Monthly Progressive Test (Solution)

Class: XI

Subject: PCMB

Academic Excellence Programme TECHNO ACE

Test Booklet No.: MPT010 **Test Date:** 10/02/2025

Physics

1. Ⓓ

$v = \sqrt{\frac{\gamma p}{D}} \Rightarrow \frac{V_{air}}{V_H} = \sqrt{\frac{d_h}{d_{air}}} \cong \sqrt{\frac{1}{16}}$ (nearly)

$V_H = 4\ Vair$

$= 4 \times 332 = 1328$ m/s

[Molar mass of air $= 28 \times 0.8 + 32 \times 0.2$

$= 22.4 + 6.4 = 28.8 \cong 29$, here it is taken 32 unit for approximate calculation.]

2. Ⓑ

$v = \sqrt{\frac{\gamma RT}{M}}$

$\therefore \frac{T}{M_H} = \frac{T_{100}}{M_O} \Rightarrow T = (373) \times \frac{1}{16} = 273 + t$

$t = -249.7^\circ$ C

3. Ⓓ

$y_1 = a_1 \cos(\omega t - kx) = a \sin(wt - kx + \pi/2)$

$y_2 = a_2 \sin(wt - kx + \pi/3)$

$\therefore$ phase difference $= \frac{\pi}{2} - \frac{\pi}{3} = \frac{\pi}{6}$

4. Ⓒ

$\sqrt{\frac{\gamma R(273+t)}{M_O}} = \sqrt{\frac{\gamma R(273+14)}{M_N}}$

$273 + t = 287 \times \frac{16}{14}$

$t = 55^\circ$ C

5. Ⓓ

$n = \frac{v}{2l} = \frac{350}{2 \times 0.5} = 350$ Hz.

$n' = \frac{v}{4l} = 175$ Hz.

6. Ⓓ

H_1 = heat required 5g ice to melt $= 5 \times 80 = 400$ calorie.

H_2 = heat given out by water from 40° C to 0° C water $= (20)(1)(40) = 800$ Calorie.

$\therefore\ 400 + (5)(1) \times (t - 0) = (20)(1)(40 - t)$

$\Rightarrow 400 + 5t = 800 - 20\ t.$

$\Rightarrow 25\,t = 400$

$t = 16^\circ C.$

7. ©

$$\cup = f\frac{RT}{2} = (1)C_\nu(T)$$

$$\Rightarrow f\frac{R}{2} = \frac{R}{\gamma - 1}$$

$$\Rightarrow \gamma - 1 = \frac{2}{f}$$

$$\Rightarrow \gamma = 1 + \frac{2}{f} \Rightarrow (C).$$

8. Ⓑ

$C_P - C_V = R \quad \Rightarrow {}^{\gamma}C_v - C_v = R$

$$\Rightarrow C_v = \frac{R}{(\gamma - 1)}$$

9. ©

$$\frac{n_1 + n_2}{\gamma - 1} = \frac{n_1}{\gamma_1 - 1} + \frac{n_2}{\gamma_2 - 1}$$

$$\Rightarrow \frac{2}{\gamma - 1} = \frac{1}{\left(\frac{7}{5}\right) - 1} + \frac{1}{\left(\frac{5}{3}\right) - 1}$$

$$\Rightarrow \frac{2}{\gamma - 1} = \frac{5}{2} + \frac{3}{2} = 4$$

$$\Rightarrow \gamma - 1 = \frac{1}{2} \Rightarrow \gamma = \frac{3}{2} = \frac{24}{16}$$

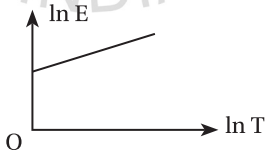
10. Ⓓ

as $C_P - C_V = R$

11. ©

$E = (\in\sigma)T^4$

$\Rightarrow \ln E = \ln(\in\sigma) + 4 \ln T$



12. Ⓐ

Reason statement supports Assertion.

13. ©

$P = A \in \sigma T^4$

$\therefore P \alpha T^4$

Sun is black body ($\therefore \in = 1$)

14. Ⓑ

$$R = \frac{l}{KA} \text{ so } R\,\alpha\,\frac{1}{K}$$

$$\text{as } \frac{Q}{t} = \left(\frac{kA}{l}\right)(\theta_1 - \theta_2) = \frac{\theta_1 - \theta_2}{R}$$

$$R = \frac{(\theta_1 - \theta_2)}{\left(\frac{Q}{t}\right)}$$

15. Ⓑ

$$R = \frac{100}{10} = 10\,\text{ohm} \qquad \frac{\Delta R}{R} = \frac{\Delta V}{V} + \frac{\Delta I}{I}$$

$$\Rightarrow \frac{\Delta R}{10} = \frac{5}{100} + \frac{0.2}{10}$$

$$\Rightarrow \Delta R = 0.7$$

$$\Rightarrow \frac{\Delta R}{R} \times 100 = 7\%$$

16. Ⓑ

$$[I\omega] = ML^2 \frac{1}{T} = ML^2 T^{-1}$$

17. Ⓓ

Zero.

18. Ⓑ

$$h = \frac{1}{2}gt^2 ; h' = \frac{1}{2}g(t-1)^2 \quad \therefore h - h' = \frac{1}{2}g(2t-1)$$

$$\Rightarrow \frac{h}{2} = \frac{g}{2}(2t-1) \quad \Rightarrow \frac{1}{2}gt^2 = \frac{g}{2}(2t-1) \quad \Rightarrow t^2 - 2t + 1 = 0$$

$$\Rightarrow t = 2 \pm \sqrt{2} \quad \therefore t = 3.41\,\text{s}.$$

19. Ⓐ

$$v = k\sqrt{x}$$

$$\Rightarrow \frac{dx}{dt} = k\sqrt{x}$$

$$\Rightarrow \int \frac{dx}{\sqrt{x}} = \int k\,dt \quad \Rightarrow 2\sqrt{x} = kt + c$$

as $t = 0,\ x = 0 \Rightarrow c = 0$

$$\therefore \sqrt{x} = \left(\frac{1}{2}k\right)t$$

$$\nu = k\sqrt{x} = \frac{k^2 t}{2}.$$

20. Ⓐ

given $\frac{dv}{dt} = 3t \quad \Rightarrow \nu = \frac{3t^2}{2}$ (by integrating)

$$\Rightarrow \frac{dx}{dt} = \frac{3t^2}{2} \quad \Rightarrow x = \frac{t^3}{2} + c$$

at $t = 0 \quad \Rightarrow x = 0$

$$\therefore x = \left(\frac{t^3}{2}\right)$$

Now displacement at $t = 2s$ is $x = 4$ m.

21. Ⓑ

Downward $\frac{S}{t_1} = v + u$ ..... (1)

Upward $\frac{S}{t_2} = v - u$ ..... (2)

Adding equation (1) & (2)

$$S\left[\frac{1}{t_1} + \frac{1}{t_2}\right] = 2v$$

or $t = \frac{s}{v} = \frac{2t_1t_2}{t_1 + t_2} = \frac{2\times8\times12}{8+12} = 9.6\,\text{hour}.$

22. Ⓑ

$$\vec{v} = \frac{dx}{dt}\hat{i} + \frac{dy}{dt}\hat{j} = 2at\,\hat{i} + 2bt\hat{j}$$

$$\therefore\ \nu = 2t\sqrt{a^2 + b^2}$$

23. Ⓓ

$a_c = k^2rt^2$

$$\Rightarrow \frac{\nu^2}{r} = k^2rt^2 \ \Rightarrow \nu = krt.$$

$$a_t = \frac{d\nu}{dt} = kr$$

$F_t = m\,a_t = mkr \ \therefore\ P = F\nu = mk^2r^2t$

24. Ⓑ

$$\cup f - \cup i = \frac{-GMm}{nR+R} - \left(\frac{-GMm}{R}\right) = \frac{GMm}{R}\left(1 - \frac{1}{n+1}\right)$$

$$W = \frac{(gR^2)m}{R}\left(\frac{n}{n+1}\right) = \frac{mgRn}{n+1}$$

25. Ⓑ

$$\frac{1}{2}K_A\,A_1^{\,2} = \frac{1}{2}\,K_B\,A_2^{\,2}$$

$$\Rightarrow \frac{A_1}{A_2} = \sqrt{\frac{K_B}{K_A}}$$

Chemistry

26. Ⓑ

In oxides sulphur, S = 50%, So, 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	$\frac{50}{16} = 3.12$	$\frac{3.12}{1.56} = 2$
$\therefore$ Empirical Formula = SO_2				

27. Ⓓ

$4NH_3 + 5O_2 \longrightarrow 4NO + 6H_2O$
$4 \times 17g \quad 5 \times 32g \quad 4\,[14+16] = 4 \times 30g$

$4gO_2 = \frac{4\times17\times4}{5\times32}g\ NH_3 = 1.7g\ NH_3$

So, NH_3 is the limiting reagent.

Now, 1.7g NH_3 produces $\frac{4\times30\times1\cdot7}{4\times17} = 3gNO$

28. Ⓐ

Initial concentration of urea solution = $\left[\frac{0.3\times1000}{60\times500}\right] = 0.01$ (M)

Now, final concentration = $\frac{500\times0.01}{1250} = 0.004$(M)

29. Ⓓ

$2H_2 + O_2 \longrightarrow 2H_2O$
4g 32g $2 \times 18 = 36g$
Gives 10g 64g ?
(L.R.)

$\therefore$ 32g $O_2 \equiv$ 36g H_2O

64g $O_2 \equiv \frac{36\times64}{32}g\ H_2O \equiv 72gH_2O$

$= \frac{72}{78} = 4$ moles water

30. Ⓐ

	n	l
$3s$	3	0
$2p$	2	1

Number of Radial nodes = $n - l - 1$

$\therefore$ For $3s$ orbital = 3 – 0 – 1 = 2

For $2p$,, = 2 – 1 – 1 = 0

31. Ⓑ

Orbital angular momentum = $\sqrt{l(l+1)}\frac{h}{2\pi}$B.M.
For 'S' electron $l = 0$
$\therefore$ orbital angular momentum = 0

32. Ⓓ

$n = 1$
$(4n + 2)\ \pi$e's
$= (4 \times 1 + 2)\ \pi$es
$= 6\pi$ electrons

$n = 0$
$(4 \times 0 + 2)\ \pi$e's
$= 2\pi$ electron

33. ©

$\overset{-2}{O}=\overset{+2}{C}=\overset{0}{C}=\overset{+2}{C}=\overset{-2}{O}$

(Carbon suboxide)

34. ©

F_2O^{+2}; $H_2O_2^{-1}$, H_2O^{-2}, SO_2^{-2}

35. Ⓓ

$\Psi_{4\,2\,0}$ means $4d_z2$

$\downarrow\downarrow\downarrow$

$n\,l\,me$

36. Ⓑ

Molality, $m = \dfrac{X_A \times 100}{X_B \times M_B}$; X_A = mole fraction of solute

X_B = Mole fraction of solute

$= \dfrac{(1-0.95)}{0.95} \times \dfrac{1000}{18}$ $\Big|$ M_B = M.W. of solubes

$= \dfrac{0.05}{0.95} \times \dfrac{1000}{18}$

$= 2.9 \approx 3$

37. Ⓑ

Caro's Acid = H_2SO_5; Let the 0.N of 'S' be x

$$\overset{+1}{H}-\overset{-2}{O}-\overset{x}{\underset{\displaystyle \overset{\uparrow}{O^{-2}}}{\underset{\displaystyle \downarrow}{S}}}-\overset{-1}{O}-\overset{-1}{O}-\overset{+1}{H}$$

O^{-2}

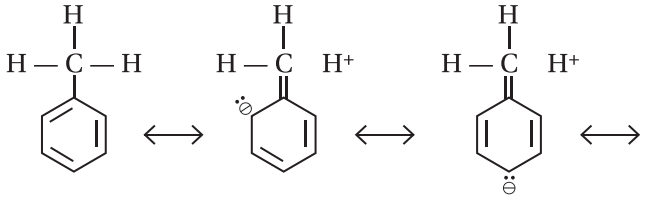
$2(+1) + 3(-2) + 2(-1) + x = 0$

$\Rightarrow 2 - 6 - 2 + x = 0$

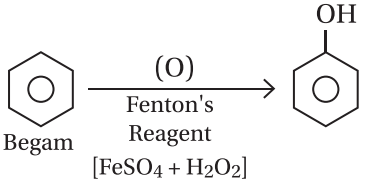
$\Rightarrow x = +6$

38. Ⓓ

Toluene is orthopara directing compound due to hyperconjugation,

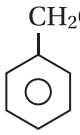


39. ©



[One step conversion]

40. Ⓐ



gives the highest ratio of ortho-para isomers (relatively more ortho) when reacts with $Cl_2/FeCl_3$ because it centain more 'H' attached with carbon, then the others.

41. Ⓑ

$^{19}F_9$; moles of F_2, $n_{F_2} = \frac{w}{m} = \frac{76}{38} = 2$

$\therefore$ 2 mole of F_2 B.E = 180 kcal

1 mole of F_2 B. E = $\frac{180}{2} = 90$ kcal.

42. Ⓒ

V_1 = 10L ; n = 10 mol.

T = 300 k (constant; P = 1 bar).

$\therefore \quad V_2 = \frac{nRT}{P} = \frac{10 \times 0.083 \times 300}{1} = 249L$

$W = P\Delta V = 1\ (249 - 10) = 239L$

43. Ⓓ

$MX_4 \rightleftharpoons M^{4+} + 4X^{\ominus}$

$\quad\quad\quad S \quad\quad 4S$

$K_{sp} = [M^{4+}] \cdot [4X]^4$

$= (s) \quad (4s)^4$

$= 256S'^5$

$\therefore \boxed{S = \left(\frac{K_{Sp}}{256}\right)^{\frac{1}{5}}}$

44. Ⓓ

50 ml 0.1(M) $NH_4OH \equiv$ 5 ml 1(M) NH_4OH

50 ml of 0.05 (M) HCl ≡ 2.5 ml 1(M) HCl

Excess = 2.5 ml 1(M) NH_4OH

Thus, it forms Basic Buffer [$NH_4OH + NH_4Cl$]

$\therefore \quad pOH = pk_b + \log_{10}\frac{[Salt]}{[Base]}$

$= 4.75 + \log_{10}\left(\frac{\frac{2.5}{100}}{\frac{2.5}{100}}\right)$

$= 4.75. \qquad [\because \log_{10}^{1} = 0]$

$\therefore$ pH = 14 – pOH

= 14 – 4.75

= 9.25.

45. Ⓑ

pOH = 14 – pH = 14 – 9.25 = 4.75

$$pOH = pk_b + \log_{10}\frac{[Salt]}{[Base]}$$

$$\Rightarrow \quad 4.75 = pk_b + \log_{10}\left(\frac{0.1}{0.1}\right)$$

$$\Rightarrow \quad pk_b = 4.75. \quad [\because \log_{10}^{1} = 0]$$

46. ©

	CH_3COOH	+	NaOH	$\longrightarrow$	CH_3COONa	+	H_2O
Initial m – moles :	10		5		0		0
m.moles after reaction :	10 – 5 = 5		0		5		5

Since, CH_3COONa & CH_3COOH, the solution is a acidic buffer.

$$\therefore \quad pH = pk_a + \log_{10}\frac{[Salt]}{[Acid]}$$

$$= 4.75 + \log_{10}\left(\frac{\frac{5}{150}}{\frac{5}{150}}\right) = 4.75.$$

47. ©

Resonance can occur when all the atoms involved lie in the same plane and early in the same plane. This is correct.

$CH_3 - \overset{\overset{O}{\|}}{C} - CH_3$ and $CH_3 - \overset{\overset{CH_3}{|}}{C} = CH_2$ are resonating structure. This is wrong

48. Ⓐ

Ice floats on water. This is correct. Due to H-bonding ice has open cage like structure and occupies large volume as compared to water. This is also correct and the correct explanation of assertion.

49. Ⓑ

Total electrons is $NO_3^- = 7 + 24 + 1 = 32$

Total electrons in $CO_3^{2-} = 6 + 24 + 2 = 32.$

Thus, NO_3^- and CO_3^{2-} are isoelectronic species. This is correct.

Hybridisation of $NO_3^{\ominus}$, $H = \frac{1}{2}(V + M - C + A)$

$= \frac{1}{2}(5 + 0 - 0 + 1)$

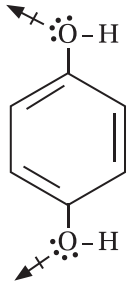
$= 3 \Rightarrow sp^2.$

Hybridisation of CO_3^{2-}

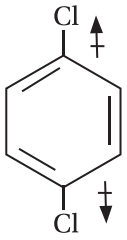
$H = \frac{1}{2}(4 + 0 - 0 + 2) = 3 \Rightarrow sp^2$

Thus, central atom in both NO_3^- and CO_3^{2-} are sp^2 hybridised. But it is not the correct explanation of assertion.

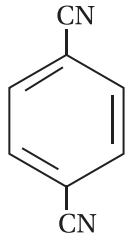
50. Ⓑ



$\mu \neq 0$,



$\mu = 0$ &



$\mu = 0$

Mathematics

51. Ⓓ

$$\overset{\downarrow}{^{20}C_3} - \underbrace{16 \times 20}_{\text{Invalid triangle}} = 1140 - 320 = 820$$

Total triangle

52. Ⓑ

$$\left.\begin{aligned} \lim_{x\to 0+} \frac{[x]^2}{x^2} &= \lim_{x\to 0+} \frac{0}{x^2} = 0 \\ \lim_{x\to 0-} \frac{[x]^2}{x^2} &= \lim_{x\to 0-} \frac{1}{x^2} = \infty \end{aligned}\right\} \Rightarrow l \to \text{D.N.E}$$

$$\text{For m}: \left.\begin{aligned} \lim_{x\to 0+} \frac{[x]^2}{x^2} &= \lim_{x\to 0} \frac{0}{+x^2} = 0 \\ \lim_{x\to 0-} \frac{[x]^2}{x^2} &= \lim_{x\to 0} \frac{1}{x^2} = 0 \end{aligned}\right\} \text{exists}$$

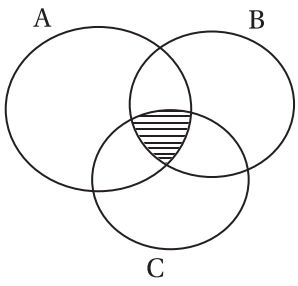
53. Ⓓ

$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$

$\Rightarrow 60 = 48 + 25 + 18 + 5 - n(A \cap B) - n(B \cap C) - n(C \cap A)$

$\therefore\ n(A \cap B) + n(B \cap C) + n(C \cap A) = 36$

Required number $= 36 - 3 \times 5\ (n(A \cap B \cap C) = 5) = 21$



54. Ⓐ

$m = \pm 1$

$$\frac{\sin\theta + 3\cos\theta}{2\sin\theta - \cos\theta} = 1, -1 \ \Rightarrow\ \tan\theta = 4,\ -\frac{2}{3}$$

$$\tan(\theta_1 + \theta_2) = \frac{\tan\theta_1 + \tan\theta_2}{1 - \tan\theta_1 . \tan\theta_2} = \frac{4 - \frac{2}{3}}{1 + \frac{8}{3}} = \frac{10}{11}$$

55. Ⓓ

$$\left.\begin{aligned} &\left(\sqrt{2} - 1\right)x - 2y = 2\sqrt{2} \\ &(x-1)^2 + y^2 = 1 \end{aligned}\right\} \bigcap z_1 = 2 + \frac{1}{\sqrt{2}} + \frac{i}{\sqrt{2}}$$

$z_2 = 1 + i$

$$\left|\sqrt{2}\, z_1 - z_2\right|^2 = 2$$

56. Ⓑ

$x^2 + y^2 = 2$

$(x\cos 60° - y\sin 60°)^2 + (x\sin 60° + y\cos 60°)^2 = 2$

$\Rightarrow x^2 + y^2 = 2$

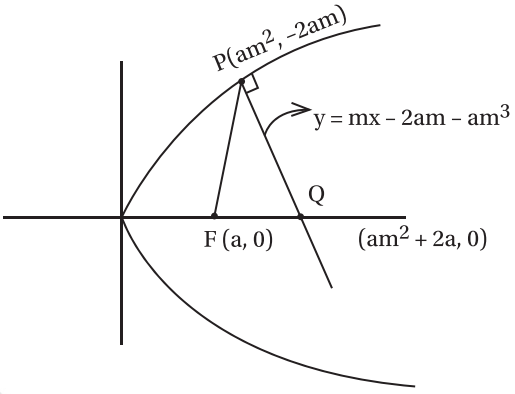
57. Ⓐ

$$\Delta PFQ = \left| \frac{1}{2} \begin{vmatrix} 2a+am^2 & 0 & 1 \\ a & 0 & 1 \\ am^2 & -2am & 1 \end{vmatrix} \right|$$

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

given $a^2m(1 + m^2) = 120$ ..... (1)

$a = 2,\ m = 3$ Satisfies (1)



58. Ⓐ

$x = \pm 3, \pm 2 \quad \rightarrow$ product $= 36$

59. Ⓑ

a, ar, ar^2

$a + ar > ar^2 \quad \Rightarrow \quad 1 + r > r^2 \quad \Rightarrow \quad r^2 - r - 1 < 0$

$a + ar^2 > ar \quad \Rightarrow \quad 1 + r^2 > r \quad \Rightarrow \quad r^2 - r + 1 < 0$ (complex roots)

$ar + ar^2 > a \quad \Rightarrow \quad r^2 + r > 1 \quad \Rightarrow \quad r^2 + r - 1 > 0$

$r^2 - r - 1 < 0 \ \Rightarrow \ \frac{1-\sqrt{5}}{2} < r < \frac{\sqrt{5}+1}{2}$ .....(1)

$r^2 + r - 1 > 0 \ \Rightarrow \ r < \frac{-1-\sqrt{5}}{2}$ or $r > \frac{\sqrt{5}-1}{2}$ ..... (2)

And $r > 1$ .....(3)

(1) ∩ (2) ∩ (3) : $\boxed{1 < r < \frac{\sqrt{5}+1}{2}}$

$[r] = 1,\ [-r] = -2$

$3[r] + [-1] = 3 \times 1 - 2 = 1$

60. Ⓓ

$\sin x + i\cos 2x = \cos n - i\sin 2x = \cos x + i\sin 2x$

$\Rightarrow \sin x = \cos x$ and $\cos 2x = \sin 2x$

$\Rightarrow \tan x = 1$ and $2x = n\pi + \frac{\pi}{4}$

$\Rightarrow x = n\pi + \frac{\pi}{4}$ and $x = \frac{n\pi}{2} + \frac{\pi}{8} \quad n \in I.$

61. Ⓑ

$y = -(x + 4)(y - 2)$

$= -(x^2 + 2x - 8)$

$= -x^2 - 2x + 8$

62. ©

put $x = 0,\ y = 8 = Q(0, 8)$

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{8-0}{0-(-4)} = +2$

63. Ⓓ

$3^{100} = (3^2)^{50} = 9^{50} = (10 - 1)^{50} = 10k + (-1)^{50} = 10k + 1$

$\therefore$ required value $= \left\{10k + \dfrac{1}{5}\right\} = \left\{\dfrac{1}{5}\right\} = \dfrac{1}{5}$

64. Ⓓ

given $h(g(g(x))) = x$

Replace x by $f(x) - h(g(g(fx)))) = f(x)$

$\Rightarrow hg(x) = f(x)\ [\because g(f(x)) = x]$

Replace x by $f(x) \Rightarrow hg(f(x)) = f(f(x))$

$\Rightarrow h(x) = f(f(x))\ [\because g(f(x))) = x]$

$\Rightarrow h(1) = f(f(1))$ ..... (1)

Now, $f(1) = 1 + 5 + 3 = 9$

$f(g) = 93 + 5 \times 9 + 3 = 777 = 37 \times 3 \times 7$

largest prime 37.

65. ©

Required prob $= \dfrac{\dfrac{{}^{2n-2}C_{n-1}}{2!} \times 2}{\dfrac{{}^{2n}C_n}{2!}} = \dfrac{n}{2n-1}$

66. ©

Notice that $x_{n+1} > x_n \Rightarrow$ increasing sequence.

$\left(x_{n+1} - \sqrt{5}\, x_n\right)^2 = 4(x^2 + 1)$ .....(i)

$\left(x_{n+2} - \sqrt{5}\, x_{n+1}\right)^2 = 4(x^2{}_{n+1} + 1)$ .....(ii)

Solving equation (i) & (ii) we get,

$(x_{n+2} - x_n)(x_{n+2} + x_n - 2\sqrt{5}\, x_{n+1}) = 0$

As $x_{n+2} + x_n$ (increasing sequence),

So, $\dfrac{x_{n+2} + x_n}{x_{n+1}} = 2\sqrt{5}$

Among the three terms x_n, x_{n+1}, x_{n+2} at least are of them is irrational. Hence, in total here at least $\left[\frac{100}{3}\right] = 33$ irrational nos.

67. Ⓑ

$$y = \frac{ax^2 - 7x + 5}{5x^2 - 7x + a} \qquad \Rightarrow (49 - 20a)\, y2 + 2(1 + 2a^2)\, y + (49 - 20a) \geq 0$$

if $49 - 2a > 0$ and $D \leq 0$

$\Rightarrow < 2.45$ and $D \leq 0$

$D = (2\,(1 + 2a2))^2 - 4\,(49 - 20a)\,(49 - 2a) \leq 0$

$\Rightarrow (a - 5)2\,(a + 12)\,(a - 2) \leq 0$

$\Rightarrow \{5\} \cup (-2 \leq a \leq 2)$ but $a < 2.45$

$\Rightarrow a \in [-12, 2]$

At end points $a = -12$ and $a = 2$ we have to check y

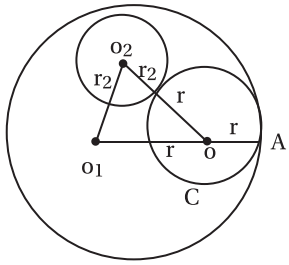
at $a = -12$ $y = \frac{-(12x-5)(x+1)}{(5x-12)(x+1)}$ = not defined at $x = -1$

$\therefore$ $a = -12$ rejected

Similarly, $a = +2$ rejected.

$\therefore$ a $(-12, 2)$

68. Ⓑ



$OO_2 = r_2 + r$

$OO_1 = r_1 + r$

$OO_1 + OO_2 = r_2 + r + r_1 - r = r_1 + r_2 > 0_1 0_2$

$\therefore$ $O,O_2 < r_1 + r_2$

$\Rightarrow$ Ellipse.

69. Ⓓ

Check the options A, B, C.

for D we get, Let $k = 7$ then $x^2 + 16x + 58 = 0$

$\left.\begin{aligned}\alpha + \beta &= -16\\ \alpha\beta &= 58\end{aligned}\right\}$ $D > 0$

$\Rightarrow$ roots are real and negative.

70. Ⓑ

$2 \times {}^{n+4}C_S = {}^{n+4}C_4 + {}^{n+4}C_6 \Rightarrow n^2 - 13n + 30 = 0$

$\Rightarrow n = 3, 10$

$(1 + x^2)^7 \rightarrow$ Greatest Binomial Coeff $= {}^7C_3 = 35$.

71. Ⓓ

$(x^2 - 9x + 11) = 0$ and $(x^2 - 9x + 20) = 0$

$x_1x_2 = 11$ $\qquad$ $x_3x_4 = 20$

$x_1 + x_2 = 9,$ $\qquad$ $x_3 + x_4 = 9$

$x_1 + x_2 + x_3 + x_4 = 18$ (A) False.

R $\rightarrow$ True.

$\Rightarrow$ (D).

72. Ⓐ

$^4C_2 \times {}^3C_1 + {}^4C_1 \times {}^3C_2$

$= 6 \times 3 + 4 \times 3$

$= 18 + 12$

$= 30$ (A) $\rightarrow$ true

R $\rightarrow$ True.

73. Ⓒ

$$|z_1| = \sqrt{\left(\frac{1}{2}\right)^2 + \left(\frac{-\sqrt{3}}{2}\right)^2} = \sqrt{\frac{1}{4} + \frac{3}{4}} = \sqrt{\frac{4}{4}} = 1$$

$$|z_1| = \sqrt{\left(\frac{-1}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2} = \sqrt{\frac{1}{4} + \frac{3}{4}} = 1$$

74. Ⓓ

$$-\tan^{-1}\left|\frac{-\frac{\sqrt{3}}{2}}{\frac{1}{2}}\right| \text{ (as } Z_1 \text{ lies in 4th quadrant)}$$

$$= -\frac{\pi}{3}$$

75. Ⓓ

amplilude of $z_1 = -\frac{\pi}{3}$

amplilude of $z_2 = \frac{2\pi}{3}$

angle between $z_1, z_2 = \frac{2\pi}{3} - \left(\frac{-\pi}{3}\right) = \pi$

Biology

76. Ⓒ

Mycoplasma

77. Ⓑ

Cycas

78. Ⓐ

Excretory organs of insects

79. Ⓒ

Acropetal order

80. Ⓐ

Exarch

81. Ⓓ

All of these

82. Ⓐ

a – 3; b – 2; c – 4; d – 1

83. Ⓓ

Type of R group

84. Ⓑ

Multinucleate cells

Cytokinesis is division of cytoplasm, in absence of which mother cells do not multiply

85. Ⓓ

Both A and C

86. Ⓓ

Succinic acid → Fumaric acid

Succinic acid is oxidised to Fumaric acid, in which FAD gets reduced to FADH2. No NAD is involved

87. Ⓒ

Elongation of shoot system

88. Ⓓ

Tissues and deoxygenated blood

Tissues have less pO_2 to allow diffusion of oxygen from oxygenated blood to tissues; deoxygenated blood has less pO_2 for the same reason

89. Ⓓ

All

90. Ⓑ

Thromboplastin

Thromboplastin is released from injured tissues and injured capillaries

91. Ⓑ

Outward projection of head region of meromyosin

92. Ⓑ

X-spinal; Y – cranial

For faster saltatory conduction of nerve impulse

93. Ⓐ

Inhibits gastric secretion and motility

94. Ⓐ

Both A and R are true and R is the correct explanation of A

95. Ⓑ

Both A and R are true, but R is not the correct explanation of A

96. Ⓐ

Both A and R are true and R is the correct explanation of A

97. Ⓑ

Both A and R are true, but R is not the correct explanation of A

98. Ⓓ

All of these

99. Ⓑ

Vasoconstrictor

100. Ⓒ

125 ml/min