SOLUTIONS

RESHUFFLING TEST-1

GZBS-1904-1905

(JEE MAIN PATTERN)

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PHYSICS

1. **(D)**
2. **(A)**
3. **(D)**
4. **(C)**

$$\frac{|\vec{R}|_{min}}{|R|_{max}} = \frac{1}{4} = \frac{||\vec{A}|-|\vec{B}||}{|\vec{A}|+|\vec{B}|}$$

$$|\vec{A}|+|\vec{B}| = 4\,||\vec{A}|-|\vec{B}||$$

If $|\vec{A}| > |\vec{B}|$

$$|\vec{A}|+|\vec{B}| = 4\,(|\vec{A}|-|\vec{B}|)$$

$$3|\vec{A}| = 5|\vec{B}| \Rightarrow \frac{|\vec{A}|}{|\vec{B}|} = \frac{5}{3}$$

If $|\vec{B}| > |\vec{A}|$

$$|\vec{A}|+|\vec{B}| = 4\,(|\vec{B}|-|\vec{A}|)$$

$$\frac{|\vec{A}|}{|\vec{B}|} = \frac{3}{5}$$

5. **(A)**

Component of $\vec{A}$ along $\vec{B}$ = $\frac{\vec{A}.\vec{B}}{|\vec{B}|} \cdot \hat{B}$

6. **(A)**
7. **(C)**
8. **(B)**

$$|\vec{a}-\vec{b}|^2+|\vec{b}-\vec{c}|^2+|\vec{c}-\vec{a}|^2$$

$$= (\vec{a}-\vec{b})\cdot(\vec{a}-\vec{b}) + (\vec{b}-\vec{c})\cdot(\vec{b}-\vec{c}) + (\vec{c}-\vec{a})\cdot(\vec{c}-\vec{a})$$

$= a^2 + b^2 - 2\vec{a}\cdot\vec{b} + b^2 + c^2 - 2\vec{b}\cdot\vec{c} + c^2 + a^2 - 2\vec{c}\,\vec{a}$

$= 2\left(a^2 + b^2 + c^2\right) - 2\left(\vec{a}.\vec{b} + \vec{b}.\vec{c} + \vec{c}.\vec{a}\right)$

Now, as

$|\vec{a}+\vec{b}+\vec{c}\,|^2 = a^2 + b^2 + c^2 + 2\left(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}\right) \geq 0$

$\vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{c}\cdot\vec{a} \geq -\dfrac{3}{2}$

for maximum value of

$|\vec{a}-\vec{b}|^2 + |\vec{b}-\vec{c}|^2 + |\vec{c}-\vec{a}|^2$

the minimum value of $\vec{a}\cdot\vec{b} + \vec{b}\cdot\vec{c} + \vec{c}\cdot\vec{a}$ should be taken.

So, $2(1+1+1) - 2\times\left(\dfrac{-3}{2}\right) = 9$ is the maximum value of $|\vec{a}-\vec{b}|^2 + |\vec{b}-\vec{c}|^2 + |\vec{c}-\vec{a}|^2$

9. **(C)** **10.** **(B)** **11.** **(C)** **12.** **(D)**

13. **(C)** **14.** **(C)** **15.** **(B)** **16.** **(A)**

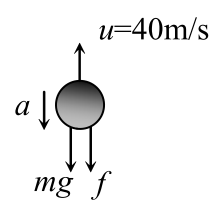
17. **(D)**

18. **(D)**

Let retardation of body is *a* and air resistance is *f*

$v = u + at$

$0 = 40 - 3a$



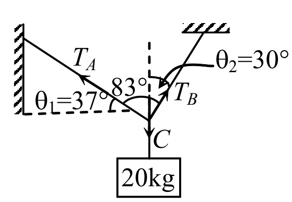
$a = \dfrac{40}{3}$ m/s^2

$ma = mg + f$

$f = ma - mg = 1.5\left(\dfrac{40}{3} - 10\right) = 5$ N

19. **(A)**

20. **(A)**



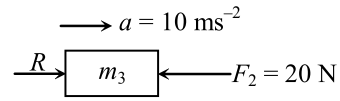
$T_A \cos\theta_1 = T_B \sin\theta_2$

$T_A \cos 37° = T_B \sin 30°$

$T_A \times \dfrac{4}{5} = T_B \times \dfrac{1}{2}$; $\dfrac{T_A}{T_B} = \dfrac{5}{8}$

21. (D)

$$a = \frac{F_1 - F_2}{m_1 + m_2 + m_3} = 10\ ms^{-2}$$

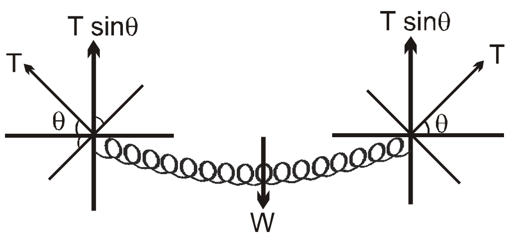


$$R - F_2 = m_3 a$$

$$R = 30N$$

22. (A)

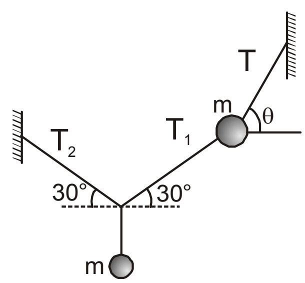
23. (A)



$$2T \sin\theta = W$$

$$T = \frac{W}{2} \operatorname{cosec}\theta$$

24. (C)



$T_1 \cos 30^\circ = T_2 \cos 30^\circ$

$\Rightarrow T_1 = T_2$

$(T_1 + T_2)\sin 30^\circ = mg$

$T_1 = T_2 = mg$

$T \sin\theta = mg + T_1 \sin 30^\circ$

$T \sin\theta = mg + \frac{mg}{2}$ ....(i)

$T \cos\theta = T_1 \cos 30^\circ = mg \times \frac{\sqrt{3}}{2}$ ....(ii)

dividing (i) and (ii)

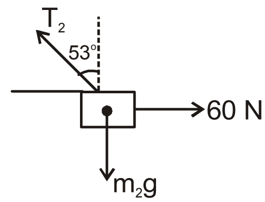
$$\tan\theta = \frac{3mg/2}{\sqrt{3}\,mg/2} = \sqrt{3} \Rightarrow \theta = 60^\circ$$

25. **(A)** **26.** **(B)** **27.** **(C)** **28.** **(B)**

29. **(B)**

30. **(A)**

From euquilibrium of lower block,



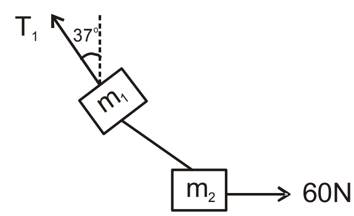
$T_2 \sin 53^\circ = 60$

$\Rightarrow T_2 = 75\text{N}$

$T_2 \cos 53^\circ = M_2 g$

$\Rightarrow 75 \times \frac{3}{5} = m_2 g \Rightarrow m_2 = 4.5\text{kg}$

From equilibrium of both the blocks together.



$T_1 \sin 37^\circ = 60$

$\Rightarrow T_1 = 100\text{ N}$

$T_1 \cos 37^\circ = (m_1 + m_2) g$

$\Rightarrow 80 = (m_1 + m_2) g \Rightarrow m_1 = 3.5\text{kg}$

CHEMISTRY

31. **(A)**

$\because$ 1 mole of $K_4[Fe(CN)_6]$ contains 6 moles of carbon.

$\therefore$ 0.5 mol contains 3 moles of C = 36g of C

32. **(C)**

vol of gold = $\frac{x}{d_1}$

Vol. of quartz = $\frac{y}{d_2}$

Total vol. of alloy = $\frac{x+y}{d}$

$\therefore \quad \frac{x}{d_1} + \frac{y}{d_2} = \frac{x+y}{d}$

33. (D)

Moles of Fe_2O_3 = $\frac{1.6 \times 1000}{160} = 10$

Moles of CO requred = 30 moles

$2C + O_2 \rightarrow 2CO$

Moles of O_2 required = 15 mol.

$\therefore$ Mass of O_2 = 15 x 32 = 480g.

34. (C)

Mole of Nx = $\frac{8}{1} \times \frac{1}{3} \times \frac{1}{1} \times (\text{Moles of M})$

Mole of M = $\frac{206}{103} \times \frac{3}{8} = \frac{3}{4}$

$\therefore$ Mass of M = $\frac{3}{4} \times 56 = 42\,g$

35. (A)

Moles of HCl = $\frac{50}{1000} \times 4$

$\therefore$ Mole of Fe^{2+} = $\frac{1}{2} \times \frac{50}{1000} \times 4 = 0.1$

36. (D)

By POAC on Ag.

Moles of Ag = 2 x moles of Ag_2S

Moles of Ag_2S = $\frac{1}{108} \times \frac{1}{2}$

Mass of Ag_2S = $\frac{1}{216} \times 248\,g$

$\frac{1.34 \times \omega}{100} = 1.148$

$\omega = 85.7\,g$

37. (C)

Let $n_{P_4O_{10}} = x$

$n_{P_4O_6} = y$

By POAC on P

$4\times\frac{31}{124}=4x+4y$ ... (i)

By POAC on O

$2\times1=10\times x+6y$ ... (ii)

On solving (i) & (ii)

x = 1/8 y = 1/8

$\therefore$ Mass of P_4O_{10} = $\frac{1}{8}\times284\,g=35.5\,g$

$\therefore$ Mass of P_4O_6 = $\frac{1}{8}\times220\,g=27.5\,g$

38. (D)

$0.5=\frac{0.4\times V\times2+50\times0\times3}{50+V}$

V = 33.33 ml

39. (A)

1000 g of H_2O contains 0.2 moles of H_2SO_4

Mass of H_2SO_4 = 0.2 x 98 g = 19.6 g

$\therefore$ Total mass = 1000 + 19.6 g = 1019.6 g

40. (B)

$(e/m)_{Proton}=\frac{e}{m_P},\ (e/m)_{neutrons}=\frac{O}{m_P}$

$(e/m)_{Deuterium}=\frac{e}{2m_P},\ \ (e/m)\alpha-\text{particle}=\frac{2e}{4m_P}=\frac{e}{2m_P}$

41. (C)

$-1\cdot6\times10^{-19}$ and $-4\cdot0\times10^{-19}$

has highest common factor $.-.8\times10^{-19}$ coulomb

So electronic charge is $-0\cdot8\times10^{-19}C$

42. (D)

$x\,\vdots\,x\longrightarrow2\times\ 160\times10^3\ J/mole^{-1}$

B.E per molecule $=\frac{160\times10^3\,J}{6\cdot023\times10^{23}}$

$$h\nu = \frac{160 \times 10^3 J}{6 \cdot 023 \times 10^{23}}$$

$$\nu = \frac{160 \times 10^3 J}{6 \cdot 63 \times 10^{-34} \times 6 \cdot 023 \times 10^{23} J - sec} = 4 \times 10^{14} Hz$$

43. (A)

$$\frac{hc}{\lambda} = \frac{hc}{\lambda_1} + \frac{hc}{\lambda_2}$$

$$\frac{1}{\lambda} = \frac{\lambda_1 + \lambda_2}{\lambda_1 + \lambda_2}$$

$$\lambda = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$$

44. (D)

Planck's theory says radiat energy emitted in small packets i.e., discontinuous manner.

45. (B)

$$K.E. = \frac{hc}{\lambda} - \frac{hc}{\lambda_o}$$

$$\frac{1}{2} mv^2 = hc\left[\frac{\lambda_o - \lambda}{\lambda\lambda_o}\right]$$

$$v = \left[\frac{2hc}{m}\left\{\frac{\lambda_o - \lambda}{\lambda\lambda_o}\right\}\right]^{1/2}$$

46. (A)

$$K.E. = h\nu - h\nu_o$$

Since intercept is different for these curve.

$$(h\nu_o)_A \neq (h\nu_o)_B$$

47. (B)

$$V.S = \frac{250 x 1.5 + 750 x .5}{1000} x 11.2 = 8.4 \text{ V}$$

48. (C)

$$\text{No. of molecule} = \frac{2 \times 1.2}{70 \times 35} \times N_A = \frac{1.2}{35^2} N_A$$

49. (B)

$$\underset{7\text{ mole}}{12C(s)} + \underset{6\text{ mole}}{11H_2(g)} + \underset{\substack{2.5\text{ mole}\\ \text{L.R.}}}{\frac{11}{2}O_2(g)} \longrightarrow C_{12}H_{22}O_{11}(s)$$

$\therefore$ Weight of $C_{12}H_{22}O_{11}$ formed = $\frac{1}{5.5} \times 2.5 \times 342 = 155.45$ g

50. (C)

Final molarity = $\frac{480 \times 1.5 + 520 \times 1.2}{1000} = 1.344$ M

51. (A)

$$\underset{\substack{0.0145\text{ mole}\\ \text{L.R.}}}{C_7H_6O_3} + \underset{0.0392\text{mole}}{C_4H_6O_3} \longrightarrow C_9H_8O_4 + C_2H_4O_2$$

Weight of $C_9H_8O_4$ formed = 0.0145 × 180 = 2.61 g

$\therefore$ %yield = $\frac{2.1 \times 100}{2.61} = 80.46\%$

52. (C)

K.E. of photo electron = $(0.20 \times 1.6 \times 10^{-19})$J

$\frac{hc}{\lambda}$ = (work function) + (K.E of photo electron)

$\Rightarrow$ Work function = $\frac{(6.50 \times 10^{-34})(3 \times 10^{8})}{(390 \times 10^{-9})} - (0.20 \times 1.6 \times 10^{-19})$

= $(5 \times 10^{-19}) - (0.32 \times 10^{-19})$ = 4.68×10^{-19} J/atom

53. (B)

Weight of sulphur present in coal

$\frac{2 \times 10^{6} \times 1}{100} = 2 \times 10^{4}$ kg   S + $O_2 \rightarrow SO_2$

32×10^{-3} kg $\rightarrow$ 64×10^{-3} kg. 2×10^{4} kg $\rightarrow$?

weight of sulphur dioxide

= $\frac{2 \times 10^{4} \times 64 \times 10^{-3}}{32 \times 10^{-3}} = 4 \times 10^{4}$ kg

54. (C)

$C + CO_2 \rightarrow 2CO$

The resultant mixture contains 0.6 L of CO_2 and 0.8 L of CO

55. (A)

$$[H^+]_{final} = \frac{50\times10\times2+25\times12+40\times5}{1000}$$

$$= \frac{1000+300+200}{1000} = \frac{1500}{1000} = 1.5\text{ M}$$

56. (B)

$$0.33 = \frac{2\times56}{M}\times100$$

$\Rightarrow \quad M = 33939$

57. (D)

Atomic weight of an element

$x = 6.643\times10^{-23} \times N_A = 40$

no. of moles of 'X' $= \dfrac{20\times1000}{40} = 500$

58. (D)

let, volume of CO_2 = x, then vol. of N_2 = (40–x)

$$\left(\frac{x}{22.4}\times44\right)+\left(\frac{40-x}{22.4}\times28\right)=70$$

44x + 28(40-x) = 22.4×70

44x + 1120 – 28x = 1568

16 x = 448

x = 28 litre

59. (A)

no. of mole = $\dfrac{252\times10^{-3}}{126} = 2\times10^{-3}$

$\therefore$ Each mole $H_2C_2O_4\cdot2H_2O$ have 2 mole of H_2O

$\therefore$ 2×10^{-3} mole of $H_2C_2O_4\cdot2H_2O$ have $2\times2\times10^{-3}$ mole of H_2O.

So no. of molecule of $H_2O = 2\times2\times10^{-3}\times6\times10^{23}$

$= 24\times10^{20} = 2.4\times10^{21}$

60. (C)

The reaction is

$$2KClO_3 \longrightarrow 2KCl + 3O_2$$

Now, $\dfrac{\text{Moles of } KClO_3}{2} = \dfrac{\text{Moles of } O_2}{3}$

mole of O_2 produced = $\dfrac{3\times 3}{2}$ = 4.5 moles

MATHEMATICS

61. (D)

$$\sum_{r=2}^{43}\frac{1}{\log_r n} = \sum_{r=2}^{43}\log_n r$$

$$= \log_n 2 + \log_n 3 + ... + \log_n 43$$

$$= \log_n(2.\,3.\,4 ----43) = \log_n 43!$$

62. (C)

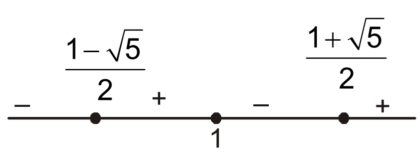
$\log_2 x \ge \log_{\frac{1}{2}}(x-1)$ $\qquad \because x > 0 \;\; \& \; x-1 > 0$

$\log_2 x \ge \log_2 (x-1)^{-1}$ $\qquad x > 0 \;\; \& \;\; x > 1$

$x \ge \dfrac{1}{x-1}$ $\qquad$ so, x > 1 ....(1)

$$x - \frac{1}{x-1} \ge 0$$

$$\frac{(x^2 - x - 1)}{(x-1)} \ge 0$$



$x \in \left[\dfrac{1-\sqrt{5}}{2}, 1\right) \cup \left[\dfrac{1+\sqrt{5}}{2}, \infty\right)$ $\qquad$ ....(2)

from (1) and (2)

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

63. (B)

$x \neq 3, |x-3| = 1 \Rightarrow x = 4, 2$ and $3x^2 - 10x + 3 = 0 \Rightarrow x = \frac{1}{3}$ (x = 3 rejected)

64. (B)

$$18^{4x-3} = \left(54\sqrt{2}\right)^{3x-4}$$

taking log both side

$$(4x-3)\log 18 = (3x-4)\log\left(54\sqrt{2}\right)$$

$$(4x-3)\log 18 = (3x-4)\log(18)^{3/2}$$

$$\log 18\left((4x-3) - \frac{3}{2}(3x-4)\right) = 0$$

$$4x - 3 = \frac{3}{2}(3x-4)$$

(x = 6)

65. (D)

$$\frac{2}{\log_a x} + \frac{1}{1+\log_a x} + \frac{3}{2+\log_a x} = 0$$

$$\frac{2}{t} + \frac{1}{1+t} + \frac{3}{2+t} = 0$$

66. (B)

We have,

$$\frac{\log x}{2a+3b-5c} = \frac{\log y}{2b+3c-5a} = \frac{\log z}{2c+3a-5b},$$

$$\Rightarrow \frac{\log x}{2a+3b-5c} = \frac{\log y}{2b+3c-5a} = \frac{\log z}{2c+3a-5b} = \frac{\log x + \log y + \log z}{0}$$

$$\Rightarrow \log x + \log y + \log z = 0 \Rightarrow \log(xyz) = 0 \Rightarrow xyz = 1.$$

67. (B)

68. (D)

If $x^2+4x+3=(x+3)\ (x+1)\geq 0, x\in R-(-3,-1)$ ....(1)

The given equation becomes $x^2+6x+8=0$

$\Rightarrow\ x=-2,-4$ ....(2)

From (1) and (2) $\Rightarrow$ x = –4

If $x^2+4x+3<0, x\in(-3,-1)$ ....(3)

The equation becomes $-\left(x^2+4x+3\right)+2x+5=0$

or $x^2+2x-2=0 \Rightarrow x=-1\pm\sqrt{3}$ ....(4)

From (3) and (4) $\Rightarrow$ $x=-1-\sqrt{3}$

Sum of the roots = $-4+(-1-\sqrt{3})=-5-\sqrt{3}$.

69. (D)

70. (C)

$x^{(\log_{10}x)^2-3\log_{10}x+1}>1000=10^3$

$\Rightarrow\ [(\log_{10}x)^2-3\log_{10}x+1]\log_{10}x>3\log_{10}10=3$

$\Rightarrow\ (\log_{10}x)^3-3(\log_{10}x)^2+\log_{10}x>3\ \Rightarrow\ (\log_{10}x)^2(\log_{10}x-3)+(\log_{10}x-3)>0$

$\Rightarrow\ (\log_{10}x-3)((\log_{10}x)^2+1)>0\ \Rightarrow\ x>10^3=1000\ \Rightarrow\ x\in(1000,\infty)$

71. B

We have, $\frac{1}{4}\cos(3\theta)=\frac{1}{8}\ \Rightarrow\ \cos(3\theta)=\frac{1}{2}$

$\Rightarrow\ 3\theta = 60° \ \Rightarrow\ \theta = 20°$

72. (A)

73. (A)

$(2\sin^2 91°-1)(2\sin^2 92°-1)...(2\sin^2 180°-1)$

In this product there exists a factor

$(2\sin^2 135°-1)$ which is equal to zero.

$\therefore$ The product of all terms is zero.

74. (D)

75. (A)

Maximum value of $4\sin^2 x + 3\cos^2 x$ i.e., $\sin^2 x + 3$ is 4 and that of $\sin\frac{x}{2}+\cos\frac{x}{2}$ is $\frac{1}{\sqrt{2}}+\frac{1}{\sqrt{2}}=\sqrt{2}$,

both attained at x = $\pi/2$. Hence the given function has maximum value of 4 + $\sqrt{2}$

Hence (a) is the correct answer.

76. (A)

77. (D)

$\sqrt{2+\sqrt{2(1+\cos 4\theta)}}=\sqrt{2+2|\cos 2\theta|}$ = $\sqrt{2(1-\cos 2\theta)}$ = $2|\sin\theta|=2\sin\theta$ as $\frac{\pi}{2}<\theta<\frac{3\pi}{4}$

Hence (d) is the correct answer.

78. (B)

$|x^2 - 2x| + |x - 2| = |x^2 - x - 2|$

$(x^2 - 2x)(x - 2) \geq 0$

$x(x - 2)^2 \geq 0$

$x \in [0, \infty)$

79. (B)

We have,

$$\frac{1}{\log_a bc+1}+\frac{1}{\log_b ca+1}+\frac{1}{\log_c ab+1} =$$

$$\frac{1}{\log_a bc+\log_a a}+\frac{1}{\log_b ca+\log_b b}+\frac{1}{\log_c ab+\log_c c}$$

$$= \frac{1}{\log_a abc}+\frac{1}{\log_b abc}+\frac{1}{\log_c abc}$$

$$= \log_{abc} a+\log_{abc} b+\log_{abc} c=\log_{abc} abc=1$$

80. (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)

81. (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 $\cos A.\cos B = \frac{1}{2\sqrt{2}}(1 + \sqrt{2})$

82. (C)

According to property

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

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

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

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

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

combining above all we get common value is

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

83. (C)

Let $P = \cos\theta \cos 2\theta \cos 3\theta ... \cos 1004\theta$

and $Q = \sin\theta \sin 2\theta \sin 3\theta ... \sin 1004\theta$

Then $2^{1004} PQ = \sin 2\theta \sin 4\theta ... \sin 2008\theta$

$$= (\sin 2\theta \ \sin 4\theta ... \ \sin 1004\theta) \ [\sin(2\pi - 1003\theta)\sin(2\theta - 1001\theta)...\sin(2\pi - \theta)]$$

$$= (\sin 2\theta \ \sin 4\theta \ ... \ \sin 1004\theta) \ [-\sin 1003\theta][-\sin 1001\theta] \ ... \ [-\sin\theta] = Q$$

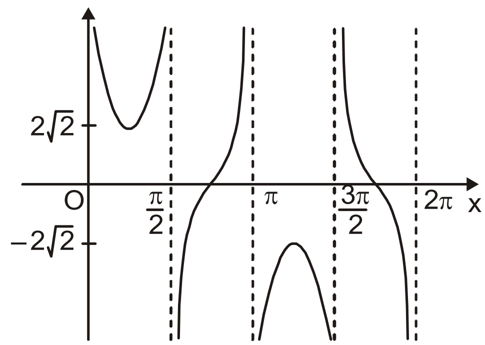
$$\Rightarrow \quad P = \frac{1}{2^{1004}}.$$

84. (A)

since

$\cos 90° = 0$

85. (A)



From graph of $f(\theta) = \sec\theta + \operatorname{cosec}\theta$, it is clear that for four solutions

$p > 2\sqrt{2}$ or $p < -2\sqrt{2}$ i.e. $p^2 > 8$.

86. (D)

$$\because \quad \prod_{i=1}^{n} \cos\alpha_i = \prod_{i=1}^{n} \sin\alpha_i$$

$$\Rightarrow \quad \prod_{i=1}^{n} \cos^2\alpha_i = \prod_{i=1}^{n} \frac{\sin 2\alpha_i}{2} \le \frac{1}{2^n} \quad \Rightarrow \quad \prod_{i=1}^{n} \cos\alpha_i \le \frac{1}{2^{\frac{n}{2}}}$$

87. (A)

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

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

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

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

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

88. (C)

$$\frac{4\cos^3\theta}{4\sin^3\theta} = \cot^3\theta$$

89. (D)

$\sin^6 a + 3\sin^2 a\cos^2 b + \cos^6 b - 1 = 0$

$\Rightarrow (\sin^2 a)^3 + (\cos^2 b)^3 + (-1)^3 - 3\sin^2 a\cos^2 b(-1) = 0$

$\Rightarrow (\sin^2 a + \cos^2 b - 1) = 0$ or $\sin^2 a = \cos^2 b = -1 \Rightarrow$ $a = b$; r $a,b \in \left[0, \frac{\pi}{2}\right]$

90. (C)

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

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

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