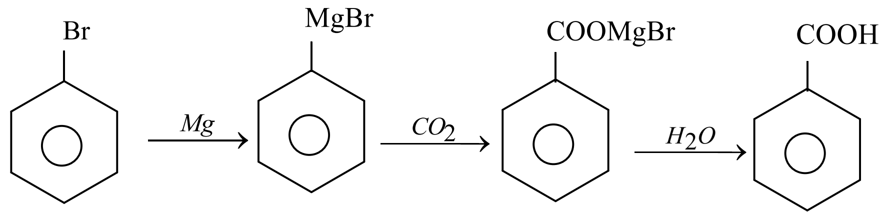
GRAND TEST-2 **Max Marks : 360**

SOLUTIONS

CHEMISTRY

1. Volume strength $= 5.6 \times Normality$

2.

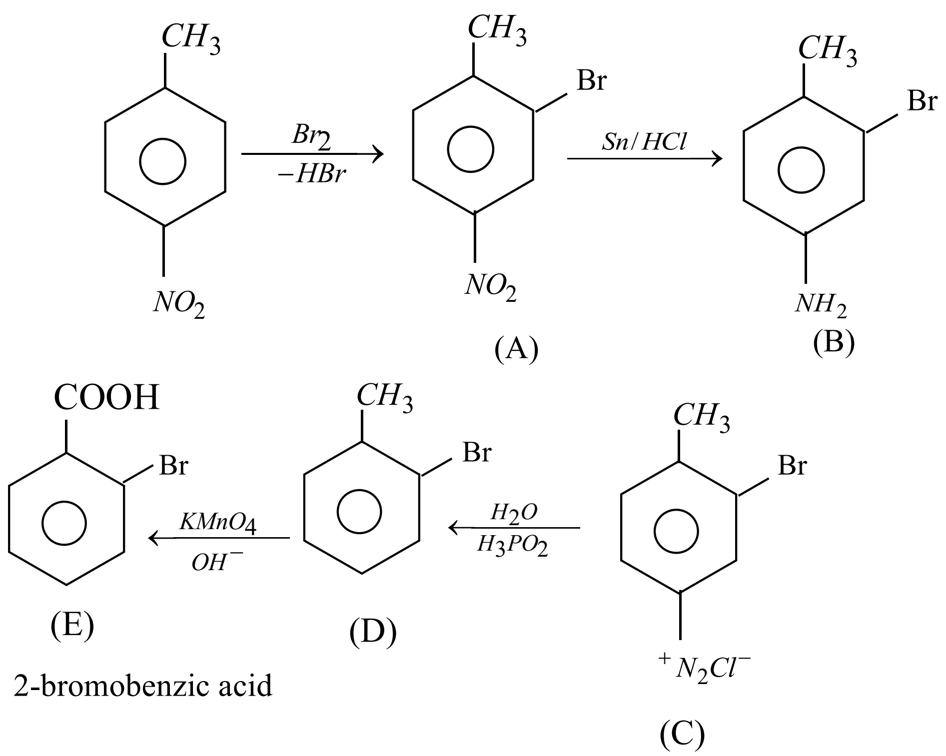


3. $5f^{14}, 6d^3 \Rightarrow Total\ 17e^-$

$5f^{14} = (n+l) = 5+3 = 8$

$6d^3 = (n+l) = 6+2 = 8$

5.



2-bromobenzic acid

6. $\overline{V}_{H_2} = \overline{V}_{He^+} \Rightarrow \frac{1}{\lambda_{H_2}} = \frac{1}{\lambda_{He^+}}$

$R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right) = Rz^2\left(\frac{1}{2^2} - \frac{1}{4^2}\right)$

$\therefore n_1 = 1$ & $n_2 = 2$

9. Vender wall's equation for 1 mole gas is $\left(p + \frac{a}{v^2}\right)(v-b) = RT$

AT low p, volume is High. so (V-b)=V

$\therefore \left(p+\frac{a}{V^2}\right)v = RT$

(or) PV + $\frac{a}{V} = RT$

$\therefore PV = RT - \frac{a}{V}$

10. Work done $= \frac{1}{2}(4P_1 - P_1)(3V_1 - 2V_1)$

$= 3\ P_1V_1$

12. Given $\frac{\Delta T_{fA}}{\Delta T_{fB}} = \frac{2}{1} = \frac{1}{1/2}\ \therefore e$

B should associate to show lower in ΔT

14. Cell reaction : $2Fe^{3+} + Fe \rightarrow 3Fe^{2+}$

$E^0_{cell} = 0.77 - (-0.44) = +1.21 \rightarrow spon\tan eous$

$\Rightarrow \therefore Fe^{3+}$ & Fe will reduce

15. $Al^{3+} + 3e^- \rightarrow Al$

1 mol Al = 27g = 3F

13.5 gr of Al = ? F= 1.5F

17. Order with respect to A $\left[\frac{0.03}{0.01}\right]^x = \frac{45}{5}$

$3^x = 3^2 \quad x = 2$

Order with respect to B $\left(\frac{0.02}{0.01}\right)^x = \frac{5}{2.5}$

$2^y = 2^1$ y = 1

Rate = $K[A]^2[B]^1$

19. I order 100% $\xrightarrow{t_{1/2}}$ 50% $\xrightarrow{H_2}$ 25%

Given $2t_{1/2} = 1hr$

$\therefore t_{1/2} = \frac{1}{2}hr$

20. $\%N = \frac{28 \times V_{N_2\ at\ STP} \times 100}{22400 \times W_{oC}}$

$$=\frac{28\times22.4\times100}{22400\times0.25}=11.2\%$$

24. It is a basic buffer

pH = 8.65

$\therefore pOH = 14-8.65 = 5.35$

pOH= $p^{kb}+\log\frac{[NH_4^+]}{[NH_4OH]}$

$5.35 = 4.75 + \log\frac{[NH_4^+]}{[NH_4OH]}$

$\therefore \frac{[NH_4^+]}{[NH_4OH]} = anti\log(5.35-4.75)$

≈ 4

$\therefore \frac{[NH_4^+]}{[NH_4OH]} = \frac{0.2\times30}{0.3\times V_1} = 4$

$\therefore$ V= 5 ml

25. 1°-alkyl halides follows SN^2 path and walden Inversion takes place

26. $B_2H_6 + 6H_2O \rightarrow 2H_3BO_3 + 6H_2\uparrow$

$3B_2H_6 + 6NH_3 \xrightarrow[200°C]{above} 2B_3N_3H_6 + 12H_2\uparrow$

27. $A_2B_3 \rightleftharpoons 2A^{3+} + 3B^{2-}$

$\therefore K_{sp} = 108x^5$

28. $4\times58.5g$ - No. of unit cells $=6\times10^{23}$

1 gram = ?

$=\frac{1}{4\times58.5}\times6\times10^{23}=2.56\times10^{21}$

30. $Al_2(SO_4)_3 \rightleftharpoons 2Al^{3+} + 3SO_4^{2-}$

Initially let	1	0	0
After	$1-\alpha$	2α	3α

$i = \frac{1-\alpha+2\alpha+3\alpha}{1} = 4.2$

$\Rightarrow 1+4\alpha = 4.2$

$\Rightarrow 4\alpha = 3.2 \Rightarrow \alpha = \frac{3.2}{4} = 0.8 = 80\%$

MATHEMATICS

31. $T_{r+1} = 100c_r (5^{1/6})^{100-r}(2^{1/8})^r$ As 5 and 2 are relatively prime, T_{r+1} will be rational if $\frac{100-r}{6}$ and $\frac{r}{8}$ are both integers $\Rightarrow$ 100-r is a multiple of 6 and r is a multiple of 8, 100-r is multiple of 6 if r = 4, 12, 20… 100 of which 12, 36, 60, 84 are divisible by 6. Hence, there are just four rational terms.$\Rightarrow$no. of irrational terms is 101 – 4 = 97.

32. **Z =** $re^{i\theta}$ Then $\frac{r^2}{12}(e^{i\theta}+e^{-i\theta})^2 = 1-\frac{r^2}{3}$

$\Rightarrow \frac{r^2\cos^2\theta}{3} = \frac{3-r^2}{3}$ $\Rightarrow r^2 = \frac{3}{1+\cos^2\theta} \le 3$ max value of |z| = r = $\sqrt{3}$

33. If the lines a_1 x +b_1 y+c_1 = 0 and a_2x +b_2y+c_2 = 0 meets the axes is concyclic points then $a_1a_2 = b_1b_2$

34. **Sol :** A (x_1, y_1) be any point on parabola y^2 = 4x and B (h,k) is its image w.r.t x-y+13 = 0 then $\frac{h+x_1}{2} - \frac{k+y_1}{2} + 13 = 0$ and $\left(\frac{k-y_1}{h-x_1}\right)(1) = -1 \Rightarrow x_1 = h-13, y_1 = -k+13$

$\therefore (h+13)^2 = 4(k-13)$

35. Formula application

36. Taking the coordinates of vertices O,P,Q,R as (0,0), (a,0), (a,a), (0,a) respectively we get the coordinates of M as $\left(a,\frac{a}{2}\right)$ and of N as $\left(\frac{a}{2},a\right)$

37. Area $= \frac{|c|}{2\sqrt{h^2-ab}}$

38. Shortest distance is 0.

39. foot of the perpendicular A (1,0,2) to the line is $B\left(\frac{1}{2},1,-3/2\right)$

40. we find $\frac{dx}{dt}$ when $x=\frac{1}{2}$ and $y=\frac{\sqrt{3}}{2}$ given that $\frac{dy}{dt}=-3$ units/s and $x^2+y^2=1$

Differentiating $x^2+y^2=1$, we have $2x\frac{dx}{dt}+2y\frac{dy}{dt}=0$

Putting $x=\frac{1}{2}, y=\frac{\sqrt{3}}{2}$ and $\frac{dy}{dt}=-3$, we have $\frac{1}{2}\frac{dx}{dt}+\frac{\sqrt{3}}{2}(-3)=0 \Rightarrow \frac{dx}{dt}=3\sqrt{3}$

41. Let $f(x) = x^2-2ax+a^2+a-3=0$

Then (i) $\Delta \ge 0$ (ii) sum of root <6 (iii) $f(3)>0$

42. $b=\frac{2ac}{a+c}; c=\frac{2bd}{b+d}$ $\therefore (a+c)(b+d) = \frac{2ac}{b}.\frac{2bd}{c} = 4ad \Rightarrow ab+bc+cd+ad=4ad$

43. $\sqrt{\frac{\sum_{i=1}^{x} x_i^2}{n}} = \sqrt{\frac{400}{n}} \ge \frac{80}{n}$ $\Rightarrow n \ge 16$ hence, possible value of n = 18.

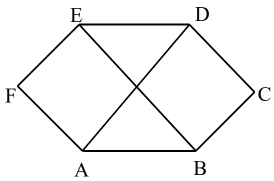
44. $\cot\theta+\tan\theta = m \Rightarrow \sec^2\theta. = m\ \tan\theta - (1)$

$\sec\theta - \cos\theta = n \Rightarrow \tan^2\theta. = n\ \sec\theta - (2)$ $\tan^2\theta = n(nm^2)^{1/3}$

from (1) & (2) $\Rightarrow$ similarly $\sec^2\theta = m(n^2m)^{1/3}$ eliminate θ

45. $\sin^{-1}(\sin 3) = \pi - 3 \quad \sin^{-1}(\sin 4) = \pi - 4 \quad \sin^{-1}(\sin 5) = 5 - 2\pi \quad sum = -2$

46. $\left.\begin{array}{l} \overrightarrow{AD} = 2\overrightarrow{BC} \Rightarrow x = 2 \\ \overrightarrow{CF} = 2\overrightarrow{BA} \Rightarrow y = 2 \end{array}\right\} \Rightarrow xy = 4$



47. for no solution or infinitely many solutions

$$\begin{vmatrix} \alpha & -1 & -1 \\ 1 & -\alpha & -1 \\ 1 & -1 & -\alpha \end{vmatrix} = 0 \Rightarrow (\alpha - 1)^2 (\alpha + 2) = 0 \qquad \Rightarrow \alpha = 1, 1, -2$$

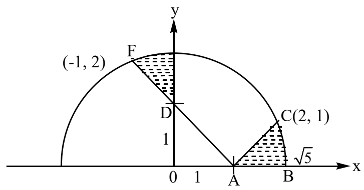
but for $\alpha = 1$, there are infinite solutions when $\alpha = -2$, we have

$-2x - y - z = 3, \quad x + 2y - z = -3 \quad x - 2y + 2z = -3$ adding 0 = - 9, which is not true $\Rightarrow$ no solution.

48. $AA' = I$

$$\Rightarrow \begin{pmatrix} \lambda & 0 & \lambda \\ \lambda & 0 & -\lambda \\ 0 & 1 & 0 \end{pmatrix} \begin{pmatrix} \lambda & \lambda & 0 \\ 0 & 0 & 1 \\ \lambda & -\lambda & 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\Rightarrow \begin{pmatrix} 2\lambda^2 & 0 & 0 \\ 0 & 2\lambda^2 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

49. 

The two shaded areas are congruent

Area = The area ACEF

$$= \frac{1}{4}(area\ of\ circle) - \Delta OAD$$

$$= \frac{5\pi}{4} - \frac{1}{2} = \frac{5\pi - 2}{4}.$$

50. Differentiating $x^2 + 2y^2 - y = c, 2x + 4yy_1 - y_1 = 0 \to 2x = -(4y - 1)y_1$

Replacing y by $-\frac{1}{y_1}, \frac{2xdy}{dx} = 4y - 1$

$$\int \frac{4dy}{4y - 1} = \int \frac{2dx}{x}$$

$$\ln (4y - 1) = lnx^2 + ln\ c_1$$

$4y - 1 = c_1 x^2 \qquad y = cx^2 + \frac{1}{4}, 4c = c_1.$

51. Clearly $\lim_{x \to 0} x e^{-\left(\frac{1}{|x|} + \frac{1}{x}\right)} = 0 = f(0)$ Continuous at x = 0

Let $\underset{x\to 0-}{\text{Lt}}\ \frac{f(x)-f(0)}{x-0}=\underset{x\to 0}{\text{Lt}}\ \frac{xe^{-\left(\frac{1}{|x|}+\frac{1}{x}\right)}-0}{x-0}=1$

$\underset{x\to 0+}{\text{Lt}}\ \frac{f(x)-f(0)}{x-0}=\underset{x\to 0}{\text{Lt}}\ \frac{xe^{-\left(\frac{1}{|x|}+\frac{1}{x}\right)}-0}{x-0}=\underset{x\to 0}{\text{Lt}}\ e^{-2/x}=0$

Not differentiable at x = 0

52. $\frac{1}{\alpha},\frac{1}{\beta}$ are the roots of $cx^2+bx+a=0$

$cx^2+bx+a=c\left(x-\frac{1}{\alpha}\right)\left(x-\frac{1}{\beta}\right)$

53. T : x –x = 0 is integers reflexives y – x is integer symmetric (x-y) + (y-z) = x -z is integers transitive $\therefore$ T is equivalence and S : y – x = 1 $\Rightarrow$ x – x $\neq 1$ not reflexive.

54. $\int_{-\pi}^{\pi}\frac{\cos^2 x}{1+a^x}dx=\int_0^{\pi}\left[\frac{\cos^2 x}{1+a^x}+\frac{\cos^2(-x)}{1+a^{-x}}\right]dx$

$=\int_{-\pi}^{\pi}\cos^2 x\,dx=2\int_0^{\pi/2}\cos^2 x\,dx=\frac{\pi}{2}$

55. $\int_{\pi}^{2\pi}[2\sin x]dx = \int_{\pi}^{\frac{7\pi}{6}}(-1)dx+\int_{\frac{7\pi}{6}}^{\frac{3\pi}{2}}(-2)dx+\int_{\frac{3\pi}{2}}^{\frac{11\pi}{6}}(-2)dx+\int_{\frac{11\pi}{6}}^{2\pi}(-1)dx$

56. $\frac{dy}{dx}=\frac{x^2+xy+y^2}{x^2}$ is a homogeneous differential equation, put y = vx.

57. We have $\int e^x\cos x dx=\frac{1}{2}e^x(\sin x+\cos x)$

Therefore, $I=x.\frac{1}{2}e^x(\sin x+\cos x)-\frac{1}{2}\int e^x(\sin x+\cos x)dx+\int e^x\sin x dx$

$=\frac{x}{2}e^x(\sin x+\cos x)-\frac{1}{2}\int e^x(\cos x-\sin x)dx$

$=\frac{x}{2}e^x(\sin x+\cos x)-\frac{1}{2}\left[e^x\cos x\right]+c$

$=\frac{1}{2}e^x(x\sin x+x\cos x-\cos x)+c$

58. from truth table $p\to(q\to p)\approx p\to(p\vee q)$

59. We have ${}^{100}c_{50}=\frac{100!}{50!50!}$

The exponent of 7 in 50! is $\left[\frac{50}{7}\right]+\left[\frac{50}{7^2}\right]=7+1=8$

And the exponent of 7 in 100! $=\left[\frac{100}{7}\right]+\left[\frac{100}{7^2}\right]=14+2=16$,

Thus, exponent of 7 in ${}^{100}C_{50}$ is $16-2(8)=0$

60. total no of ways of answering is 15. Out of 15 combinations only one is correct. The probability of ticking the answer at the first .. is $\frac{1}{15}$, that of 2nd is $\frac{14}{15}.\frac{1}{14}=\frac{1}{15}$ and that of

third is $\frac{14}{15}.\frac{13}{14}.\frac{1}{13}=\frac{1}{15}$ $\therefore$ probability that the student will get marks for the question if he is allowed into 3 chances $=3\left(\frac{1}{15}\right)=\frac{1}{5}$.

PHYSICS

61. $V_m = 3i$

Let $V_R = ai + bj$

$V_{RM} = \overline{V_R} = \bar{V}_m$

$=3i - (ai + bj)$

$V_{RM} = (3- a)i + bj$

V_{RM}. Vertical

i.e $3- a = 0$

$a = 3$

If $V_m = 6i$

$V_{RM}^1 = 6i - (ai + bj)$

$V_{RM}^1 = (6- a)i - bj$

It is 45^0 with vertical

i.e , $6- a = b$

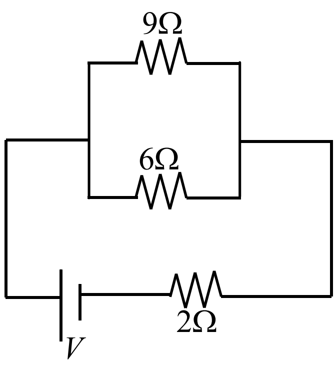
$6- 3 = b$

$b = 3$

$VR = 3i + 3j$

$|VR| = 3\sqrt{2}\ kmph$

62. Given $\frac{v^2}{R} = 36$



$V^2 = 36´\ 9$; $V = 18V$

Equivalent of $6W \& 9W$

$\frac{6´\ 9}{15} = \frac{18}{5} = 3.6W$

$3.6W\ and\ 2W$

Are in series

So $v¥\ R$ $\frac{V_1}{V_2} = \frac{R_1}{R_2}$

$$\frac{18}{V_2} = \frac{3.6}{2}$$

$$V_2 = 10V$$

63. $x = 3t^2 - t^3$

When x is maximum $\frac{dx}{dt} = 0$

$\frac{dx}{dt} = 6t - 3t^2 = 0$ so maximum $x \rightarrow$

$6t = 3t^2$ $x = 3 \times 4 - 8$

$3t = 6$ $= 4m$

$t = 2$

$x = 0 . 3t^2 = t^3$

$t = 3\sec$

When $t = 4\sec$

$x = 3 \times 16 - 64 = -16m$

So distance travel . $4 + 4 + 16 = 24m$

64. $P = 1000kw = 10^3 \times 10^3 J/\sec$

$Energy\ in\ one\ hour = 10^6 \times 3600J$

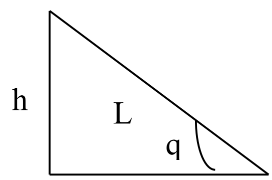
$36 \times 10^8 J$

$mass\ decay = \frac{E}{C^2} = \frac{36 \times 10^8}{9 \times 10^{16}}$

$= 4 \times 10^{-8} kg = 40mg$

65. PE at the top of the inclined plane

= work done against friction



$$mgh = \frac{\mu}{2} mg \frac{L}{3}\cos\theta + \mu mg \frac{L}{3}\cos\theta$$

$$h = \frac{\mu L\cos\theta}{3}\left[\frac{1}{2} + 1\right]$$

$$\frac{h}{L} = \frac{\mu}{3}\cos\theta\left(\frac{3}{2}\right)$$

$$\sin\theta = \frac{\mu\cos\theta}{2} \quad \mu = 2\tan\theta$$

66. $\frac{E}{l} \times \frac{l}{5} = \frac{E}{3l/2} \times l^1$

$$\frac{l}{5} = \frac{2}{3}l^1$$

$$l^1 = \frac{3l}{10}$$

67. $F = ks^{-1/3}$

$$m\frac{dJ}{dt} = ks^{-1/3}$$

$$m\frac{dJ}{ds}\frac{ds}{dt} = ks^{-1/3}$$

$$m\frac{dJ}{ds}J = ks^{-1/3}ds$$

$$m\frac{J^2}{2} = \frac{ks^{2/3}}{2/3}$$

$$J ¥ \; s^{1/3}$$

$$P = FV$$

$$P \mu \; s^{-1/3}s^{1/3}$$

$$P \mu \; s^0$$

68. $\frac{8q}{x^2} = \frac{2q}{(x-L)^2}$

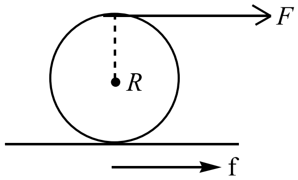
$$\frac{2}{x} = \frac{1}{x - l}$$

$$2x - 2L = x$$

$$x = 2L$$

69. $F + f = Ma$ ® translational motion

$FR - fR = I\text{a} = I\frac{a}{R}$ Rotational motion



$F - f = \frac{Ia}{R^2}$ ® (1) $\quad I = \frac{2}{5}MR^2$

$F + f = Ma$ ® (2)

Solving

$$a = \frac{10F}{7M}$$

70. Mean square value $\frac{\int v^2 dt}{\int dt}$

For $\frac{T}{4}$

$v = at$ (up to T/4increases with time)

At $t = T/4, V = v_0$

$v_0 = \frac{aT}{4}$

$a = \frac{4v_0}{T}$

$ms = \frac{\int v^2 dt}{\int dt} = \frac{\int_0^{T/4} a^2 t^2 dt}{\int_0^{T/4} dT}$

$= \frac{16v_0^2}{T^2} \frac{\left[t^3/3\right]_0^{T/4}}{T/4}$

$= \frac{V_0^2}{3}$

$v_{rms} = \frac{v_0}{\sqrt{3}}$

71. $\phi = a\tau - at^2$

$\frac{d\phi}{dt} = e = a\tau - 2at$

$H = \int P\,dt = \int_0^{\tau} \frac{e^2}{R} dt$

$H = \frac{1}{R}\int_0^{\tau} (a\tau - 2at)^2 dt$

$= \frac{1}{R}\left[a^2\tau^2 + \frac{4a^2t^3}{3} - 4a^2\tau . \frac{t^2}{2}\right]_0^{\tau}$

$= \frac{1}{R}\left[a^2\tau^3 + \frac{4}{3}a^2\tau^3 - 2a^2\tau^3\right]$

$= \frac{a^2}{R}\left[\tau^3 + \frac{4}{3}\tau^3 - 2\tau^3\right]$

$= \frac{a^2}{R}\left[\frac{4}{3} - 1\right]\tau^3$

$= \frac{a^2}{3R}\tau^3$

72. In FM Band width is less

73. $B = \frac{\mu_0 i}{2r} = \frac{\mu_0}{2r}\frac{e}{T}$

$T a\, r^{3/2}$

$B a \dfrac{1}{r.r^{3/2}} a \dfrac{1}{r^{5/2}}$

$r a\, n^2$ $\qquad\qquad$ $B a \dfrac{1}{n^5}$

74. Voltage gain = $Av = \dfrac{v_0}{V_{in}} = \dfrac{D Ic\, R_o}{D I_b\, Ri}$

$\dfrac{5mA}{50m4}\,\dfrac{6kW}{600W}$

$=1000$

75. After two hours $\quad x : y = \dfrac{No}{2} : \dfrac{No}{2} = 1:1$

Four hours $\quad = \dfrac{No}{4} : \dfrac{3No}{4} = 1:3$

Six hours$= \dfrac{No}{8} : \dfrac{7No}{8} = 1:7$

Here it is 1 : 4

So t > 4 hrs $\qquad$ < 6 hrs

76. If $u = x$

$J = 10 + x$

$f = 12cm$

$\dfrac{1}{u} + \dfrac{1}{n} = \dfrac{1}{f}$

$\dfrac{1}{x} + \dfrac{1}{10 + x} = \dfrac{1}{12}$ ® *solving*

$u = x = 20cm$

$J = 30$

$M = 1 - 5$

$M = v / u = 1.5$

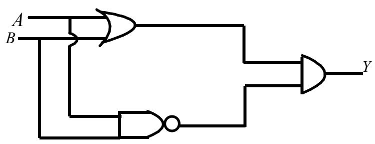
77. $Y = (A + B)\left(\overline{AB}\right)$

$= (A + B)\left(\overline{A} + \overline{B}\right)$

$= A\overline{A} + \overline{A}B + A\overline{B} + B\overline{B}$

$= O + \overline{A}B + A\overline{B} + O$

$= \overline{A}B + A\overline{B} = ' \; OR\ gate$



78. $dQ = mSdT$

$$\int dQ = mA\int T^3 dt$$

$$= mA\left|\frac{T^4}{4}\right|_0^{20}$$

$$= \frac{mA}{4}(20)^4 = \frac{mA}{4}\times 16\times 10^4 = 4mA\times 10^4$$

79. $$h\nu = R\left[\frac{1}{(n-1)^2} - \frac{1}{n^2}\right]$$

$$R\left[\frac{n^2 - n^2 + 2n - 1}{n^2(n-1)^2}\right] \text{ if n >>1}$$

$$= \frac{R\times 2n}{n^4} = \propto \frac{1}{n^3}$$

80. $$Initial\ internal\ energy = 4(Cv)_{dia}\times T = 4\times\frac{5R}{2}T$$

$$final\ internal\ energy = 2(Cv)_{dia}T + 4(Cv)_{mono}T$$

$$2\left(\frac{5R}{2}\right)T + 4\left(\frac{3R}{2}\right)T$$

$$= 11RT$$

Then $Q = 11RT - 10RT = RT$

81. Equation of the particles are

$$x_1 = A\sin\left(\omega t + \frac{\pi}{6}\right)$$

$$x_2 = A\sin\left(\omega t + \frac{\pi}{6}\right)$$

When they meet $A\sin\left(\omega t + \frac{\pi}{6}\right) = -A\sin\left(\omega t + \frac{\pi}{6}\right)$

$$2A\sin(\omega t + \pi/6) = 0 \qquad\qquad \omega t + \pi/6 = \pi$$

$$\omega t = \frac{5\pi}{6}$$

$$t = \frac{5\pi}{6\omega} = \frac{5\pi T}{6.2\pi} = \frac{5T}{12}$$

Altier

$$-\frac{A}{2}\ to\ A \rightarrow \frac{T}{6}$$

They meet at the mean position

$-A - A \rightarrow 0 = \frac{T}{4}$ so $\frac{T}{4} + \frac{T}{6} = \frac{5T}{12}$

82. No.of beats $\frac{20}{2} = 10$

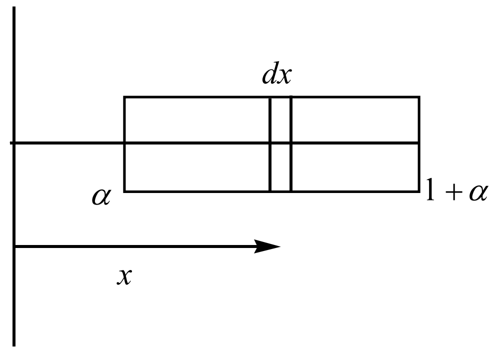
If tuning fork frequency is n.

$\frac{n+10}{n-10} = \frac{10.2}{9.2}\left(n \propto \frac{1}{1}\right)$

$n = 194 Hz$

83. $dF = \frac{Gm.1\, dx}{x^2}$

$dF = \frac{Gm\left(a + bx^2\right)dx}{x^2}$



$F = Gm\int_{\alpha}^{l+\alpha} \frac{a}{x^2}dx + Gmb\int_{\alpha}^{l+a} dx$

$= Gm\left[a\left[-\frac{1}{x}\right]_{\alpha}^{l+\alpha}\right] + Gmb[l]$

$= Gm\left[a\left[\frac{1}{\alpha} - \frac{1}{l+\alpha}\right] + bl\right]$

84. $I = \frac{3}{4}I_0$

$I_0 \cos^2(\delta/2) = \frac{3}{4}I_0$

$\cos(\delta/2) = \frac{\sqrt{3}}{2}$

$(\delta/2) = 30^0$

$\delta = 60^0 = \frac{\pi}{3}$ $\Delta x = \lambda/6$

As it is formed between 5[th] maxima and 6[th] minima

$\Delta x \rightarrow$

$5\lambda + \frac{\lambda}{6} = \frac{31\lambda}{6}$

$\frac{31\lambda}{6} = (\mu_2 - \mu_1)t$

$t = \frac{31\lambda}{3(\mu_2 - \mu_1)}$ substituting t=9.3 μm

85. When separation occurs

$mg = m\omega^2 r$

$g = \omega^2 r$

$r = \dfrac{g}{\omega^2}$

$T = 1\sec$, $\omega = 2\pi$

$r = \dfrac{g}{4\pi^2} = \dfrac{1}{4} = 0.25m$

86. $surface\ tensional\ force = wt.\ of\ the\ liquid\ column$

$2\pi\left(\dfrac{d_1 + d_2}{2}\right)T = \pi\left(\dfrac{d_2^2 - d_1^2}{4}\right)h\rho g$

$h = \dfrac{4T}{(d_2 - d_1)\rho g}$

87. $4\pi R^2 x\rho = \dfrac{4}{3}\pi R^3(\rho_w)$

$x\rho = \dfrac{R}{3}$ $\qquad (\rho_w = 1)$

$x = \dfrac{R}{3\rho}$

88. $h = \dfrac{r^2\omega^2}{2g} = \dfrac{25\times 10^{-4}\times(2\times 2\pi^2)}{2\times 10}m = 0.02m$

89. $T = \dfrac{2m_1m_2g}{m_1 + m_2}$ $\qquad S = \dfrac{T}{\pi r^2}$

$= \dfrac{2.m.2mg}{3m}$ $\qquad r = \sqrt{\dfrac{T}{\pi \sigma}}$

$r = \sqrt{\dfrac{4mg}{3\pi \sigma}}$

90. Stoping potential 1.1V

i.e. $KE_{max} = 1.1eV$

$h\nu = w_0 + KE_{max}$ $\qquad \lambda = 4000A^0$

$\dfrac{12400}{4000} = w_0 + 1.1eV$ $\qquad w_0 = 2eV$

$\lambda_0 = \dfrac{12400}{2} = 6200A^0 = 620nm$