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ANSWER KEY

DATE: 30-11-2018

COURSE
NUCLEUS

JEE-MAIN MOCK TEST-6
XII

TEST CODE				
1	1	2	7	8

Q.No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans	4	2	4	1	4	3	2	3	3	1	2	3	4	4	3
Q.No.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans	2	3	3	2	3	3	3	1	1	1	3	2	3	2	3
Q.No.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans	2	4	2	2	1	3	1	1	3	1	4	4	4	1	3
Q.No.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans	3	3	3	2	4	2	3	2	4	2	3	1	2	3	3
	IOP	OC	PC	IOP	OC	PC	IOP	OC	PC	IOP	OC	PC	IOP	OC	PC
Q.No.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans	1	2	3	1	3	3	4	4	4	1	1	2	3	3	4
	IOP	OC	PC	IOP	OC	PC	IOP	OC	PC	IOP	OC	PC	IOP	OC	PC
Q.No.	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Ans	3	4	2	1	2	2	2	4	2	1	3	3	2	2	4

HINTS & SOLUTIONS

PHYSICS

Q.1 $A = 2 + |T - 2|$

for $t \le 2$

$a = 2 - t + 2$

$a = 4 - t$

$dv = (4 - t)\,dt$

$v = 4t - t^2/2$

at $t = 2$, $v = 6$ m/s

for $t > 2$

$a = 2 + t - 2 = t$

$$\int_6^v dv = \int_2^1 t\,dv$$

$$v - 6 = \left[t^2/2\right]_2^t$$

$$v = \frac{t^2}{2} + 4$$

at $t = 4$, $v = 12$ m/s

Q.3 Friction force on upper block is $f = ma$

So work done $= ma \times 5$

Q.4 $$T = \frac{2\pi R_2}{\sqrt{\dfrac{GM}{R_2}}}$$

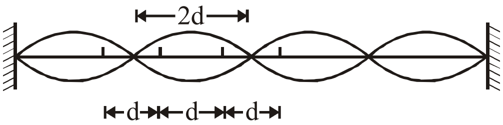
$$\Rightarrow \frac{GM}{R_2^3} = \frac{4\pi^2}{T^2}$$

$$g = \frac{GM}{R_1^2} = \frac{4\pi^2 R_2^3}{T^2 R_1^2}$$

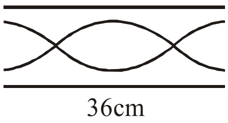
$$\frac{1}{4\pi\varepsilon_0}\left(\frac{-2Q}{PA}\right) + \frac{1}{4\pi\varepsilon_0}\frac{Q}{PB} = 0$$

$$\frac{2}{PA} = \frac{1}{PB} \Rightarrow 4PB^2 - 4PB^2 = PA^2$$

$(x = 5a)^2 + y^2 = (4a)^2$

Q.5 

length of string is 8d.

Q.6 

$\lambda = 36$ cm

frequency remains same

now $C = \sqrt{\dfrac{rRT}{M}} = f\lambda$

$$\Rightarrow \quad \frac{\lambda}{\sqrt{T}} = \text{constant}$$

Q.7 Say speed of boat is v w.r.t. water and speed of river is C. Then, distance travelled in ground frame

$$= (c + v) \times \frac{1}{2} \text{ hour} + (v - c) \times \frac{1}{2} \text{ hour}$$

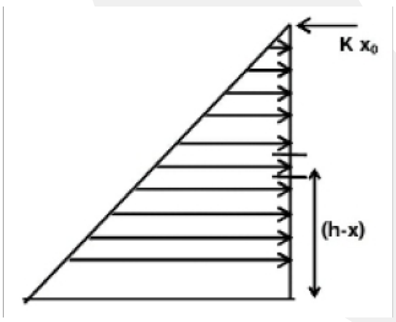
$= v \times 1$ hour

= distance travelled by boat w.r.t. river.

Q.8 $kx_0 h = \int_0^h (bdx)\rho g x (h - x)$

$\Rightarrow kx_0 h$

$$= b\rho g \int_0^h (hx - x^2)dx = b\rho g\left[h\frac{h^2}{2} - \frac{h^3}{3}\right]$$



$$\Rightarrow kx_0 h = b\rho g \frac{h^3}{6} \Rightarrow x_0 = \frac{b\rho g h^2}{6k}$$

$$PE = \frac{1}{2}kx_0^2 = \frac{1}{2}k\frac{b^2\rho^2 g^2 h^4}{36k^2} = \frac{b^2\rho^2 g^2 h^4}{72k}$$

Q.9 $T = 2\pi\sqrt{LC}$

In SHM time from A to $\dfrac{A}{2}$ is $\dfrac{T}{6}$ so here also it is $\dfrac{T}{6}$.

Q.10 Spring time period is always

$$T = 2\pi\sqrt{\frac{m}{k}}$$

Q.11 Initial extension is $x = \dfrac{mg}{k}$

at mean position

$$F + mg = k\left(\frac{mg}{k} + y\right)$$

$y = \dfrac{F}{m} = A$ (amplitude of SHM)

maximum displacement is 2A.

Q.12 $\dfrac{dT}{dx} = -\dfrac{l}{kA}$

Q.13 $\omega = F \times \dfrac{\pi R}{2} = \mu mg \times \dfrac{\pi l}{2}$

Q.14 The cylinder will step so

$f = \mu mg \cos\theta$

Q.15 Centre of mass falls vertically down so that mass m falls at origin.

Q.16 $H_{max} = \dfrac{(20)^2 \sin^2\theta}{2g} \le 5$

$$\Rightarrow \sin\theta \le \frac{1}{2} \Rightarrow \theta \le 30^\circ$$

$$\therefore R = \frac{(20)^2 \sin 2\theta}{g} \to \text{max. for } \theta = 30^\circ$$

$$\Rightarrow R_{max} = 20\sqrt{3} \text{ m.}$$

Q.17 $T_A = T_B = T$(say)

$$\text{Now } V_A = \frac{nRT}{16P_0} = V$$

$$\Rightarrow V_B = V_C = \frac{nRT}{2P_0} = 8V$$

Now in $A \to C$, $16 P_0 V^\gamma = P_0 (8V)^\gamma$

$$\Rightarrow \gamma = \frac{4}{3} \Rightarrow C_V = \frac{R}{\gamma - 1} = 3R$$

Q.18 Both waves at M from P and Q are in same phase as originated.

$\therefore$ Constructive interference

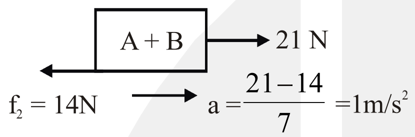
$$\Rightarrow I = \left(\sqrt{I_0} + \sqrt{I_0/4}\right)^2 = \frac{9I_0}{4}$$

Q.19 $f_{1_{max}}$ (between A and B) $= 0.4 \times 20 = 8$ N

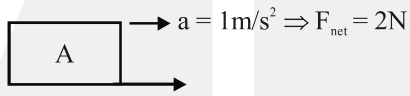
$f_{2_{max}}$ (between B and ground) $= 0.2 \times 70$

$= 14$ N

Assuming system,



$\therefore$



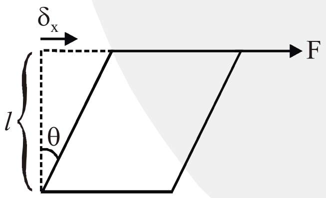
$\therefore f_1 = 2\text{ N} < f_{1max} \Rightarrow$ Assumption correct

$\therefore \quad f_1 - f_2 = 2$N.

Q.20 $2Sl = 1.8 \times 10^{-2}$ N

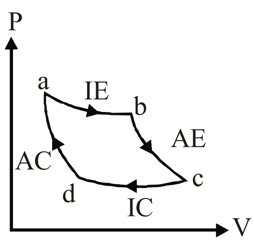
$$\Rightarrow S = \frac{1.8\times10^{-2}}{2\times0.1} = 0.09 \text{ N/m}$$

Q.21 $\theta \approx \dfrac{\delta x}{l} = \dfrac{1.2\times10^{-4}}{5\times10^{-2}}$



$$\therefore \eta = \frac{F/A}{\theta} = 1.67 \times 10^{10} \text{ N/m}^2$$

Q.22



Q.23 By equation of continuity, 'A' in horizontal pipe $\rightarrow$ constant $\Rightarrow$ v $\rightarrow$ constant $\Rightarrow$ same 'P' at all points.

Q.24 $\alpha = -\omega \dfrac{d\omega}{d\theta} \propto \theta = -k\theta$

$$E = \frac{1}{2} I\omega^2 \Rightarrow \frac{dE}{d\theta} = \frac{1}{2} I \cdot 2\omega \frac{d\omega}{d\theta} = -kI\theta$$

$$\therefore \int dE = -kI\int \theta \, d\theta \Rightarrow \Delta E \propto \theta^2$$

Q.25 On earth's surface, $\sigma = \dfrac{x\rho rg}{2}$

In the mine, $\sigma = \dfrac{y\rho rg_d}{2}$

Dividing, we get $\dfrac{x}{y} = \dfrac{g_d}{g}$

$$= \frac{g\left(1 - \frac{d}{R}\right)}{g} = 1 - \frac{d}{R}$$

Hence the correct choice is (1)

Q.26 $f = M \Rightarrow M = \dfrac{\text{Tesla} - m^2}{\text{Ampere}}$

$F = qVB$

$$\Rightarrow \text{Tesla} = \frac{N}{\text{coulomb} \times (\text{meter/second})}$$

$$\frac{kg - ms^2}{\text{Ampere} \times \text{meter}} = \frac{kg - s^{-2}}{\text{Ampere}}$$

$$M = \frac{kg - m^2 s^{-2}}{\text{Ampere}^2} \Rightarrow ML^2T^{-2}A^{-2} = [M]$$

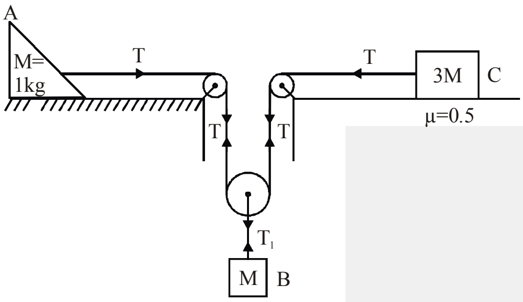
Also, $\dfrac{L}{R} = T$

$CR = T \Rightarrow LC = T^2$

$$\therefore C = \frac{T^2}{L} = \frac{T^2}{M}$$

$\Rightarrow [C] = M^{-1}T^{-2}T^4A^2$

Q.27 Clearly the block on the right hand side will not move



$Mg - 2T = Ma_B$

$T = Ma_A = 2Ma_B$ (constraint)

$2T = 4M\,a_B$

$Mg = 5M\,a_B$

$a_B = \frac{g}{5} = 2\text{m/s}^2$

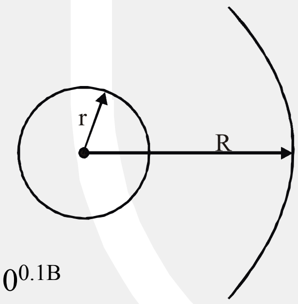
$T_1 = 2T = 4M \times 2 = 8$ N

$W = 8 \times \left(-\frac{1}{2} \times 2 \times 1^2\right) = -8$ J

Q.28 $1 \times 0.6 = v_B \times 0.3$, $v_B = 2$ m/s

Force = $\rho A V^2 = 10^3(0.3)(2 \times 2) = 1.2 \times 10^3$

Q.29 $B = 10\log_{10}\left(\frac{I}{I_0}\right)$



$\Rightarrow \frac{I}{I_0} = 10^{B/10}$

$\Rightarrow I = \frac{P}{4\pi r^2} = I_0 10^{0.1B}$

$\Rightarrow P = 4\pi r^2 I_0 10^{0.1}$ B

$I_R = \frac{4\pi r^2 I_0 10^{0.1B}}{4\pi R^2} = \frac{r^2}{R^2}[I_0]10^{0.1B}$

Q.30 Before collision $\quad v_0 = \vec{u}$; $\vec{v}_m = 0$

$v_3 = -\vec{u}$

After collision $\quad v_0 = 0$; $v_m = \vec{u}$

$v_3 = 3\vec{u}$

MATHEMATICS

Q.31 $\log_4\left(\frac{3-x}{3+x}\right) = \log_4\left(\frac{1-x}{2x+1}\right)$

$\Rightarrow \frac{3-x}{3+x} = \frac{1-x}{2x+1}$

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

$5x - 2x^2 + 3 = 3 - 2x - x^2$

$x^2 - 7x = 0 \Rightarrow x = 0$ or $x = 7$.

Reject $x = 7$; as domain $= x \in \left(\frac{-1}{2}, 1\right)$.

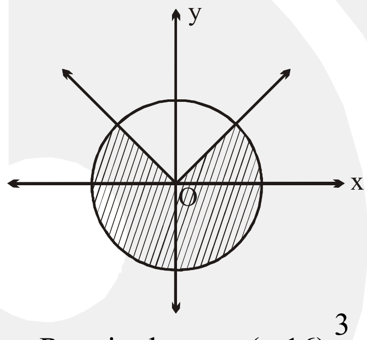
$\therefore$ Only solution is $x = 0$.

Q.32 From the first radical sign

$x^2 + y^2 \le 16$ i.e. interior of a circle with circle (0, 0) and radius 4.

From the 2nd radical sign $y \le |x|$

i.e. $\frac{3}{4}$ th of the circle



$\therefore$ Required area $= (\pi \cdot 16)\frac{3}{4} = 12\pi$. **Ans.**

Q.33 D = 0 gives $m = 6, \frac{2}{3}$

Q.34 Seperable $\int_0^y e^y\,dy = \int_0^x (2 + \cos x)\,dx$

$\Rightarrow e^y - 1 = 2x + \sin x$

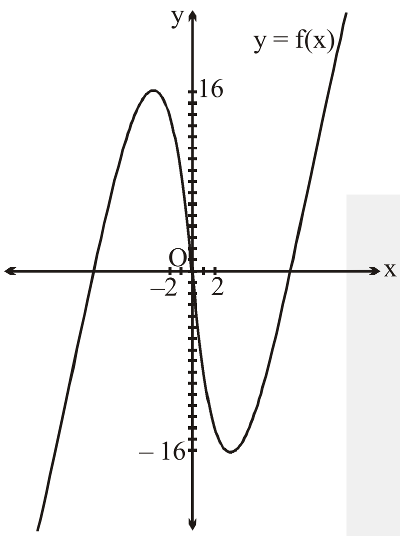
For $x = \frac{\pi}{2}$, we find $y = \ln(2 + \pi)$. **Ans.**

Q.35 Let $y = f(x) = x^3 - 12x$ and $y = -a$

For $f(x) = -a$ to have exactly one real root, we must have

$-a > 16$ or $-a < -16$

$\Rightarrow a \in (-\infty, -16) \cup (16, \infty)$



Ans.

Alternate: Let $f(x) = x^3 - 12x + a$

$f'(x) = 3x^2 - 12 = 3(x+2)(x-2)$

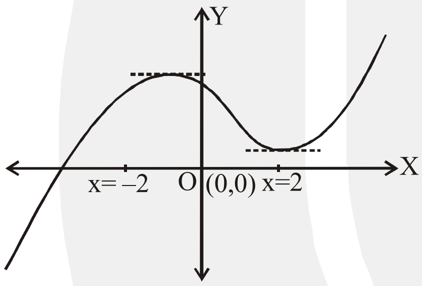
$\therefore$ The equation $f(x) = 0$

has exactly one real root, if

$f(-2)\, f(2) > 0 \Rightarrow (16 + a)(-16 + a) > 0$

$\Rightarrow (a - 16)(a + 16) > 0$

$\therefore a \in (-\infty, -16) \cup (16, \infty)$



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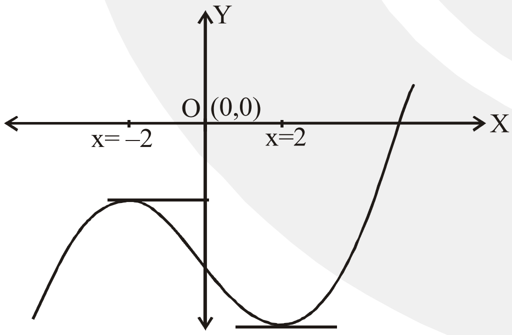


Two possible graph of $f(x)$. **Ans.**

Q.36 $\displaystyle\sum_{r=1}^{15} r\cdot\frac{a_r}{a_{r-1}} = \sum_{r=1}^{15} r\cdot\frac{{}^{15}C_r}{{}^{15}C_{r-1}}$

$$= \sum_{r=1}^{15} r\cdot\frac{(15)!}{(15-r)!\,r!} \times \frac{(r-1)!\,(15-r+1)!}{(15)!}$$

$$= \sum_{r=1}^{15}(16-r) = (1 + 2 + 3 + \ldots\ldots + 15)$$

$$= \frac{15\times 16}{2} = 120.$$

Q.37 Using LMVT, $\forall$ some $c \in (1, 8)$ s. t.

$$f'(c) = \frac{f(8) - f(1)}{7} = \frac{f(8) - 3}{7} \le 1.4$$

$f(8) = 9 \cdot 8 + 3 = 12.8$ Ans.

Q.38 $\because \displaystyle\int (x^9 + x^6 + x^3)(2x^6 + 3x^3 + 6)^{\frac{1}{3}}\, dx$

$$= \int (x^8 + x^5 + x^2)\,(2x^9 + 3x^6 + 6x^3)^{\frac{1}{3}}\, dx$$

Let $2x^9 + 3x^6 + 6x^3 = t$

$\Rightarrow$ $18(x^8 + x^5 + x^2)dx = dt$

$$\therefore\ I = \int \frac{t^{1/3}}{18}\, dt = \frac{1}{18}\cdot\frac{t^{4/3}}{4/3} + C = \frac{1}{24}t^{4/3} + C$$

$\therefore AB = 24 \times \dfrac{4}{3} = 32$ **Ans.**

Q.39 $\cos\theta + \sqrt{3}\sin\theta = 2\sin\theta$

$\Rightarrow \cot\theta = 2 - \sqrt{3}$ and $\tan\theta = 2 + \sqrt{3}$

$$\frac{\sin\theta - \sqrt{3}\cos\theta}{\cos\theta} = \tan\theta - \sqrt{3}$$

$= 2 + \sqrt{3} - \sqrt{3} = 2$ **Ans.**

Q.40 Use L'Hospital's rule

$$\lim_{x\to\infty}\frac{(\tan^{-1}x)\sqrt{x^2+1}}{x}\ ;\ \frac{\pi}{2}\lim_{x\to\infty}\frac{\sqrt{x^2+1}}{x}$$

$= \dfrac{\pi}{2}$. **Ans.**

Q.41 We know that

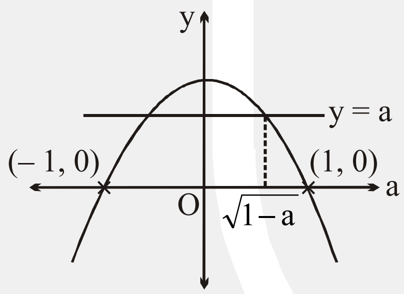
$\frac{\sin\theta}{\theta}$ and $\frac{\theta}{\tan\theta}$ both are decreasing functions of θ in $\left(0, \frac{\pi}{2}\right)$. So maximum value, when $\theta \to 0$ is $1 + 1 = 2$ and minimum value, when $\theta \to \frac{\pi}{2}$ is $\frac{2}{\pi}$.

Q.42 $T_n = \frac{(n+1)^2 - n}{n(n+1)} = 1 + \left(\frac{1}{n} - \frac{1}{n+1}\right)$

$\therefore\ S_{10} = 10 + \left(1 - \frac{1}{11}\right) = \frac{120}{11}$ **Ans.**

Q.43 $A(a) = 2\int_0^{\sqrt{1-a}}\left((1-x^2) - a\right)dx = \frac{4}{3}\ (1-a)^{3/2}$

$\therefore\ A(0) = \frac{4}{3}$



and $A\left(\frac{1}{2}\right) = \frac{4}{3}\left(\frac{1}{2}\right)^{\frac{3}{2}} \Rightarrow \frac{A(0)}{A\left(\frac{1}{2}\right)} = 2\sqrt{2}$.

Q.44 Use expansion.

Q.45 Replace x by $(1 - x)$, we get

$$\frac{f^2(1-x)}{f(x)} = (1-x)^3$$

$\therefore\ f^3(x) = x^6 (1-x)^3 \Rightarrow f(x) = x^2 (1-x)$

$\Rightarrow f\left(\frac{1}{2}\right) = \frac{1}{2}$ **Ans.**

Q.46 Let $u = \frac{c}{x}$, so $du = \frac{-c}{x^2}dx$, so $\int_1^{\sqrt{c}} \frac{f(x)}{x}dx$

$= \int_c^{\sqrt{c}} \frac{u\,f(u)}{c}\left(\frac{-x^2}{c}\right)du = \int_{\sqrt{c}}^{c} \frac{f(u)}{u}du$

Therefore, $\int_1^c \frac{f(x)}{x}dx$

$= \int_1^{\sqrt{c}} \frac{f(x)}{x}dx + \int_{\sqrt{c}}^{c} \frac{f(u)}{u}du = 3 + 3 = 6$ **Ans.**

Q.47 $2\alpha^3 = \alpha - 1 \Rightarrow \alpha^3 = \frac{\alpha - 1}{2}$

$\therefore\ \alpha^3 + \beta^3 + \gamma^3 = \frac{1}{2}(\alpha - 1 + \beta - 1 + \gamma - 1)$

$= \frac{1}{2}(\alpha + \beta + \gamma - 3) = -\frac{3}{2}$ **Ans.**

Q.48 $\int e^x\ (\tan x - x + \tan^2 x - \tan^2 x - 2\tan x \sec^2 x)dx$

$= \int e^x\ (\tan x - x + \tan^2 x)\ dx - \int e^x\ (\tan^2 x + 2\tan x \sec^2 x)dx$

$= e^x\ (\tan x - x - \tan^2 x) + C$

$f(x) = \tan x - x - \tan^2 x$

$f\left(\frac{\pi}{4}\right) = \frac{-\pi}{4}$.

Q.49 $(e - 1)e^{xy} + x^2 = e^{x^2} + y^2$

$(e - 1)\ e^{xy}\ (xy' + y) + 2x = e^{x^2+y^2}\ (2x + 2yy')$

Put $x = 1$ and $y = 0$ to get $\left.\frac{dy}{dx}\right|_{(1,0)} = 2$.

Q.50 $y = \left(5 - x^{2/3}\right)^{\frac{3}{2}}$

$\frac{dy}{dx} = \frac{-3}{2}\ \sqrt{\left(5 - x^{2/3}\right)}\ \left(\frac{2}{3}, \frac{1}{x^{1/3}}\right)$

$\left.\frac{dy}{dx}\right|_{M(1,\,8)} = \sqrt{5-1} = -2$

When $x = 1$, $y = 8$

tangent is $y - 8 = -2(x - 1)$

$2x + y = 10$

length of intercept $= \sqrt{100 + 25} = \sqrt{125}$

$\Rightarrow\quad N = 125$ **Ans.**

Q.51 $\sin\left(\frac{5x}{6}\right)+\cos\left(\frac{10x}{9}\right)=2$

$\sin\left(\frac{5x}{6}\right)=1$

$\Rightarrow \frac{5x}{6}=2n\pi+\frac{\pi}{2} \Rightarrow x=(4n+1)\frac{3\pi}{5}, n \in I$

and $\cos\left(\frac{10x}{9}\right)=1$

$\Rightarrow \frac{10x}{9}=2m\pi$

$\Rightarrow x=\frac{9m\pi}{5}, m \in I$

$\therefore$ least common value of x is $\frac{27\pi}{5}$.

Q.52 $l=\lim\limits_{x\to 1} k\left(\frac{x-1-\ln x}{(x-1)\ln x}\right)$

$x=1+h$

$l=k\lim\limits_{h\to 0}\frac{h-\ln(1+h)}{h^2}=\frac{k}{2}$

$\therefore$ For $\sin^{-1}\left(\frac{k}{2}\right)$ to exist

$-1\le\frac{k}{2}\le 1 \Rightarrow k\in[-2, 2]$

Number of integers is 5. **Ans.**

Q.53 $\log_{\pi}x>0 \quad\Rightarrow\quad x>1$

For $x>1$, $\sin^{-1}\frac{2x}{1+x^2}=\pi-2\tan^{-1}x$

$\log_{\frac{1}{\pi}}\left(\pi-2\tan^{-1}x+2\tan^{-1}x\right)=\log_{\frac{1}{\pi}}(\pi)$

$=-1$ **Ans.**

Q.54 $y_1=e^{2\sin^{-1}x}\cdot\frac{2}{\sqrt{1-x^2}}=\frac{2y}{\sqrt{1-x^2}}$

$y_1^2(1-x^2)=4y^2$

$y_1^2(-2x)+(1-x^2)2y_1y_2=8yy_1$

$(1-x^2)y_2=xy_1+4y$

$\therefore\ \lambda=4$. **Ans.**

Q.55 Put $x^2-1=t$

$$I=\frac{1}{2}\int_0^1\tan^{-1}t\,dt=\frac{1}{2}\left[\tan^{-1}t\cdot t\Big|_0^1-\int_0^1\frac{t}{1+t^2}dt\right]$$

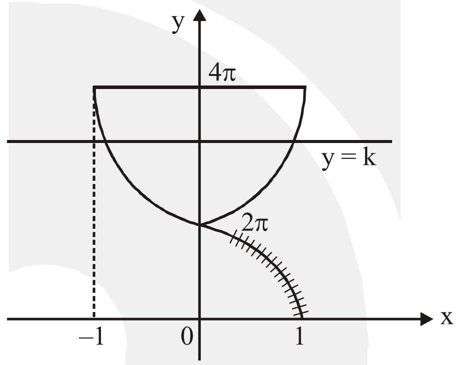
$I=\frac{\pi}{8}-\frac{1}{2}\cdot\frac{1}{2}\ln(2)=\frac{\pi}{8}-\frac{\ln 2}{4}$. **Ans.**

Q.56 Graph of $y=4\cos^{-1}(-|x|)$

From the graph it is

Clear that $k\in(2\pi, 4\pi]$

$\therefore$ integral values of k are 7, 8, 9, 10, 11, 12



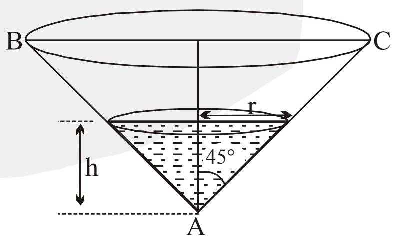
Q.57 We have

$\frac{dV}{dt}=2 \Rightarrow \frac{d}{dt}\left(\frac{1}{3}\pi r^3\right)=2$

[Here r = h, as $\theta=45°$]

$\Rightarrow \pi r^2\frac{dr}{dt}=2 \Rightarrow \frac{dr}{dt}=\frac{2}{\pi r^2}$ ....(1)

Now, perimeter = $2\pi r$ = p (let)



$\Rightarrow \frac{d}{dt}(2\pi r)=2\pi\left(\frac{2}{\pi r^2}\right)=\frac{4}{r^2}$ ....(2)

(Using equation (1))

When h = 2 meters $\Rightarrow$ r = 2 meters

Hence $\frac{dp}{dt} = \frac{4}{4} = 1$ m/sec. **Ans.**

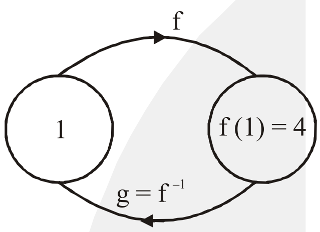
Q.58 Here, $T_n = n\,(2n)^2 = 4n^3$

$\therefore\ S_{10} = \sum_{n=1}^{10} T_n = 4\sum_{n=1}^{10} n^3$

$= 4\left(\frac{10\times 11}{2}\right)^2 = 4 \times (55)^2 = (2 \times 55)^2$

$= (110)^2 = 12100$. **Ans.**

Q.59 $g'(4) = \frac{1}{f'(1)} = \frac{1}{13} \equiv \frac{a}{b}$



So, a = 1 and b = 13
Hence, (a + b) = 14 **Ans.**

Q.60 g(x) =

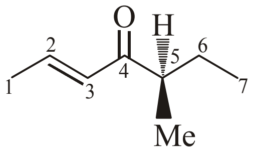
$$f(|x|) = \begin{cases} -\sin(x^3) + x^3 + 1; & -\infty < x \le -1 \\ -\sin(x^3) - x^3 - 1; & -1 \le x < 0 \\ \sin(x^3) + x^3 - 1; & 0 \le x < 1 \\ \sin(x^3) - x^3 + 1; & 1 \le x < \infty \end{cases}$$

$\therefore$ g(x) is non-derivable at x = –1, 1.

CHEMISTRY

Q.61 $[Pt(NH_3)_2Cl_2]$
x + 0 + (–2) = 0
x = +2
NH_3 (Ammine)–Neutral ligand
Cl^- (Chloride) $\rightarrow$ Anionic ligand
* Oxidation state of Pt = +2
* It is a neutral complex $\rightarrow$
CMI name – Platinum
* Ligands are named alphabetically
* Naming of complex $\rightarrow$
Diamminedichloridoplatinum(II)

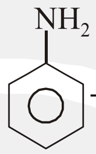
Q.62



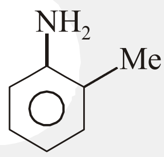
(2E, 5R)-5-methylhept-2-en-4-one.

Q.63 Theory based

Q.64 $[Pd(C_6H_5)_2(SCN)_2] \longleftrightarrow$
$[Pd(C_6H_5)_2(NCS)_2]$
SCN $\rightarrow$ Thiocynato
NCS $\rightarrow$ Isothiocynato
In both complexes Pd is co-ordinated by ambidentate ligands it shows linkage isomerism.

Q.65 (a)  $\longrightarrow$ Give isocyanide test

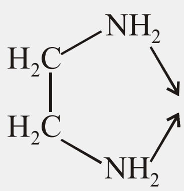
(b) $Me - \overset{\overset{\displaystyle O}{||}}{C} - NH_2 \longrightarrow$ Amide functional group

(c)  $\longrightarrow$ Ortho methyl aniline

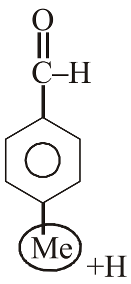
not give isocyanide test
(d) $Me - NH_2 \longrightarrow$ 1°-Amine give isocyanide test

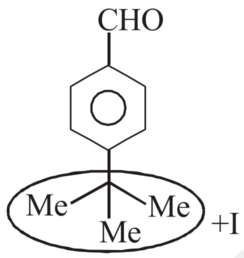
Q.66 Theory based

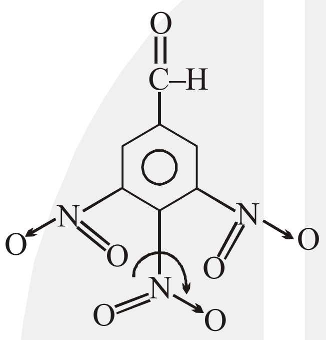
Q.67 Ethane-1, 2-diamine



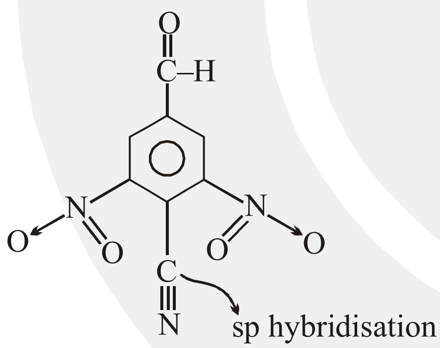
* It is a neutral ligand
* Bidentate ligand
* Chelating ligand

Q.68 (a) 

(b) 

(c) 

SIR

(d) 

Planar

Q.69 $2d\sin\theta = n\lambda$

$2d\sin 30° = 227 \times 1$

$$d = \frac{227}{2\times\sin 30°} = \frac{227}{2\times\frac{1}{2}} = 227 \text{ pm}$$

Q.70 $KMnO_4 \rightarrow$ Purple – due to charge transfer

$Ag_2C_2O_4 \rightarrow$ Colourless

$TiCl_4 \rightarrow$ Colourless

$Cu_2Cl_2 \rightarrow$ Colourless

Q.71 Glucose and Fructose are monosaccharides than show mutarotation

Q.72 $K_{\text{saturated solution}} = 2.06 \times 10^{-6}\ \text{ohm}^{-1}\ \text{cm}^{-1}$

$K_{\text{water}} = 4.1 \times 10^{-7}\ \text{ohm}^{-1}\ \text{cm}^{-1}$

$K_{CO_2[Fe(CN)_6]} = K_{sol} - K_{H_2O}$

$= 2.06 \times 10^{-6} - 0.41 \times 10^{-6}$

$= 1.65 \times 10^{-6}\ \text{ohm}^{-1}\ \text{cm}^{-1}$

$\Lambda^0_m\ [Co_2(Fe(CN)_6)] = 2\Lambda^0_m\,(Co^{2+}) + \Lambda^0_m\,[Fe(CN)_6]^{-4}$

$= 2 \times 86 + 444$

$= 616\ \text{ohm}^{-1}\ \text{cm}^{-1}\ \text{mol}^{-1}$

For SSS

$\Lambda^0_m = \Lambda_m$

$$\Lambda_m = \frac{K\times 1000}{M}$$

$$611 = \frac{1.65\times 10^{-6}\times 1000}{M}$$

$M = 0.267\times 10^{-5}$

S or M $= 2.67 \times 10^{-6}$

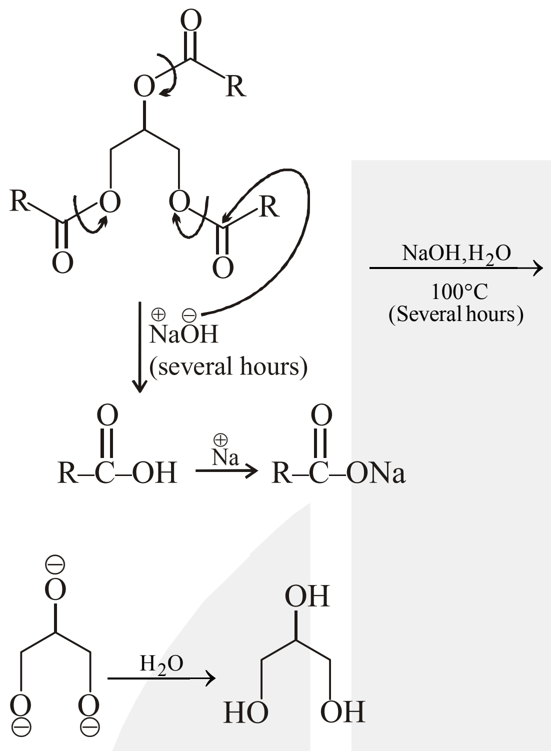
Q.73 (1) Pu (Atomic no. 94) $\rightarrow$ [Rn], $5f^6, 6d^0, 7s^2$

(2) Am (Atomic no. 95) $\rightarrow$ [Rn], $5f^7, 6d^0, 7s^2$

(3) Cm (Atomic no. 96) $\rightarrow$ [Rn], $5f^7, 6d^1, 7s^2$

(4) Bk (Atomic no. 97) $\rightarrow$ [Rn], $5f^9, 6d^0, 7s^2$

Q.74



Q.75 $k_{obs} = \left(\dfrac{k_1}{k_2}\right)^{1/2} . k_3$

$$= \left(\frac{A_1 e^{-E_1/RT_1}}{A_2 e^{-E_2/RT_2}}\right)\left(A_3 e^{-E_3/RT}\right)$$

$$= \left(\frac{A_1}{A_2}\right)^{1/2} .A_3 \left[e^{\frac{-E_1+E_2}{RT}}\right]^{1/2} e^{-E_3/RT}$$

$$= \left(\frac{A_1}{A_2}\right)^{1/2} .A_3 \left[e^{\frac{-\left(\frac{1}{2}(E_1-E_2)+E_3\right)}{RT}}\right]$$

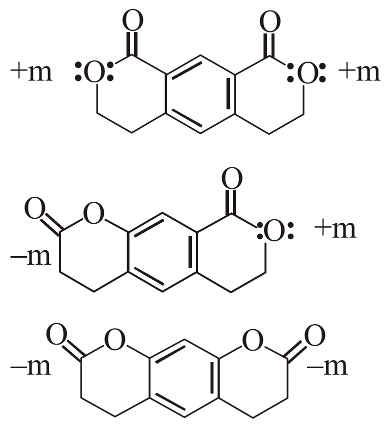
Comparing with $Ae^{-Ea/RT}$

$$E_a = E_3 + \frac{1}{2}\left(E_1 - E_2\right)$$

Q.76 $Fe^{3+} + H_2O_2 / OH^- \longrightarrow Fe^{2+} + O_2$

$Mn^{2+} + H_2O_2 / OH^- \longrightarrow \overset{+4}{Mn}O_2 + H_2O$

Q.77



Increasing rate of reaction with HNO_3 / H_2SO_4 is (i) < (ii) < (iii)

Q.78 Let γ, β and γ be the angle of rotation of sucrose, glucose and fructose per mol respectvely.

$C_{12}H_{22}O_{11} + H_2O \xrightarrow{H^{\oplus}} C_6H_{12}O_6 + C_6H_{22}O_6$

t = 0   a   0   0

$\Rightarrow a.\alpha = r_0$ ....(1)

t = 50% $a - \frac{a}{2} = \frac{a}{2}$ $\frac{a}{2}$ $\frac{a}{2}$

$\Rightarrow \frac{a}{2}(\alpha+\beta+\gamma) = r_1$ ...(2)

t = ∞   0   a   a

$\Rightarrow a(\beta+\gamma) = r_\infty$

$$\frac{a}{2}(\alpha+\beta+\gamma) = r_1$$

$$a\alpha + a(\beta+\gamma) = 2r_1$$

$$r_0 + r_\infty = 2r_1$$

$$r_0 = 2r_1 - r_\infty$$

Q.79

(1) Haematite(Fe_2O_3)

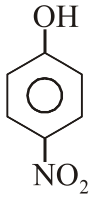
→ Oxides ore is directly reduced by carbon ($Fe_2O_3 + 3C \longrightarrow 2Fe + CO\uparrow$)

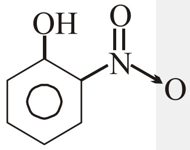
(2) Chalcocite(Cu_2S)

(3) Iron pyrites (FeS_2)

(4) Sphalerite (ZnS)

} Sulphide ores are roasted first converted to oxide and then reduced by coke.

Q.80 p-nitrophenol 

o-nitrophenol 

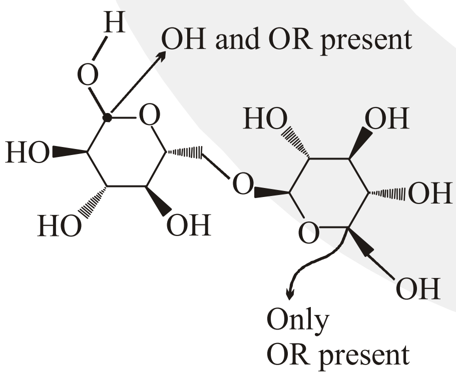
p-nitrophenol and o-nitrophenol are separated by Steam distillation

Q.81 $AgNO_3 + KCl$
20 ml 25 ml
1M xM
$20 \times 1 \times 1 = 25 \times x \times 1$

$$m \text{ or } M = 25 = \frac{20}{25} = \frac{4}{5} = 0.8$$

$\Delta T_f = K_f .m.i$
$\Delta T_f = (1.86)\ (0.8)\ (2)$
$\Delta T_f = 3.2$ **Ans**

Q.82 (1) $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$
(In reduction zone)
(2) $FeO + SiO_2 \longrightarrow FeSiO_3$
(No reaction in blast furnance)
(3) $FeO + 3C \longrightarrow 2Fe + 3CO$
(In combustion zone)
(4) $CaO + SiO_2 \longrightarrow CaSiO_3$
(Slag formation)

Q.83 

If one C have OH and OR than hemiacetals.
If one C have OR and OR than acetal.

Q.84 Given :
Weight of PVC : W = 4 gm
Volume of solution, V = 1L
Osmotic pressure, $\pi = 6 \times 10^{-4}$
Temperature (T) = 300 K
$\pi V = nRT$

$$(6 \times 10^{-4}) \times 1 = \frac{4}{M} \times 0.0821 \times 300$$

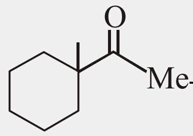
$$M = \frac{4}{6 \times 10^{-4}} \times 0.0821 \times 300$$

$M = 1.6 \times 10^5$

Q.85 This type of method of purification is used in Mond's process.
For - Ni ; Reagent - CO

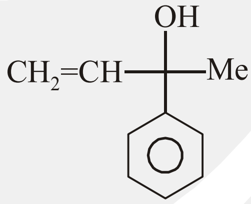
$$Ni(impure) + CO(reagent) \xrightarrow{\Delta} Ni(CO)_4$$

$$Ni(CO)_4 \xrightarrow{\Delta} \underset{(Pure)}{Ni} + CO\uparrow$$

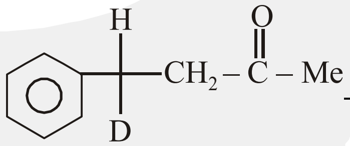
Q.86 (1)  $\longrightarrow$ Give Iodoform Test

(2) $Ph - CH = CH - \underset{\underset{OH}{|}}{CH} - Me \longrightarrow$

Give Iodoform Test

(3)  $\longrightarrow$

In capable to show Iodoform Test

(4)  $\longrightarrow$ Give

Iodoform Test

Q.87 $A(g) + 2B(g) \rightarrow C(g) + D(g)$
0.6 0.8 0 0
0.6 – x 0.8 – 2x x x
[0.4] [0.4] x = 0.2
$R_1 = K[A]\ [B]$
$= K[0.8]\ [0.8]^2$

$R_2 = K\,[0.6]\,[0.4]^2$

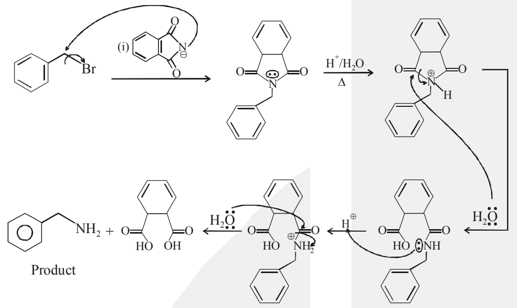
$$\frac{R_2}{R_1} = \frac{K[0.6][0.4]^2}{K[0.8][0.8]^2} = \frac{3}{16}\ \textbf{Ans.}$$

Q.88 $I_2 + Na_2CO_3 \xrightarrow{\Delta} NaI(X) + NaIO_3(Y)$

$Y = NaIO_3$(Oxidising agent)

It will not oxidise $Cr_2O_7^{2-}$ in basic medium.

Q.89



Q.90 Theory based