SOLUTIONS

PHASE TEST-2

GZRM-1901-1902

GZR-1908-1909

JEE MAIN PATTERN

Test Date: 25-11-2017

Mentors® Eduserv™

Corporate Office: Paruslok, Boring Road Crossing, Patna-01
Kankarbagh Office: A-10, 1st Floor, Patrakar Nagar, Patna-20
Bazar Samiti Office : Rainbow Tower, Sai Complex, Rampur Rd., Bazar Samiti Patna-06
Call : 9569668800 | 7544015993/4/6/7

PHYSICS

1. [D]

P = $\sqrt{P^2 + Q^2 + 2PQ\cos\theta}$

$Q^2 + 2PQ \cos\theta = 0$

$2P \cos\theta + Q = 0$

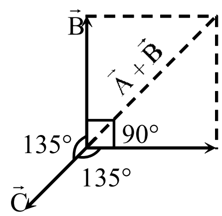
Angle $\Rightarrow$ $\tan\alpha = \dfrac{2P\sin\theta}{Q + 2P\cos\theta}$

$\tan\alpha = \dfrac{2P\sin\theta}{0} = \infty$

$\alpha = 90^\circ$

2. [D]

Let $|\vec{A}| = |\vec{B}|$ = a and $|\vec{C}| = \sqrt{2}a$



then, $\vec{A} + \vec{B} + \vec{C}$ = 0 $\Rightarrow$ $\vec{C} = -(\vec{A} + \vec{B})$

$\Rightarrow C^2 = A^2 + B^2 + 2AB\cos\theta$

$\Rightarrow 2a^2 = a^2 + a^2 + 2a^2\cos\theta$

$\Rightarrow \cos\theta = 0 \Rightarrow \theta = 90^\circ$

3. [A]

Let direction of river flow be along x-axis.

$\therefore$ Angle made by $\vec{V}_{MG}$ with x-axis

$\tan\theta = \dfrac{V_{RG}}{V_{MR}}$

4. [C]

$= r(\sqrt{2} + 1)$

5. [D]

$m = \dfrac{|\vec{F}|}{a} = \dfrac{\sqrt{6^2 + 8^2 + 10^2}}{1} = 10\sqrt{2}\text{ kg}$

6. [B]

$\vec{A} \times \vec{B}$ = AB sin θ = 0

$\theta = 0^\circ$ or 180°

so = – 4

7. (A)

$$y = x \ln x$$

$$\frac{dy}{dx} = x \cdot \frac{1}{x} + \ln x$$

$= (1 + \ln x)$

8. (**D**)

$$y = \sin x \cos x$$

$$\Rightarrow y = \frac{1}{2} \sin 2x$$

$$\Rightarrow \frac{dy}{dx} = \frac{1}{2} \cdot 2\cos 2x$$

$$\Rightarrow \frac{dy}{dx} = \cos 2x$$

9. **(B)**

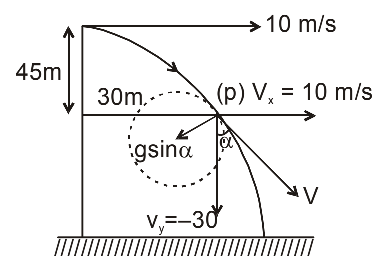
Mathod (I)

After 3 sec.

$V_y = u_y + gt = -30$ m/s

and $V_x = 10$ m/s $\quad \therefore V^2 = V_x^2 + V_y^2$

$$\Rightarrow \quad V = 10\sqrt{10} \text{ m/s}$$



Now, $\tan \alpha = \frac{V_x}{V_y} = \frac{1}{3} \quad \Rightarrow \sin \alpha = \frac{1}{\sqrt{10}}$

Radius of curvature $r = \frac{V_\perp^2}{g \sin \alpha}$

$$r = 100\sqrt{10} \text{ m}$$

10. **(C)**

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

Velocity of take off at *P* or $u = \sqrt{Rg} = \sqrt{90 \times 10} = 30 \text{m/s}$

$v = \sqrt{u^2 + 2g \sin\theta S}$ [$v \rightarrow$ velocity at point *O*]

$$= \sqrt{(30)^2 + 2 \times 10 \times \frac{1}{\sqrt{2}} \times 80\sqrt{2}} = 50 m/s$$

11. (B)

$v_B \cos 30^0 = v_A \cos 60^0$; $v_B \frac{\sqrt{3}}{2} = \frac{3}{2}$; $v_B = \sqrt{3}$ m/s

12. (A)

This is the situation similar to elastic collision of ball impinging on floor and bouncing back.

13. (B)

Distance travelled = Area under the given graph = $\frac{1}{2} \times 10 \times 4 = 20$ m

14. (C)

15. (A)

At equilibrium, let tension in each spring be *T*. Then

$2T\cos 60° = Mg$

$T = Mg$

When right spring breaks, the net force on the block is *T*.

$\therefore \quad a = \frac{T}{M} = 10$ m/s²

16. (A)

In condition (i), $20g - T = 20a$, $N = 20a$

$T - N = 40a \quad \Rightarrow \quad a = \frac{20g}{80} = \frac{g}{4}$

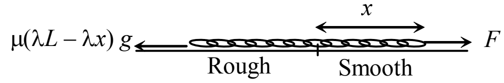
Net acceleration = $a_1 = a\sqrt{2}$, $\sqrt{2}a = \frac{\sqrt{2}g}{4} = \frac{g}{2\sqrt{2}}$

In condition (ii) $20g - T = 20a$, $T = 40a$, $a = \frac{g}{3}$, $a_2 = \frac{g}{3}$

$$\frac{a_1}{a_2} = \frac{g/2\sqrt{2}}{g/3} = \frac{3}{2\sqrt{2}}$$

17. (A)

$$F - \mu(\lambda L - \lambda x)g = \lambda L v \frac{dv}{dx}$$



$$F\int_0^L dx - \mu\lambda g\int_0^L (L-x)dx = \lambda L\int_0^v v\,dv$$

$$FL - \mu\lambda g\left(L^2 - \frac{L^2}{2}\right) = \frac{\lambda L v^2}{2}$$

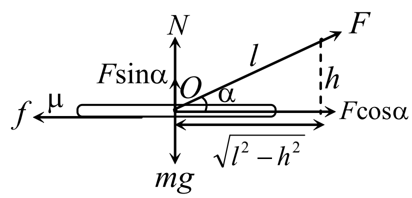
$$v = \sqrt{F - L}$$

18. (A)

$$N = mg - F\sin\alpha$$

$$F\cos\alpha = f = \mu N$$

$$F\cos\alpha = \mu(mg - F\sin\alpha)$$



$$\mu = \frac{F\cos\alpha}{mg - F\sin\alpha} = \frac{F \times \frac{\sqrt{l^2-h^2}}{l}}{mg - F\times\frac{h}{l}}$$

$$\mu = \frac{F\sqrt{l^2-h^2}}{mgl - Fh}$$

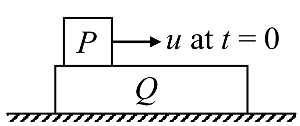
19. (C)

Friction between *P* and *Q* will retard *P* (and accelerate *Q*) till slipping is stopped

Masses of the blocks are same so

$\therefore$ Retardation of *P* = acceleration of $Q = \mu g$

Thus $v_p = u - \mu gt$ and $v_q = \mu gt$



Once slipping is stopped both blocks will move with same velocity $\left(\text{i.e.} \frac{u}{2}\right)$. Graph (C) depicts this treatment.

20. (B)

$T_1 = \dfrac{mg}{\cos\theta}$, $T_2 = mg\cos\theta$ ‼

$$\frac{T_1}{T_2} = \sec^2\theta = 2$$

21. (C)

From constraint relation $v_B = \frac{v}{3}$

22. (A)

$T = kp^x d^y E^z$

$[T] = [ML^{-1}T^{-2}]^x [ML^{-3}]^y [ML^2T^{-2}]^z$

$x + y + z = 0$ ...(1)

$-x - 3y + 2z = 0$ ...(2)

$-2x - 2z = 1$ ...(3)

$x + z = -\frac{1}{2}$ ...(4)

$-y = -\frac{1}{2}$

$\Rightarrow \; y = \frac{1}{2}$

by equation (2) $-x - \frac{3}{2} + 2z = 0$

$-x + 2z = \frac{3}{2}$ ...(5)

Adding (4) & (5)

$3z = 1, \; z = \frac{1}{3}$

$\Rightarrow \; x = -\frac{1}{2} - \frac{1}{3} = -\frac{5}{6}$

23. Minimum stopping distance = s

Force of friction $= \mu mg$

Work done against the friction $W = \mu mgs$

Initial kinetic energy of the toy cart $= (p^2 / 2m)$

$\therefore \; \mu mgs = (p^2 / 2m)$

$$\frac{s_1}{s_2} = \left(\frac{m_2}{m_1}\right)^2$$

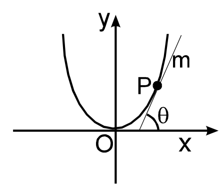
$\therefore$ **(C)**

24. **(A)**

25. **(C)**

$x^2 = 4ay$

Differentiating w.r.t. y, we get



$$\frac{dy}{dx} = \frac{x}{2a}$$

$\therefore$ At (2a, a), $\frac{dy}{dx} = 1$ $\Rightarrow$ hence $\theta = 45°$

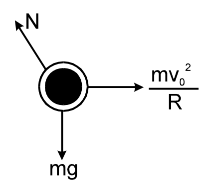
the component of weight along tangential direction is mg sin θ.

hence tangential acceleration is g sin $\theta = \frac{g}{\sqrt{2}}$

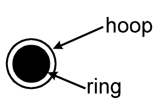
26. **(D)**

The free body daigram of hoop is

$\therefore$ The normal reaction $N = \sqrt{m^2g^2 + \frac{m^2{v_0}^4}{r^2}}$



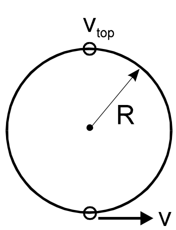
$\therefore$ Frictional force = $\mu_k N = \mu_k \sqrt{m^2g^2 + \frac{m^2{v_0}^4}{r^2}}$



$\therefore$ dangential acceleration = $\frac{\mu_k N}{m} = \mu_k \sqrt{g^2 + \frac{{v_0}^4}{r^2}}$

27. **(B)**

In the frame of ring (inertial w.r.t. earth), the initial velocity of the bead is v at the lowest position.



The condition for bead to complete the vertical circle is, its speed at top position

$v_{top} \geq 0$

From conservation of energy

$$\frac{1}{2} m \; v_{top}^2 + mg\,(2R) = \frac{1}{2} mv^2$$

or $v = \sqrt{4gR}$

28. (B)

$kx = m\omega^2 \ell + m\omega^2 x$

$(k - m\omega^2)\, x = m\omega^2 \ell$

$$x = \frac{m\omega^2 \ell}{k - m\omega^2}$$

29. (C)

$V = \sqrt{gR\tan\theta} \Rightarrow (20)^2 = 10 \times 100 \times \tan\theta$

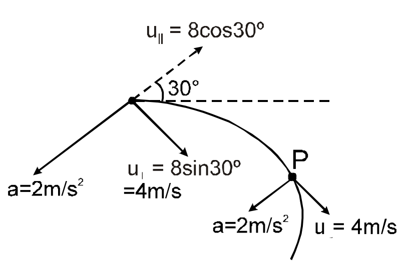
$\Rightarrow \tan\theta = \dfrac{4}{10} = \dfrac{2}{5} \Rightarrow \theta = \tan^{-1}(2/5)$

30. (C)

The acceleration vector shall change the component of velocity $u_{\parallel}$ along the acceleration vector.

$$r = \frac{v^2}{a_n}$$

Radius of curvature r_{min} means v is minimum and a_n is maximum. This is at point P when component of velocity parallel to acceleration vector becomes zero, that is $u_{\parallel} = 0$.

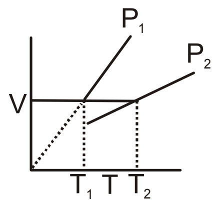


$$\therefore \quad R = \frac{u_{\perp}^2}{a} = \frac{4^2}{2} = 8 \text{ meter.}$$

CHEMISTRY

31. (B)

$P_1 < P_2$



'V' is constant

Then $T_2 > T_1$

So, $P_2 > P_1$ ($\because T \alpha P$ according to Gay-Lussac's Law)

32. (D)

$H_2 > NH_2 > N_2 > O_2$ $\left[\text{rate of diff. } \alpha \frac{1}{\sqrt{M}}\right]$

33. (A)

Let mole % of ^{26}Mg be x

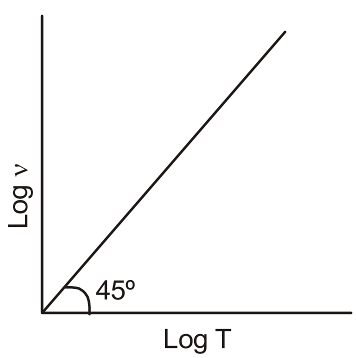
$$\therefore \quad \frac{(21-x)25+x(26)+79(24)}{100}=24.31$$

x = 10%

34. (A)

$PV = nRT \Rightarrow \cancel{0.821} \times V = 10 \times \cancel{0.821} \times T$

$\nu = T \Rightarrow \text{Log } \nu = \text{Log } T$



35. (A)

Total number of spectral lines given by

$$\frac{1}{2}[n-1]\times n = 15; \quad \therefore \quad n = 6$$

Thus, electron is excited upto 6^{th} energy level from ground state. Therefore,

$$\frac{1}{\lambda} = R_H\left[\frac{1}{1^2} - \frac{1}{n^2}\right] = 109737 \times \frac{35}{36};$$

$$\lambda = 9.373 \times 10^{-6}\ \text{cm} = 937.3\ \text{Å}$$

36. (B)

37. (D)

4s–orbital

38. (A)

$$\frac{P_{O_2}}{P_{N_2}} = \frac{n_{O_2}}{n_{N_2}} = \frac{M_{N_2}}{M_{O_2}} = \frac{28}{32} = \frac{7}{8} = 0.875$$

39. (B)

40. (A)

The gas with greater inter molecular force is liquified easily and the intermolecular force is directly proportional to the van der Waals' constant 'a'.

$\therefore \quad a(Cl_2) > a(C_2H_6)$

Bigger is the size of molecule, more is the value of 'b'.

$\therefore \quad b(Cl_2) < b(C_2H_6)$

41. (B)

1 mole $(NH_4)_3PO_4$

= 12 mole H–atoms = 4 mole O–atoms

6 mole H–atoms = 2 mole O–atoms

42. (D)

Let mole fraction of O2 is x

40 = 32 × x + 80 (1 – x)

or x = 5/6

a : b = x : (1 – x) = $\frac{5}{6} : \frac{1}{6}$

when ratio is changed

$$M_{mixture} = 32 \times \frac{1}{6} + 80 \times \frac{5}{6} = 72$$

43. (B)

Real gas approaches ideal hehaviour with increase in temperature.

44. (A)

45. (A)

$E_4 - E_3 = -0.85 - (-1.5) = +0.65\text{ eV}$

This energy is compatible with the infrared region of the spectrum.

46. (B)

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

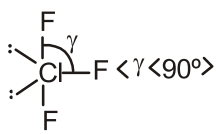
47. (C)

$BH_4^- \langle Sp^3, \alpha = 109.5^o \rangle$

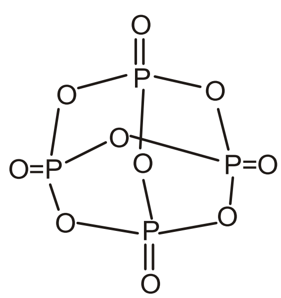
48. (C)

$BF_3 < \alpha = 120^o >$ Bond

$: PF_3 < P < 109.5^o >$ angle $= BF_3 > PF_3 > ClF_3$



49. (D)



50. (A)

$$\begin{array}{cccc} CH_2 = & CH - & C \equiv & N \\ \uparrow & \uparrow & \uparrow & \uparrow \\ Sp^2 & Sp^2 & Sp & Sp \end{array}$$

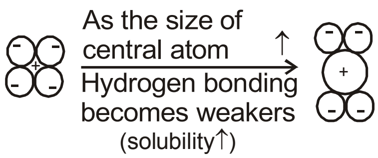
51. (D)

As the lattice energy increases solubility will decreases.

(i) $BeF_2 > Ca\ F_2 > Mg\ F_2$ – solubility

(ii) $LiH\ CO_3 < NaHCO_3 < KHCO_3$ – solublity

Through Hydrogen bonding Bi-Carbonate ions (Na^+ is best fitted in the void) and an moving down the group with inc. Size of central atom Hydrogen bonding becomes weaker and hence solubility inc. down the group.



$H.B.\,\alpha \dfrac{1}{\text{solubility}}$ [H.B. α small size] (H.B – Hydrogen bond)

(iii) $LiClO_4 > NaClO_4 > KClO_4$ – solubility

(iv) LiOH < NaOH < KOH – order of solubility

52. (C)

$NaCl_{(s)}$ and NaCl (Molten) both are soluble in water but are two keys to conducting electrically.

(i) Charged particles

(ii) The charged particles must be free to move in the case of any form of NaCl there are charged particales (the positive and negative ions).

However, in solid NaCl to charged particles are locked in place to the crystal lattice and not able to move and thus NaCl doe not conduct electricity.

When NaCl (molted) dissolved in water the crystal lattic break down and the charge particles are able to move and electrical conductivity is higher than NaCl(s).

II. Covalent compounds are weaker than ionic compound except gaint covalent compound.

(iv) Ionic bond are non directional. This is because the electrostatic force of attractions equally distrilauted in all direction.

53. (A)

$E_n = \dfrac{I.E. + E_A}{2}$ (Here I.E. & E_A in ev/atom)

$E_n = \dfrac{I.E. + E_A}{540}$ KJ/mol

54. (B)

Due to electronic configuration.

55. (C)

2 (inert gas configuration)

56. (C)

O^- ion will resist the addition of another electron due to inter-electronic repulsion.

57. (A)

18 electrons is all species.

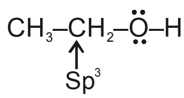
58. (B)

order of I.E: Active < Non-metal < inert gas
metal

59. (C)

$CsBr_3$ exist as $Cs^+ \ Br_3^-$, due to lattice energy effect (large cations stabilises by large anion)

60. (B)



MATHEMATICS

61. (C)

Let $f(t) = 9^t + 9^{1-t}$ where $t = \sin^2 x,\ t \in [0,1]$

Use $A.M. \geq G.M.$

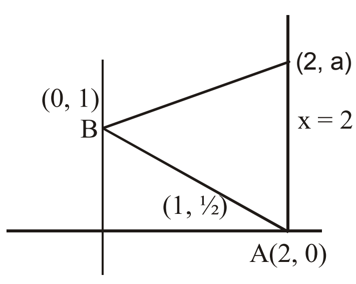
62. (C)

We have,

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

$\Rightarrow \frac{1}{x}, \frac{1}{y}, \frac{1}{z}$ are in AP $\qquad \Rightarrow$ x, y, z are in HP

63. (C)



AC = BC

$a^2 = 2^2 + (a - 1)^2$

$\because a = \frac{5}{2} \qquad \therefore m = \frac{5}{4}$

64. (C)

$$\frac{H_1+2}{H_1-2}+\frac{H_{20}+3}{H_{20}-3} = \frac{\frac{1}{2}+\frac{1}{H_1}}{\frac{1}{2}-\frac{1}{H_1}}+\frac{\frac{1}{3}+\frac{1}{H_{20}}}{\frac{1}{3}-\frac{1}{H_{20}}}$$

$$=\frac{\frac{1}{2}+\frac{1}{2}+d}{\frac{1}{2}-d-\frac{1}{2}}+\frac{\frac{1}{3}+\frac{1}{3}-d}{\frac{1}{3}+d-\frac{1}{3}} = \frac{1+d}{-d}+\frac{\frac{2}{3}-d}{d} = \frac{\frac{2}{3}-1}{d}-2 \quad = 2\times 21-2 = 40$$

65. (A)

$$10\tan^4\alpha+15=6(\tan^2\alpha+1)^2 \Rightarrow \tan^2\alpha=\frac{3}{2} \Rightarrow 9\operatorname{cosec}^4\alpha+8\sec^4\alpha=75$$

66. (B)

$$t_3=t_1+t_2\,;t_7=1000\ ;\ t_1=1$$

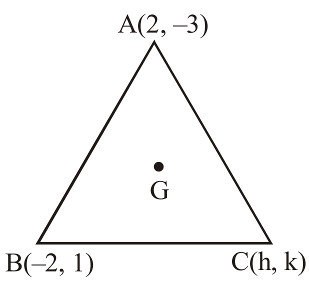
$$\because\ t_7=t_1+t_2+t_3+t_4+t_5+t_6$$

$$\Rightarrow\ 1000=2(t_1+t_2+t_3+t_4+t_5)=8(t_1+t_2+t_3)$$

$$\Rightarrow\ 1000=16(t_1+t_2)\Rightarrow t_1+t_2=\frac{1000}{16}\Rightarrow t_2=\frac{123}{2}$$

67. (A)

$$G\left(\frac{2-2+h}{3},\frac{-3+1+K}{3}\right)\equiv G\left(\frac{h}{3},\frac{k-2}{3}\right)$$



lies on 2x + 3y = 1,

$$\therefore\ 2\left(\frac{h}{3}\right)+3\left(\frac{k-2}{3}\right)=1$$

$$\Rightarrow\ 2h+3K-6-3=0\Rightarrow 2x+3y-9=0$$

68. (C)

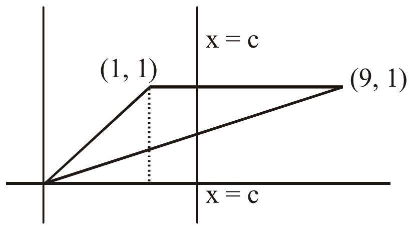
cosecA + cotA = 2

$\Rightarrow$ cosecA – cot A = 1/2

$\Rightarrow$ cosecA = 5/4 & cotA = 3/4

$\Rightarrow$ cosA = 3/5

69. (B)



$$\left(9-c\right)\times\frac{\left(9-c\right)}{9}=\frac{1}{2}\times 8\times 1$$

$$\left(9-c\right)^2=36 \quad \therefore c=3$$

70. (B)

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

$x^2 + y^2 + 2xy = x^2 - 2x + 1 + y^2 - 2y + 1$

$2xy = -2x - 2y + 2$

$x + y + xy + 1 = 2$

$x(y + 1) + 1(y + 1) = 2$

$(x + 1)(y + 1) = 2$

71. (C)

$(A\cap B)\cup C=\{1,3,5,7,8,9\}$

$A'\cap B'=\{10\}$

$\left(A\cup B\right)'=\{10\}$

$\left(A\cap B\right)\cap(A\cap C)=\{8\}$

72. (B)

Let $(\alpha, 3, -\alpha)$ be any point on x + y = 3

$\therefore$ equation of chord of contact is $ax + (3-\alpha)y = 8$

i.e. $\alpha(x - y) + 3y - 9 = 0$

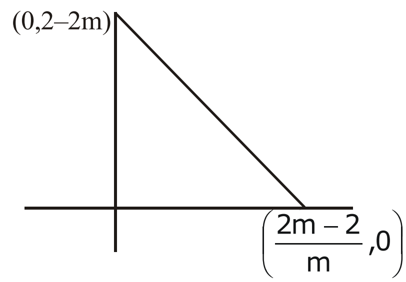
$\therefore$ the chord passes through the point (3, 3) for all values of α.

73. (A)

eq^n of line,

$(y - 2) = m(x - 2)$

$x = \dfrac{-2 + 2m}{m}, \dfrac{2m - 2}{m}$



$\dfrac{1}{2}\left|\dfrac{(2 - 2m)(2m - 2)}{m}\right| = 9$

solve to get

$m = -2 \ \& \ -\dfrac{1}{2}$

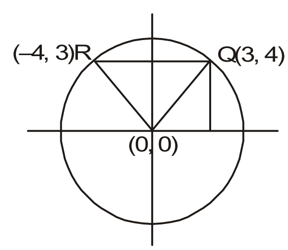
74. (C)

$\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$

$\sin\theta_1 = \sin\theta_2 = \sin\theta_3 = 1$

$\therefore \cos\theta_1 = 0, \ \cos\theta_2 = 0, \ \cos\theta_3 = 0$

75. (C)



Slope of OQ = $\dfrac{4}{3}$

Slope of OR = $-\dfrac{3}{4}$

$\therefore \angle ROQ = 90°$ $\qquad \therefore \qquad \angle QPR = \dfrac{\pi}{4}$

76. (B)

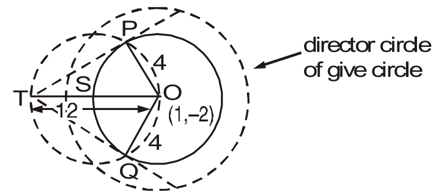
centre $(-a, 0)$, $a > 0$

$(2 + a)^2 + 9 = 25 \Rightarrow a = 2$

Equation of circle is $x^2 + y^2 + 4x - 21 = 0$

y-intercept = $2\sqrt{f^2 - c} = 2\sqrt{21}$

77. (D)



$(x-1)^2+(y+2)^2=16$

$(x-1)^2+(y+2)^2=32$

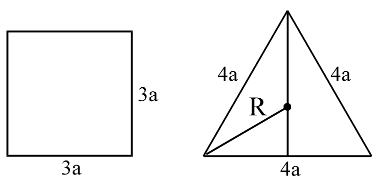
$\Rightarrow$ OS = $4\sqrt{2}$

$\therefore$ required distance TS = OT – SO = 12 – $4\sqrt{2}$

78. (C)

Radius of the circle circumscribing the square = $\dfrac{3\sqrt{2}\,a}{2}$

$A = \pi\cdot\dfrac{18a^2}{4} = \dfrac{9\pi a^2}{2}$

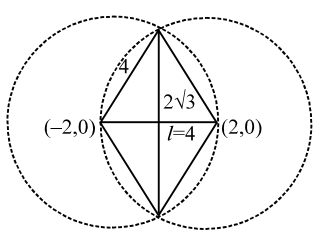


radius of the circle circumscribing triangle = 2a sec 30° = 2a $\cdot\ \dfrac{2}{\sqrt{3}} = \dfrac{4a}{\sqrt{3}}$

$B = \pi\cdot\dfrac{16a^2}{3}$; Hence $\dfrac{A}{B} = \dfrac{9}{2}\cdot\dfrac{3}{16} = \dfrac{27}{32}$

79. (A)

circles with centre (2, 0) and (– 2, 0) each with radius 4



$\Rightarrow$ y – axis is their common chord.

The inscribed rhombus has its diagonals equal to 4 and $4\sqrt{3}$

$\therefore$ $A = \frac{d_1 d_2}{2} = 8\sqrt{3}$

80. **(C)**

E					$= \frac{4!}{2}$

Q	E				$= \frac{3!}{2!}$

Q	U	E	E	U	= 1

Q	U	E	U	E	= 1

Total = 12 + 3 + 1 + 1 = 17

81. **(A)**

area of an equilateral triangle inscribed in a circle

is $\frac{3\sqrt{3}}{4}$ r^2 where r = 1

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

82. **(D)**

Any number between 1 to 999 is of the form abc when $0 \le a, b, c, \le 9$,. Let us first count the number in which 5 occurs exactly once. Since 5 occur at one place in $1 \times {}^3C_1 \times {}^3C_1 \times 9 \times 9 = 243$ ways. Next, 5 Can lastly, 5 can occur in all three digits in only one ways Hence the number of time 5 occurs is

$= 1 \times 243 + 27 \times 2 + 1 \times 3$

$= 243 + 54 + 3 = 300.$

83. **(C)**

Let T_r be the r^{th} term of given series, $T_r = \frac{2r+1}{\frac{r(r+1)(2r+1)}{6}} = \frac{6}{r(r+1)} = 6\left[\frac{1}{r} - \frac{1}{r+1}\right]$

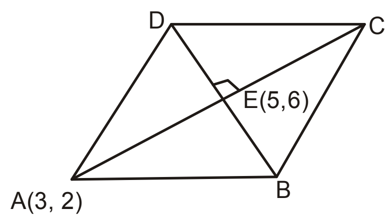
$$\sum_{r=1}^{35} T_r = 6\left[1 - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + ... + \frac{1}{35} - \frac{1}{36}\right] = 6\left[1 - \frac{1}{36}\right] = \frac{35}{6}$$

84. **(D)**

$M_{AC} = \frac{6-2}{5-3} \Rightarrow M_{BD} = -\frac{1}{2}$

equation of BD is $(y-6) = -\frac{1}{2}(x-5)$

$\Rightarrow 2y + x - 17 = 0$



85. (A)

Since A_1 is always ahead of A_2 . Hence, number of ways = $\frac{10!}{2}$ or $8! \times {}^{10}C_2$

86. (B)

y = mx be chord

the points of intersection are given by $x^2(1 + m^2) - x(3 + 4m) - 4 = 0$

$\therefore x_1 + x_2 = \frac{3+4m}{1+m^2}$ and $x_1 x_2 = \frac{-4}{1+m^2}$

Since (0, 0) divides the point of (x_1, y_1) and (x_2, y_2) in the ratio 1 : 4

$\therefore x_2 = -4x_1$

then $-3x_1 = \frac{3+4m}{1+m^2}$ and $-4x_1^2 = -\frac{-4}{1+m^2}$

$\therefore 9 + 9m^2 = 9 + 16m^2 + 24m$

i.e. $m = 0, \quad -\frac{24}{7}$

$\therefore$ the lines are y = 0 and 7y + 24x = 0

87. (D)

Let $y = 3^{\log_7 x} \Rightarrow y^2 - 2y + 1 = 0$

$\Rightarrow y = 1 \Rightarrow x = 1$

88. **(D)**

D P M L can be arranged in 4! ways & the two gaps out of 5 gaps can be selected in $^5C_2$. ways

{AA and E E} or {A E and A E} can be placed in 6 ways.

Total = 4! $^5C_2$. 6 = 1440

89. **(D)**

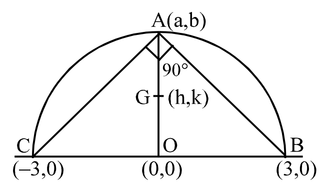
$$\sin A \sec A \sqrt{\operatorname{cosec}^2 A - 1} = \tan A \,|\cot A|$$

$$= -1 \qquad (\because 90^o < A < 180^o)$$

90. **(A)**

Let $A(a, b)$ and $G(h. k)$

Now A, G, O are collinear



$\Rightarrow h = \dfrac{2.0 + a}{3}$

$\Rightarrow a = 3h$ and similarly $b = 3k$.

Now (a, b) lies on the circle $x^2 + y^2 = 9$

$\Rightarrow$ A