Sri Chaitanya IIT Academy.,India.

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A right Choice for the Real Aspirant

ICON Central Office - Madhapur - Hyderabad

SEC: Sr.S60_Elite, Target & LIIT-BTs JEE-MAIN Date: 03-01-2025
Time: 09.00Am to 12.00Pm GTM-13/08 Max. Marks: 300

KEY SHEET

MATHEMATICS

1	**1**	2	**3**	3	**2**	4	**3**	5	**4**
6	**2**	7	**3**	8	**1**	9	**3**	10	**3**
11	**1**	12	**3**	13	**2**	14	**2**	15	**4**
16	**1**	17	**3**	18	**2**	19	**3**	20	**1**
21	**6**	22	**36**	23	**8**	24	**0**	25	**14**

PHYSICS

26	**2**	27	**2**	28	**2**	29	**3**	30	**4**
31	**4**	32	**3**	33	**1**	34	**4**	35	**3**
36	**2**	37	**3**	38	**2**	39	**1**	40	**3**
41	**2**	42	**4**	43	**3**	44	**2**	45	**3**
46	**2**	47	**3**	48	**2**	49	**3**	50	**1**

CHEMISTRY

1	**1**	52	**4**	53	**3**	54	**2**	55	**1**
56	**1**	57	**3**	58	**2**	59	**4**	60	**3**
61	**1**	62	**2**	63	**1**	64	**2**	65	**1**
66	**1**	67	**4**	68	**2**	69	**3**	70	**4**
71	**36**	72	**1**	73	**5**	74	**3**	75	**6**

SOLUTION
MATHEMATICS

1. $\lim_{x\to 0}\dfrac{(\tan x)^{3/2}\left[1-(\cos x)^{3/2}\right]}{x^{3/2}.x^2}$

$$=1\times\lim_{x\to 0}\frac{1-\cos^3 x}{x^2}.\frac{1}{1+(\cos x)^{3/2}} \qquad =\frac{1}{2}.\frac{1}{2}\left(1+\cos x+\cos^2 x\right)=\frac{3}{4}$$

2. $\dfrac{\sum x_i}{20}=10, \sum x_i=10\times 20=200$

If 8 replaced by 12 then $\sum x_i=200-8+12=204$

Now, correct mean $(\bar{x})=\dfrac{\sum x_i}{20}=\dfrac{204}{20}=10.2$

Standard deviation $=2$

So, variance $=(S.D)^2=2^2=4$

By definition, $\Rightarrow \dfrac{\sum x_i^2}{20}-\left(\dfrac{\sum x_i}{20}\right)=4\Rightarrow\dfrac{\sum x_i^2}{20}-(10)^2=4$

$\Rightarrow \sum x_i^2=2080$

$\Rightarrow V_{ar}=\dfrac{\sum x_i^2}{20}-\left(\dfrac{\sum x_i}{20}\right)^2=\dfrac{2160}{20}-(10.2)^2$

3. $I.F.=e^{\int\frac{xdx}{x^2-1}}=\sqrt{1-x^2}$

$y=f(x)=\dfrac{3x^5+x^4+2x^2+x}{\sqrt{1-x^2}}=\displaystyle\int_{-1/2}^{1/2}\frac{f(x)}{(x^2+2)}dx=\frac{\pi}{6}-\frac{1}{4}$

4. $S_k=\displaystyle\sum_{r=1}^{k}\tan^{-1}\left(\frac{\frac{1}{3}\left(\frac{2}{3}\right)^r}{\left(\frac{2}{3}\right)^{2r+1}+1}\right)=\sum_{r=1}^{k}\left[\tan^{-1}\left(\frac{2}{3}\right)^r-\tan^{-1}\left(\frac{2}{3}\right)^{r+1}\right]=\tan^{-1}\left(\frac{2}{3}\right)^r-\tan^{-1}(0)=\cot^{-1}\left(\frac{3}{2}\right)$

5. $2|=2\displaystyle\int_{\pi/8}^{3\pi/8}\frac{11+\cos 4x}{1-\cos 4x}dx$

$$\Rightarrow|=|=\int_{\pi/8}^{3\pi/8}\frac{12-(1-\cos 4x)}{1-\cos 4x}=12\int_{\pi/8}^{3\pi/8}\frac{1}{2\sin^2 2x}dx-\int_{\pi/8}^{3\pi/8}dx=6\int_{\pi/8}^{3\pi/8}\operatorname{cosec}^2 2x\,dx-\frac{\pi}{4}$$

$$=\left[-\frac{6}{2}\cot 2x\right]_{\frac{3\pi}{8}}^{\frac{\pi}{8}}-\frac{\pi}{4}=-3\left[(1)+(1)\right]-\frac{\pi}{4}=-6-\frac{\pi}{4}$$

6. LCM of $\alpha,\beta,\gamma = p^3q^2r$ & $HCF=pqr$ $\quad\therefore a=p^{m_1}q^{m_1}r$

$\beta=p^{m_2}q^{n_2}r\ \ \gamma=p^{m_3}q^{n_3}r$

Minimum of $(m_1,m_2,m_3)=1$ & maximum of $(m_1,m_2,m_3)=3$

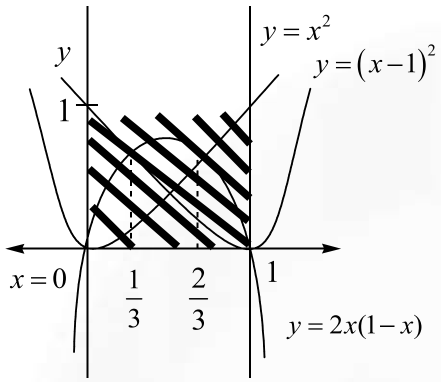
$\therefore$ Number of possibilities for $m_1,m_2,m_3=12$

And minimum of $n_1, n_2, n_3 = 1$ and maximum $(n_1, n_2, n_3) = 2$

$\therefore$ Number of possibilities = 6

$\therefore$ Total Number of ordered triplets = 12 x 6 = 72

7. The required Area $A = \int_0^1 f(x)$



$$= \int_0^{\frac{1}{3}} (1-x)^2\, dx + \int_{\frac{1}{3}}^{\frac{2}{3}} 2x(1-x)dx + \int_{\frac{2}{3}}^{1} x^2 dx = \left[-\frac{1}{3}(1-x)^3\right]_0^{\frac{1}{3}} + \left[\left(x^2 - \frac{2x^3}{3}\right)\right]_{\frac{1}{3}}^{\frac{2}{3}} + \left[\frac{x^3}{3}\right]_{\frac{2}{3}}^{1} = \frac{17}{27}$$

8. I) $\frac{y^2}{9} - \frac{x^2}{16} = 1 \quad \frac{x^2}{16} - \frac{y^2}{9} = 1 \quad e = \sqrt{\frac{16+9}{16}} = \frac{5}{4} \qquad \frac{1}{e^2} + \frac{1}{e'^2} = 1$

$$\frac{1}{e'^2} = 1 - \frac{16}{25} = \frac{9}{25} \quad e' = \frac{5}{3}$$

II) $2a = 10 \Rightarrow a = 5 \quad b^2 = 16 \quad b = 4 \qquad e = \sqrt{\frac{25-16}{25}}$

III) $(a\sec\theta, 3\tan\theta)$

$$6\tan\theta = 2 \qquad \tan\theta = \frac{1}{3} \qquad \frac{1}{\sqrt{3}} = \frac{3\tan\theta}{a\sec\theta}$$

$$a^2\sec^2\theta = 27.\frac{1}{9}$$

$$a^2\left(1+\frac{1}{9}\right) = 27.\frac{1}{9} \qquad a^2(10) = 27$$

IV) $k^2a^2 - a^2 = a^2 + a^2 \qquad k^2 - 1 = 2 \Rightarrow k^2 = 3 \Rightarrow \sqrt{3}$

9. $W_1 =$ ball drawn in the first drawn is white

$W_2 =$ ball drawn in the second drawn is white $P(W_1) = \frac{7}{12}$

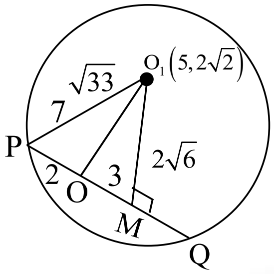
$$P(B_1) = \frac{5}{12}, P(W_2/W_1) = \frac{10}{15}, P(W_2/B_1) = \frac{7}{15}$$

$$P(W_2) = P(W_1) \times P(W_2/W_1) + P(B_1) \times P(W_2/B_1)$$

10. $\frac{S_{10}}{S_P} = \frac{100}{P^2} \Rightarrow S_P = \frac{S_{10}P^2}{100}, \frac{a_{11}}{a_{10}} = \frac{S_{11} - S_{10}}{S_{10} - S_9} = \frac{21}{19}$

11. Line L is the shortest distance line of given lines.

12. $O_1O = \sqrt{33}$ and $OM = 3$



$\Rightarrow O_1M = 2\sqrt{6}$ And PM = 5 $\Rightarrow O_1P = 7$.

13. $\because \; 2\cos\theta_1 = \frac{8}{5} \Rightarrow \cos\theta_1 = \frac{4}{5} \Rightarrow \tan\frac{\theta_1}{2} = \sqrt{\frac{1-\frac{4}{5}}{1+\frac{4}{5}}} = \frac{1}{3}$ and e = $\frac{1}{2}$

$\because \quad \tan\frac{\theta_2}{2} \times \frac{1}{3} = \frac{-\frac{1}{2}}{\frac{3}{2}} \quad \frac{\theta_2}{2} = \frac{3\pi}{4} \Rightarrow \theta_2 = \frac{3\pi}{2}$

$B = \left(0,-\sqrt{3}\right) \Rightarrow AB = 2+2-\frac{1}{2}\times\frac{8}{5} = 4-\frac{4}{5} = \frac{16}{5}$

14. $f(x) = \int x^{\sin x}\left(1+x.\cos x.inx+\sin x\right)dx$

$f(x) = x^{\sin x} = e^{\sin x.inx}$, then

$f(x) = \int\left(f(x)+xf'(x)\right)dx = x.x^{\sin x}+c$

$f\left(\frac{\pi}{2}\right) = \frac{\pi}{2}.\left(\frac{\pi}{2}\right)+cc \qquad \Rightarrow c=0$

$f(x) = (x)(x)^{\sin x}, f(\pi) = \pi$.

15. $x^2+x+1=0 \qquad \Rightarrow \qquad x+\frac{1}{x} = -1 \quad \therefore \quad \sum_{r=1}^{5}\left(x^r+\frac{1}{x^r}\right)^2 = 8$.

16. Check for reflexivity . As $3(a-a)+\sqrt{7} = \sqrt{7}$ which belongs to relation

So relation is reflexive, Check for symmetric

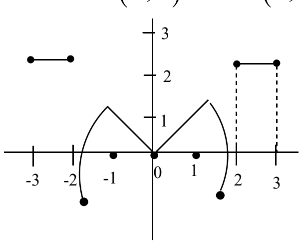
Take $a = \frac{\sqrt{7}}{3}, b=0$ LNow $(a,b)\in R$ but $(b,a)\notin R$

As $3(b-a)+\sqrt{7}=0$ which is rational so relation is not symmetric

Check for Transitivity, Take (a,b) as $\left(\frac{\sqrt{7}}{3},1\right)$ & (b,c) as $\left(1,\frac{2\sqrt{7}}{3}\right)$

So now $(a,b)\in R \,\&\, (b,c)\in R$ but $(a,c)\notin R$, Which means relation is not transitive

17.



It is non diff at 5 point $-2,-1,0,12$

18. $\begin{Bmatrix} x^2-12x+37 \ ; \ x\le 2 \\ 2x-x^2+17 \ ; \ 2<x<5 \\ x^2-12x+37 \ ; \ x\ge 5 \end{Bmatrix}$

19. $y=ax^2+bx+c$

$\frac{-b}{2a}=4 \quad \Rightarrow b=-8a$

$16a+4b+c=2 \quad c=16a+2$

$As \ \ a\in[1,3]\Rightarrow c\in[18,50]$

20. A= {2, 3, 4}

21. Given

$\vec{a}+3\vec{b}=\lambda\vec{c}$

$2\vec{b}+3\vec{c}=\mu\vec{a}$

$\Rightarrow 2\vec{b}+3\vec{c}=\mu\left(\lambda\vec{c}-3\vec{b}\right)$

$\Rightarrow(2+3\mu)\vec{b}+(3-\mu\lambda)\vec{c}$

$\Rightarrow \mu=-\frac{2}{3}$

$Thus,\ 2\vec{a}+6\vec{b}+9\vec{c}=\vec{0}$

$\Rightarrow|2\vec{a}-9\vec{c}|=6|\vec{b}|=6$

22. $x^4-3x^3-x^2-x^2+3x+1=0$

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

Let the root of $x^2-3x-1=0$ be α and β other two roots of given of given equation are 1 and -1

So, sum of cubes of roots $=1^3+(-1)^3+\alpha^3+\beta^3$

$=(\alpha+\beta)^3-3\alpha\beta(\alpha+\beta)=(3)^3-3(-1)(3)=36$

23. $f(\theta)=\frac{(\cos\theta)^x}{(\cos\theta)^x+(\sin\theta)^x}, f(\theta)+f\left(\frac{\pi}{2}-\theta\right)=1$

24. $3^{256}-3^{12}=3^{12}\times\left(3^{256}-1\right) \ =(1+8)^6\left((1+8)^{112}-1\right) \quad =(1+8\lambda)(1+8\mu-1)$

$=8\mu(1+8\lambda)$, Which is divisible by 8. Hence, remainder is zero

25. $AB=\begin{bmatrix} a+2c & b+2d \\ 3a+4c & 3b+4d \end{bmatrix}$

$BA=\begin{bmatrix} a+3b & 2a+4b \\ c+3d & 2c+4d \end{bmatrix}, AB=BA\Rightarrow 2a-2d=-3b, \frac{a-d}{3b-c}=-1$

PHYSICS

26. $\Delta S = \Delta x\cos\theta + x\sin\theta.\Delta\theta$

27. For a given charge $U = a^2/2C = \dfrac{Q^2 d}{2\in_0 A}$ $i.e., U \propto d$.

28. Assume $a = c_1x^2 \Rightarrow \dfrac{da}{ax} = 2c_1x \Rightarrow 2c_1\sqrt{3} = \tan 60^0$

$$\Rightarrow c_1 = \frac{1}{2} \Rightarrow v^2 - 4^2 = \frac{1}{2}\left[\frac{\left(\sqrt{3}\right)^3}{3} - 0^2\right]$$

29. Range will be maximum at only one value of θ that is possible if

$$R_{\max}^2 - 4\left(\frac{gR_{\max}^2}{2v^2}\right)\left(H - \frac{gR_{\max}^2}{2v^2}\right) = 0, 0 = \frac{v^2}{2g} + H - \frac{gR_{\max}^2}{2v^2}, R_{\max} = \frac{v}{g}\sqrt{v^2 + 2gH}$$

30. $\vec{F} = x^2y\hat{i} + yz^2e^{2z}\hat{j} - \left(\dfrac{z}{x+2y}\right)\hat{k}$

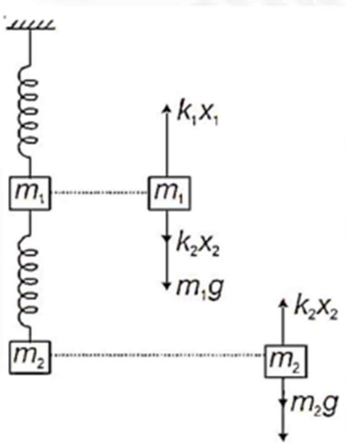
$$d\vec{r} = dx\hat{i} + dy\hat{j} + dz\hat{k}$$

$$dw = \vec{F}\cdot d\vec{r} = x^2ydx + yz^2e^{2z}dy - \left(\frac{z}{x+2y}\right)dz$$

for the given path $z = 0, y = \dfrac{2x^2}{a}$

$$dw = x^2ydx = \frac{2x^4}{a}dx,\ w = \int dw = \frac{2}{a}\int_0^a x^4dx = \frac{2a^4}{5}$$

31.



$$k_1x_1 = k_2x_2 + m_1g; k_2x_2 = m_2g$$

$$x_1 = \frac{k_2}{k}\left[\frac{m_2g}{k_2}\right] + \frac{m_1g}{k_1};$$

$$x_2 = \frac{m_2g}{k_2}$$

$$x_1 = \frac{(m_1+m_2)g}{k_1}$$

$$\frac{x_1}{x_2} = \frac{(m_1+m_2)k_2}{k_1m_2}$$

32. Ans: 3

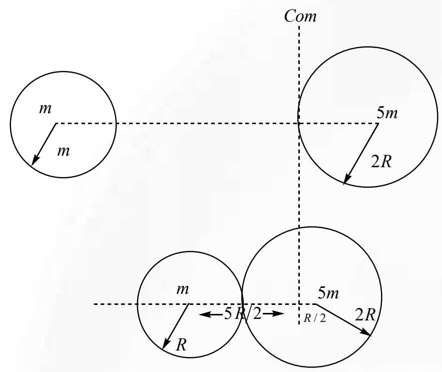
$$E_0 \sin\omega t = \frac{Q}{C} + L\frac{d^2Q}{dt^2}$$

Putting $Q = Q_0 \sin\omega t$

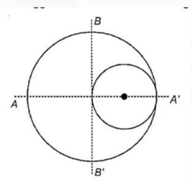
$$Q_0 = \frac{E_0}{L\left(\omega^2 - \omega_n^2\right)}$$

33. KEY: 1

Sol.



Distance covered by the smaller sphere $= 10R - \frac{5R}{2} = \frac{15R}{2}$



34.

$$I_{A'} = \frac{2}{5}MR^2 - \frac{2}{5}\frac{M}{8}\times\frac{R^2}{4}$$

$$I_{A'} = \frac{2}{5}MR^2 \times \frac{31}{32}$$

$$I_{B'} = \frac{2}{5}MR^2 - \frac{7}{5}\frac{M}{8}\frac{R^2}{4}$$

$$I_{B'} = \frac{2}{5}MR^2\left[1 - \frac{7}{64}\right]$$

$$I_{B'} = \frac{2}{5}MR^2 \times \frac{57}{64}$$

$$\frac{I_{A'}}{I_{B'}} = \frac{31}{32}\times\frac{64}{57} = \frac{62}{57}$$

35. **Assertion** is True, **Reason** is False as impulse will be imparted by string

36. Applying Bernoulli is equation from section-(1) and (2)

$$P_1 + \frac{1}{2}\rho V_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho V_2^2 + \rho g h_2$$

$$P_1 + \frac{1}{2}\rho V^2 + 0 = P_2 + \frac{1}{2}\rho (2V)^2 + \rho g h$$

and $P_1 - P_2 = \rho g(2h)$

Solving we get, $V = \sqrt{\dfrac{2gh}{3}}$

(C) Work done by gravitation force per unit value $W_g =$ decrease in gravitational

$PT_{value} = \rho gh_1 - \rho g_2$ $PT_{value} = \rho gh_1 - \rho gh_2$

$W_{gr} = 0 - \rho gh$

(D) Work done by elastic force volume, $W_e =$ decrease in elastic P.E vol $=$ decrease in pressure $E_{vol} = P_1 - P_2 = \rho G(2h)$.

37.

$$At\ P_2, Stress = S_2 = \frac{F}{A}$$

$$At\ P_1, stress = S_1 \times \frac{F\cos 60^0}{\dfrac{A}{\cos 60^0}} = \frac{F}{4A}$$

$$\Rightarrow \frac{S_1}{S_2} = \frac{1}{4}$$

38. [Because absorption of energy decreases BE and release of energy increases BE] In Y nucleus there are $A+1$ nucleus.$\therefore \dfrac{BE}{\text{nucleon}} = \dfrac{6A-1}{A+1}$

39. $p = \dfrac{h}{\lambda}$

K.E. $= \dfrac{p^2}{2\text{ m}} = \dfrac{h^2}{2\text{ m}\lambda^2}$

$$\frac{h^2}{2\text{ m}\lambda^2} = \frac{hc}{\lambda_0}$$

$$\lambda_0 = \frac{2mc\lambda^2}{h}$$

40. $For\ SHM, x = A\sin\omega t = A\sin\dfrac{2\pi t}{T}, v = \omega\sqrt{A^2 - x^2}$, When t=4s. time taken by particle to travel from the mean position to given position=4-2=2s

$$x = A\sin\frac{2\pi t}{T} = A\sin\frac{2\pi \times 2}{16} = \frac{A}{\sqrt{2}}$$

$$So, v = \omega\sqrt{A^2 - x^2} = \omega\sqrt{A^2 - \frac{A^2}{2}} = \frac{\omega A}{\sqrt{2}} = \frac{2\pi}{16} \times \frac{32\sqrt{2}}{\pi} \times \frac{1}{\sqrt{2}}$$

41. Here frequency f is constant. Speed of wave

$$v = \sqrt{\frac{T}{\mu}} \Rightarrow \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2} = \sqrt{\frac{T_1}{T_2}} = \sqrt{\frac{Mg/2}{Mg}} \Rightarrow \lambda_2 = \sqrt{2}\lambda_1 = \sqrt{2}\lambda_0$$

42. $\Rightarrow$ Slope of line joining origin to that point $\propto \dfrac{1}{V}$

as the slope of line OE is greater than the slope of line OC, SO, volume at ' E ' is less than that at ' C '. So, ans.is (D).

43. A photodiode is reverse biased. When light falling on it produces charge carriers, the fractional change, in minority carriers is high since the original current is very small.

$TE(2R) = -\frac{GMm}{4R}$

$TE(3R) = -\frac{GMm}{6R}$

44. $\Delta E = TE(3R) - TE(2R)$

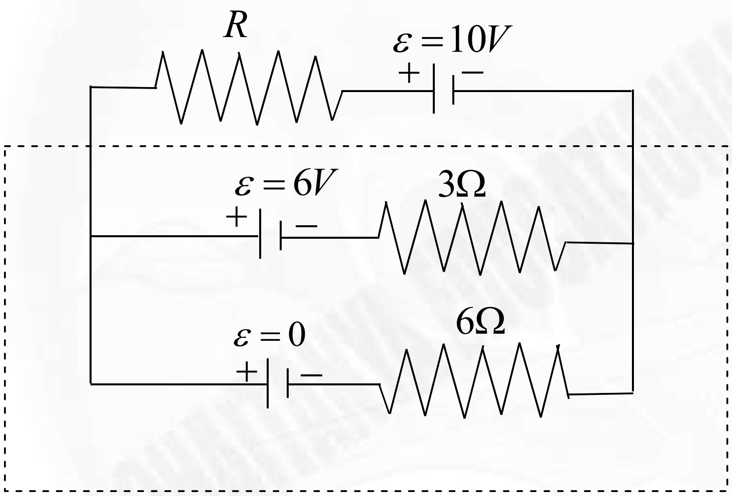
$\Delta E = -\frac{GMm}{6R} + \frac{GMm}{4R} = \frac{GMm}{R}\left[\frac{1}{4} - \frac{1}{6}\right]$

$\Delta E = \frac{GMm}{R}\left[\frac{6-4}{24}\right] = \frac{GMm}{12R}$

45. The polarity of induced voltage changes periodically

46. KEY: 2

Sol. Given circuit can be simplified as dotted part can be replaced as



$P = \left(\frac{6}{2+R}\right)^2 R = \frac{36R}{(2+R)^2}$,

for P to be maximum $\frac{dP}{dR} = 0$

47. For $S_1S_2 = 2.5\lambda$, max path different $= 2.5\lambda$

min path different $= 0$

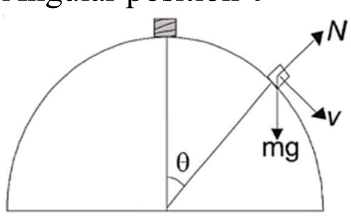
Between 2.5λ and 0 lie 2λ and $\lambda \Rightarrow$ two circular bright fringes

$n_1 = 2$ For $S_1S_2 = 5.7\lambda$, max. path different $= 5.7\lambda$ min path different $= 0$

Between 5.7λ and 0 lie $5\lambda, 4\lambda, 3\lambda, 2\lambda, \lambda \Rightarrow$ Five circular bright fringes. $\Rightarrow n_2 = 5$

$\therefore n_2 - n_1 = 5 - 2 = 3$

48. Angular position θ



$mg\cos\theta - N = \frac{mv^2}{R}$

$If\ it\ loosen\ contct, N = 0$

$\Rightarrow v = \sqrt{gR\cos\theta}$

$Now, \cos\theta = \frac{3}{5} \Rightarrow v = \sqrt{\frac{3}{5}gR}$

$By\ work\ energy\ theorem, w_{mg} + w_f = \frac{1}{2}mv^2$

$mgR(1-\cos\theta) + w_f = \frac{1}{2}m \times \frac{3}{5}gR$

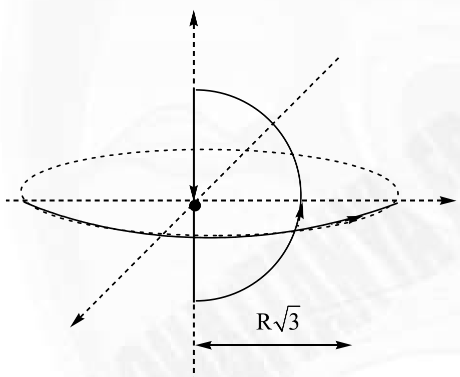
$w_f = -\frac{1}{10}mgR$

$\Rightarrow x = 2$

49. $\oint \vec{B}_{net} \cdot d\vec{\ell} = \oint \vec{B}_1 \cdot d\vec{\ell} + \oint \vec{B}_2 \cdot d\vec{\ell}$

$\vec{B}_1$ is magnetic field due to straight part,

$\vec{B}_2$ is magnetic field due to curved part



$0 = B_1 2\pi R\sqrt{3} + \int \vec{B}_2 \cdot d\vec{\ell}$

$0 = -\frac{\mu_0 I}{4\pi R\sqrt{3}} 2\pi R\sqrt{3} + \int \vec{B}_2 \cdot d\vec{\ell}$

$0 = -\frac{\mu_0 I}{2} + \int \vec{B}_2 \cdot d\vec{\ell}$

50.

$ML^2\ T^{-3}\ A^{-2} = \left[MLT^{-2}\ A^{-2}\right]^a \left[M^{-1}\ L^{-3}\ T^4\ A^2\right]^b$

$a - b = 1$

$a - 3b = 2$

$a = \frac{1}{2},\ b = -\frac{1}{2}$

CHEMISTRY

51. $C_5H_{12} = \dfrac{\text{5 mole Carbon atom}}{\text{17 mole atom}} \times 100\% = 29.41\%$

52. As the $T \uparrow$ rate of reaction increases in the beginning after same time
Being exothermic reaction equilibrium shift backward and yield decreases

53. Weak base strong acid titration curve

54. $Na_2S_2O_3.5H_2O$ called hypo
Mol.wt = 248
$M = \dfrac{1.24}{248} \times \dfrac{1000}{250} = 0.02$

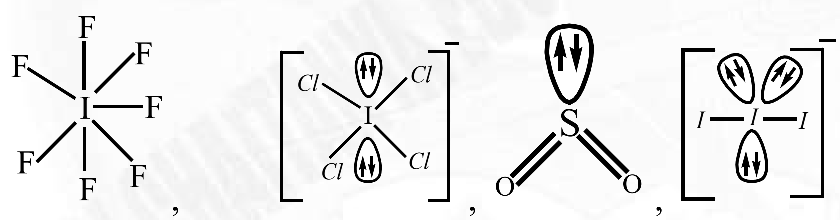
55. Limiting Λm of weak electrolyte > strong electrolyte
$\Lambda m \propto$ volume of solution

56. 3 mole CO occupies $= 3 \times 22.4$
$= 67.22$
112g Fe production required $= 67.2\ Liter\ CO$
$2000g\ Fe ------ = \dfrac{67.2}{112} \times 2000 \qquad = 1200\ Liters$

57. Cobalt gives blue colour both in oxidizing flame or in reducing flame

58. $PbCrO_4 + 4NaOH \rightarrow Na_2\left[Pb(OH)_4\right] + Na_2CrO_4$

59.

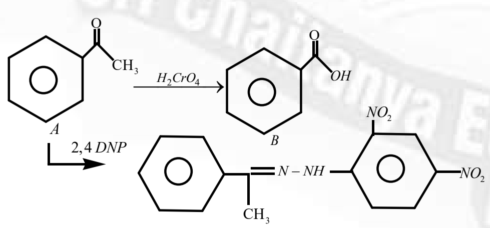


60. Fluorine forms only oxy acid HOF due to smaller size and highest electronegativity

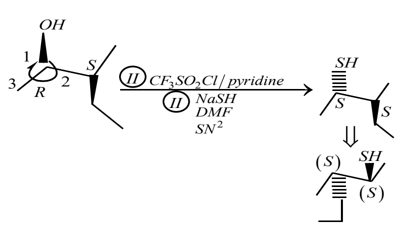
61. $\text{Th}^{+3} = 5f^1$

62. H_2O (W.F.L) no force pairing hence C.F splitting E = C.F stabilisation energy
$CO^{+2} = 3d^7 \quad t_{2g}^5\ e_g^2 \quad C.F.S.E = (-0.4 \times 5 + 2 \times 0.6)\Delta_0 = -0.8\Delta_0 \quad \mu = \sqrt{3(3+2)} = 3.87\,Bm$

63.

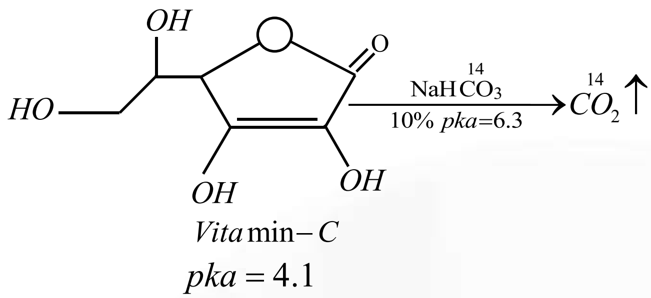


64.

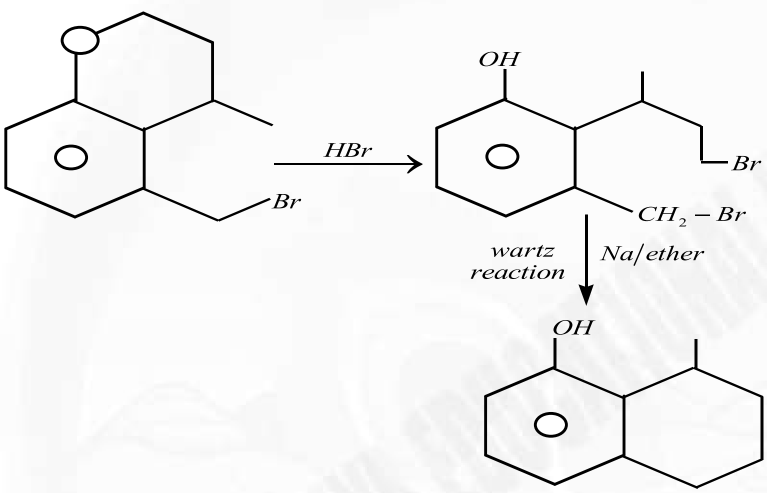


65. E_{1cb} 1^{st} step is fast and 2^{nd} step is slow

66.



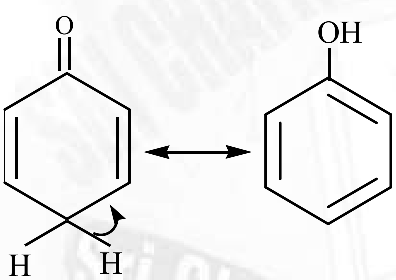
67.



68. $\beta-$naphthol does not give coupling reaction in strong acidic medium

69. Most polar compound retains at the top of column and eluted last

70.



71. $\frac{P_1}{P_2}=\frac{m_1}{m_2}$ $=\frac{6}{60}=\frac{m_1}{88}$

$m_1 = 8.8g$ Mole $=\frac{8.8}{44}=0.2$

$pH=\frac{1}{2}pka-\log c$ $=\frac{1}{2}\times 6.4-\log\left(2\times 10^{-1}\right)$

$ka = 4\times 10^{-7}$ $pka = 7-0.6 = 6.4$ $\Rightarrow 3.2+0.35=3.55 = 35.5\times 10^{-1} = 36\times 10^{-1}$

72. AB Isobaric $C_{p,m}=\frac{7R}{2}$

AC polytropic process $P = KV$

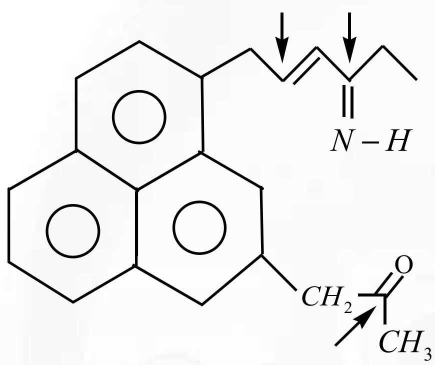
$PV^{-1}=K$

$$C_{p,m} = C_{v,m} + \frac{R}{(1-x)} \quad [x=-1] \quad = \frac{5R}{2} + \frac{R}{2} \quad = 3R$$

$$\frac{q_{AC}}{q_{AB}} = \frac{\int_{T_A}^{T_C} nC_m.dT}{\int_{T_A}^{T_B} nC_m.dT} \quad = \frac{2\times 3R\times 2}{2\times 7R}\frac{(T_C - T_A)}{(T_B - T_A)} = \frac{6}{7} \qquad \Rightarrow \frac{6}{7}\times\frac{7}{6} = 1$$

73. $\frac{rHe^{+}}{rBe^{+3}} = \frac{n_1^2}{z_1}\times\frac{z_2}{n_2^2} = \frac{2^2}{2}\times\frac{4}{16} = \frac{1}{2} = 0.5 = 5\times 10^{-1}$

74.



75. K_2MnO_4 $+6$