Monthly Progressive Test

Class: XI

Subject: PCMB

Solution

Physics

1. Ⓓ

like [velocity] = LT^{-1}, [Force] = MLT^{-2}

2. Ⓐ

$[z]=[x]\frac{L}{T^2}$

and [x] = [y][w], put dimensional formula of y, then we get dimensional formula of w.

3. Ⓐ

as (P – Q) is invalid

4. Ⓓ

force = 2y. $\left(\frac{R}{x^2}\right)$; since $\frac{10R}{x^2}$ is acceleration, 2y is mass.

Mass $=\frac{2y}{10}=\frac{y}{5}=\frac{10}{5}=2kg$

5. Ⓐ

as refractive index is dimensionless quantity

6. Ⓐ

equations of Kinematics are independent of mass

7. Ⓒ

$\frac{h'}{h}=\frac{t^2}{100}\Rightarrow h'=\frac{h}{4}, h-h'=\frac{3h}{4}$ from ground

8. Ⓑ

$$v = \frac{dx}{dt} = -\left(\frac{4}{3}\right)^t + 16 = 0 \Rightarrow t = 12s$$

9. Ⓑ

$$s = at + bt^2 \Rightarrow \frac{ds}{dt} = v = a + 2bt, \text{ again } a = \frac{dv}{dt} = 2b$$

10. Ⓐ

use average velocity $= \left[\frac{(u+v)}{2}\right]$

11. Ⓓ

$$v = \alpha t_1 = \beta t_2 \Rightarrow t = t_1 + t_2 = \frac{v(\alpha+\beta)}{\alpha\beta} \Rightarrow v = \frac{\alpha\beta t}{\alpha+\beta}$$

12. Ⓐ

magnitude of velocity remains same at same level

13. Ⓓ

s = area of graph

$$= \left(\frac{1}{2}\right) \times 2 \times 3 - \left(\frac{1}{2}\right)(1)(2) + (1)(1) = 3m$$

14. Ⓐ

apply formula $s = u + \frac{1}{2}a(2n-1)$ with $u = 0$

we get $\frac{10-1}{8-1} = \frac{9}{7}$

15. Ⓓ

as they fall down with same amount from top

16. Ⓒ

alternate angle

17. Ⓓ

$$s = \left[\frac{(0+10)}{2}\right] \times 5 = 25\,m$$

18. Ⓒ

$$s = \left(\frac{1}{2}\right)a.t^2 = \left(\frac{1}{2}\right)(3)(2)^2 = 6\,m \text{ as } u = 0 \text{ m/s}$$

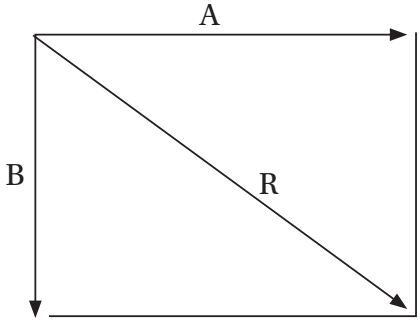
19. Ⓑ

$$\text{average velocity} = \frac{2x}{\frac{x}{u}+\frac{x}{v}} = \frac{2uv}{u+v}$$

20. Ⓐ

$R^2 = P^2 + P^2 + 2P^2 \cos 120° \Rightarrow R = P$

21. Ⓓ



22. Ⓒ

$|\hat{A}| = 1$

23. Ⓐ

$$\text{unit vector} = \frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{1+1+1}} = \frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$$

24. Ⓑ

$A - B = \hat{i} + \hat{j} - \hat{i} + \hat{j} = 2\hat{j} \quad |A - B| = 2 \text{ unit}$

25. Ⓐ

$V_{wg} = 4\hat{i}\ m/s; V_{rw} = -3\hat{j}\ m/s$

Apply, $V_{rw} = V_{rg} - V_{wg}$

Chemistry

26. Ⓓ

$2H_2 + O_2 \rightarrow 2H_2O$

4g 32g $2 \times 18 = 36$g

Given 10g 64g ?

(L.R)

$32\text{g } O_2 \equiv 36 \text{ g } H_2O$

$$64\text{g } O_2 \equiv \frac{36\times64}{32}\text{ g } H_2O$$
$$\equiv 72\text{g } H_2O$$
$$\equiv \frac{72}{18}\text{ g moles water}$$
$$\equiv 4 \text{ moles water}$$

27. Ⓑ

1 mole of $Mg_3(PO_4)_2 = Mg_3P_2O_8$

$\therefore$ 1 mole magnesium phosphate = 8 moles of oxygen atom.

$\therefore$ 8 moles oxygen atom = 1 mole magnesium phosphate

$$0.25 \text{ moles oxygen atom} = \frac{1\times0.25}{8} = 0.03125 \text{ mole magnesium phosphate}$$
$$= 3.125\times10^{-2} \text{ mole magnesium phosphate}$$

28. Ⓑ

Mixture of $(CO + CO_2) + I_2O_5 \rightarrow CO_2 + I_2$

$5CO + I_2O_5 \rightarrow 5CO_2 + I_2\uparrow$

$5(12+16)g \qquad 2\times127 = 254g$

$= 140g$

$\therefore$ $254gI_2 = 140g$ CO

$$2.54gI_2 = \frac{140\times2.54}{254}\text{ g} = 1.40\text{g}$$

$\therefore$ Mass of $CO_2 = 2 - 1.40 = 0.6g$

$\therefore$ Mass % of $CO_2 = \frac{0.6}{2g}\times10\% = 30\%$

29. Ⓑ

Element	%	At. Wt.	R.A.M	Simplest Ratio
C	10.06	12	$\frac{10.06}{12} = 0.83$	$\frac{0.83}{0.83} = 1$
H	0.84	1	$\frac{0.84}{1} = 0.84$	$\frac{.84}{.83} = 1.01 \approx 1$
Cl	89.10	35.5	$\frac{89.10}{35.5} = 2.5$	$\frac{2.5}{0.83} = 3$

$\therefore$ Empirical formula = $CHCl_3$

30. Ⓑ

In oxides sulphur

S = 50% $\quad \therefore$ oxygen (O) = 100 – 50 = 50%

Element	%	At. Wt.	R.A.M	Simplest Ratio
S	50	32	$\frac{50}{32}=1.56$	$\frac{1.56}{1.56}=1$
O	50	16	$\frac{50}{16}=3.12$	$\frac{3.125}{1.56}=2$

$\therefore$ Empirical formula = SO_2

31. Ⓓ

$8gO_2=\frac{8}{32}\text{moles}=\frac{1}{4}\times\text{No molecules}$

$7gCO=\frac{7}{28}\text{moles}=\frac{1}{4}\times\text{No molecules}$

$11gCO_2=\frac{11}{44}\text{mole}=\frac{1}{4}\times\text{No molecules}$

$7\text{g of } N_2=\frac{7}{28}\text{moles}=\frac{1}{4}\times\text{No molecules (No = Avogadro number)}$

32. Ⓓ

$90\%\text{ of }10g=\frac{90}{100}\times10g=9g\text{ pure }CaCO_3$

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

100g $\qquad$ 22.4 litre

$\therefore$ 100g $CaCO_3$ = 22.4 lt. CO_2 at S.T.P

$\therefore$ 9 g ,, $= \frac{22.4\times9}{100}\text{L }CO_2=2.016\text{ L }CO_2$

33. Ⓑ

$2H_3PO_4 + 3Mg(OH)_2 \rightarrow Mg_3(PO_4)_2 + 6H_2O$

$2(3+31+64) \qquad 3(24+2\times17)$

$=2\times98g \qquad =3\times58g$

$\therefore$ 3 × 58 g $Mg(OH)_2$ = 2 × 98 g H_3PO_4

$\therefore$ 100g $Mg(OH)_2 = \frac{2\times98\times100}{3\times58}$ gH_3O_4

$= 112.64$g H_3PO_4

$\therefore$ 112g H_3PO_4

34. Ⓑ

Molarity depends on temperature as it depends on volume.

Mole fraction, Molarity do not change with temperature as they depend on mass.

35. Ⓐ

At S.T.P. = 22.4L $N_2 = 6.023 \times 10^{23}$ molecules N_2

$1.12\,L\,N_2 = \frac{6.023\times10^{23}\times1.12}{22.4}$ molecules $N_2 = 3.01 \times 10^{22}$

36. Ⓒ

$ZnO = 65 + 16 = 81; \%\text{ of } 0 = \frac{16}{81}\times100\% = 19.7\%$

$Na_2O = 46 + 16 = 62; \%\text{ of } 0 = \frac{16}{82}\times100 = 25.8$

$MgO = 24 + 16 = 40; \%\text{ of } 0 = \frac{\cancel{16}}{\cancel{40}}\times100 = 40\%$

$N_2O = 28 + 16 = 4\%; \text{of } 0 = \frac{16}{44}\times100 = 36\%$

37. Ⓑ

$H_2SO_4 = 2 + 32 + 4 \times 16 = 98$

$\%\text{ of '0'} = \frac{64}{98}\times100 = 65.3\%$

38. Ⓓ

$V_1M_1 + V_2M_2 = (V_1 + V_2)\,M_3$

or $200 \times 1 + 300 \times 0.2 = 500 \times x$

or $x = 0.52$

39. Ⓑ

$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$

100 $\quad$ 2×36

Given : 40g $\quad$ 25g (L.R)

$100gCaCO_3 = 2 \times 36$ g HCl

$$40\text{g } CaCO_3 = \frac{2\times36\times40}{100} \text{ of HCl}$$
$$= 28.8\text{ g HCl (Need)}$$

But given 25g. So, HCl is Limiting Regret.

Again, 2×36 g HCl = 100g $CaCO_3$

$$25\text{g HCl} = \frac{100\times25}{2\times36} \text{ of } CaCO_3$$
$$= 34.72\text{ g } CaCO_3 \text{ (Need)}$$

But, $CaCO_3$ Present 40g. So, $CaCO_3$ is in excess

40. Ⓑ

$$2KClO_3 \xrightarrow{\Delta} 2KCl + 3O_2\uparrow$$
$$2[39+35.5+48] \qquad 2[39+35.5]$$
$$=2\times122.5 \qquad =2\times74.5$$
$$=245\text{ g} \qquad =149\text{ g}$$

245g $KClO_3$ = 149g KCl	245g $KClO_3$ = $3 \times 22.4LO_2$
$\therefore\ 1.22\text{g} = \frac{149\times1.22}{245}$	$1.22\text{g} = \frac{3\times22.4}{245}\times1.22$
= 0.74g	= $0.335LO_2$

41. Ⓒ

28g N_2 produces (2×17)g of NH_3

$\therefore$ 5.6g N_2 produces $\frac{2\times17\times5.6}{28} = 6.8$ g of NH_3

42. Ⓑ

Molecular weight of $CaCO_3$ = 40 + 12 + 48 = 100

100g $CaCO_3 = 6.02 \times 10^{23}$ $CaCO_3$ molecule

1g ,, $= \left[\frac{6.02\times10^{23}}{100}\right] = 6.02\times10^{21}$ molecules

43. Ⓒ

One $CaCO_3$ molecule contains 5 atoms and molecular weight of $CaCO_3$ = 40 + 12 + 48 = 100

100g $CaCO_3$ contain $(5 \times 6.02 \times 10^{23})$ atoms

20g $CaCO_3$ contain $\left(\frac{5\times6.02\times10^{23}}{100}\times20\right)$ atom

$= 6.02 \times 10^{23}$ atom

44. Ⓓ

For oxygen $= \frac{3.01\times10^{22}}{6.02\times10^{23}} = \frac{1}{20} = 0.05$ moles

For hydrogen $= \frac{560}{22400} = \frac{1}{20} = 0.025$ moles

So, total number of moles = (0.05 + 0.025) = 0.075 moles

45. Ⓑ

$0.355\,g\,Cl_2 = \frac{0.355}{71} = 0.005$ mole Cl_2

$1.204 \times 10^{23} O_2$ molecules $= \frac{1.204\times10^{23}}{6.02\times10^{23}} = 0.2$ mole of O_2

$0.112L\,N_2$ at STP $= \frac{0.112}{22.4} = 0.005$ mole N_2

46. Ⓐ

N_2	+	$3H_2$	⟶	$2NH_3$
28 g		3×2		2×17
		$= 6$ g		$= 34$ g

Given : 2g 2g

(L.R)

$6gH_2 = 28g\,N_2$ So, $2gH_2 = \frac{28\times2}{6} g\,N_2$ $= 9.33g\,N_2$ (required) L.R.	$28g\,N_2 = 6g\,H_2$ $\therefore 2g\,N_2 = \frac{6\times2}{28} g\,H_2$ $= 0.42g\,H_2$ (Need)

So, H_2 is excess

47. Ⓓ

$4NH_3$	+	$5O_2$	⟶	$4NO$	+	$6H_2O$
4×17		5×32		$4(14+16)$		
$= 68$ g		$= 160$ g		$= 4\times30$		
				$= 120$ g		

Given : 1.7g 4g

(L.R)

68g NH_3 = 160g O_2

So, 1.7g $NH_3 = \frac{160 \times 1.7}{68}$ g O_2

= 4g O_2 (Need)

160g O_2 = 68g NH_3

$\therefore$ 4g $O_2 = \frac{68 \times 4}{160}$ g $NH_3 = 1.7$g NH_3 (Need)

So, NH_3 is the limiting reagent

68g NH_3 = 120g NO

1.7 g $NH_3 = \frac{120 \times 1.7}{68}$ g NO = 3g NO

48. Ⓑ

200 ml 0.2 (N) NaOH = (2.00 – 25) × x (N)

$\Rightarrow x = \frac{200 \times 0.2}{175}$ (N)

$\Rightarrow$ x = 0.22g

49. Ⓐ

Molarity $(M') = \frac{w \times 6000}{m \times V(c.c)}$

$= \frac{0.3 \times 1000}{60 \times 500} = 0.01$ (M)

Let, the final concentration be x ; (n factor of urea =1)

Acc problem,

500 × 0.01 = 1250x

$\Rightarrow x = \frac{500 \times 0.01}{1250} = 0.004$ (M)

50. Ⓒ

Na_2CO_3	+	2HCl	→	2NaCl	+	CO_2 + H_2O
46 + 12 + 48 = 106 g						22.42 at STP; 6.02×10^{23} molecules of water

Given : 0.53g

$106\text{g } Na_2CO_3 = 22.4\text{L}CO_2$ at STP

$0.53\text{ g } Na_2CO_3 = \frac{22.4\times 0.53}{106}\text{L} = 0.112\text{L } CO_2$

Again, $106\text{g } Na_3CO_3 = 6.023 \times 10^{23}$ molecules H_2O

$0.53\text{ g } Na_2CO_3 = \frac{6.023\times 10^{23}}{106}\times 0.53$

$= 0.0301 \times 10^{23}$ molecule of H_2O

$= 3.01 \times 10^{21}$ molecule of H_2O

Mathematics

51. ©

Given $\frac{x}{\cos\theta} = \frac{y}{\cos\left(\theta+\frac{2\pi}{3}\right)} = \frac{z}{\cos\left(\theta-\frac{2\pi}{3}\right)} = \lambda$ (say)

$$\Rightarrow x+y+z = \lambda\left\{\cos\theta+\cos\left(\theta+\frac{2\pi}{3}\right)+\cos\left(\theta-\frac{2\pi}{3}\right)\right\} = \lambda\left\{\cos\theta+2\cos\theta\cos\frac{2\pi}{3}\right\} = 0$$

52. Ⓓ

Given $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3 \Rightarrow \sin\theta_1 = \sin\theta_2 = \sin\theta_3 = 1$

($\because$ maximum value of $\sin x$ is 1, therefore, given statement is possible only when each term on L.H.S. is equal to 1)

$\Rightarrow \cos\theta_1 = \cos\theta_2 = \cos\theta_3 = 0$ ($\because \cos^2 x = 1 - \sin^2 x \ \forall\ x$)

$\Rightarrow \cos\theta_1 = \cos\theta_2 = \cos\theta_3 = 0$

53. ©

Let $\sin A + \sin B = a$ ... (1)

and $\cos A + \cos B = b$ ... (2)

$\cos 2A + \cos 2B + 2\cos(A+B) = b^2 - a^2$.

So, $2\cos(A+B)\cos(A-B) + 2\cos(A+B) = b^2 - a^2$.

or $\cos(A+B)\{2\cos(A-B)+2\} = b^2 - a^2$ .. (3)

$2 + 2\cos(A-B) = a^2 + b^2$ ... [Use this in (3)]

$\cos(A+B)(a^2+b^2) = (b^2 - a^2)$.

or $\cos(A+B) = (b^2 - a^2)/(a^2 + b^2)$

54. Ⓑ

$$3\left[\sin^4\left(\frac{3\pi}{2}-\alpha\right)+\sin^4(3\pi+\alpha)\right]-2\left[\sin^6\left(\frac{\pi}{2}+\alpha\right)+\sin^6(5\pi-\alpha)\right]$$

$$=3[\cos^4\alpha+\sin^4\alpha]-2[\cos^6\alpha+\sin^6\alpha]$$

$$=3\left[\left(\cos^2\alpha+\sin^2\alpha\right)^2-2\cos^2\alpha\sin^2\alpha\right]$$

$$-2\left[\left(\cos^2\alpha+\sin^2\alpha\right)^3-3\cos^2\alpha\sin^2\alpha(\cos^2\alpha+\sin^2\alpha)\right]$$

$$=3[1-2\cos^2\alpha\sin^2\alpha]-2[1-3\cos^2\alpha\sin^2\alpha]$$

$$=3-6\cancel{\cos^2\alpha\sin^2\alpha}-2+6\cancel{\cos^2\alpha\sin^2\alpha}$$

$$=1$$

55. Ⓒ

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

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

$$=3(1-4\sin x\cos x+4\sin^2 x\cos^2 x)+6+12\sin x\cos x+4-12\sin^2 x\cos^2 x$$

$$=3-12\cancel{\sin x\cos x}+12\cancel{\sin^2 x\cos^2 x}+6+12\cancel{\sin x\cos x}+4-12\cancel{\sin^2 x\cos^2 x}$$

$$=13$$

56. Ⓒ

$$A-B=\frac{\pi}{4}\Rightarrow\tan(A-B)=\tan\frac{\pi}{4}$$

$$\Rightarrow\ \frac{\tan A-\tan B}{1+\tan A\tan B}$$

$$\Rightarrow\ \tan A-\tan B-\tan A\tan B=1$$

$$\Rightarrow\ \tan A-\tan B-\tan A\tan B+1=2$$

$$\Rightarrow\ (1+\tan A)(1-\tan B)=2\ \Rightarrow\ y=2$$

Hence, $(y+1)^{y+1}=(2+1)^{2+1}=(3)^3=27$

57. Ⓒ

We have $\sin x+\sin^2 x=1$

$\Rightarrow\ \sin x=1-\sin^2 x\Rightarrow\sin x=\cos^2 x$

Now $\cos^{12}x + 3\cos^{10}x + 3\cos^{8}x + \cos^{6}x - 2 = \sin^{6}x + 3\sin^{5}x + 3\sin^{4}x + \sin^{3}x - 2$

$= (\sin^{2}x)^{3} + 3(\sin^{2}x)^{2}\sin x + 3(\sin^{2}x)(\sin x)^{2} + (\sin x)^{3} - 2 = (\sin^{2}x + \sin x)^{3} - 2$

$= (1)^{3} - 2 = -1$

58. ©

$$\sin^2\frac{\pi}{6} + \cos^2\frac{\pi}{4} - \sec\frac{\pi}{3}$$

$$= \left(\frac{1}{2}\right)^2 + \frac{1}{2} - 2 = \frac{1}{4} + \frac{1}{2} - 2 = \frac{1+2-8}{4} = \frac{-5}{4}$$

59. Ⓑ

$$\frac{1}{\sec\alpha - \tan\alpha} + \frac{1}{\sec\alpha + \tan\alpha}$$

$$= \frac{\sec\alpha + \cancel{\tan\alpha} + \sec\alpha - \cancel{\tan\alpha}}{\sec^2\alpha - \tan^2\alpha} = 2\sec\alpha$$

60. Ⓐ

$(a\cos\theta + b\sin\theta)^2 + (a\sin\theta - b\cos\theta)^2 = 9 + 16$

$\Rightarrow\ a^2 + b^2 = 25$

61. ©

$$\operatorname{cosec}A + \cot A = \frac{11}{2}$$

$$\Rightarrow\ \operatorname{cosec}A - \cot A = \frac{2}{11}$$

$$\therefore\ 2\cot A = \frac{11}{2} - \frac{2}{11} = \frac{121-4}{22} = \frac{117}{22}$$

$$\cot A = \frac{117}{44} \Rightarrow \tan A = \frac{44}{117}$$

62. Ⓑ

$\tan\alpha + \cot\alpha = a$

$\Rightarrow\ \tan^2\alpha + \cot^2\alpha = a^2 - 2$

$\Rightarrow\ \tan^4\alpha + \cot^4\alpha + 2 = a^4 - 4a^2 + 4$

$\Rightarrow\ \tan^4\alpha + \cot^4\alpha = a^4 - 4a^2 + 2$

63. Ⓓ

$\cos A = -\frac{5}{13}$ and A is not in 3rd quadrant.

$\therefore$ A is in 2nd quadrant.

$\therefore \sin A = \frac{12}{13}, \quad \tan A = -\frac{12}{5}$

$\therefore \sin A - \tan A = \frac{12}{13} + \frac{12}{5} = \frac{60+156}{65} = \frac{216}{65}$

64. Ⓐ

$\cos(540° - \theta) - \sin(630° - \theta)$

$= \cos(3 \times 180° - \theta) - \sin(7 \times 90° - \theta)$

$= -\cos\theta + \cos\theta = 0$

65. Ⓓ

$\frac{\sin13°\cos47° + \cos13°\sin47°}{\cos72°\cos12° + \sin72°\sin12°}$

$= \frac{\sin(13° + 47°)}{\cos(72° - 12°)} = \frac{\sin60°}{\cos60°} = \tan60° = \sqrt{3}$

66. Ⓑ

$\alpha + \beta = K + 6, \alpha\beta = 2(2K - 1)$

$\alpha + \beta = \frac{1}{2}\alpha\beta$

$\Rightarrow K + 6 = 2K - 1$

$\Rightarrow K = 7$

67. Ⓐ

One root $= 3 + 2\sqrt{3}$

$\therefore$ other root $= 3 - 2\sqrt{3}$

$\therefore$ The quadratic equation is $x^2 - 6x - 3 = 0$

68. Ⓑ

$n(A \times B) = n(A) \times n(B)$

$\Rightarrow 45 = n(A) \times n(B)$

$\therefore$ $n(A)$ cannot be 17

69. Ⓒ

$R : A \to B \quad \therefore R \subseteq A \times B$

70. Ⓒ

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

$f\left(\frac{1}{x}\right)=\frac{1}{x^3}-x^3$

$\therefore\ f(x)+f\left(\frac{1}{x}\right)=0$

71. Ⓑ

$$=\frac{1}{\sin 1^\circ}[(\tan 1^\circ-\tan 0^\circ)+(\tan 2^\circ-\tan 1^\circ)+(\tan 3^\circ-\tan 2^\circ)+(\tan 4^\circ-\tan 3^\circ)$$
$$+\ldots+(\tan 45^\circ-\tan 44^\circ)]$$

$=\frac{1}{\sin 1^\circ}=\frac{1}{x}$

72. Ⓒ

$5\tan\theta=4\Rightarrow\tan\theta=\frac{4}{5}$

Now, $\frac{5\sin\theta-3\cos\theta}{5\sin\theta+2\cos\theta}=\frac{5\frac{\sin\theta}{\cos\theta}-3}{5\frac{\sin\theta}{\cos\theta}+2}=\frac{5\tan\theta-3}{5\tan\theta+2}=\frac{5\times\frac{4}{5}-3}{5\times\frac{4}{5}+2}=\frac{1}{6}$

73. Ⓑ

$\frac{\sin(x+y)}{\sin(x-y)}=\frac{a+b}{a-b}$

$\Rightarrow\ \frac{\sin(x+y)+\sin(x-y)}{\sin(x+y)-\sin(x-y)}=\frac{(a+b)+(a-b)}{(a+b)-(a-b)}$

$\Rightarrow\ \frac{2\sin x\cos y}{2\cos x\sin y}=\frac{2a}{2b}$

$\Rightarrow\ \frac{\tan x}{\tan y}=\frac{a}{b}$

74. Ⓓ

From the given relations, $m+n=2\tan\theta$, $m-n=2\sin\theta$

$\Rightarrow\ m^2-n^2=4\tan\theta\sin\theta$

Also $4\sqrt{mn}=4\sqrt{\tan^2\theta-\sin^2\theta}=4\sin\theta\tan\theta$

$\therefore$ From equations (i) and (ii), we get $m^2-n^2=4\sqrt{mn}$

75. Ⓐ

$\sin x+\operatorname{cosec} x=2$

$\Rightarrow\ (\sin x-1)^2=0\ \Rightarrow\ \sin x=1\ \Rightarrow\ \sin^n x+\operatorname{cosec}^n x=1+1=2$

76. Ⓒ

Metatheria

77. Ⓑ

Tiny pebbles eaten by some birds are used in crushing

Makes up for the lack of teeth

78. Ⓑ

Ophiology

79. Ⓑ

Balanoglossus

80. Ⓓ

Whale-Ammonotelic

81. Ⓐ

Archaeopteryx

82. Ⓓ

Bat

83. Ⓓ

Subphylum *Urochordata*

84. Ⓒ

Ingestion

85. Ⓐ

Male *Hippocampus*

86. Ⓑ

Paedogenesis

87. Ⓓ

Birds

To meet the high demand for oxygen during flight

88. Ⓑ

Nutrition

89. Ⓐ

Incisors

90. Ⓓ

Retina of owls contain only rods

Bats have no cones in their retina as they are nocturnal.

Rods are concerned with dim light or night vision

91. Ⓐ

Gingko

It continues to live with its ancient features that have shown no change over millions of years

92. Ⓐ

Pteridophytes

Only cryptogams to have xylem and phloem for transport of substances

93. Ⓒ

Generic name and specific epithet

94. Ⓒ

Basidiomycetes

95. Ⓒ

Echinoderms

96. Ⓒ

They are all tetrapods

Have two pairs of limbs (modified as per the habitat)

97. Ⓓ

To make the body light

Adaptive feature to facilitate flight

98. Ⓓ

Dry and cornified skin

99. Ⓓ

III & IV

100. Ⓑ

A-Post anal tail; B-Notochord; C- Dorsal nerve chord; D – Pharyngeal gill slits

Basic features of embryos of all chordates