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ANSWER KEY

DATE: 23-11-2018

COURSE
NUCLEUS

JEE-MAIN MOCK TEST-3
XII

TEST CODE				
1	1	2	6	8

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

HINTS & SOLUTIONS

PHYSICS

Q.2 Component of velocity along north will increase

Q.3 $V_{rel}^2 = u_{rel}^2 - 2a_{rel}S_{rel}$

$0 = (200)^2 - 2(a_{rel})\,(1000)$

or $a_{rel} = 20\ m/s^2$

So to avoit the hit,

$a_{rel} > 20\ m/s^2$

or $a_p > 10\ m/s^2$

Q.4 $\omega_0{}^2$ .025 rad/s

$V_2{}^1 = r\omega$

$$= \frac{h}{\sin 60°} \times 0.025 = \frac{8 \times 0.025}{\sin 60°}$$

$$V = \frac{V'}{\sin 60°} = \frac{8 \times 0.025}{\sin^2 60°}$$

$$= \frac{8 \times 0.025}{3} \times 4 \times 1000 = 960\ km/h$$

Q.5 Counting the squares under the graph from t = 0 to t = 1. We get change in velocity.

Q.6 $m_1 = \left(\frac{m}{L}\right)l_1,\ m_2 = \left(\frac{m}{L}\right)l_2$

$$\sin\alpha = \frac{h}{l_1}$$

$h = l_1 \sin\alpha = l_2 \sin\beta$

$\because\quad l_1 + l_2 = L$

$$l_1 + \frac{l_1 \sin\alpha}{\sin\beta} = L$$

$$l_1 = \frac{L}{1 + \frac{\sin\alpha}{\sin\beta}},\quad l_2 = \frac{L\ \sin\beta}{\sin\beta + \sin\alpha} \times \frac{\sin\alpha}{\sin\beta}$$

$$l_2 = \frac{L\ \sin\alpha}{\sin\alpha + \sin\beta}$$

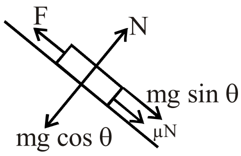
$$m_1 = \frac{m \sin\beta}{\sin\alpha + \sin\beta}, \quad m_2 = \frac{m \sin\alpha}{\sin\alpha + \sin\beta}$$

Let $\alpha > \beta$

$m_1 g \sin\alpha - T = m_1 a$

$T - m_2 g \sin\beta = m_2 a$

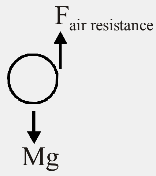
$$a = \frac{m_1 g \sin\alpha - m_2 g \sin\beta}{m_1 + m_2} = 0$$

Q.8 

N = mg cos q

$F = mg \sin\theta + \mu N$

Q.9 By COE loss in gravitational P.E. = gain in K.E.

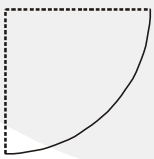
+ work against air resistance. 

Q.10 This is subtle, because it is the force that the rope applies to the man that causes him to move upward, against the force of gravity. Nonetheless, as he climbs hand over hand, the hand that is holding the rope is always stationary, while man's body and his free hand move upward. Since the force of the rope is applied to the man's stationary hand, there is no displacement of the object to which the force is applied, and hence no work done.

Q.11 $628 = \frac{\pi}{2} R$

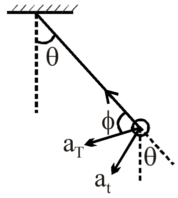
$628 = \frac{3.14}{2} R$

$\Rightarrow R = 400$



$$F = \frac{mv^2}{R} = 1000 \times \frac{20^2}{400} = 1000 \text{ N}$$

Q.12 $mgl \cos\theta = \frac{1}{2} mv^2$



$\frac{v^2}{l} = 2g \cos\theta$

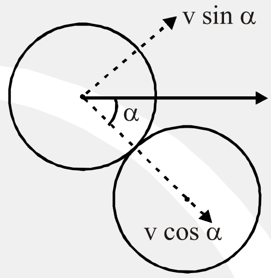
$ma_t = mg \sin\theta$

$$\tan f = \frac{a_t}{a_R} = \frac{g \sin\theta}{2g \cos\theta} = \frac{\tan\theta}{2}$$

Q.14 $e = 1 = \frac{10 - V}{12 - 10}$

V = 8 m/s

Q.15 As masses are equal and collision elastic



∴ velocity along line of impact gets exchanged and
velocity perpendicular to line of impact remains unchanged.

Q.16 $\vec{v}_0 = \frac{100\vec{v}_1 + 60\vec{v}_2 + 40\vec{v}_2}{200}$

$\vec{v}_1 = 250\hat{i} - 100\hat{j} + 125\hat{k}$

$\vec{v}_2 = 125\hat{i} - 50\hat{k}$

$\vec{v}_3 = \frac{x\hat{i} + y\hat{j} + z\hat{k}}{t} \quad t = 2$

Q.18 $\frac{mL^2}{3} = 0.2$

$\frac{mL^2}{12} = I$

$\frac{I}{0.2} = \frac{1}{4} \Rightarrow I = 0.05$

Q.19 $R \sin 30° \times 2 = I\alpha = 4 \times \frac{1^2}{4} \times \alpha$

$\alpha = 1$ rad/s^2

Q.20 $\Delta\vec{L} = \vec{J}_R = \int \vec{L}dt = \vec{L}t$

Same for all

Q.21 If car is in pure rolling; contact point is instantaneously at rest whereas topmost point has maximum speed. Even if there is slipping forward rolling and car is moving forward, topmost point has greater speed.

Q.22 $\frac{Gm}{R^2} - \omega^2 R > 0$

Q.23 $v_{esc} = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2G \times 10M}{R/10}}$

$= 10 \times 11 = 110$ km/s

Q.25 In CM frame both the masses execute SHM with

$\omega = \sqrt{\frac{k}{\mu}} = \sqrt{\frac{2k}{m}}$

Initially particles are at extreme

distance $= L_0 + (L - L_0) \cos \sqrt{\frac{2k}{m}}\, t$

Q.26 $F = \frac{YA}{L/2} \cdot \Delta L_1$

$\therefore DL_1 + DL_1 = \frac{3FL}{4YL}$

$F = \frac{Y \cdot 2A}{L/2} \cdot \Delta L_2$

Q.27 Pressure at p & that at q are equal as they are both equal to atmospheric pressure.

$$\Rightarrow \left.\begin{matrix} P \to p_f + p_\omega \times g \times \frac{10}{100} \\ Q \to p_f + p_2 \times g \times \frac{12}{100} \end{matrix}\right\} \text{ equating}$$

$\Rightarrow p_w 10 = p_2 \times 12 \qquad \Rightarrow p_2 = 0.83$ g/cm^3

Q.29 Pressure at liquid surface outside the capillary is P_0. As we go up a distance h/2 pressure decreases by $\rho gh/2$

Q.30 $F_{stokes} = F_{buoyancy}$

$6\pi\eta rv = \left(\frac{4}{3}\pi r^3\right)\rho g$

MATHEMATICS

Q.31

Q.32 $60^a = 3 \quad \Rightarrow \quad a = \log_{60}3$

$60^b = 5 \quad \Rightarrow \quad b = \log_{60}5$

let $\quad x = 12^{\frac{1-a-b}{2(1-b)}}$

$\log_{12}x = \frac{1-a-b}{2(1-b)} = \frac{1-(a+b)}{2(1-b)}$

$= \frac{1-(\log_{60}3 + \log_{60}5)}{2(\log_{60}60 - \log_{60}5)} = \frac{1-(\log_{60}15)}{2(1-\log_{60}5)}$

$= \frac{\log_{60}4}{2\log_{60}12}$

$= \frac{1}{2}\log_{12}4 = \log_{12}2 \qquad (a + b = \log_{16}15)$

$\therefore \quad \log_{12}x = \log_{12}2 \Rightarrow x = 2$ Ans.]

Q.33 Domain is $(-3, -2) \cup (-1, \infty)$; for $x > -1$, LHS is negative & RHS is positive and for $-3 < x < -2$ it is the other way $\Rightarrow x > -1$ is the final answer]

Q.34 $\qquad x + \sin y = 2008$

subtract $\qquad \underline{x + 2008 \cos y = 2007}$

$\sin y - 2008 \cos y = 1$

$\sin y = 1 + 2008 \cos y$

This is possible only if $\cos y = 0$

$\therefore \quad y = \frac{\pi}{2}$ and $x = 2007$

$x + y = 2007 + \frac{\pi}{2} \quad \Rightarrow$

$[x + y] = 2008$ **Ans.**]

Q.35 Given
p : Ram races
q : Ram wins
$\therefore$ The statement of given proposition $\sim(p \vee (\sim q)) = \sim p \wedge q$ is
"Ram does not race and Ram wins." **Ans.**]

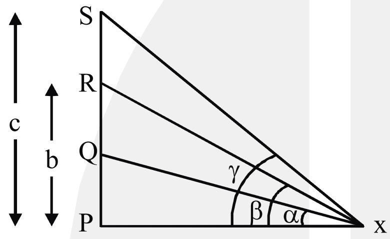
Q.36 We have

$\tan\alpha = \frac{a}{x}$, $\tan\beta = \frac{b}{x}$ and $\tan\gamma = \frac{c}{x}$

$\therefore$ $\alpha + \beta + \gamma = 180^\circ$, so

$\tan\alpha + \tan\beta + \tan\gamma = \tan\alpha\tan\beta\tan\gamma$

or $\frac{a}{x} + \frac{b}{x} + \frac{c}{x} = \frac{a}{x}\cdot\frac{b}{x}\cdot\frac{c}{x}$



or $x^2 = \frac{abc}{a+b+c}$]

Q.37 $A = \{1, 2, 3, 4, 5, 6\} \Rightarrow n(A) = 6$
$B = \{1, 2\} \Rightarrow n(B) = 2$
$\therefore A \cap B = \{1, 2\} \Rightarrow n(A \cap B) = 2$
So, number of elements in $A \times (A \cap B) = 12$
$\therefore$ Number of subsets containing 3 elements = ${}^{12}C_3 = 220$]

Q.38

Q.39 RHS when simplified is equal x.

$x_1 = 1$; $x_2 = \frac{1}{10}$; $x_3 = \frac{1}{100}$

Q.40 $\frac{1}{20}\sum_{i=1}^{20}(x_i - \bar{x})^2 = 5$

$\sum_{i=1}^{20}(x_i - \bar{x})^2 = 100$

New, observations are,
$2x_1, 2x_2, 2x_3, ..., 2x_{20}$

Their mean,

$\bar{x} = \frac{2(x_1 + x_2 + ...x_{20})}{20} = 2\bar{x}$

Now, variance,

$\frac{1}{20}\sum_{i=1}^{20}(2x_i - 2\bar{x})^2 = \frac{1}{20} \times 4\sum_{i=1}^{20}(x_i - \bar{x})^2$

$= \frac{1}{20} \times 4 \times 100 = 20$]

Q.41 $3^{400} = 81^{100} = (1 + 80)^{100} = {}^{100}C_0 + {}^{100}C_1\, 80 + ... + {}^{100}C_{100}\, 80^{100}$
$\Rightarrow$ Last two digits are 01]

Q.42 $A\log_{200}5 + B\log_{200}2 = C$

$\frac{A\log 5}{\log 200} + \frac{B\log 2}{\log 200} = C$

$A\log 5 + B\log 2 = C\log 200 = C\log(5^2\ 2^3)$
$= 2C\log 5 + 3C\log 2$
hence, $A = 2C$
$B = 3C$
for no common factor greater than 1, $C = 1$
$\therefore$ $A = 2$; $B = 3$ $\Rightarrow$ $A + B + C = 6$
Ans.]

Q.43 Let
$E = \sin^2\alpha + \sin^2\beta + \cos^2(\alpha+\beta) + 2\cdot\sin\alpha\cdot\sin\beta\cdot\cos(\alpha+\beta)$
$= \sin^2\alpha + \sin^2\beta + \cos^2(\alpha+\beta) + [\cos(\alpha-\beta) - \cos(\alpha+\beta)]\cdot\cos(\alpha+\beta)$
$= \sin^2\alpha + \sin^2\beta + (\cos^2\alpha - \sin^2\beta) = 1$. **Ans.**]

Aliter: $E = \sin^2\alpha + \sin^2\beta + \cos^2(\alpha+\beta) + 2\sin\alpha\sin\beta\cos(\alpha+\beta)$
$= \sin^2\alpha - \sin^2(\alpha+\beta) + \sin^2\beta + 1 + 2\sin\alpha\sin\beta\cos(\alpha+\beta)$
$= -\sin(2\alpha+\beta)\cdot\sin\beta + \sin^2\beta + 1 + 2\sin\alpha\sin\beta\cos(\alpha+\beta)$
$= 1 - \sin\beta[\sin(2\alpha+\beta) - \sin\beta] + 2\sin\alpha\sin\beta\cos(\alpha+\beta)$
$= 1 - \sin\beta[2\cos(\alpha+\beta)\sin\alpha] + 2\sin\alpha\sin\beta\cos(\alpha+\beta)$
$= 1 - 2\sin\alpha\sin\beta\cos(\alpha+\beta) + 2\sin\alpha\sin\beta\cos(\alpha+\beta)$
$\therefore$ $E = 1 \Rightarrow$ (A). **Ans.**]

Q.44 $\cos^3 3x + \cos^3 5x = (2\cos 4x \cos x)^3$
$= (\cos 5x + \cos 3x)^3$
$\cos^3 3x + \cos^3 5x = \cos^3 5x + \cos^3 3x + 3\cos 5x \cos 3x (\cos 5x + \cos 3x)$
$\Rightarrow (3\cos 3x \cdot \cos 5x)(2\cos 4x \cdot \cos x) = 0$
$\Rightarrow \cos x \cdot \cos 3x \cdot \cos 4x \cdot \cos 5x = 0$

$\therefore x = (2n+1)\frac{\pi}{2}, (2n+1)\frac{\pi}{6}, (2n+1)\frac{\pi}{8}, (2n+1)\frac{\pi}{10}$

$\Rightarrow$ smallest +ve values of x is $\frac{\pi}{10}$ i.e. 18° Ans.]

Q.45 $6x^2 + 2ax + 2 = 0$ and $6x^2 + 3bx + 3 = 0$

subtracting $x(2a - 3b) - 1 = 0 \Rightarrow x = \frac{1}{2a-3b}$
(put in any equation)

$\therefore \quad 2\frac{1}{(2a-3b)^2} + \frac{b}{2a-3b} + 1 = 0$
$2 + b(2a - 3b) + (2a - 3b)^2 = 0$
$4a^2 + 5b^2 - 12ab + 2ab - 3b^2 + 2 = 0$
$-10ab + 6b^2 + 4a^2 + 1 = 0$
$\Rightarrow \quad 5ab - 3b^2 - 2a^2 = 1 \Rightarrow$ B]

Q.46 Answer is $(-\infty, -3] \cup (0, 2]$]

Q.47 $S = \frac{1}{1} + \frac{1}{1+2} + \frac{1}{1+2+3} + \ldots\ldots$

$T_n = \frac{1}{1+2+3+4+\ldots\ldots\ldots+n} = \frac{2}{n(n+1)}$

$= 2\left[\frac{1}{n} - \frac{1}{n+1}\right] \Rightarrow S_\infty = 2.$]

Q.48 coefficient of A in n^{th} term $= 8 + (n-1)(-2)$
$= 10 - 2n$

coefficient of B in n^{th} term $= 2 + (n-1)(-1)$
$= 3 - n$
$10 - 2n = 2(3 - n) \quad \Rightarrow \quad 10 = 6$
which is absurd $\Rightarrow$ none]

Q.49 $8 = 3 + \frac{1}{4}(3+d) + \frac{1}{4^2}(3+2d) + \ldots\ldots + \text{upto } \infty$

$\frac{8}{4} = \frac{3}{4} + \frac{3+d}{4^2} + \ldots\ldots\ldots\ldots\ldots\infty$

$8 - 2 = 3 + \frac{d}{4} + \frac{d}{4^2} + \frac{d}{4^3} + \ldots\ldots\ldots\ldots\ldots\infty$

$6 = 3 + \frac{d/4}{1-1/4} \quad \Rightarrow \quad d = 9$]

Q.50 $x^2 + kx + 1 - y^2 = 0$

$x = -\frac{-k \pm \sqrt{4y^2 + k^2 - 4}}{2}$

for real linear factors $4y^2 + 0y + k^2 - 4$ must be a perfect square.
Hence $D = 0 \quad \Rightarrow \quad 0 - 16(k^2 - 4) = 0$
$\therefore \quad k = 2, -2 \quad \Rightarrow \quad k_1 = -2$
and $k_2 = 2$
$k_2 - k_1 = 2 - (-2) = 4$ **Ans.**

Aliternatively: Comparing $x^2 - y^2 + kx + 1$, with $Ax^2 + 2Hxy + By^2 + 2Gx + 2Fy + C$;

we get $A = 1, B = -1, H = 0, G = \frac{k}{2}$,
$F = 0, C = 1$
Now, using condition,
$ABC + 2FGH - AF^2 - BG^2 - CH^2 = 0$, we get

$-1 + \frac{k^2}{4} = 0 \Rightarrow k = \pm 2$

$\Rightarrow k_1 = -2, k_2 = 2$
Hence, $(k_2 - k_1) = 2 - (-2) = 4$. **Ans.**]

Q.51 $f(0) < 0 \Rightarrow a^2 - 4a < 0$
$\therefore \quad a \in (0, 4)$.
Hence, number of integral value of a is 3.]

Q.52 Given $\left|\frac{x}{2} - \frac{\pi}{2}\right| \le \frac{3\pi}{4}$; let $x = \frac{n\pi}{2}$;

$\left|\frac{n\pi}{4} - \frac{\pi}{2}\right| \le \frac{3\pi}{4}$ or $|n\pi - 2\pi| \le 3\pi$

Hence possible n satisfying this case
0, 1, 2, 3, 4, 5

now given

$$\sin\frac{x}{2}-\cos\frac{x}{2}=(\sin\frac{x}{2}-\cos\frac{x}{2})^2$$

$\Rightarrow$ either $\sin\frac{x}{2}=\cos\frac{x}{2}$

or $\sin\frac{x}{2}-\cos\frac{x}{2}=1$

corresponding n can be 1, 2, 4 and 5.]

Q.53

p	q	~ p	~ p ∨ q	r
T	T	F	T	T
F	F	T	T	T
T	F	F	F	F
F	T	T	T	T

$\therefore$ Clearly from above table, If r has a truth value F, then the truth values of p and q are T and F respectively.]

Q.54 Median will remain same.

Q.55 $(1+z)^3$ where $z = x(1+2x+3x^2)$

$1 + {}^3C_1 z + {}^3C_2 z^2 + {}^3C_3 z^3$

coefficient of x^3 in $(1+z)^3$

${}^3C_1(3) + {}^3C_2(4) + {}^3C_3(1) = 22$

$\Rightarrow$ a = 22

now again $(1+y)^3$

where $y = x(1+2x+3x^2+4x^3)$

$(1+y)^3 = 1 + {}^3C_1 y + {}^3C_2 y^2 + {}^3C_3 y^3$

$\therefore$ coefficient of x^3 is

${}^3C_1(3) + {}^3C_2(4) + {}^3C_3(1)$

$= 9 + 12 + 1 = 22$

$\Rightarrow$ b = 22

Hence a = b $\Rightarrow$ a + b = 44 Ans.]

Q.56 If α, β, γ are the roots then $\alpha+\beta+\gamma = 2$; also $\alpha+\beta = 0$ (where α, β are additive inverse)

$\therefore$ $\gamma = 2$ which must satisfy the given equation

$\therefore$ $a = -5$ $\Rightarrow$ (D)]

Q.57 $x^3-2x^2+4x+5074 = (x-r_1)(x-r_2)(x-r_3)$

put $x = -2$

$-8-8-8+5074 = -(2+r_1)(2+r_2)(2+r_3)$

$\therefore$ $5050 = -(2+r_1)(2+r_2)(2+r_3)$

$(2+r_1)(2+r_2)(2+r_3) = -5050$ **Ans.**]

Q.58

a , b, c are in H.P.

$$\Rightarrow b=\frac{2ac}{a+c} \quad \Rightarrow \frac{\log 4}{\log(2^{1-x}+1)} = \frac{2.\frac{\log 2}{\log(5.2^x+1)}.1}{\frac{\log 2}{\log(5.2^x+1)}+1}$$

$$\frac{2\log 2}{\log\left(2^{1-x}+1\right)} = \frac{2\log 2}{\log(5.2^x+1)[\log 2+\log(5.2^x+1)}$$

10. t +2 = 2/t + 1 $\Rightarrow$ $10t^2 + 2t = 2 + t$

$(2^x = t)$

$10t^2 + t - 2 = 0$

$10t^2 + 5t - 4t - 2 = 0$

$5t(2t-1) - 2(2t+1) = 0$

$\Rightarrow$ t = 2/5 , –1/2 (rejected)

x log2 = log 2/5

$\Rightarrow$ $2^x = 2/5$

$x \log_2 2 = 1 - \log_2 5$

$x = 1 - \log_2 5$.

Aliter: $\log_2(5\cdot 2^x+1),\ \frac{1}{2}\log_2(2^{1-x}+1),\ 1 \rightarrow$ A.P.

$\therefore$ $\log_2(2^{1-x}+1) = \log_2(5\cdot 2^x+1)+1$

$\therefore$ $2^{1-x}+1 = (5\cdot 2^x+1)\times 2$

$\Rightarrow$ $\frac{2}{2^x}+1 = 10\times 2^x+2$

$\therefore$ $2+t = 10t^2+2t \Rightarrow 10t^2+t-2=0$

$\therefore$ $2^x = \frac{-1}{2^x}$ or $\frac{2}{5}$ $\Rightarrow x = \log_2\frac{2}{5} = 1-\log_2 5$,

$x < 0$.]

Q.59 Let $\frac{\alpha}{\delta}, \alpha, \alpha\delta$ are the roots of the given cubic

$\therefore$ $\alpha^3 = r$; $\alpha\left[\frac{1}{\delta}+1+\delta\right] = p$;

$\frac{\alpha^2}{\delta}+\alpha^2\delta+\alpha^2 = q$ (Taken two at a time) hence $\alpha^2 \left(\frac{1}{\delta} + \delta + 1\right) = q$;

$\therefore \quad \alpha = \frac{q}{p}$, also $\alpha^3 = r$;

$\therefore \quad \frac{q^3}{p^3} = r \Rightarrow q^3 = p^3 r$

Q.60 Let the 1st 5 terms of the A.P. are

$a - 2d$, $a - d$, a , $a + d$, $a + 2d$

now $a_1 + a_3 + a_5 = -12$

$\therefore \quad 3a = -12$

$\Rightarrow \quad a = -4$

also $a_1 . a_2 . a_3 = 8$

$(a - 2d)(a - d)a = 8$

$-4(-4 - 2d)(-4 - d) = 8 \Rightarrow d = -3$

Hence the A.P. is 2 , – 1 , – 4, – 7, – 10, – 13 ,.w.....

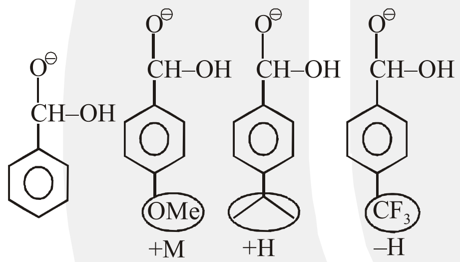
Hence $a_2 + a_4 + a_6 = -21$

CHEMISTRY

Q.61 $[Co(NH_3)_5Cl]Cl_2 \longrightarrow$ purplecolour

$\longrightarrow$ Electrolyte $\longrightarrow$ 1 : 2

Q.62



Hydride donation tendency α e^- donating group.

Q.63

HB HA

$H_2 + 2H^+ \rightleftharpoons 2H^+ + H_2$

1atm x y 1 atm

$\sqrt{10^{-7}} \quad \sqrt{10^{-5}}$

$K_a = 10^{-5}$

$[H^+] = \sqrt{K_a.C}$

$[H^+] = \sqrt{10^{-5}.1}$

$[H^+]_{HB} = \sqrt{10^{-7}.1}$

$E = 0 - \frac{0.0591}{2} \log \frac{10^{-5}}{10^{-7}}$ V

$= -0.059$V

Q.64 (1) $KCl(aq) + MgCl_2(aq) \xrightarrow{\Delta} KCl.MgCl_2.6H_2O$

(Double salt) (Carnallite)

(2) $(NH_4)_2SO_4(aq) + FeSO_4(aq) \xrightarrow{\Delta} FeSO_4.(NH_4)_2SO_4.6H_2O$

(Mohr's salt) (Double salt)

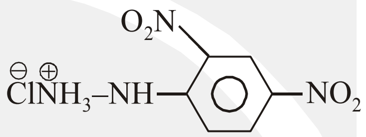
(3) $K_2SO_4(aq) + Al_2(SO_4)_3(aq) \xrightarrow{\Delta} K_2SO_4.Al_2(SO_4)_3.24H_2O$

(Potash Alum) (Double salt)

(4) $CoCl_3(aq) + KNO_2(aq) \xrightarrow{\Delta} K_3[Co(NO_2)_6]$

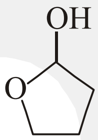
(Fisher's salt) (Complex salt)

Q.65 (a)



$\rightarrow$ Present acidic 'H'

(b)



$\rightarrow$ Not give ppt.

(c) $Me - C \equiv C - H \rightarrow$ 1-Alkyne has acidic 'H' t han give ppt.

(d) $Me - \overset{O}{\overset{\|}{C}} - H \rightarrow$ Not give ppt.

Q.66 $Fe(OH)_3 \rightleftharpoons Fe^{+3} + OH^-$

$\Delta G = -RT\ln K_{sp}$

$\downarrow Fe(OH)_3 + 3e^- \rightleftharpoons Fe(s)$;

$\Delta G = -3F(-0.036)$

$Fe(OH)_3(s) \rightleftharpoons Fe^{+3}(aq) + 3OH^-(aq)$

$\Delta G = -RT\ln K_{sp}$

$Fe(OH)_3(s) + 3e^- \rightleftharpoons Fe(s) + 3OH^-$

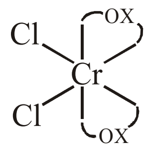
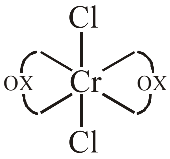
$\Delta G° = -3FE°$

$-3F(-0.716) = -3F(0.036) - RT \ln K_{sp}$

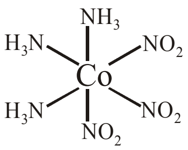
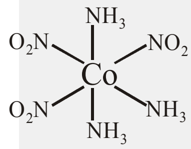
$+3F(-0.756) = +3F(0.036) + RT \ln K_{sp}$

On solving

$\log K_{sp} = -36.52$

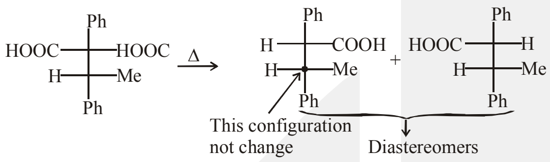
Q.67 (1)  (2) 

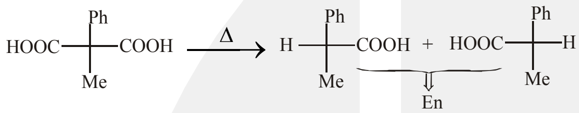
[POS absent] [POS present]

(3)  (4) 

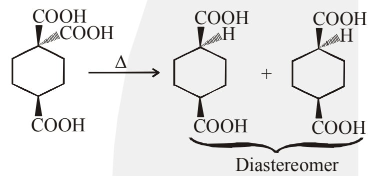
[POS present]

Q.68

(1) 

(2) 

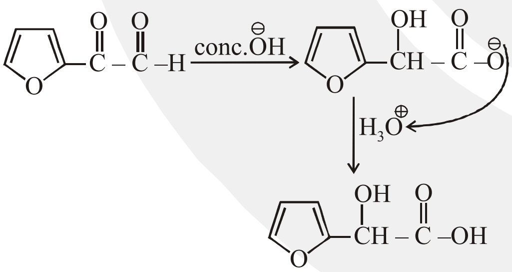
Enantiomer is not separated by fractional distillation.

(3) 

(4) None

Q.69 Theory based

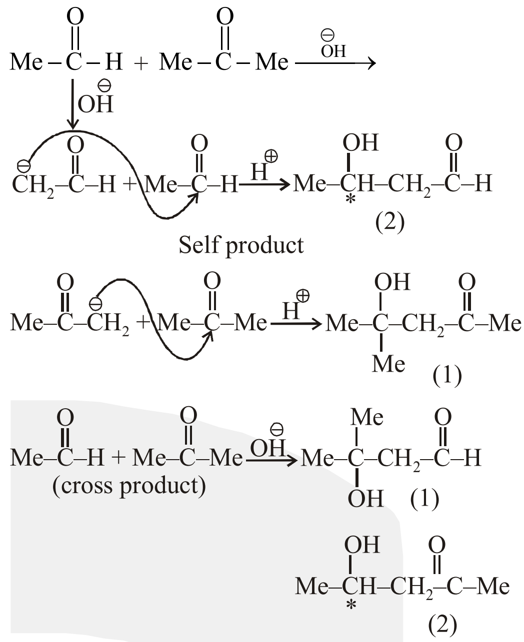
Q.70 Theory based

Q.71 

→: More reactive Aldehyde oxidise and Less reactive reduced.

Q.72 Theory based

Q.73 Due to d^{10} configuration Zn^{2+} does not impart any colour on heating

Q.74 

Total = 6 product **Ans.**

Q.75 $\Delta G = \Delta G^\circ + RT\ln Q$

$= -6\text{kJ mol}^{-1} + 8 \times 298 \times \ln \dfrac{0.2}{(0.4)^2}$

$= -6\text{kJ mol}^{-1} + 8 \times 298 \times \ln \dfrac{10}{8}$

$= -6\text{kJ mol}^{-1} + \dfrac{2386}{1000} \times 2.303 \times (1 - 0.9)$

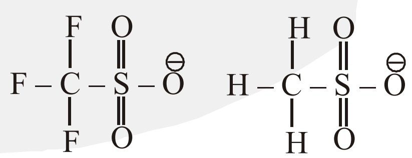
$= -6\text{ kJmol}^{-1} + 2.366 \times 0.23\text{ kJ mol}^{-1}$

$= -6 + 0.549 = -5.45\text{ kJmol}^{-1}$

So, reaction is spontaneous in forward direction.

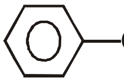
Q.76 $Na^+ + EDTA^{4-} \longrightarrow Na_4\ EDTA$

Q.77 (1) Protonation increases electrophilic of carbonyl group.

(2) 

–I +I

$CF_3SO_3^-$ is better leaving group than $CH_3SO_3^-$ because $CH_3SO_3^-$ is weak base in compare of $CH_3SO_3^-$

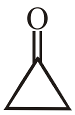
(3)  $\overset{\ominus}{C}H_2$ (Resonance stabilized)

(4) $CCl_3CH(OH)_2$ **OR** $Cl–C(Cl)(Cl)–CH(OH)_2$

Q.78 $C(s) + 2S(s) \rightarrow CS_2(l)$
$\Delta_f H° = –390 – (290) \times 2 – (–1100)$
$= + 130\ kJmol^{–1}$

Q.79 $Mn \longrightarrow [Ar]\ 3d^5\ 4s^2$; $Mn^{3+} \longrightarrow d^4$
$Fe \longrightarrow [Ar]\ 3d^6\ 4s^2$; $Fe^{2+} \longrightarrow d^6$, $Fe^{3+} \longrightarrow d^5$
$Co \longrightarrow [Ar]\ 3d^7\ 4s^2$; $Co^{3+} \longrightarrow d^6$

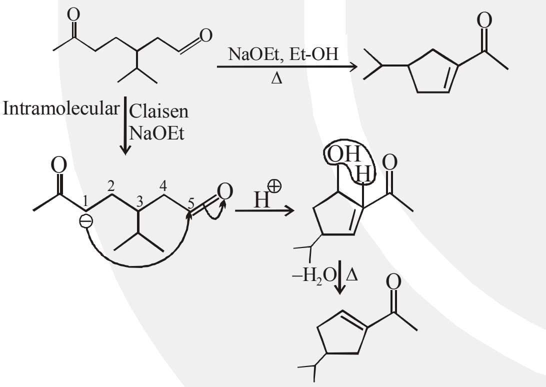
Q.80 Cyclopropone has largest equilibrium constant.



Q.81 $\Delta H = – 10$ kcal
$= \frac{1}{2} \times 104 + \frac{1}{2} \times 120 – E_{O–H} – 10 = 112 – E_{O–H}$
$E_{O–H} = 122\ kcal\ mol^{–1}$

Q.82 CaC_2 & $Mg_2C_2 \rightarrow$ Ionic carbide
$Fe_3C \rightarrow$ Interstitial carbide
$SiC \rightarrow$ Covalent carbide

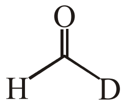
Q.83

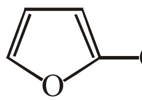


Q.84 The salt weakest acid will produce highest pH with strong base.

Q.85 $K_2Cr_2O_7/H^+ \longrightarrow$ Colour $\rightarrow$ Orange red
Alcohol means alkali added to $K_2Cr_2O_7/H^+$ its colour change to yellow due to formation of chromate ion.

Q.86 (1) $Me_2CH – \overset{O}{\overset{||}{C}} – H$ $\rightarrow$ These compound not give aldol than give Cannizaro reaction.

(2)  $\rightarrow$ No. α-H

(3)  CHO $\rightarrow$ No. α-H

Q.87 $\Delta H_{vap} = 37.3 \times 18\ kJmol^{–1}$

$\Delta S_{vap} = \frac{\Delta H_{vap}}{373} \times \frac{373 \times 18 \times 10^3}{373} = 1800$ $kJmol^{–1}$

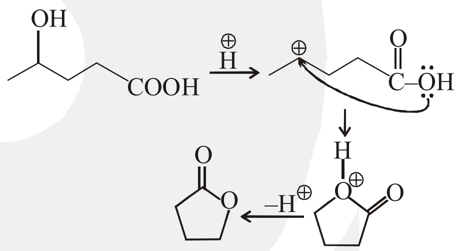
Q.88 (1) Europium (Eu) $\rightarrow [Xe]\ 4f^7\ 5d^0\ 6s^2$
$\rightarrow$ Half filled (+2)

(2) Praseodymium (Pr) $\rightarrow [Xe]\ 4f^3\ 5d^0\ 6s^2$
$\rightarrow$ (+2, +3, +4, +5)

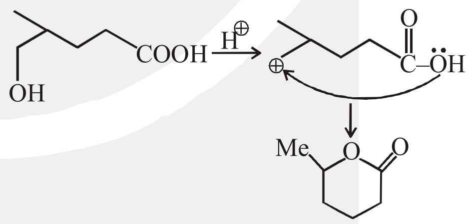
(3) Ytterbium(Yb) $\rightarrow [Xe]\ 4f^{14}\ 5d^0\ 6s^2$
$\rightarrow$ Full filled (+2)

(4) Lutetium (Lu) $\rightarrow [Xe]\ 4f^{14}\ 5d^1\ 6s^2$
$\rightarrow$ Full filled (+3, +2)

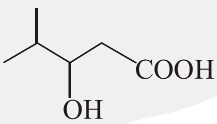
Q.89 (a)



(b)

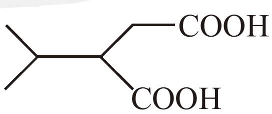


(c)



$\rightarrow$ Not give

(d)



$\rightarrow$ Not give

Q.90 $\frac{\Delta U}{\Delta S} = \frac{nC_{v,m}(T_2 – T_1)}{nC_{v,m}\left(\frac{T_2}{T_1}\right)} = \frac{100}{\ln\left(\frac{400}{300}\right)} = 333\ K$ **Ans.**