SOLUTIONS

PROGRESS TEST-3

GZBS-1902

JEE MAIN PATTERN

Test Date: 22-07-2017

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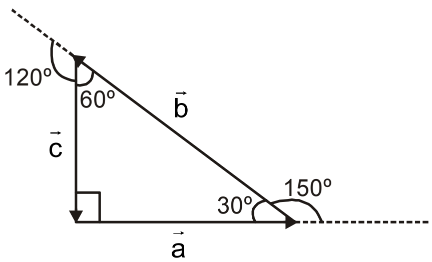
PHYSICS

1. **(C)**

2. **(C)**

If $\vec{a}+\vec{b}+\vec{c}=0,$ then they form slides of a triangle taken in order, according to Polygon Law.



$\sin 30^{o}=\dfrac{c}{b}$

$\therefore\ b:c=2:1$ ....(i)

$\cos 30^{o}=\dfrac{a}{b}$

$\therefore\ a:b=\sqrt{3}:2$ ...(ii)

From (i) and (ii) we get

$\Rightarrow a:b:c=\sqrt{3}:2:1$

3. **(C)**

4. **(C)**

As, $\vec{P}=\vec{F}_1+\vec{F}_2$

$\therefore\quad P^2=F_1^2+F_2^2+2F_1F_2\cos\theta$

$\because\quad \vec{Q}=\vec{F}_1-\vec{F}_2$

$\therefore\quad Q^2=F_1^2+F_2^2-2F_1F_2\cos\theta$

$\therefore\quad P^2+Q^2=2\left(F_1^2+F_2^2\right)=2(18+32)=100$

$\therefore\quad \sqrt{P^2+Q^2}=\sqrt{100}=10N$

5. **(B)**

$\cos^2\alpha+\cos^2\beta+\cos^2\gamma=1$

or $\cos^2 60^{o}+\cos^2 60^{o}+\cos^2\gamma=1$

or $\frac{1}{4}+\frac{1}{4}+\cos^2\gamma=1$

or $\cos^2\gamma=1-\frac{1}{2}=\frac{1}{2}$

or $\cos\gamma=\frac{1}{\sqrt{2}}$ $\Rightarrow \gamma=\frac{\pi}{4}$

$\therefore$ n = 4

6. (B)

The resultant is $\vec{R}=\hat{j}$

$\vec{R}=\hat{i}-2\hat{j}+2\hat{k}+2\hat{i}+\hat{j}-\hat{k}+\vec{c}$

or $\hat{j}=3\hat{i}-\hat{j}+\hat{k}+\vec{c}$

$\therefore$ $\vec{c}=-3\hat{i}+2\hat{j}-\hat{k}$

7. (D)

8. (B)

$A=|\vec{A}|=\sqrt{(2)^2+(1)^2\,(-1)^2}=\sqrt{6}$

$B=|\vec{B}|=\sqrt{(1)^2+(-1)^2}$ **=** $\sqrt{2}$

$\vec{A}.\vec{B}=(2\hat{i}+\hat{j}-\hat{k}).\,(\hat{i}-\hat{k})$ = (2) (1) + (-1) (-1) = 3

Now, $\cos\theta=\frac{\vec{A}.\vec{B}}{AB}=\frac{3}{\sqrt{6}.\sqrt{2}}=\frac{3}{\sqrt{12}}=\frac{\sqrt{3}}{2}$

$\therefore\ \theta$ = **30°**

9. (A)

10. (D)

11. (D)

$(\vec{A}+\vec{B}).\vec{A}=0$

$A^2 + AB\cos\theta = 0$

$A^2 = -AB\cos\theta$

$\theta=\cos^{-1}\left(-\frac{A}{B}\right)$

12. (D)

13. (A)

Let the components of $\vec{A}$ makes angles α, β and γ with *x,* y and *z* axis respectively then $\alpha = \beta = \gamma$

$$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$$

$$\Rightarrow 3\cos^2\alpha = 1 \Rightarrow \cos\alpha = \frac{1}{\sqrt{3}}$$

$$\therefore A_x = A_y = A_z = A\cos\alpha = \frac{A}{\sqrt{3}}$$

14. (B)

$$\vec{A} = \hat{i} + \hat{j}$$

$$\cos\alpha = \frac{A_x}{|A|} = \frac{1}{\sqrt{2}} = \cos 45° \quad \therefore \alpha = 45°$$

15. (B)

Magnitude of unit vector = 1

$$\Rightarrow \sqrt{(0.5)^2 + (0.8)^2 + c^2} = 1$$

By solving we get $c = \sqrt{0.11}$

16. (B)

Let $\hat{n}_1$ and $\hat{n}_2$ are the two unit vectors, then the sum is

$\vec{n}_s = \hat{n}_1 + \hat{n}_2$ or $n_s^2 = n_1^2 + n_2^2 + 2n_1n_2\cos\theta$

$= 1 + 1 + 2\cos\theta$

Since it is given that n_s is also a unit vector, therefore

$$1 = 1 + 1 + 2\cos\theta \Rightarrow \cos\theta = -\frac{1}{2} \quad \therefore \theta = 120°$$

Now the difference vector is $\hat{n}_d = \hat{n}_1 - \hat{n}_2$ or $n_d^2 = n_1^2 + n_2^2 - 2n_1n_2\cos\theta = 1 + 1 - 2\cos(120°)$

$$\therefore n_d^2 = 2 - 2(-1/2) = 2 + 1 = 3 \Rightarrow n_d = \sqrt{3}$$

17. (D)

If two vectors A and B are given then Range of their resultant can be written as $(A - B) \le R \le (A + B)$.

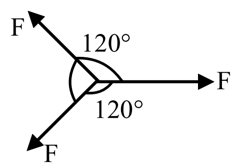
i.e. $R_{max} = A + B$ and $R_{min} = A - B$

If B = 1 and A = 4 then their resultant will lies in between 3N and 5N. It can never be 2N.

18. (A)

In *N* forces of equal magnitude works on a single point and their resultant is zero then angle between any two forces is given

$$\theta = \frac{360}{N} = \frac{360}{3} = 120°$$



If these three vectors are represented by three sides of triangle then they form equilateral triangle

19. (C)

Resultant of two vectors $\vec{A}$ and $\vec{B}$ can be given by $\vec{R} = \vec{A} + \vec{B}$

$$|\vec{R}| = |\vec{A} + \vec{B}| = \sqrt{A^2 + B^2 + 2AB\cos\theta}$$

If $\theta = 0°$ then $|\vec{R}| = A + B = |\vec{A}| + |\vec{B}|$

20. (B)

Let $\vec{A}.(\vec{B} \times \vec{A}) = \vec{A}.\vec{C}$

Here $\vec{C} = \vec{B} \times \vec{A}$ is perpendicular to both vector

$\vec{A}$ and $\vec{B}$ $\quad \therefore \ \vec{A}.\vec{C} = 0$

21. (D)

$\vec{\Delta v} = \vec{v_f} - \vec{v_i}$

$\vec{\Delta v}$ = [50 $(-\hat{i})$ – 50 $(\hat{j})$] km/hr

$\vec{\Delta v}$ = (–50$\hat{i}$ – 50$\hat{j}$) km/hr

$|\vec{\Delta v}|$ = 50$\sqrt{2}$ km/hr

and direction of $\vec{\Delta v} = \dfrac{\vec{\Delta v}}{|\vec{\Delta v}|} = \dfrac{-\hat{i} - \hat{j}}{\sqrt{2}}$

$\therefore\ \overrightarrow{\Delta v} = 50\sqrt{2}\ \frac{km}{hr}$ south-west

22. (A)

Given that $\left(\vec{F_1}+\vec{F_2}\right).\ \vec{F_1} = 0$

where $F_1 < F_2$

$\therefore\ F_1^2 + F_1\, F_2 \cos\theta = 0$

Given that $F_2 = 2F_1$

$F_1^2 + 2F_1^2 \cos\theta = 0$

$\cos\theta = -\frac{1}{2}$

$\therefore\ \theta = 2\pi/3$

23. (C)

24. (B)

$\int (\sin x + \cos x)^2 dx$

$= \int (1 + 2\sin x \cos x) dx$

$= \int dx + \int \sin 2x\, dx$

$= x - \frac{\cos 2x}{2} + c$

$= \frac{1}{2}(x + \frac{1}{2}\sin 2x) + c$

25. (B)

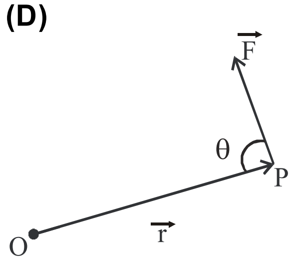
$y = \frac{x+1}{x-1}$

26. (D)

$\int_0^{\pi} \sin x\, dx = (-\cos x)_0^{\pi} = 1 + 1 = 2$

27. (C)

28. (D)



Let force acts at point P.

Position vector of O = $\hat{i}+2\hat{j}+3\hat{k}$

Position vector of P = $-2\hat{i}+3\hat{j}+\hat{k}$

Then $\overrightarrow{OP}=$ Position Vector of P – p.v. of O

$\Rightarrow\ \vec{r}=-3\hat{i}+\hat{j}-2\hat{k}$

Let $\vec{M}$ be the vector moment of $\vec{F}$ acting at P about point O. Then $\vec{M}=\vec{r}\times\vec{F}$

$$=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ -3 & 1 & -2\\ 2 & 2 & 2\end{vmatrix}=6\hat{i}+2\hat{j}-8\hat{k}\ .$$

29. (C)

30. (A)

CHEMISTRY

31. (D)

$v_{sol}=30+20=50\,ml$

$w_{HCl}=\frac{30}{100}\times12+\frac{20}{100}\times18=3.6+3.6=7.2$

$\therefore\ \%\,w/v=\frac{7.2}{50}\times100=14.4$

32. (B)

$v_A=\frac{3}{1.2},v_B=\frac{2}{1.5}$

$$\therefore d = \frac{m}{v} = \frac{3+2}{\frac{3}{1.2}+\frac{2}{1.5}} = 1.30\,g/ml$$

33. (A)

$$\text{\% of 'B'} = \frac{3B}{2A+3B}\times 100 = \frac{3\times(1.5A)}{2A+3\times(1.5A)}\times 100 = \frac{4.5}{6.5}\times 100 = 69.2\%$$

34. (C)

$$v_i = 1 \quad v_f = 1 + \frac{10}{100}\times 1 = 1.1$$

$$\therefore M_i v_i = M_f v_f \Rightarrow M_f = \frac{M_i}{1.1} \therefore \%\Delta M = \frac{|\Delta M|}{M_i}\times 100 = 9.09$$

35. (C)

36. (B)

$$H_2O + SO_3 \longrightarrow H_2SO_4$$

100 g oleum $\rightarrow$ 4.5 g H_2O $\rightarrow$ 20 g SO_3

$\therefore$ 10 g oleum $\rightarrow$ 2 g SO_3

37. (A)

$$M = \frac{5.6}{11.2} = \frac{1}{2} = \frac{\text{moles}}{v(\ell t)} = \frac{m/34}{20/1000}$$

$$\therefore m = \frac{1}{2}\times\frac{20}{1000}\times 34 = 0.34\text{ g}$$

38. (C)

$$\frac{n_O}{n_B} = \frac{y}{3} = \frac{1}{0.3} \Rightarrow y = 10$$

$$\frac{n_H}{n_A} = \frac{4}{1} = \frac{2y}{x} = \frac{2\times 10}{x} \Rightarrow x = 5$$

39. (D)

	HCl +	NaOH $\longrightarrow$ $NaCl + H_2O$
m.mole	100×0.06	70×0.07
$(t=0)$	$=6$	$=4.9$
m.mole	$6-4.9$	0
(after reaction) $=1.1$		

So, m.mole of HCl (left) = 1.1 = M × V (ml)

$$\therefore M = \frac{1.1}{(100+70)} = \frac{1.1}{170} = 0.006$$

40. (C)

Moles of 'N' = $\frac{0.12}{12} \times 6 = 0.06$

$\therefore$ Moles of NO = 0.06

$\therefore$ No. of molecules of NO = 0.06 × N_A = 3.6 × 10^{22}

41. (A)

$n_{NaOH} = 1.2 \quad m_{H_2O} = 1000$ g

$\therefore m_{NaOH} = 1.2 \times 40 = 48\,g$

So, % of NaOH $= \frac{48}{48+1000} \times 100 = 4.6\%$

42. (B)

$n_{solute} = 1.4 \quad m_{solvent} = 1000\,g$

$\therefore m_{solute} = 1.4 \times 40 = 56$ So, $m_{solution} = 1056$

$\therefore v_{solution} = \frac{m}{d} = \frac{1056}{1.2} ml = 0.88$ L

$\therefore \text{molarity} = \frac{1.4}{0.88} = 1.59M$

43. (D)

m.mole of $Fe^{2+} = 5 \times$ m.mole of $MnO_4^- = 5 \times 0.24 \times 1000$

$\Rightarrow$ m.mole of $Fe^{2+} = 0.20 \times v = 5 \times 0.24 \times 1000$

$\therefore$ V = 6000 mL = 6 L

44. (A)

$A_3 \rightarrow \ 3A$

$1-0.3 \quad 3x0.3$

$=0.7 \quad =0.9$

% change $= \frac{(0.9+0.7)-1}{1} \times 100 = 60\%$

45. (C)

$$v_{sol} = \frac{m}{d} = \frac{10}{1.1}ml = \frac{10}{1.1\times10^3}L$$

$$\therefore n_{NaOH} = M\times v(L) = 0.8\times\frac{10}{1.1\times10^3} = \frac{8}{1.1}\times10^{-3}$$

$$\therefore n_{OH^-} = \frac{8}{1.1}\times10^{-3}\text{ moles} = \frac{80}{11}\text{millimoles}$$

46. (D)

$$\frac{1}{2}mv^2 = 3.01eV - 2.1eV = 0.91\,eV$$

47. (A)

48. (A)

S.C on $Li^{2+} = \frac{2e}{7m}$; S.C on $He^{+} = \frac{e}{4m}$

$$\therefore \text{Ratio} = \frac{2e/7m}{e/4m} = \frac{8}{7}$$

49. (B)

$$eV_{S.P} = 3eV - 2.1eV = 0.9eV$$

50. (D)

Energy of a quanta $= \frac{hc}{\lambda} = hc\omega$

$$\therefore E_{Total} = 12\times3 = n\times(hc\omega)$$

$$\therefore n = \frac{36}{hc\omega}$$

51. (C)

Number of moles of SO_2 = $\frac{16}{64} = \frac{1}{4}$

$\therefore$ Number of molecules of SO_2

$= \frac{1}{4}xN_A = \frac{1}{4}x6.022x10^{23} = 1.5x10^{23}$

52. (D)

Element	%	$\frac{\%}{\text{At. weight}}$	$\frac{\text{Value}}{\text{min}^m\text{ Value}}$	Simple ratio

A	75	$\frac{75}{75}=1$	$\frac{1}{1}=1$	1
B	25	$\frac{25}{25}=1$	$\frac{1}{1}=1$	1

$\therefore$ Formula of the compound will be AB.

53. (B)

$$\underset{1\,\text{mole}}{C_5H_{10}} + \frac{15}{2}O_2 \longrightarrow 5CO_2 + 5H_2O$$

$$\frac{n_{C_5H_{10}}}{1} = \frac{n_{O_2}}{15/2}$$

$$\Rightarrow n_{O_2} = \frac{15}{2}$$

$\therefore$ Volume of O_2 gas at $NTP = \frac{15}{2} \times 22.4 = 168L.$

54. (D)

$$\underset{4.2g}{2NaHCO_3} \longrightarrow Na_2CO_3 + H_2O + CO_2$$

Number of moles of $NaHCO_3 = \frac{4.2}{84} = \frac{1}{20}$, No of moles of CO_2 = 1/20 × 1/2 = 1/40

So, Volume of CO_2 formed at $NTP = \frac{1}{40} \times 22.4$ = 0.56 L

55. (A)

$$\underset{2\text{mole}}{6LiH} + \underset{2\text{mole}}{8BF_3} \longrightarrow 6LiBF_4 + B_2H_6$$

(LR) $\downarrow$

$$\frac{1}{8} \times 2 = 0.25\,\text{mole}.$$

56. (A)

$$CaCO_3 \longrightarrow CaO + CO_2$$

1L STP

Mole of $CO_2 = \frac{1}{22.7}$

Mole of $CaCO_3 = \frac{1}{22.7}$

gm of $CaCO_3 = \frac{100}{22.7} = 4.405$

% Purity of $CaCO_3 = \frac{4.405}{5} \times 100 = 88.1\%.$

57. (D)

$x_{C_2H_5OH} = 0.25$

$x_{H_2O} = 0.75$

$$\frac{x_{C_2H_5OH}}{x_{H_2O}} = \frac{1}{3} = \frac{n_{C_2H_5OH}}{n_{H_2O}}$$

$C_2H_5OH = 1\ \text{mole} = 46\,g$

$H_2O = 3\ \text{mole} = 54\,g$

$\%\ C_2H_5OH = \frac{46}{46+54} \times 100 = 46\%.$

58. (C)

Moles of Na = 2 x 4 = 8

$\therefore$ No. of Na – atom = 8 N_A

59. (B)

$2Al + 6HCl \rightarrow 2Al^{3+} + 6Cl^- + 3H_2$

2mole 6mole 3mole

3×22.4

67.2L

1 mole Al = 33.6 L H_2 (NTP only)

1 mole HCl = 11.2 L H_2 (NTP)

60. (C)

Let mass of oxygen = 1 g, then mass of nitrogen = 4 g

Mol. wt. of N_2 = 28 g, Mol. wt. of O_2 = 32 g

28 g of N_2 = 6.02×10^{23} molecules of nitrogen

$4\,g\,\text{of}\,N_2 = \frac{6.02 \times 10^{23}}{28} \times 4$ molecules of nitrogen and 1 g $O_2 = \frac{6.02\times10^{23}}{32}\times1=\frac{6.02\times10^{23}}{32}$ molecules of oxygen

Thus, ratio of molecules of oxygen : nitrogen

$$=\frac{6.02\times10^{23}/32}{6.02\times10^{23}/7}=7:32$$

MATHEMATICS

61. (B)

$$a=\log_{10}2=\log_{10}\frac{10}{5}=1-\log_{10}5$$

$$\Rightarrow \log_{10}5=1-a$$

62. (D)

$$\left|\frac{1-x^2}{x}\right|+|x|=\left|\frac{1-x^2}{x}+x\right|=\left|\frac{1}{x}\right|$$

$$\Rightarrow \frac{1-x^2}{x}.\ x\ge0 \Rightarrow x\in[-1,1]-\{0\}$$

63. (A)

$$\frac{a}{r}+a+ar=21 \text{ and } \frac{a^2}{r^2}+a^2+a^2r^2=189$$

$$\Rightarrow a=6,\ r=2 \text{ or } \frac{1}{2}$$

$\therefore$ G.P. is 3, 6, 12, ...

64. (C)

We have first term A = a ....(i)

Second term A + d = b ....(ii)

and last term $l=2a$ ....(iii)

From (i), (ii) and (iii), $d=(b-a)$ and $n=\frac{b}{b-a}$

Then sum

$$S=\frac{n}{2}[a+l]=\frac{b}{2(b-a)}[a+2a]=\frac{3ab}{2(b-a)}.$$

Trick : Let $a=2, b=3$ then the sum $=9$ which is given by option (c).

65. (C)

Let $S_{Even} = 2+4+6+8+..........\infty$ ....(i)

and $S_{Odd} = 1+3+5+7+9+......\infty$ .....(ii)

Sum $S_E = \frac{n}{2}[4+(n-1)2] = \frac{n}{2}[2n+2] = \frac{n}{2}2(n+1)$

and $S_O = \frac{n}{2}[2+(n-1)2] = \frac{n}{2}(2n)$

Now $\frac{S_E}{S_O} = \frac{(n+1)}{n}$ or $S_E : S_O = (n+1):n.$

66. (B)

$\cos 10° + \cos 170° = \cos 20° + \cos 160° = \cos 30° + \cos 150° = ... = \cos 80° + \cos 100° = 0$

$\cos 90° = 0$

$\cos 180° = -1$

$\therefore$ over all sum = –1

67. (B)

$\sin^4 x + \cos^4 x = (\sin^2 x + \cos^2 x)^2 - 2\sin^2 x \cos^2 x$

$= 1 - \frac{1}{2}\sin^2 2x$

Mininimum value is 1/2 at x = $\pi/4$

68. (A)

$$\frac{\cos 15° + \cos 45° + \cos 75°}{\sin 15° + \sin 45° + \sin 75°} = \frac{\cos 15° + \cos 45° + \sin 15°}{\sin 15° + \sin 45° + \cos 15°} = 1$$

69. (A)

70. (C)

71. (B)

72. (C)

73. (A)

74. (B)

$\log_{1/2}(x^2 - 6x + 12) \geq -2$ .....(i)

For log to be defined, $x^2 - 6x + 12 > 0$

$\Rightarrow (x-3)^2 + 3 > 0,$ which is true $\forall x \in R.$

From (i), $x^2 - 6x + 12 \le \left(\frac{1}{2}\right)^{-2}$

$\Rightarrow x^2 - 6x + 12 \le 4 \Rightarrow x^2 - 6x + 8 \le 0$

$\Rightarrow (x-2)(x-4) \le 0 \qquad \Rightarrow 2 \le x \le 4; \therefore x \in [2,4].$

75. (A)

$\sqrt{2+\sqrt{2+\sqrt{2+2\cos 8\theta}}}$

$= \sqrt{2+\sqrt{2+\sqrt{4\cos^2 4\theta}}} \qquad \left[\because 1+\cos 8\theta = 2\cos^2\frac{8\theta}{2}\right]$

$= \sqrt{2+\sqrt{2+2\cos 4\theta}}$

$= \sqrt{2+\sqrt{2(1+\cos 4\theta)}}$

$= \sqrt{2+\sqrt{2(2\cos^2 2\theta)}} \qquad [\because 1+\cos 4\theta = 2\cos^2 2\theta]$

$= \sqrt{2+2\cos 2\theta} = \sqrt{2(1+\cos 2\theta)} = \sqrt{2(2\cos^2\theta)}$ = 2 $\cos\theta$

76. (A)

Maximum value of 2sinx + 4cosx = $2\sqrt{5}$.

Hence the maximum value of 2sinx + 4cosx + 3 is $2\sqrt{5}$ + 3.

Hence (a) is the correct answer.

77. (A)

$= 2\cos^4\frac{\pi}{8} + 2\cos^4\frac{3\pi}{8}$

$\frac{1}{2}\left\{\left(1+\cos\frac{\pi}{4}\right)^2 + \left(1+\cos\frac{3\pi}{4}\right)^2\right\}$

$= \frac{1}{2}\left\{\left(1+\frac{1}{\sqrt{2}}\right)^2 + \left(1-\frac{1}{\sqrt{2}}\right)^2\right\} \quad = \frac{3}{2}$

78. (D)

$\log_{16} x + \log_4 x + \log_2 x = 14$

$$\log_{2^4} x+\log_{2^2} x+\log_2 x=14 \Rightarrow \frac{1}{4}\log_2 x+\frac{1}{2}\log_2 x+\log_2 x=14$$

$$\Rightarrow \log_2 x\left(\frac{1}{4}+\frac{1}{2}+1\right)=14 \Rightarrow \frac{7}{4}\log_2 x=14 \Rightarrow \log_2 x=\frac{14\times 4}{7}=8$$

$$\Rightarrow \log_2 x = 8\log_2 2 \Rightarrow x=2^8$$

79. (C)

$3^x-8=3^{2-x}$ and $3^x-8>0$

Let $3^x=y(y>0)$

$$\Rightarrow y-8=\frac{9}{y}$$

$$\Rightarrow y^2-8y=9$$

$y = 9,\ y = -1$

$x = 2$

80. (B)

use $x^2-5x+7<1$ and $x^2-5x+7>0$

81. (A)

$$\cot(\alpha-\beta)=\frac{\tan\alpha.\tan\beta+1}{\tan\alpha-\tan\beta}=\frac{\frac{x}{y}+1}{x}=\frac{x+y}{xy}$$

82. (C)

$\because \tan\frac{P}{2}$ and $\tan\frac{Q}{2}$ are the roots of equation $ax^2+bx+c=0$

$\because \tan\frac{P}{2}+\tan\frac{Q}{2}=-\frac{b}{a}$ and $\tan\frac{P}{2}\tan\frac{Q}{2}=\frac{c}{a}$

$$\frac{P}{2}+\frac{Q}{2}+\frac{R}{2}=\frac{\pi}{2} \qquad (\because P+Q+R=\pi)$$

$$\Rightarrow \frac{P+Q}{2}=\frac{\pi}{2}-\frac{R}{2}$$

$$\Rightarrow \frac{P+Q}{2}=\frac{\pi}{4} \qquad (\because \angle R=\frac{\pi}{2})$$

$\Rightarrow \tan\left(\frac{P+Q}{2}\right) = 1 \qquad \Rightarrow \frac{\tan\frac{P}{2}+\tan\frac{Q}{2}}{1-\tan\frac{P}{2}.\tan\frac{Q}{2}} = 1$

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

83. (A)

Use $\tan\theta\tan(60-\theta)\tan(60+\theta) = \tan 3\theta$

84. (D)

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

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

85. (D)

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

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

86. (B)

$\tan 2B = \tan((A+B)-(A-B)) = \frac{p-q}{1+pq}$

87. (A)

cosec 10 – 4 sin 70

$= \frac{1}{\sin 10} - 4\sin 70$

$= \frac{1-4\sin 70\sin 10}{\sin 10} = \frac{1-2(\cos(60)-\cos(80))}{\sin 10}$

$= \frac{1-2\left(\frac{1}{2}-\cos(80)\right)}{\sin 10}$

$= \frac{1-1+2\cos(80)}{\sin 10} = 2\frac{\cos(80)}{\sin 10} = 2$

88. (B)

$$\frac{(\cos 6x+\cos 4x)+5(\cos 4x+\cos 2x)+10(1+\cos 2x)}{\cos 5x+5\cos 3x+10\cos x}=2\cos x$$

89. (B)

We know that

$\sin\alpha + \sin(\alpha + \beta) + \sin(\alpha + 2\beta) + ... + \sin\{\alpha + (n-1)\beta\}$

$$=\frac{\sin\left\{\alpha+(n-1)\frac{\beta}{2}\right\}\sin\left(\frac{n\beta}{2}\right)}{\sin\frac{\beta}{2}}$$

$\therefore\quad \sin\frac{\pi}{n}+\sin\frac{3\pi}{n}+\sin\frac{5\pi}{n}+...\text{to } n$ terms

$$=\frac{\sin\left\{\frac{\pi}{n}+(n-1)\frac{\pi}{n}\right\}\sin\left(\frac{n\pi}{n}\right)}{\sin\frac{\pi}{n}}\qquad\left[\text{Here, } \alpha=\frac{\pi}{n}\text{ and }\beta=\frac{2\pi}{n}\right]$$

$$=\frac{\sin\pi\sin\pi}{\sin\frac{\pi}{n}}=0$$

90. (A)

$3 < |x-1| < 5$

$\Rightarrow\quad x \in (-4, -2) \cup (4, 6)$