Let x' be the object distance we have

u = – x'; v = – 2x' ; f = + 30

Let x' be the object formula, we have $\frac{1}{-2x'} + \frac{1}{x} = \frac{1}{30}$

$\Rightarrow$ x' = 15 cm

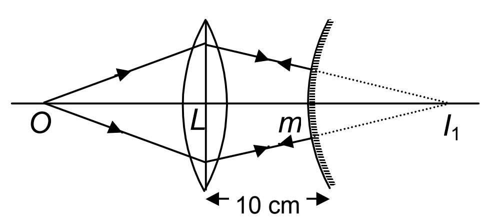
Hence the distance between the object and the image = 15 cm

**4.** **(C)**

For the refraction at the convex lens, we have

u = – 12 cm; v = ? f = + 10 cm

Using lens formula, we have



$$\frac{1}{v}-\frac{1}{(-12)}=\frac{1}{10}$$

or, $v = +60$ cm

Thus, in the absence of the convex mirror, convex lens will form the image $I_1$, at a distance of 60 cm behind the lens. As the mirror is at a distance of 10 cm from the lens, $I_1$ will be at a distance of (60 – 10) = 50 cm from the mirror, i.e., $MI_1 = 50$ cm.

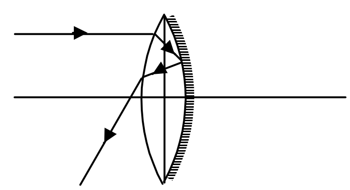
Now, as the final image $I_2$ is formed at the object itself, the rays after reflection from the mirror retraces its path, i.e., the rays on the mirror are incident normally, i.e., $I_1$ is the centre of the mirror so that

$R = MI_1 = +50$ cm

and $f = \frac{R}{2}=\frac{50}{2} = +25$ cm

**5. (A)**

Let R be the radius of curvalue of each surface.



$$(P_m)_{eq} = 2P_L + P_m$$

$$P_L = \frac{1}{60}\times 100 = \frac{5}{3}D$$

Also $\frac{1}{60}=(1.5-1)\frac{2}{R}$

R = 60 cm

$$f_m = -30\text{cm}\ ,\ P_m = \frac{1}{30}\times 100D$$

$$(P_m)_{eq} = 2\times\frac{5}{3}+\frac{10}{3}=\frac{20}{3}D$$

$$f_{eq} = -\frac{3}{20}\times 100$$

$$f_{eq} = -15\,\text{cm}$$

The negative sign indicates that the resulting mirror is concave.

**6. (A)**

**7. (C)**

**8. (C)**

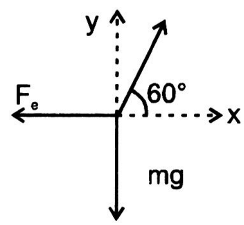
| | | | |
|---|---|---|---|
| **9. (D)** | **10. (A)** | **11. (D)** | **12. (B)** |
| **13. (D)** | **14. (C)** | **15. (A)** | **16. (C)** |

**17. (B)**

**18. (A)**

Two bowl, exerts a normal force N on each bead, directed along the radius line or at 60° above the horizontal. Consider the free–body diagram of the bead on the left with the electric force $F_e$ applied.

$$\Sigma F_y = N \sin 60° - mg = 0, \quad \Rightarrow N = mg / \sin 60°$$




$$\Sigma F_y = -F_e + N\cos 60° = 0, \quad \Rightarrow \frac{Kq^2}{R^2} = N\cos 60° = \frac{mg}{\tan 60°} = \frac{mg}{\sqrt{3}}$$

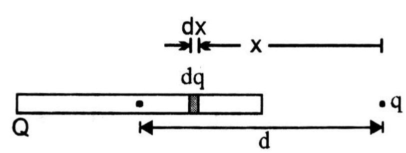
$$K = \frac{1}{4\pi\varepsilon_0}$$

$$\text{Thus } q = \boxed{R\left(\frac{mg}{K\sqrt{3}}\right)^{1/2}}$$

**19. (B)**

$$F = \frac{Kqdq}{x^2}$$

$$dq = \lambda dx$$




$$F = \int_{d-\ell/2}^{d+\ell/2} \frac{Kq\lambda dx}{x^2} \qquad F = \frac{Kq\lambda\ell}{\left(d^2 - \frac{\ell^2}{4}\right)} \Rightarrow F = \frac{KqQ}{\left(d^2 - \frac{\ell^2}{4}\right)}$$

**20. (D)**

**21. (D)**

Distance of the point P from any axis = $a\sqrt{2}$

$\therefore$ magnitude of field due to each line charge

$$E = \frac{2k\lambda}{a\sqrt{2}}$$

electric field dut to charg along x–axis.

$$\vec{E}_x = \frac{E}{\sqrt{2}}(\hat{j} + \hat{k})$$

Similarly

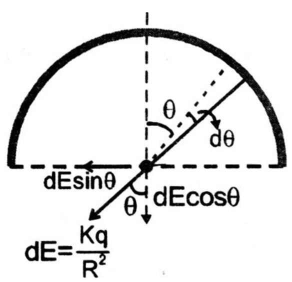
$$\vec{E}_x = \frac{E}{\sqrt{2}}(\hat{j} + \hat{k}) \quad ; \quad \vec{E}_z = \frac{E}{\sqrt{2}}(\hat{j} + \hat{j})$$

$$\therefore \quad \vec{E}_{net} = \vec{E}_x + \vec{E}_y + \vec{E}_z = E\sqrt{2}(\hat{i} + \hat{j} + \hat{k})$$

$$\therefore \quad E_{net} = E\sqrt{2} \cdot \sqrt{3} = \frac{2k\lambda\sqrt{3}}{a}$$

**22.** (B)

$$dE = K\frac{dq}{R^2}$$




So, $E = \int_{\theta=-\pi/2}^{\theta=+\pi/2} dE\cos\theta = \int_{\theta=-\pi/2}^{\theta=+\pi/2} K\frac{(\lambda_0 \sin\theta)}{R^2} Rd\theta\cos\theta$

$$\vec{E} = \frac{\lambda}{4\pi\varepsilon_0}(-\hat{j})$$

**23.** (A)

**24.** (D)

**25.** (C)

The retardation is given by

$$\frac{dv}{dt} = -av^2$$

integrating between proper limits

$\Rightarrow -\int_u^v \frac{dv}{v^2} = \int_0^t a\,dt$ or $\frac{1}{v} = at + \frac{1}{u}$

$\Rightarrow \frac{dt}{dx} = at + \frac{1}{u}$ $\Rightarrow dx = \frac{u\ dt}{1+aut}$

integrating between proper limits

$\Rightarrow \int_0^s dx = \int_0^t \frac{u\ dt}{1+aut}$ $\Rightarrow S = \frac{1}{a}\ \ell n\ (1 + aut)$

**26. (A)** **27. (D)** **28. (D)** **29. (A)**

**30. (C)**

# CHEMISTRY

**31. (C)**

$H_2O(\ell) \longrightarrow H_2O(g)$

0.0006 g/ml

$V = 1L = 1000\,mL$

$w = 0.6g$

$\frac{0.6}{18}$ mole

mole of $H_2O(\ell) = 0.6/18; w_{H_2O} = \frac{0.6}{18} \times 18 = 0.6\,g$

$\Rightarrow v_{H_2O} = 0.6\,mL$

**32. (B)**

$\tan\theta = 1.5 \times 10^{22} = \frac{\text{No. of atom}}{\text{wt}}$

$\frac{N_A}{\text{at.wt.}} = 1.5 \times 10^{22}$

$\text{At.wt.} = \frac{6.023 \times 10^{23}}{1.5 \times 10^{22}}$

$= 4 \times 10 = 40$

**33. (B)**

$w_{A\ell F_3} = 4.2g$

mole of $A\ell F_3 = \frac{4.2}{84} = 0.05$ mole

$= 0.15$ mole $F^-$

**34. (A)**

$22.4L$ of gas at STP $\equiv 6.02 \times 10^{23}$

$22400$ mL of gas at STP $\equiv 6.023 \times 10^{23}$

$1mL$ of gas at STP $\equiv \frac{6.023 \times 10^{23}}{22400} = 2.7 \times 10^{19}$

**35. (B)**

Mole = $\frac{448}{22400} = \frac{2}{3a}$

$a = \frac{2 \times 22400}{3 \times 448}$ amu

= 33.33 amu

= $33.33 \times 1.66 \times 10^{-24}$ g

**36. (C)**

**37. (B)**

$$\underset{\frac{420\times1000}{42}\text{mol}}{C_3H_6(g)} + \frac{3}{2}NO(g) \rightarrow C_3H_3N + \frac{3}{2}H_2O + \frac{1}{4}N_2$$

$w_{C_3H_3N} = 10^4 \times 53\,g$ = 530 kg

**38. (B)**

$$NH_3\,(g) + \frac{5}{4}O_2(g) \xrightarrow{Pt} NO(g) + \frac{3}{2}H_2O(g)$$

0.12 mole 0.14mole

$\Rightarrow O_2$ is L.R.

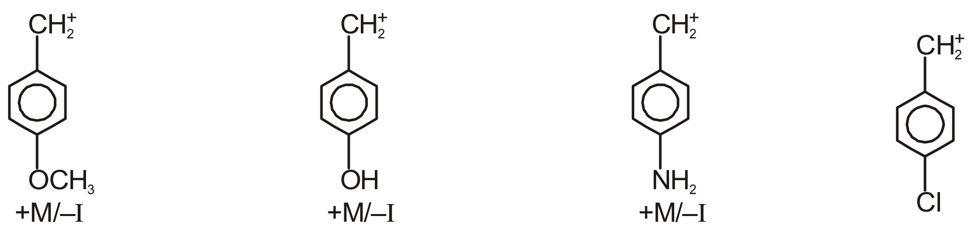
$n_{NO} = 0.112$ mole

**39. (C)**

**40. (A)**

$$\text{Molarity} = \frac{\left(\frac{12}{60}\right)}{\left(\frac{1200}{1.2}\right)} \times 1000 = 0.2\text{M}$$

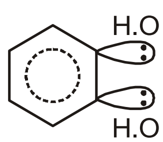
**41. (B)**




+M effect in order of $-NH_2 > -OH > -OR$

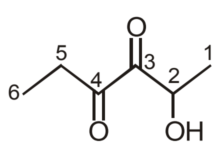
So, stabality order $\rightarrow$ III > II > I > IV

**42. (C)**

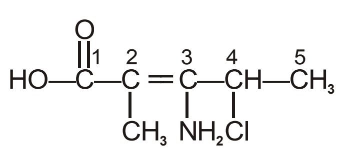



All the carbon in Benzyne is $sp^2$ hybridised.

**43. (C)**




**44. (B)**




**45. (B)**

$-COOH > -SO_3H > -CONH_2 > -CHO$

**46. (A)**

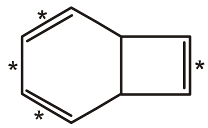
$\rightarrow$ (III) & (II) having resonance, but (iii) is more effectively involve is resonance

$\rightarrow$ Stabality of free radical $\rightarrow$ III > II > I > IV

**47. (B)**

In structure (B) resonance operates and it also contain 10 hyperconjugating hydrogen atom. So, most stable.

**48. (C)**

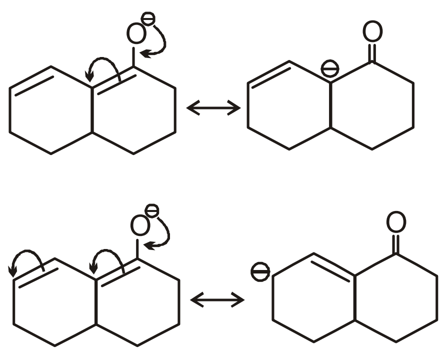


(*) marked bonds are formed by $sp^2$-$sp^2$ overlap.

**49. (C)**

Compound is aromatic and extended conjugation. So, most stable having lower value for heat of hydrogenation.

**50. (D)**



**51. (B)**

$NaOH \rightarrow Na + :\ddot{O}^{\ominus}-H$

**52. (C)**

positive radius $\alpha \frac{1}{+\text{ve O.S.}}$

(A) $\overset{+4}{Mn}O_2^{-2}$ (B) $\overset{+1}{K}\overset{+7}{Mn}O_4^{-8}$ (C) $\overset{+2}{Mn}\overset{-2}{O}$ (D) $K_3[\underset{x=+3}{Mn}(CN)_6]$

**53. (B)**

$19K^+ = 1.34\,\mathring{A}$ (Cationic radius)

$9^F = 1.34\,\mathring{A}$ (Anionic radius)

**54. (D)**

All are iso-electronic species.

**55.** **(D)**

A Gives equeous solution [PH < 7]

B Reacts with strong acid and alkalis respectively.

C Gives an aqueous solution which is strongly alkaline

A - Acidic – P $(OH)_3$ or $H_3PO_4$

B - Amphoteric – Al $(OH)_3$, $H_3AlO_3$

C - Basic – NaOH

x = Phousphorous – Non metal

y = Aluminium - Metal

c = Sodium - Metal

**56.** **(A)**

Lattice $\alpha$ Hardness

(A) Ti > ScN > MgO > NaF – order of lattic energy

(B) NaCl < CsCl – Co-ordinate no. NaCl = 6

CsCl = 8

(C) $BeCl_2$ < $MgCl_2$ < $CaCl_2$ – Melting point

**57.** **(B)**

$Cs^+I_3^-$ (large cation stabilises by large anion)

**58.** **(D)**

$\underset{2S'}{Li} + e^- \xrightarrow{Ea} \underset{2S^2}{Li^-}$ exothermic

**59.** **(C)**

(I) $HClO_4 > H_2SO_4 > HNO_3 > H_3PO_4$

(II) $HClO_3 > HBrO_3 > HIO_3$

**60.** **(A)**

**(A)** Lattic energy depend upon :

(i) Size of cation and anion both

(ii) Product of charges at cation & anion

**(B)** $CdCl_2$>$CaCl_2$–Both Hydration & Lattice is high than $CaCl_2$

As per (born haber cycle)

**(C)** $F^- > Cl^- > Br^- > I^-$ (Hydration energy)

so, AgF > AgCl > AgBr > Ag I (Solubility in water)

**(D)** $Be_3N_2 > Mg_3N_2 > Ca_3N_2$ (Thermal stability)

# MATHEMATICS

**61. (D)**

Circumcentre of $\Delta PQR$ is point of intersection of given lines is A (1, –1)

Hence line through A (1, –1) is $y + 1 = m(x - 1)$

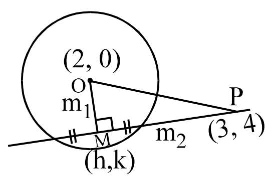
For x = 0 $\Rightarrow$ y = –1 – m and y = 0 $\Rightarrow$ $x = \frac{1}{m} + 1$

Hence area $(\Delta) = \frac{1}{2}\left|\left(1+\frac{1}{m}\right)(m+1)\right| = \frac{1}{2}\left|2+m+\frac{1}{m}\right| = \frac{1}{2}\left(2+m+\frac{1}{m}\right)$ as (m > 0)

$\Rightarrow \frac{d\Delta}{dm} = 2\left(1-\frac{1}{m^2}\right) = 0 \qquad \Rightarrow \quad m = 1, -1$

at m = 1, $\Delta$ = 2 which is maximum

**62. (A)**




**63. (A)**

Normals are (y – 2) (y – 2x) = 0

$\Rightarrow$ centre is (1, 2)

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

**64. (A)**

$$\frac{(x-1)^3\left(x^2+3x+2\right)^5|x+4|}{\left(x^2+4x+4\right)^7} < 0$$

$$\Rightarrow \frac{(x-1)^3(x+2)^5(x+1)^5|x+4|}{\left((x+2)^2\right)^7} < 0 \Rightarrow \frac{(x-1)^3(x+2)^5(x+1)^5|x+4|}{(x+2)^{14}} < 0$$

$\Rightarrow x \in (-\infty, -2) \cup (-1, 1)$ and $1 < |x-3| < 5$

$\Rightarrow 1 < x - 3 < 5$ or $-5 < x - 3 < -1 \Rightarrow 4 < x < 8$ or $-2 < x < 2$

Hence common solution is (–1, 1)

**65. (A)**

$$\tan(\pi\cos\theta) = \cot(\pi\sin\theta) = \tan\left(\pm\frac{\pi}{2} - \pi\sin\theta\right)$$

$$\Rightarrow \pi\cos\theta = \pm\frac{\pi}{2} - \pi\sin\theta \Rightarrow \cos\theta + \sin\theta = \pm\frac{1}{2}$$

$$\Rightarrow \sqrt{2}\cos\left(\theta - \frac{\pi}{4}\right) = \pm\frac{1}{2} \Rightarrow \cos\left(\theta - \frac{\pi}{4}\right) = \pm\frac{1}{2\sqrt{2}}$$

Hence (A) is the correct answer.

**66. (A)**

From sin x + $\sin^2$x = 1, we get sin x = $\cos^2$x, Now, the given expression is equal to

$\cos^6x(\cos^6x + 3\cos^4x + 3\cos^2x + 1) - 1 = \cos^6x(\cos^2x + 1)^3 - 1$

$= \sin^3x(\sin x + 1)^3 - 1 = (\sin^2x + \sin x)^3 - 1 = 1 - 1 = 0$

Hence (a) is the correct answer.

**67. (A)**

$$\cos A.\cos(45° - A) = \cos A\left(\frac{\cos A + \sin A}{\sqrt{2}}\right)$$

$$= \frac{1}{\sqrt{2}}(\cos^2 A + \sin A.\cos A)$$

$$= \frac{1}{2\sqrt{2}}((1 + \cos 2A) + \sin 2A)$$

as $\cos 2A + \sin 2A + 1 \le \sqrt{2} + 1$

$\therefore$ max. value of $\cos A.\cos B = \frac{1}{2\sqrt{2}}(1 + \sqrt{2})$

**68. (C)**

$0 \le \{x\} < 1$ i.e. $-1 < -\{x\} \le 0$

$\therefore \frac{\pi}{2} \le \cos^{-1}(-\{x\}) < \pi$

$\therefore$ the range is $\left[\frac{\pi}{2}, \pi\right)$

**69. (D)**

Equation of the lines joining the origin to the points of intersection of the given curves is

$$3x^2 + pxy - 4x(y+2x) + 1.(y+2x)^2 = 0$$

$\Rightarrow \; x^2 - pxy - y^2 = 0$

which are perpendicular for all values of p.

**70. (C)**

According to property

$$\log_2 x \ge \log_{2^{-1}}(x-1)$$

$\Rightarrow \log_2 x \ge -\log_2(x-1) \Rightarrow \log_2 x(x-1) \ge 0$

$\Rightarrow \log_2 x(x-1) \ge \log_2 1 \Rightarrow x(x-1) \ge 1 \Rightarrow x^2 - x - 1 \ge 0$

$\Rightarrow \left(x - \frac{1-\sqrt{5}}{2}\right)\left(x - \frac{1+\sqrt{5}}{2}\right) \ge 0 \Rightarrow x \ge \frac{1+\sqrt{5}}{2} \text{ or } x \le \frac{1-\sqrt{5}}{2}$

$\left(\because \log_{1/2}(x-1) \text{ is defined only } x-1>0\right)$ and log x is defined when x > 0

combining above all we get common value is

$x \in \left[\frac{1+\sqrt{5}}{2}, \infty\right)$

**71. (A)**

$3\cos 2\theta = 1 \;\Rightarrow\; \tan^2\theta = 1/2$

Now, $32\tan^8\theta = 2\cos^2\alpha - 3\cos\alpha$

$$32.\left(\frac{1}{2}\right)^4 = 2\cos^2\alpha - 3\cos\alpha$$

$\Rightarrow \quad 2\cos^2\alpha - 3\cos\alpha - 2 = 0$

$\Rightarrow \quad \cos\alpha = -\frac{1}{2}$

**72. (D)**

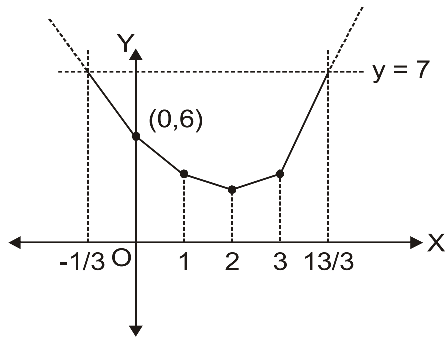
$$f(x) = \begin{cases} 6-3x, & x \le 1 \\ 4-x, & 1 < x \le 2 \\ x, & 2 < x \le 3 \\ 3x-6, & x > 3 \end{cases}$$

$$6-3x \le 7 \Rightarrow x \in \left[-\frac{1}{3}, 1\right]$$

$$4-x \le 7 \Rightarrow x \in (1, 2]$$

$$x \le 7 \Rightarrow x \in (2, 3]$$

$$3x-6 \le 7 \Rightarrow x \in \left(3, \frac{13}{3}\right]$$




Hence solution of given inequality never lies between $\left[\frac{9}{2}, 5\right]$

**73. (D)**

$$\lim_{x\to\infty} \frac{\frac{2}{x} + 2 + \frac{\sin 2x}{x}}{\left(2 + \frac{\sin 2x}{x}\right)e^{\sin x}} \text{ and } -1 \le \sin x \le 1$$

**74. (C)**

Let the circle be $x^2 + y^2 + 2gx + 2fy + c = 0$

$2(-g)(-2) + 2(-f)(3) = c + 9$

and $2(-g)\left(\frac{5}{2}\right) + 2(-f)(-2) = c - 2$

$\Rightarrow$ locus of centre is $9x - 10y + 11 = 0$

**75. (A)**

$$f(\theta) = \frac{1-\sin 2\theta + \cos 2\theta}{2\cos 2\theta} = \frac{(\cos\theta - \sin\theta)^2 + (\cos^2\theta - \sin^2\theta)}{2(\cos\theta - \sin\theta)(\cos\theta + \sin\theta)} = \frac{(\cos\theta - \sin\theta) + (\cos\theta + \sin\theta)}{2(\cos\theta + \sin\theta)}$$

$$= \frac{2\cos\theta}{2(\cos\theta + \sin\theta)} = \frac{1}{1+\tan\theta}$$

$$f(11°)\cdot f(34°) = \frac{1}{(1+\tan 11°)}\cdot\frac{1}{(1+\tan 34°)} = \frac{1}{(1+\tan 11°)}\cdot\frac{1}{(1+\tan(45°-11°))}$$

$$= \frac{1}{(1+\tan 11°)}\cdot\frac{1}{1+\frac{1-\tan 11°}{1+\tan 11°}} = \frac{1}{(1+\tan 11°)}\cdot\frac{1+\tan 11°}{2} = \frac{1}{2}$$

**76. (D)**

$x^2 + 4x + \alpha^2 - \alpha \ge 0 \ \forall \ x \in R$

According to given condition we must have D = 0 $\Rightarrow \quad \alpha = \frac{1 \pm \sqrt{17}}{2}$

**77. (A)**

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

**78. (B)**

$$f(x) = \frac{\sin^{-1}(3-x)}{\log(1x)-2)}$$

Let g(x) = $\sin^{-1}(3-x) \Rightarrow -1 \le 3-x \le 1$

The domain of g(x) is $D_1$ is [2, 4]

Let h(x) = log (|x| – 2) i.e., |x| – 2 > 0 or |x| > 2

i.e., x < – 2 or x > 2 $\therefore$ Domain $D_2$ is $(-\infty, -2) \cup (2, \infty)$

We know that domain of $\frac{f(x)}{g(x)}$ is defined $\forall \ x \in D_1 \cap D_2 - \{x : g(x) = 0\}$

Therefore, the domain of f(x) is $(2, 4] - \{3\} = (2, 3) \cup (3, 4]$

**79. (D)**

Here A, B, C lie on a circle having centre at origin. So, A, B, C form a right angled triangle, if any side is a diameter.

Now, $\gamma - \alpha = \pi \Rightarrow \angle AOC = \pi$

$\Rightarrow$ AC is a diameter

$\Rightarrow$ $\Delta ABC$ is right angled.

**80. (D)**

The given expression is equal to

$(\sin 47^0 + \sin 61^0) - (\sin 11^0 + \sin 25^0) = 2 \sin 54^0 \cos 7^0 - 2 \sin 18^0 \cos 7^0$

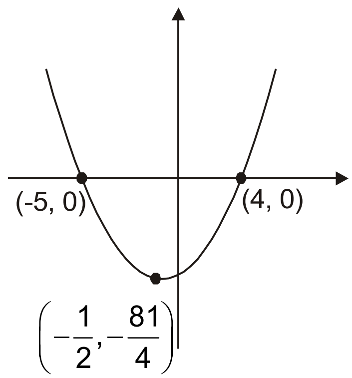
$= 2 \cos 7^0 (\sin 54^0 - \sin 18^0) = 2 \cos 7^0 \left[\frac{\sqrt{5}+1}{4} - \frac{\sqrt{5}-1}{4}\right] = \cos 7^0$

Hence (d) is the correct answer.

**81. (D)**

For f(x) to be onto function its range must be $R^+$ – the set of positive real numbers

$$f(x) = x^2 + x - 20 = \left(x + \frac{1}{2}\right)^2 - \frac{81}{4} = (x+5)(x-4)$$




For $\alpha \geq -5$, range of f(x) is superset of $R^+$ (co-domain) therefore f(x) is undefined.

For $\alpha < -5$, range of f(x) is subset of co-domain, hence f(x) is into.

Therefore no such value of $\alpha$ exists.

**82. (A)**

PR is parallel to x-axis $\Rightarrow$ PR is y = 7

Also, $PQ \perp PR$ therefore PQ is parallel to y-axis $\Rightarrow$ PQ is x = 9

Hence point P is (9,7)

Line 'L' intersect QR, PR & PQ at A, B, and C respectively

take AR = x, AB = y

and area $\Delta ABR = 12 \Rightarrow \frac{1}{2} xy = 12 \Rightarrow xy = 24$ ------(1)

Take, $\angle PRQ = \theta$ then, $\tan\theta = \frac{y}{x} \Rightarrow \frac{6}{8} = \frac{y}{x} \Rightarrow \frac{x}{4} = \frac{y}{3}$

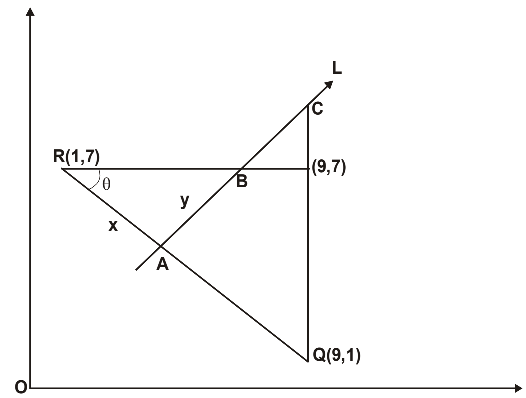
but xy = 24

$\Rightarrow$ $x = 4\sqrt{2}$ and $y = 3\sqrt{2}$

$\Rightarrow$ $BR = 5\sqrt{2}$ and point B is $(1+5\sqrt{2}, 7)$

Also, slope of QR is $\frac{-3}{4}$

$\Rightarrow$ Slope of $AB = \frac{4}{3}$




Therefore equation of line L is $4x - 3y = 20\sqrt{2} - 17$

**83. (B)**

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

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

$\therefore$ $\lambda = -1$

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

**84. (C)**

$\frac{1}{z} = 5 - x, y = 29 - \frac{1}{x}$

$\therefore$ $x\left(29 - \frac{1}{x}\right) = 5 - x$

$\therefore$ $x = \frac{1}{5}, y = 24, z = \frac{5}{24}$

**85. (A)**

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

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

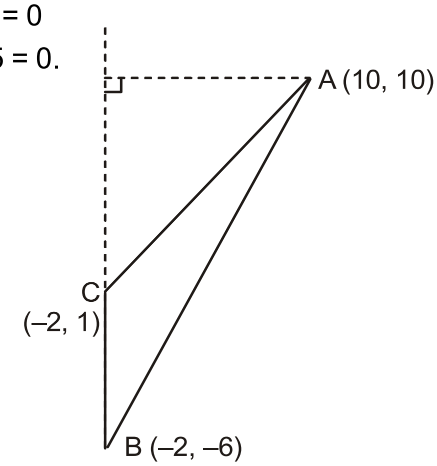
$\therefore$ $r_1 + r_2 = 2(a + b)$ & $r_1 r_2 = a^2 + b^2$

According to the given condition

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

**86. (C)**

Let perpendicular bisector of AB is $3x + 4y - 20 = 0$
and perpendicular bisector of AC is $8x + 6y - 65 = 0$.
Image of A w.r.t. $3x + 4y - 20 = 0$ is B
and image of A w.r.t. $8x + 6y - 65 = 0$ is C.




For B, $\frac{x-10}{3} = \frac{y-10}{4} = -2\left(\frac{30+40-20}{25}\right)$

$\Rightarrow$ B = (–2, –6)

For C, $\frac{x-10}{8} = \frac{y-10}{6} = -2\left(\frac{80+60-65}{100}\right)$

$\Rightarrow$ C = (–2, 1)

Area of $\Delta ABC = \frac{1}{2}(10 + 2)(1 + 6) = 42$.

**87. (A)**

$$\lim_{x\to 2^-} \frac{\cos(2x-4)-33}{2} = -16$$

$$\lim_{x\to 2^-} \frac{x^2|4x-8|}{x-2} = -16$$

$\therefore$ By sandwich theorem ; $\lim_{x\to 2^-} f(x) = -16$

**88. (A)**

$-1 \le \sin x \le 1$ then range of f(x) is [1/11, 1/5]

**89. (D)**

Given limit $= 0 + (2^2-1) + (3^2-1) + .... + (10^2-1)$

$$= \sum_{n=2}^{10}(n^2-1) = \frac{10\times 11\times 21}{6} - 1 - 9 = 385 - 10 = 375$$

**90. (C)**

Let the circle be $x^2 + y^2 + 2gx + 2fy + c = 0$

Putting $x = t,\ y = \frac{1}{t}$

$$t^2 + \frac{1}{t^2} + 2gt + 2f\frac{1}{t} + c = 0 \quad \Rightarrow \quad t^4 + 2gt^3 + ct^2 + 2ft + 1 = 0$$

$\therefore$ product of roots = 1