HINTS & SOLUTIONS

PAER - 1
MATHEMATICS

1. If n = 5, p = 0.75.....

2. Largest set of.....

Sol. (1 to 2)

$$P(E/F) = \frac{P(F/E).P(E)}{P(F/E).P(E) + P(F/\bar{E}).P(\bar{E})}$$

$$= \frac{p}{p + (1-p)\frac{1}{n}}$$

(1) For p = 0.75 and n = 5

$\therefore$ P(E/F) = 15/16

(2) P(E/F) = P(E)

$$\frac{p}{p + (1-p)\frac{1}{n}} \geq p \quad ; \quad p + (1-p)\frac{1}{n} \leq 1$$

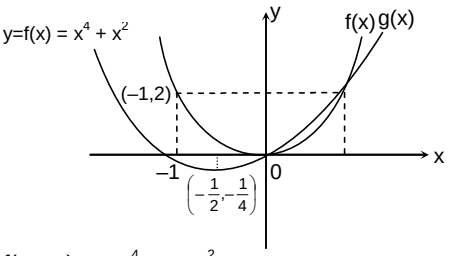
$$\left(\frac{n-1}{n}\right)p + \frac{1}{n} \leq 1 \quad ; \quad p \leq 1$$

$\therefore$ $p \in [0,1]$

3. If f(cos x) = g(sin y) .....

4. If g(sin x) = 1.....

Sol. (3 to 4)



$f(\cos x) = \cos^4 x + \cos^2 x$

$f(t) = t^4 + t^2$, $t = \cos x$ – $1 \leq t \leq 1$

$\Rightarrow 0 \leq f(t) \leq 2 \Rightarrow f(\cos x) \leq 2$ .....(1)

$g(\sin y) = \sin^2 y + \sin y$

$g(t) = t^2 + t$, $t = \sin y$, $-1 \leq t \leq 1$

$$\Rightarrow -\frac{1}{4} \leq g(t) \leq 2 \quad \text{..... (2)}$$

$\tan^2 z + \cot^2 z \geq 2$ ..... (3)

(1), (3) $\Rightarrow f(\cos x) = 2$, $\tan^2 z + \cot^2 z = 2$

(1), (3) $\Rightarrow g(\sin y) = 2$, $\tan^2 z + \cot^2 z = 2$

$\Rightarrow \cos x = \pm 1$, $\tan z = \pm 1$, $\sin y = 1$

$$x = n\pi,\ z = n\pi \pm \frac{\pi}{4},\ y = \frac{\pi}{2} + 2n\pi$$

$g(\sin x) = 1 \Rightarrow \sin^2 x + \sin x = 1$ ..... (4)

$\sin x = \cos^2 x$

$f(\cos x) = (\cos^2 x)^2 + (\cos^2 x)$

$= \sin^2 x + \sin x = 1$

5. The ratio in.....

6. The ordinate of.....

Sol. (5 to 6)

$x^2 + y^2 - 4x + 3 = 0$ $C_1(2, 0)$, $r_1 = 1$: $(x-2)^2 + y^2 = 1$

$x^2 + y^2 + 4x + 3 = 0$ $C'_2(-2, 0)$, $r_2 = 1$

slope of AB is $\sqrt{3} \Rightarrow$ slope of A'B' is $\sqrt{3}$

$y = (x-2)\sqrt{3} \pm 1.\sqrt{3+1}$

$y = \sqrt{3}x - 2\sqrt{3} + 2$ is tangent touching circle with centre $C_1(2, 0)$. A' is y-intercept of this tangent

$\therefore$ $A'(0, 2 - 2\sqrt{3})$

P_1 is foot of perpendicular of $C_1(2, 0)$ in tangent

$\sqrt{3}x - y + 2 - 2\sqrt{3} = 0$

$$\frac{x-2}{\sqrt{3}} = \frac{y-0}{-1} = -\frac{(2\sqrt{3} - 0 + 2 - 2\sqrt{3})}{3+1} = -\frac{1}{2}$$

$$x = 2 - \frac{\sqrt{3}}{2},\ y = \frac{1}{2} \qquad p_1\left(2 - \frac{\sqrt{3}}{2}, \frac{1}{2}\right)$$

B'(2, 2)

$$\text{ratio} = \frac{0 - \left(2 - \frac{\sqrt{3}}{2}\right)}{2 - \frac{\sqrt{3}}{2} - 2} = \frac{\frac{(\sqrt{3}-4)}{2}}{-\frac{\sqrt{3}}{2}} = \frac{4-\sqrt{3}}{\sqrt{3}}$$

7. If g(x) + f(x) = 0.....

8. Number of real.....

Sol. (7 to 8)

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

(Point of inflection in cubic polynomail is mid point of the local max and local Min

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

$$g'(x) = 3x^2 - 3$$

Ans.(A)

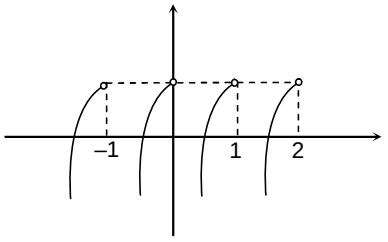
8. $-x^3 + 3x = 6x - 10$

$$h(x) = x^3 + 3x - 10 = 0$$

$$h'(x) = 3(x^2 + 1) > 0$$

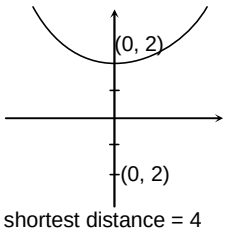
9. If α is number.....

Sol.



$\alpha = 1$ $\quad (0, -\alpha) = (0, -1)$

$y = 2 + x^2 + 2^4 + \ldots\ldots + 10x^{12}$



shortest distance = 4

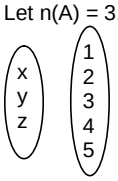
10. A ray of light travelling.....

Sol. The line of refracted ray passes through (1,0) and its slope is than 105^o.

$\therefore$ The equation of the line of refracted ray is $y - 0 = \tan 105^o (x - 1)$

11. Let n(A) = 3.....

Sol.



$x < y < z \Rightarrow f(x) < f(y) < f(z) = \Rightarrow {}^5C_3 = 10$

$f(x) = f(y) < f(z) \Rightarrow {}^5C_2 = 10$

$f(x) < f(y) = f(z) \Rightarrow {}^5C_2 = 10$

$f(x) = f(y) = f(z) \Rightarrow {}^5C_1 = 5$

total number of such mappings are = 35

12. If $\int_0^{\pi} xf(\cos^2 x + \ldots\ldots$

Sol. $I = \int_0^{\pi} xf(\cos^2 x + \tan^4 x)dx$

$= \int_0^{\pi} (\pi - x)f(\cos^2(\pi - x) + \tan^4(\pi - x))dx$

$= \int_0^{\pi} \pi f(\cos^2 x + \tan^4 x)dx - \int_0^{\pi} xf(\cos^2 x + \tan^4 x)dx$

$I = \pi \int_0^{\pi} f(\cos^2 x + \tan^4 x)dx - I$

$\Rightarrow \quad I = \frac{\pi}{2} \int_0^{\pi} f(\cos^2 x + \tan^4 x)dx$

$= \frac{\pi}{2}.2 \int_0^{\pi/2} f(\cos^2 x + \tan^4 x)dx$

$\therefore \quad k = 1$

13. Number of real.....

Sol. $(x^2 + 6x + 7)^2 + 6x^2 + 36x + 42 + 7 = x$

$(x^2 + 6x + 7)^2 + 6(x^2 + 6x + 7) + 7 = x$

$f(f(x)) = x, f(x) = x^2 + 6x + 7$

$\Rightarrow f(x) = f^{-1}(x)$, for $x \in (-\infty, -3]$

or

$f(x) = f^{-1}(x)$, for $x \in [-3, \infty)$

it is sufficient to solve $f(x) = x$

$x^2 + 6x + 7 = x$

$x^2 + 5x + 7 = 0$

no real solutions

14. If $(k + 1)x^2 + y^2 = 1$.....

Sol. $D < 0$

$4(4k - 1)^2 - 4.1.(15k^2 - 2k - 7) < 0$

$16k^2 - 8k + 1 - 15k^2 + 2k + 7 < 0$

$k^2 - 6k + 8 < 0 \Rightarrow 2 < k < 4 \Rightarrow k = 3$

$\Rightarrow 4x^2 + y^2 = 1$ put $x = \frac{\cos\theta}{2}$, $y = \sin\theta$

$12x^2 - 3y^2 + 16xy = 3\cos 2\theta + 4\sin 2\theta$

maximum value is $\sqrt{9 + 16} = 5$

15. If $\int (x^{7n} + x^{2n} + x^n)$ .....

Sol. $\int (x^{7n-1} + x^{2n-1} + x^{n-1})(2x^{7n} + 7x^{2n} + 14x^n)^{1/n} dx$

$= \frac{1}{14n} \int (14nx^{7n-1} + 14nx^{2n-1} + 14nx^{n-1})(2x^{7n} + 7x^{2n} + 14x^n)^{1/n} dx$

$= \frac{1}{14n} \frac{(2x^{7n} + 7x^{2n} + 14x^n)^{\frac{1+n}{n}}}{\left(\frac{n+1}{n}\right)} + C$

$\Rightarrow k = 14 \Rightarrow \frac{k}{2} = 7$

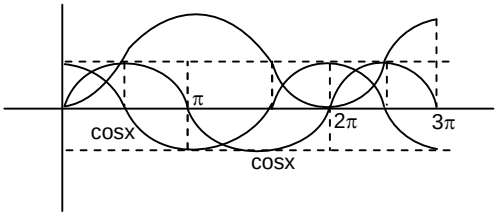
16. If a = 8, b = 3.....

17. If a = 7, b = 2.....

18. If a = – 4, b = 1.....

Sol. P(1, 8) $\quad \ell_8 = \sqrt{1 + 64 - 6 - 32 - 11} = 4$

b = 3 $\quad$ f(x) = maximum, cos x, 1 – cos x}, $x \in (0, 3\pi)$



$\int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} f(x)\,dx = \int_{\frac{\pi}{2}}^{\frac{3\pi}{2}} (1 - \cos x)\,dx = \pi - (-1 - 1)$

$= \pi + 2$

n = 5

$S_5 = \frac{1}{4}\left[\frac{n(n+1)(2n+1)}{6} + n(n+1) + n\right] = \frac{45}{2}$

a = 7 $\quad$ P(1, 7) $\quad \ell_7 = \sqrt{1 + 49 - 6 - 28 - 11} = \sqrt{5}$

b = 2 $x \in (0, 2\pi)$

Three points of non-differentiability from graph.

n = 6

$S_6 = \frac{1}{4}\left[\frac{6.7.13}{6} + 6.7 + 6\right] = \frac{1}{4}[7(19) + 6] = \frac{139}{4}$

a = –4 $\quad$ P(1, –4) $\ell_a = \sqrt{1 + 16 - 6 + 16 - 11} = 4$

b = 1 $x \in (0, \pi)$

$\lim_{x \to \frac{\pi}{2}^-} \frac{f(x) - 1}{x - \frac{\pi}{2}} = \lim_{x \to \frac{\pi}{2}^-} \frac{\sin x - 1}{x - \frac{\pi}{2}} = \lim_{x \to \frac{\pi}{2}^-} \cos x = 0$

n = 10

$$S_{10} = \frac{10}{4}\left[\frac{11.(21)}{6}+11+1\right] = \frac{5}{2}\left[\frac{77+24}{2}\right]$$

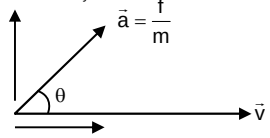
$$= \frac{5}{2}\left(\frac{101}{2}\right) = \frac{505}{4}$$

PHYSICS

20. Radius of .....

Sol.

$a\sin\theta = a_y$



$a\cos\theta = a_x$

Let $a_x\Delta t = d_1$

$a_y\Delta t = d_2$

given $\sqrt{(V+d_1)^2+d_2^2} = \frac{V}{2}$

$$V^2 + d_1^2 + 2Vd_1 + d_2^2 = \frac{V^2}{4}$$

$$\Rightarrow \frac{3V^2}{4} + (d_1^2+d_2^2) + 2Vd_1 = 0$$

$$\sqrt{(V+2d_1)^2+(2d_2)^2} = \frac{V}{4}$$

$$V^2 + 4d_1^2 + 4Vd_1 + 4d_2^2 = \frac{V^2}{16}$$

$$\Rightarrow \frac{15V^2}{16} + 4(d_1^2+d_2^2) + 4Vd_1 = 0$$

$$\sqrt{(V+3d_1)^2+(3d_2)^2} = V'$$

$$V' = \sqrt{V^2 + 9(d_1^2+d_2^2) + 6Vd_1}$$

from (1) & (2)

$$d_1^2 + d_2^2 = \frac{9V^2}{32}$$

$$2Vd_1 = \frac{-33V^2}{32}$$

$$V' = \sqrt{V^2 + \frac{81V^2}{32} - \frac{99}{32}V^2} = V\sqrt{\frac{7}{16}} = \frac{\sqrt{7}}{4}V$$

$$\rho = \frac{v^2}{a_y}, ay = \frac{d_2}{\Delta t}$$

$$d_1 = -\frac{33v}{64} \quad d_2 = \frac{\sqrt{63}V}{64}$$

$$\rho = \frac{64V\Delta t}{\sqrt{63}}$$

21. Choose the .....

Sol. ↑+ve $V_{AL} = +2$ m/s $V_L = +6$ m/s

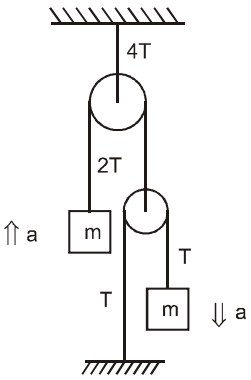
$V_A = V_{AL} + V_L = +8$ m/s

$V_{BL} = -2V_{AL} = -4$ m/s

$V_B = V_{BL} + V_L = -4 + 6 = +2$ m/s

22. If $m_A = m_B =$ .....

Sol.

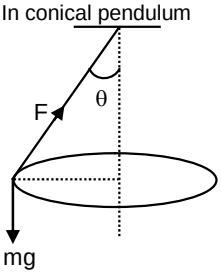


$mg - T = 2ma \Rightarrow a = \frac{g}{5}$

$2T - mg = ma \qquad T = mg - \frac{2mg}{5} = \frac{3mg}{5}$

24. Time period .....

Sol. In conical pendulum



$F\cos\theta = mg \qquad ; \qquad F\sin\theta = \frac{mv^2}{\ell\sin\theta}$

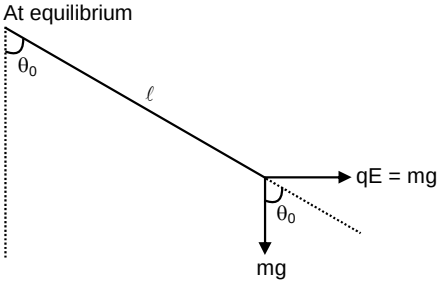
$\tan\theta = \frac{v^2}{\ell g\sin\theta} \qquad ; \qquad v = \sqrt{\ell g\sin\theta}$

$v = \sqrt{\ell g\sin\theta\tan\theta}$

Tension in the string $F = \frac{mg}{\cos\theta}$; Time period $= 2\pi\sqrt{\frac{\ell\cos\theta}{g}}$

In this problem

At equilibrium



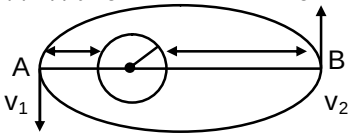
$mg\sin\theta = mg\cos\theta \Rightarrow \theta_0 = 45^\circ, \quad g_{eff} = \sqrt{2}g$

$v = \sqrt{\ell\left(\sqrt{2}g\right)\frac{1}{\sqrt{2}}I} = \sqrt{\ell g} \quad ; \quad F = \frac{m\sqrt{2}g}{\frac{1}{\sqrt{2}}} = 2mg$

$$T = 2\pi\sqrt{\frac{\ell\frac{1}{\sqrt{2}}}{\sqrt{2}g}} = 2\pi\sqrt{\frac{\ell}{2g}}$$

26. Radius of .....

Sol. (a) Applying conservation of angular momentum



$mv_1(2R) = mv_2(4R)$; $v_1 = 2v_2$ .....(1)

From C.O.E.

$$\frac{1}{2}mv_1^2 - \frac{GMm}{2R} = \frac{1}{2}mv_2^2 - \frac{GMm}{4R}$$ .....(2)

Solving Eqs. (1) and (2).

$$v_2 = \sqrt{\frac{GM}{6R}},\ v_1 = \sqrt{\frac{2GM}{3R}}$$

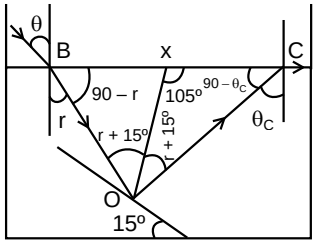
(b) if r is the radius of curvature at point B

$$\frac{mv_2^2}{r} = \frac{GMm}{(4R)^2}$$

$$r = \frac{16v_2^2R^2}{GM} = \frac{8R}{3}$$ (putting value of v_2)

27. An inclined .....

Sol.



In triangle cox: $105^\circ + r + 15^\circ + 90 - \theta_c = 180$

$r + 30^\circ = \theta_c$

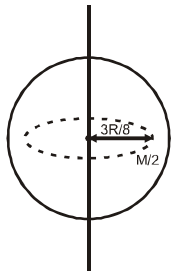
Then $\sin(r + 30^\circ) = \sin\theta_c = \frac{\sqrt{3}}{2}$; $r = 30^\circ$

Now $\frac{\sin\theta}{\sin 30^\circ} = \frac{2}{\sqrt{3}} \Rightarrow \theta = \sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

$$\theta = \sin^{-1}\left(\frac{\sqrt{3}}{3}\right)$$

29. A uniform .....

Sol.

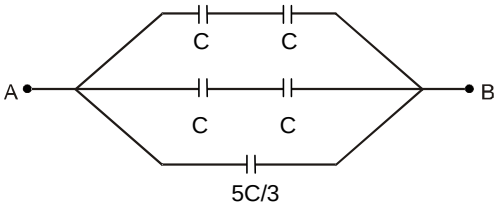


$$F = \frac{M}{2}\omega^2\left(\frac{3R}{8}\right)$$

$$F = \frac{3M\omega^2R}{16}$$

30. 32 capacitors .....

Sol. $C_{eq} = 8C/3 = 8\mu F$



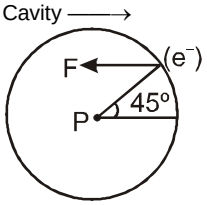
31. A cavity of .....

Sol. Electric field inside the cavity

$$= \frac{\rho\vec{a}}{3\varepsilon_0}\left[\text{Here } \vec{a} = \text{along line joining centers of sphere and cavity}\right]$$

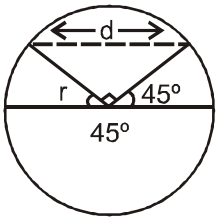
Force on the e^- inside cavity = $\frac{\rho\vec{a}}{3\varepsilon_0}$ (e)

Cavity ⟶



$\therefore$ acceleration of electron $a_e = \frac{\rho ae}{3\varepsilon_o m.}$

Now for distance



Cavity ⟶

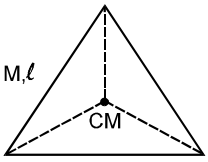
$d = \sqrt{r^2 + r^2} = \sqrt{2}r$

by $S = ut + 1/2\ at^2$, $\sqrt{2}r = \frac{1}{2} \times \frac{\rho ae}{3m\varepsilon_0} t^2$

$$\Rightarrow t = \left(\frac{6\sqrt{2}mr\varepsilon_0}{ea\rho}\right)^{1/2}$$

32. Three identical .....

Sol. MI of the system w.r.t an axis $\perp$ to plane & passing through one corner



$$= \frac{ML^2}{3} + \frac{ML^2}{3} + \left[\frac{ML^2}{12} + M\left(\frac{\sqrt{3}\ L}{2}\right)^2\right]$$

$$= \frac{2ML^2}{3} + \left[\frac{ML^2}{12} + \frac{3ML^2}{4}\right]$$

$$= \frac{2ML^2}{3} + \frac{10\ ML^2}{12} = \frac{3ML^2}{3} = \frac{18ML^2}{12} = \frac{3}{2}ML^2$$

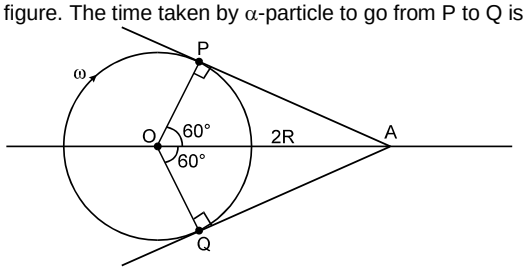
Now $\frac{3}{2} ML^2 = 3k^2M$

$k = \frac{\ell}{\sqrt{2}}$

[Ans.: $\frac{\ell}{\sqrt{2}}$ **]**

33. An α particle .....

Sol. Point A shall record zero magnetic field (due to α-particle) when the α-particle is at position P and Q as shown in figure. The time taken by α-particle to go from P to Q is



$t = \frac{1}{3} \frac{2\pi}{\omega}$

CHEMISTRY

37. Given data are for the ……..

Sol. $\frac{8.14}{4.60} = 1.77$ $\frac{0.62}{0.35} = 1.77$

Order wrt RCOOH is first order.

$\frac{10.6}{4.60} = 2.30$ $\frac{0.81}{0.35} = 2.30$

Order wrt R'–OH is first order.

Trial 1 and 4 can be used to determine the order wrt HA.

RCOOH is held constant, however, both

[R'–OH] and [HA] vary. The effect of R'–OH is :

$\frac{0.50}{0.35} = 1.43$ and then $(1.43)(4.60) = \frac{6.57}{\text{min}}$

The effect of [HA] is $\frac{9.84}{6.57} = 1.50$ $\frac{0.75}{0.50} = 1.50$

Order wrt [HA] is first order.

38. Using given data find ……..

Sol. Rate = K [RCOOH][R'–OH][HA]

$\frac{4.60M}{Min^{-1}} = K\,(0.35M)\,(0.35M)\,(0.50M)$

$K = 75M^{-2}\,min^{-1}$.

39. What is the order of ……..

Sol. $t_{\frac{1}{2}} \propto \frac{1}{[A_0]^{n-1}}$

$\therefore \quad 20 = K\frac{1}{[0.5]^{n-1}}$

$7.69 = K\frac{1}{[1.3]^{n-1}}$

n = order, $[A_0]$ = initial concentration, K = constant

$\frac{20}{7.69} = \frac{(1.3)^{n-1}}{(0.5)^{n-1}}$

$\frac{20}{7.69} = 2.6 = \left(\frac{1.3}{0.5}\right)^{n-1} = (2.6)^{n-1}$

$\therefore n-1=1 \quad \therefore n=2$

2^{nd} order

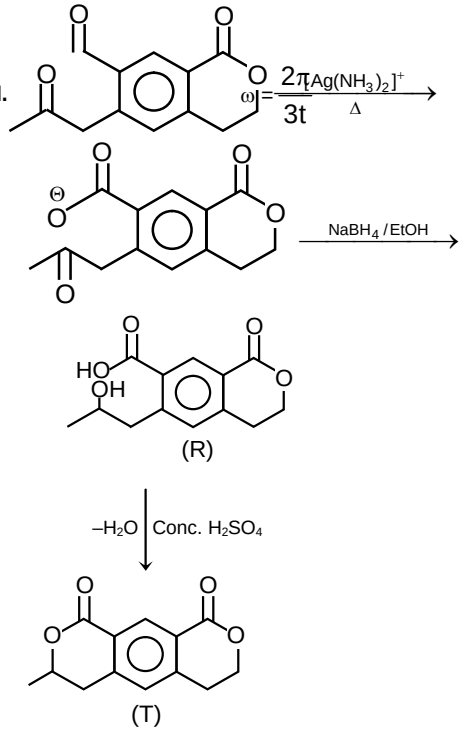
40. What is the rate constant ……..

Sol. Use $t_{½} = \frac{1}{[A_o]K}$

41. (P) and (Q) are respectively ……..

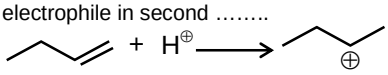
Sol. $LiAlH_4$ reduces aldehydes, ketones as well as esters. $NaBH_4$ reduces aldehyde & ketone, but ester is practically left behind. Hence (D).

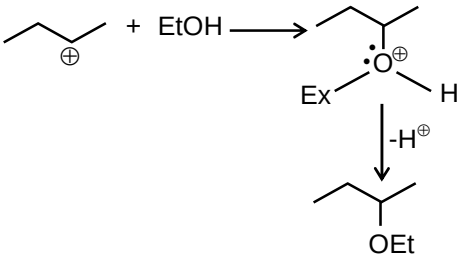
42. (S) may be ……..

Sol. 

or

44. The electrophile in second ……..

Sol. I. 

II. 

45. How many of the following ores ……..

Sol. Bauxite : $Al_2O_3 . 2H_2O$

Cuprite : Cu_2O

Cassiterite : SnO_2

are oxide ore.

Sylvine: KCl

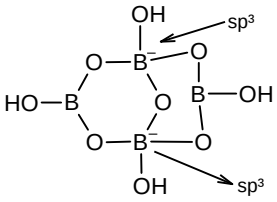
Galena: PbS

Carnallite : $KCl. MgCl_2. 6H_2O$

Argentite : Ag_2S

Number of sp^3 hybridized ……..

Sol. Borax : $Na_2B_4O_7 \cdot 10H_2O$



47. In a gaseous reaction ……..

Sol. Let at t = 0 pressure due to $A_2 = p_0 = 100$

$$A_{2(g)} \longrightarrow B_{(g)} + \frac{1}{2}C_{(g)}$$

t = 0	100	0	0
t = 5 min	100 – x	x	$\frac{x}{2}$

$$100 - x + x + \frac{x}{2} = 120 \Rightarrow x = 40$$

So $\frac{-d[A_2]}{dt} = \frac{-dP_{A_2}}{dt} = \frac{-(60-100)}{5} = \frac{40}{5} = 8$

48. How many of the following……..

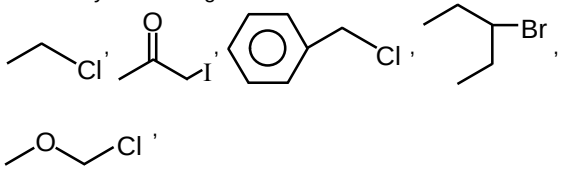
Sol. Density, Electrical resistivity, Thermal conductivity, Hardness, C – C (bond length), ΔH_f^o.

49. How many of the following ……..

Sol. (i), (ii), (iii), (iv), (v), (vi)

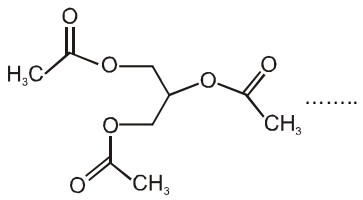
50. How many in following ……..

Sol.



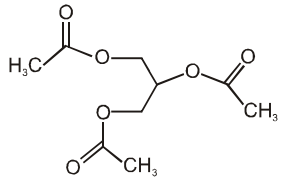
Give good yield of S_N^2 reaction.

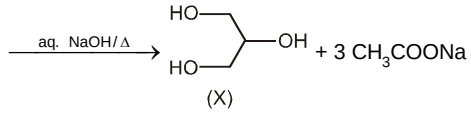
51.



……..

Sol. HCHO and HCOOH





(X)

PAPER - 2
MATHEMATICS

1. If a, b are constants.....

Sol. $\lim\limits_{x\to 0} \frac{\left(1+ax+\frac{a^2x^2}{2}+\frac{a^3x^3}{6}\right)-b\left(x-\frac{x^3}{6}\right)-1-cx^2}{x^3}$

$= \lim\limits_{x\to 0} \left(\frac{(a-b)}{x^2}+\left(\frac{a^2}{2}-c\right)\frac{1}{x}+\left(\frac{a^3+b^3}{6}\right)\right)$ exists

$\Rightarrow$ a – b = 0, $\frac{a^2}{2} - c = 0$; $a^2 = 14 \Rightarrow$ $a = b = (14)^{\frac{1}{2}}$

Limit = $\frac{2(14)^{\frac{3}{2}}}{6} = \frac{14^{\frac{3}{2}}}{3}$

2. Let A = {–3, – 2, –1, ...

Sol. $f(x) = \begin{cases} -4x : -4 < x < -3 \\ -3x : -3 \le x < -2 \\ -2x : -2 \le x < -1 \\ 1-x : -1 \le x < 1 \\ x^2 - 3x + 2 : 1 \le x < 2 \\ 2(x-2) : 2 \le x < 3 \\ 3(x-2) : 3 \le x < 4 \end{cases}$

f(x) is discontinuous at x = – 3, –2, 3
f(x) is continuous at x = –1, 0, 1, 2
f(x) is not derivable at x = – 1, x = 2
f(x) is derivable at x = 1

$\therefore$ probability = $\frac{1}{2}$

3. Assume $e^{\frac{-4}{5}} = \frac{2}{5}$ .....

Sol. $x^2 + y^2 = OP^2$
find shortest distance from origin.

$y = e^x \Rightarrow \frac{dy}{dx} = e^x$

Normal slope = $\frac{-1}{e^x} = \frac{y-0}{x-0}$

$-\frac{1}{e^x} = \frac{e^x}{x}$

$-x = e^{2x}$ By trail $x = \frac{-2}{5}$

$\therefore$ $P\left(\frac{-2}{5}, e^{\frac{-2}{5}}\right)$

$OP = \sqrt{\frac{4}{25} + e^{\frac{-4}{5}}} = \sqrt{\frac{4}{25}+\frac{2}{5}}$

$OP^2 = \frac{4+20}{25} = \frac{14}{25}$

4. Let a + b = 2c.....

Sol. $\frac{1}{2}a + \frac{1}{2}b = c \Rightarrow \frac{-1}{2}a - \frac{-1}{2}b + c = 0$

$ax + by + c = 0 \Rightarrow A\left(\frac{-1}{2},\frac{-1}{2}\right)$, slope $= \frac{-a}{b}$

$2bx - 2ay + c = 0 \Rightarrow B\left(\frac{-1}{4},\frac{1}{4}\right)$, slope $= \frac{b}{a}$

Product of slopes = – 1 $\Rightarrow$ lines are perpendicular

$\Rightarrow$ c lies on a circle with AB as diameter

$$\left(x+\frac{1}{2}\right)\left(x+\frac{1}{4}\right)+\left(y+\frac{1}{2}\right)\left(y-\frac{1}{4}\right)=0$$

$$x^2 + y^2 + \frac{3}{4}x + \frac{1}{4}y = 0$$

5. Let C be arbitrary.....

Sol. $$\int \frac{2\cos x+1}{(2+\cos x)^2}\,dx = \int \frac{2\cos x+\cos^2 x+\sin^2 x}{(2+\cos x)^2}$$

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

By parts

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

$$+ \int \frac{\sin^2 x}{(2+\cos x)^2}$$

$$= \frac{\sin x}{(2+\cos x)} + c$$

6. A bag contains.....

Sol. R : event of ball is drawn and replaced twice

$$P(R) = \frac{1}{5}\left(\frac{1}{5}\right)^2 + \frac{1}{5}\left(\frac{2}{5}\right)^2 + \frac{1}{5}\left(\frac{3}{5}\right)^2 + \frac{1}{5}\left(\frac{4}{5}\right)^2 + \frac{1}{5}\left(\frac{5}{5}\right)^2$$

$$= \frac{11}{25}$$

R_1 : event of one red ball in bag after event R

R_2 : event of two red ball in bag after event R

R_3 : event of three red ball in bag after event R

R_4 : event of four red ball in bag after event R

R_5 : event of five red ball in bag after event R

$$P(R_1) = \frac{P(R_1 \cap R)}{P(R)} = \frac{\frac{1}{5}\left(\frac{1}{5}\right)^2}{\frac{11}{25}} = \frac{1}{55}$$

$P(R_2) = \frac{4}{55}$, $P(R_3) = \frac{9}{55}$, $P(R_4) = \frac{16}{55}$, $P(R_5) = \frac{25}{55}$

E : event of drawing two red balls again.

$P(E) = P(R_1)\,P(E/R_1) + P(R_2)\,P(E/R_2) + P(R_3)\,P(E/R_3) + P(R_4)\,P(E/R_4) + P(R_5)\,P(E/R_5)$

$$= \frac{1}{55}(0) + \frac{4}{55}\frac{{}^2C_2}{{}^5C_2} + \frac{9}{55}\frac{{}^3C_2}{{}^5C_2} + \frac{16}{55}\frac{{}^4C_2}{{}^5C_2} + \frac{25}{55}\frac{{}^5C_2}{{}^5C_2}$$

$$= \frac{377}{550} = \frac{13\times 29}{550}$$

sum of propel divisors = 1 + 13 + 29 = 43

7. Let $I = \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sin x\,dx$ .....

Sol. $\frac{\pi}{6} \approx 0.52 < \frac{53}{100}, \frac{103}{100} < \frac{104}{100} = 1.04 < 1.0472 \approx \frac{\pi}{3}$

$$s = \sin\left(\frac{53}{100}\right) + \sin\left(\frac{54}{100}\right) + \sin\left(\frac{55}{100}\right) + \text{.....}$$

$$\text{.....} + \sin\left(\frac{102}{100}\right) + \sin\left(\frac{103}{100}\right)$$

Angles in A.P C.D = $\frac{1}{100}$, numbers of terms 51

$$s = \frac{\sin\left(\frac{39}{25}\right)\sin\left(\frac{51}{200}\right)}{\sin\left(\frac{1}{200}\right)}$$

Also $s = \sum_{r=0}^{50} \sin\left(\frac{53}{100}+\frac{r}{100}\right) = 100$

$$\left(\sum_{r=0}^{50}\sin\left(\frac{53}{100}+\frac{r}{100}\right).\frac{1}{100}\right)$$

$$< 100\left(\lim_{n\to\infty}\sum_{r=0}^{n/2}\sin\left(\frac{53}{100}+\frac{r}{n}\right)\frac{1}{n}\right)$$

$$< 100\int_0^{1/2}\sin\left(\frac{53}{100}+x\right)dx$$

$$< 100\int_{\frac{53}{100}}^{\frac{103}{100}}\sin t\,dt$$

$$< 100\left(\int_{\frac{\pi}{6}}^{\frac{53}{100}}\sin t\,dt + \int_{\frac{53}{100}}^{\frac{103}{100}}\sin t\,dt + \int_{\frac{103}{100}}^{\frac{\pi}{3}}\sin t\,dt\right)$$

$$< 100\int_{\frac{\pi}{6}}^{\frac{\pi}{3}}\sin x\,dx = 100\,I$$

8. Let $f(x) = \frac{2x+5}{x-2}$ .....

Sol. $f(f(x)) = x$

$f(x) = f^{-1}(x)$, $\forall\, x \in R - \{2\}$

But $f^{-1}(x) = x \Rightarrow x = -15$

9. Let A be a non.....

Sol. add 2A both sides

$3A\,BA^{-1} + 3A = 2A^{-1}\,BA + 2A$

$3A\,(BA^{-1} + I) = (A^{-1}\,B + I)\,2A$

$3A\,(BA^{-1} + AA^{-1}) = (A^{-1}B + A^{-1}A)\,2A$

$3A\,(B + A)\,A^{-1} = A^{-1}\,(B + A)\,2A$

$3^n\,|A|\,|B + A|\,|A^{-1}|\,|B + A| = 2^n\,|A|$

$3^n\,|A + B| = 2^n\,|A + B|$

$\Rightarrow |A + B| = 0$

$3AB\,A^{-1} + A = 2A^{-1}\,BA$

$2ABA^{-1} - 2\,A^{-1}\,BA = -A - ABA^{-1}$

$2(ABA^{-1} - A^{-1}BA) = -A\,(I + BA^{-1})$

$= -A\,(AA^{-1} + BA^{-1})$

$= -A(A + B)\,A^{-1}$

12. If $\sum_{n=1}^{\infty}\tan^{-1}\left(\frac{\sin^{-1}\left(\frac{\sqrt{n}-\sqrt{n-1}}{\sqrt{n(n+1)}}\right)}{1+\tan^{-1}\sqrt{n}\tan^{-1}\sqrt{n-1}}\right)$ .....

Sol. $\sum_{n=1}^{\infty}\tan^{-1}\left(\frac{\tan^{-1}\sqrt{n}-\tan^{-1}\sqrt{n-1}}{1+\tan^{-1}\sqrt{n}\tan^{-1}\sqrt{n-1}}\right)$

13. Let a function.....

Sol. $f(x+y)+f(x-y)=f(x)\cdot f(y)$

Given $f(0)\neq 0$ f(1) = 3

x = 1, y = 0 = 1

f(1) + f(1) = f(1) · f(0)

$\Rightarrow$ 2f(1) = f(0) · f(1)

$\Rightarrow$ $2\times 3 = 3f(0)$

$\Rightarrow$ f(0) = 2 .....(1)

x = 1, y = 1 $\Rightarrow$ f(2) + f(0) = f(1)f(1)

$\Rightarrow$ $f(2) + 2 = (3)^2$ $\left(\because f(0)=2\right)$

$\Rightarrow$ f(2) = 7 ..... (2)

x = 2, y = 1 $\Rightarrow$ f(3) + f(1) = f(2)f(1)

$\Rightarrow$ $f(3) + 3 = 7\times 3$

$\Rightarrow$ f(3) = 18 .....(3)

x = 3, y = 1 $\Rightarrow$ f(4) + f(2) = f(3)f(1)

$\Rightarrow$ $f(4) + 7 = 18\times 3$

$\Rightarrow$ f(3) = 47 .....(4)

x = 4, y = 3 $\Rightarrow$ f(7) + f(1) = f(4)f(3)

$\Rightarrow$ $f(7) + 3 = 47\times 18$

$\Rightarrow$ f(7) = 846 – 3 = 843

14. A culture initially.....

Sol. Let B be number of bacteria at time 't'

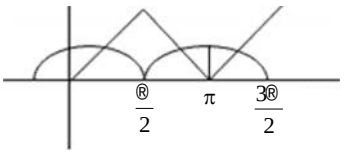
$\frac{dB}{dt} = kB \Rightarrow B = ce^{kt}$

t = 0 B = 1 $\Rightarrow$ c = 1

t = 2 B = 1 $\Rightarrow$ $2 = e^{2k}$

$B = \left(\sqrt{2}\right)^t$

$B = 2^{\frac{t}{2}}$



at t = 7 $B = 2^{\frac{7}{2}}$

$\Rightarrow$ n = 2 (A) is correct

f′(x) = 3(2x – 3π) 2 + 3 + sinx

$x = \frac{3\pi}{2}$: $f'\left(\frac{3\pi}{2}\right) = 3 - 1 = 2$

15. Consider the set.....

Sol. |f(r) – r| = λ

f(r) = r ± λ , f(r) ∈ A $\Rightarrow$ Σ f(r) = Σr

If n = 9

f(1) + f(2) + f(3) + ...+ f(9) = 1 + 2 + ...+ 9 ± λ ± λ..... ± λ

1 + 2 + ...+ 9 = 1 + 2 +.....+ 9 $\pm^{a}\pm^{a}\pm^{a}$ $\underbrace{....\pm^{a}}_{9\,times}$.

$\Rightarrow$ λ = 0

$\Rightarrow$ f(x) in identity mapping only are

If n = 4

f(1) + f(2) + f(3) + f(4) = 1 + 2 + 3 + 4 ± λ ± λ

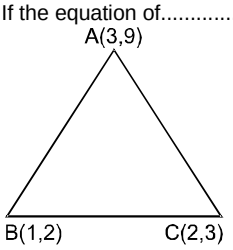
we can have 3 functions

16. Let f(x) be a differentiable.....

Sol. Apply Rolle's theorem on e^{3x} f(x), e^{-2x} f(x), $f^2(x)$ and xf(x) respectively

17. If the equation of.....

Sol.



Slope of AC = $\frac{9-3}{3-2}$ = 6

Equation of AC is y – 3 = 6 (x – 2)

$\Rightarrow$ 6x – y = 9

But we have equation of AC is ax + by = 9

$\Rightarrow$ a = 6, b = –1 $\Rightarrow$ a + b = 5

18. If the point R(α,β) lies inside.....

Sol. Clearly R (α, β) is centroid of ΔABC

$\therefore$ $R(\alpha,\beta) = \left(\frac{3+1+2}{3},\frac{9+2+3}{3}\right) = \left(2,\frac{14}{3}\right)$

$\Rightarrow$ $\alpha = 2$ and $\beta = \frac{14}{3}$

Hence $2\alpha + 3\beta = 18$

19. The value of.....

20. The sum of the.....

Sol. (19, 20)

$A^{-1} = \begin{bmatrix}1&0&0\\-2&1&0\\0&0&1\end{bmatrix}$

$U_1 = A^{-1}\begin{bmatrix}2\\0\\0\end{bmatrix} = \begin{bmatrix}1&0&0\\-2&1&0\\0&0&1\end{bmatrix}\begin{bmatrix}2\\0\\0\end{bmatrix} = \begin{bmatrix}2\\-4\\0\end{bmatrix}$

$U_2 = A^{-1}\begin{bmatrix}1\\2\\0\end{bmatrix} = \begin{bmatrix}1&0&0\\-2&1&0\\0&0&1\end{bmatrix}\begin{bmatrix}1\\2\\0\end{bmatrix} = \begin{bmatrix}1\\0\\0\end{bmatrix}$

$U_3 = A^{-1}\begin{bmatrix}1\\2\\3\end{bmatrix} = \begin{bmatrix}1&0&0\\-2&1&0\\0&0&1\end{bmatrix}\begin{bmatrix}1\\2\\3\end{bmatrix} = \begin{bmatrix}1\\0\\3\end{bmatrix}$

$$\therefore \quad U = \begin{bmatrix} 2 & 1 & 1 \\ -4 & 0 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

19. $|U| = \begin{vmatrix} 2 & 1 & 1 \\ -4 & 0 & 0 \\ 0 & 0 & 3 \end{vmatrix} = 12$

20. $\left[\begin{array}{ccc|ccc} 2 & 1 & 1 & 1 & 0 & 0 \\ -4 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right]$

$$\sim \left[\begin{array}{ccc|ccc} 2 & 1 & 1 & 1 & 0 & 0 \\ 0 & 2 & 2 & 2 & 1 & 0 \\ 0 & 0 & 3 & 0 & 0 & 1 \end{array}\right] \sim \left[\begin{array}{ccc|ccc} 1 & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 0 & 1 & 1 & 1 & \frac{1}{2} & 0 \\ 0 & 0 & 1 & 0 & 0 & \frac{1}{3} \end{array}\right]$$

$$\sim \left[\begin{array}{ccc|ccc} 1 & \frac{1}{2} & 0 & \frac{1}{2} & 0 & -\frac{1}{6} \\ 0 & 1 & 0 & 1 & \frac{1}{2} & -\frac{1}{3} \\ 0 & 0 & 1 & 0 & 0 & \frac{1}{3} \end{array}\right] \sim \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 0 & -\frac{1}{4} & 0 \\ 0 & 1 & 0 & 1 & \frac{1}{2} & -\frac{1}{3} \\ 0 & 0 & 1 & 0 & 0 & \frac{1}{3} \end{array}\right]$$

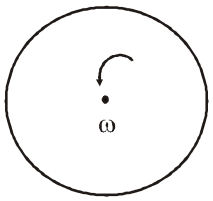
$$U^{-1} = \begin{bmatrix} 0 & -\frac{1}{4} & 0 \\ 1 & \frac{1}{2} & -\frac{1}{3} \\ 0 & 0 & \frac{1}{3} \end{bmatrix}$$

sum of elements = 5/4

PHYSICS

21. Consider a .....

Sol. $\dfrac{M}{\frac{mr^2\omega}{2}} = \dfrac{q}{2m}$



$$M = \frac{qr^2\omega}{4}$$

22. Given system .....

Sol. If J is the impulse imparted to the m_2 by spring after removal of F_0 (up to the time spring attains its natural length for the first time.)

$$\frac{J^2}{2m_2} = \frac{1}{2}K\left(\frac{F_0}{K}\right)^2 = \frac{F_0^{\,2}}{2K}$$

$$J = F_0\sqrt{\frac{m_2}{K}}$$

Same impulse is imparted to m_1 by wall.

Time required = $\dfrac{T}{4} = \dfrac{1}{4}\,2\pi\sqrt{\dfrac{m_2}{K}} = \dfrac{\pi}{2}\sqrt{\dfrac{m_2}{k}}$

$$\langle N\rangle = \frac{J}{T/4} = \frac{4J}{T} = F_0\sqrt{\frac{m_2}{K}} \Big/ \frac{\pi}{2}\sqrt{\frac{m_2}{k}} = \frac{2F_0}{\pi}$$

23. Figure shows .....

Sol. $V = \sqrt{\dfrac{T}{\mu}} = 20$ m/s

$s = Vt$

$t = 0.03$ sec.

24. A string of .....

Sol. $P = \dfrac{1}{2}\mu\omega^2a^2\upsilon$

Now $\omega = \dfrac{2\pi\upsilon}{\lambda}$ and $\upsilon = \sqrt{\dfrac{T}{\mu}}$

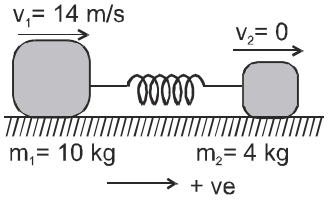
Therefore, $P = \dfrac{2p^2a^2}{\lambda^2}\sqrt{\dfrac{T^3}{\mu}}$

Substituting a = 10 mm, λ = 0.5m, T = 500N and μ = 0.8 kg/m

We get, P = 98.7W

25. Two blocks .....

Sol. $v_{COM} = \dfrac{m_1v_1 + m_2v_2}{m_1 + m_2} = \dfrac{10\times14 + 4\times0}{10+4} = 10$ m/s.



26. A square .....

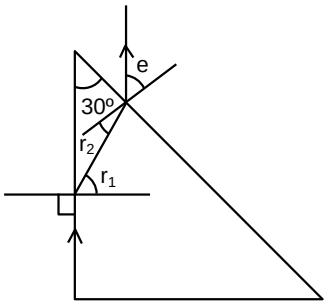
Sol. EMF = $-\frac{d\phi}{dt} = (B_2 - B_1)\ell v$

$$\text{EMF} = \ell v\left(\frac{\mu_0 i}{2\pi a} - \frac{\mu_0 i}{2\pi(a+\ell)}\right) = \frac{\mu i \ell^2 v}{2\pi a(a+\ell)}.$$

Put values x = 12

27. A light ray .....

Sol.



$$\frac{\sin 90^o}{\sin r_1} = \mu = \frac{1}{\sin 42^o} \Rightarrow r_1 = 42^o$$

Using trigonometry : $r_2 = 42^o - 30^o = 12^o$

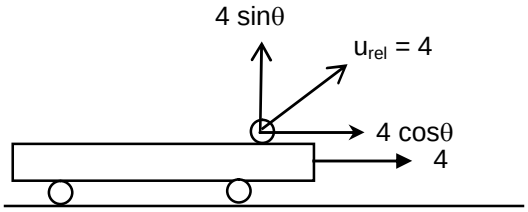
Now $\frac{\sin r_2}{\sin e} = \frac{1}{\mu} \Rightarrow \frac{\sin 12^o}{\sin e} = \sin 42^o$

$e = 18^o$

$\delta = (90^o - 42^o) - (-12 + 18^o) = 42^o$ clockwise

28. A cart is moved .....

Sol.



Wrong solution seems to be correct :

For maximum range wrt. to ground the angle of V_{net} with the horizontal should be 45°. So $V_x = V_y \Rightarrow 4\cos\theta + 4 = 4\sin\theta$.

$\Rightarrow \theta = 90°$.This is wrong method because. R_{max} for $\theta = 45°$ is valid only if $|V_{net}|$ = constant which is not valid for this case. So option (A) was a trap.

Correct Solution:

(A,B) Range with respect to ground

$$R = \frac{2u_x u_y}{g} = \frac{2(4+4\cos\theta)(4\sin\theta)}{g}$$

$$R = \frac{32\sin\theta(1+\cos\theta)}{g} = \frac{32}{g}\ (\sin\theta + \sin\theta\cos\theta)$$

R_{max} when $\sin\theta + \sin\theta\cos\theta$ will be max

$$\Rightarrow \frac{d}{d\theta}(\sin\theta + \sin\theta\cos\theta) = 0 \Rightarrow \cos\theta + 2\cos^2\theta - 1 = 0$$

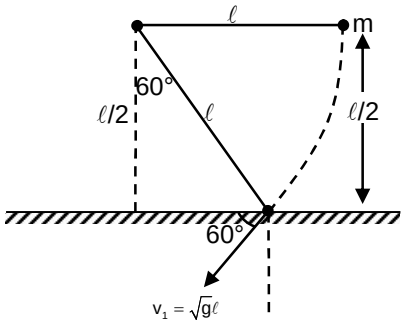
$$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$$

For C,D

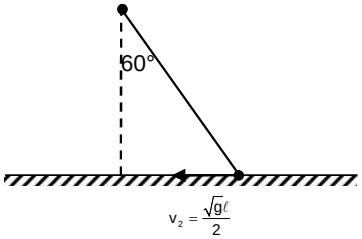
Since the |velocity| of the ball wrt. to the cart is constant. So range wrt. to the cart will be max when $\theta = 45°$

29. A bob of mass .....

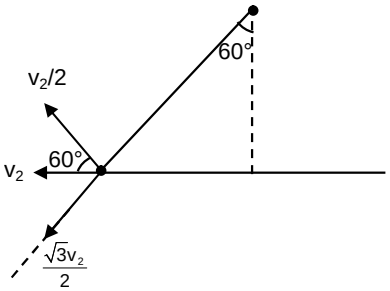
Sol. JBC

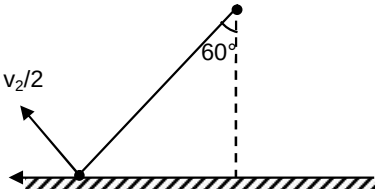


Just before string gets taught



Just after string gets taught





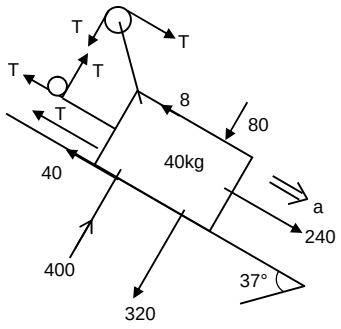
Maximum height achieved during sub sequence motion :

$$h_{max} = \frac{\left(\frac{v_2}{2}\right)^2}{2g} = \frac{v_2^2}{8g} = \frac{1}{8g}\frac{g\ell}{4} = \frac{\ell}{32}$$

$$\Delta E = \frac{mg\ell}{2} - \frac{mg\ell}{32} = \frac{15mg\ell}{32}$$

30. In the figure .....

Sol.



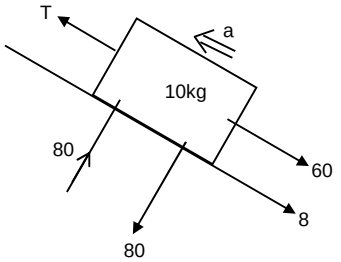
240 – T – 40 – 8 = 40a

192 – T = 40 a

T– 68 = 10 a

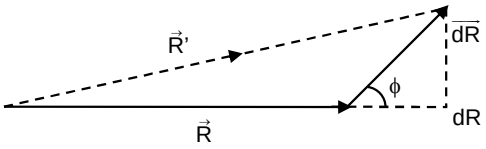
124 = 50 a

$$a = \frac{124}{50} = \frac{62}{25} m/s^2$$



31. Let $\vec{R}$ be the .....

Sol.



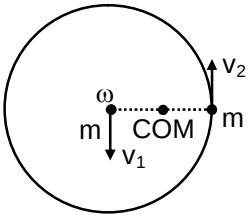
$$dR = \left|d\vec{R}\right|\cos\phi$$

$$\frac{dR}{dt} = \frac{\left|d\vec{R}\right|}{dt}\cos\phi$$

$$v = \frac{\left|d\vec{R}\right|}{dt}$$

32. A circular .....

Sol.



$v_2 + v_1 + \omega R = v$ .....(1)

$v_2 = v_1 \Rightarrow 2v_1 + \omega R = v$

$$mv_2\frac{R}{2} + mv_1\frac{R}{2} - mR^2\omega = 0$$

$mv_1R = mR^2\omega$

$v_1 = \omega R$

$$3\omega R = v \Rightarrow \omega = \frac{v}{3R}$$

$$v_1 = v_2 = \frac{v}{3}$$

34. A small sphere .....

Sol. $g\sin 37 = \frac{3g}{5}$

$$v_{min} = \sqrt{\frac{3gr}{5}}$$

$$T_B = 3\left(\frac{3g}{5}\right)m = \frac{9mg}{5}$$

$$T_C = 6m\left(\frac{3g}{5}\right)m = \frac{18mg}{5}$$

38. Starting from .....

Sol. for energy to be completely potential

$$\cos\left(\omega t+\frac{\pi}{3}\right) = \pm 1 \Rightarrow \omega t+\frac{\pi}{3} = n\pi$$

$$t = \left(\frac{3n-1}{3}\right)\frac{\pi}{\omega} = \left(\frac{3n-1}{300}\right) \text{ sec.}$$

for energy to be completely kinetic

$$\cos\left(\omega t+\frac{\pi}{3}\right) = 0$$

$$\omega t + \frac{\pi}{3} = (2n-1)\frac{\pi}{2}$$

$$t = \left(\frac{6n-5}{600}\right) \text{ sec.}$$

40. Choose the .....

Sol. Max compression in spring

$$\frac{1}{2}(2m)\left(\frac{v_0}{2}\right)^2 = \frac{1}{2}KX_1^2 \Rightarrow X_1 = \sqrt{\frac{mv_0^2}{2K}}$$

Max elongation in spring

$$\frac{1}{2}(m)\left(\frac{v_0}{2}\right)^2 = \frac{1}{2}KX_2^2 \Rightarrow X_2 = \frac{1}{2}\sqrt{\frac{mv_0^2}{K}}$$

B makes first half oscillation with A

So $t_1 = \pi\sqrt{\frac{2m}{K}}$

B makes rest half oscillation alone

$t_2 = \pi\sqrt{\frac{m}{K}}$

$t = t_1 + t_2 = \pi\sqrt{\frac{m}{K}}\ (\sqrt{2}+1)$

CHEMISTRY

41. The solubility product of ……..

Sol. (1) $CuCl(s) \longrightarrow Cu^+(aq) + Cl^-(aq)$ $\quad K_{sp} = 2\times10^{-7}$

(2) $Cu + Cu^{2+}(aq) \longrightarrow 2Cu^+(aq)$ $\quad K = 9.6\times10^{-7}$

(3) $Cu(s) + Cu^{2+}(aq) + 2Cl^-(aq) \longrightarrow 2CuCl(s)$

(3) = (2) – 2 × (1)

$$K_{(3)} = 9.6\times10^{-7}\times\left(\frac{1}{2\times10^{-7}}\right)^2 = \frac{9.6\times10^{-7}}{4\times10^{-14}} = 2.4\times10^{+7}$$

$$\Rightarrow E^o_{Cell} = \frac{0.06}{1}\log 2.4\times10^{+7}$$

$= 0.06 \times (\log 24 + 6)$

$= 0.06 \times (0.9 + 0.48 + 6)$

$= 0.4428$

Ans. $0.4428 \times 40 \simeq 18$

42. 8×10^{-x} moles of gas A ……..

Sol. $P_A = K_H X_A$

$$4\times\frac{25}{100} = 2.5\times10^3 X_A$$

$$\Rightarrow X_A = \frac{2}{5000}$$

Number of moles of water $= \frac{36}{18} = 2$

Number of moles of gas A dissolved $\approx \frac{2}{5000}\times 2 = 0.8\times10^{-3}$

$= 8\times10^{-4}$

43. The half reactions that ……..

Sol. Use the E^o values to decide the direction of the overall cell reaction.

The E^o value for the reduction of PbO_2 is more positive than that for the reduction of $PbSO_4$, so the PbO_2 half reaction will oxidize Pb to $PbSO_4$.

Anode $Pb(s) + SO_4^{2-}(aq) \rightarrow PbSO_4(s) + 2e^-$

Cathode $PbO_2(s) + 4H^+(aq) + SO_4^{2-}(aq) + 2e^-$

$\rightarrow PbSO_4(s) + 2H_2O(l)$

$E^o_{cell} = (E^o_{cathode})_{RP} - (E^o_{anode})_{RP}$

$= (+1.69\ V) - (-0.36\ V)$

$= +2.05\ V$

44. $K_4Fe(CN)_6 + H_2SO_4$ ……..

Sol. $K_4Fe(CN)_6 + 6H_2SO_4$ (concentrated) $+ 6H_2O \xrightarrow{\Delta}$

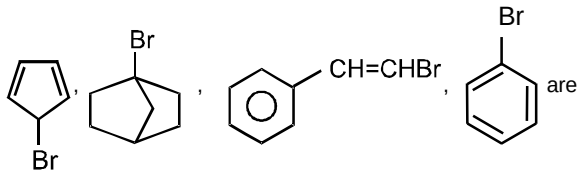
$2K_2SO_4 + FeSO_4 + 3(NH_4)_2SO_4 + 6CO$

45. How many alkene/s react ……..

Sol. (a, b , c ,d , e , g)

rate of addition of $E^{\oplus} \propto$ stability of cation

How many of these compounds ……..

Sol. 

are inert towards nucleophilic substitution by H_2O in aqueous solution.

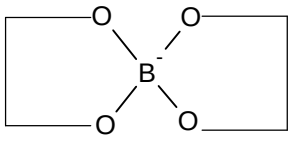
47. The incorrect statement ……..

Sol. Vapour pressure also depends on the nature of substance.

48. Correct statement(s) for ……..

Sol. $H_3BO_3 + H_2O + B^-(OH)_4 + H^+$

$B^-(OH)_4 + 2 \begin{vmatrix} CH_2-OH \\ CH_2-OH \end{vmatrix} \rightleftharpoons$

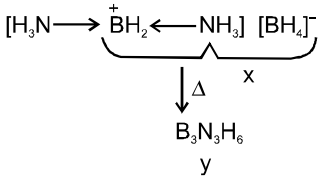


50. Which of the following metals ……..

Sol. Ag, Au and low grade copper ore are extracted by hydrometallurgy.

51. $B_2H_6 + NH_3 \xrightarrow[\text{Heating}]{\text{Slowly}}$ ……..

Sol. $B_2X_6 + 2NH_3 \longrightarrow$



In X hybridisation state of both B is sp^3.

52. On electrolysis, in which of……..

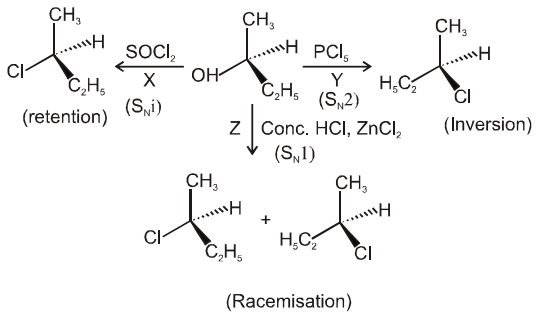
Sol. (A) Anode $2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$

(B) Anode $2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$

(C) Anode $Cu \longrightarrow Cu^{2+} + 2e^-$

(D) Anode $2H_2O \longrightarrow O_2 + 4H^+ + 4e^-$

53. Correct statements for the ……..

Sol. 

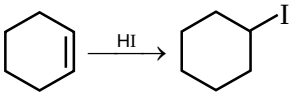
Total Products = 2

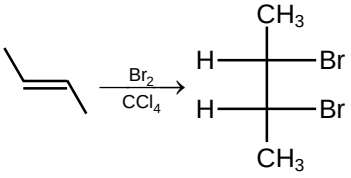
55. Benzyl alcohol can be oxidised ……..

Sol. Alcohol are oxidised in aldehyde by PCC, and Cu/Δ

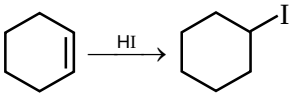
MnO_2 oxidised only allylic and benzylic alcohol.

56. Which of the following ……..

Sol. (A) 

(D) 

(trans gives meso product on anti addition)

Sol. (A) 

58. Select the correct statement……..

Sol.

	A (g)	⟶	B (g)	+	2C (g)
time t = 0	$\frac{0.1}{2}$ M		0		0
time t = 250 sec	$(\frac{0.1}{2} - x)$		x		2x

$$t_{1/2} = \frac{0.693}{2.772 \times 10^{-3}} = 250 \text{ sec.}$$

Hence after 250 sec.

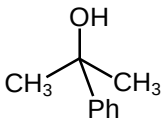
$$[A] = \frac{0.1}{2 \times 2} = 0.025 \text{ M}$$

$$[C] = 2 \times \frac{0.1}{2 \times 2} = \frac{0.1}{2} \text{ M} = 0.05 \text{ M}$$

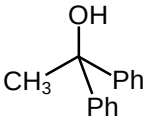
$$\Rightarrow P_C = \frac{0.1}{2} \times 0.082 \times 300 = 1.23 \text{ atm.}$$

59. Which of the following combination ……..

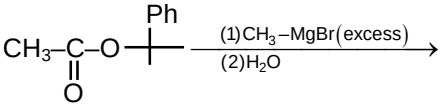
Sol. (A) CH_3MgBr (excess) + $Ph–\underset{\underset{O}{\|}}{C}–O–CH_3$ ⟶

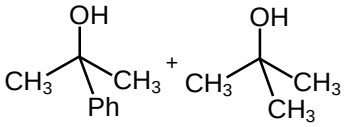


(B) PhMgBr (excess) + $Ph–\underset{\underset{O}{\|}}{C}–CH_3$ ⟶



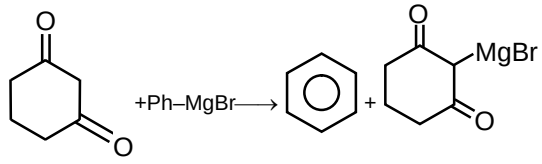
(D)





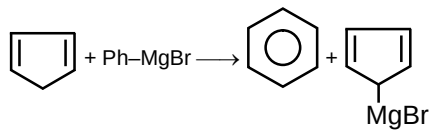
60. Which of the following compounds ……..

Sol. (1)



(2) $CH_3–C\equiv CH + Ph–MgBr \longrightarrow$  $+ CH_3–C\equiv C–MgBr$

(3)



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ADVANCED PATTERN CUMULATIVE TEST-3 (ACT-3)

TARGET : JEE (MAIN+ADVANCED) 2018

DATE : 31-12-2017

COURSE : VIJAY (01JR)

ANSWER KEY

CODE-0

PAPER-1

MATHEMATICS

1.	(D)	**2.**	(A)	**3.**	(A)	**4.**	(B)	**5.**	(B)	**6.**	(B)	**7.**	(A)
8.	(A)	**9.**	(3)	**10.**	(5)	**11.**	(8)	**12.**	(1)	**13.**	(0)	**14.**	(5)
15.	(7)	**16.**	(ABD)	**17.**	(ABCD)	**18.**	(ACD)						

PHYSICS

19.	(B)	**20.**	(A)	**21.**	(B)	**22.**	(B)	**23.**	(B)	**24.**	(A)	**25.**	(D)
26.	(D)	**27.**	(3)	**28.**	(1)	**29.**	(3)	**30.**	(8)	**31.**	(6)	**32.**	(2)
33.	(2)	**34.**	(A)	**35.**	(D)	**36.**	(B)						

CHEMISTRY

37.	(D)	**38.**	(A)	**39.**	(C)	**40.**	(A)	**41.**	(D)	**42.**	(B)	**43.**	(B)
44.	(C)	**45.**	(3)	**46.**	(2)	**47.**	(8)	**48.**	(6)	**49.**	(6)	**50.**	(5)
51.	(1)	**52.**	(ABD)	**53.**	(C)	**54.**	(ACD)						

PAPER-2

MATHEMATICS

1.	(14)	**2.**	(13)	**3.**	(11)	**4.**	(41)	**5.**	(65)	**6.**	(43)	**7.**	(CD)
8.	(ACD)	**9.**	(BC)	**10.**	(AB)	**11.**	(BD)	**12.**	(AB)	**13.**	(ACD)	**14.**	(AB)
15.	(AC)	**16.**	(ABCD)	**17.**	(ABC)	**18.**	(ABD)	**19.**	(ABCD)	**20.**	(AC)		

PHYSICS

21.	(16)	**22.**	(16)	**23.**	(30)	**24.**	(99)	**25.**	(10)	**26.**	(12)	**27.**	(BCD)
28.	(BD)	**29.**	(AD)	**30.**	(BC)	**31.**	(ACD)	**32.**	(AC)	**33.**	(BC)	**34.**	(A)
35.	(AD)	**36.**	(ABCD)	**37.**	(ABD)	**38.**	(ACD)	**39.**	(AC)	**40.**	(AC)		

CHEMISTRY

41.	(18)	**42.**	(40)	**43.**	(20)	**44.**	(12)	**45.**	(06)	**46.**	(04)	**47.**	(B)
48.	(BD)	**49.**	(AC)	**50.**	(ABC)	**51.**	(AC)	**52.**	(ABD)	**53.**	(ABC)	**54.**	(ABC)
55.	(ACD)	**56.**	(AD)	**57.**	(D)	**58.**	(AD)	**59.**	(AD)	**60.**	(ABD)		

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ANSWER KEY

CODE-1

PAPER-1

MATHEMATICS

1.	(A)	**2.**	(B)	**3.**	(D)	**4.**	(B)	**5.**	(D)	**6.**	(D)	**7.**	(D)
8.	(A)	**9.**	(3)	**10.**	(5)	**11.**	(8)	**12.**	(1)	**13.**	(0)	**14.**	(5)
15.	(7)	**16.**	(ABD)	**17.**	(ABCD)	**18.**	(ABD)						

PHYSICS

19.	(D)	**20.**	(C)	**21.**	(A)	**22.**	(D)	**23.**	(A)	**24.**	(D)	**25.**	(C)
26.	(C)	**27.**	(3)	**28.**	(1)	**29.**	(3)	**30.**	(8)	**31.**	(6)	**32.**	(2)
33.	(2)	**34.**	(D)	**35.**	(C)	**36.**	(A)						

CHEMISTRY

37.	(C)	**38.**	(B)	**39.**	(D)	**40.**	(B)	**41.**	(C)	**42.**	(A)	**43.**	(A)
44.	(D)	**45.**	(3)	**46.**	(2)	**47.**	(8)	**48.**	(6)	**49.**	(6)	**50.**	(5)
51.	(1)	**52.**	(ABD)	**53.**	(C)	**54.**	(ACD)						

PAPER-2

MATHEMATICS

1.	(14)	**2.**	(13)	**3.**	(11)	**4.**	(41)	**5.**	(65)	**6.**	(43)	**7.**	(BC)
8.	(ACD)	**9.**	(BD)	**10.**	(AB)	**11.**	(AD)	**12.**	(AD)	**13.**	(ACD)	**14.**	(BD)
15.	(AC)	**16.**	(ABCD)	**17.**	(ABC)	**18.**	(ACD)	**19.**	(ABCD)	**20.**	(BC)		

PHYSICS

21.	(16)	**22.**	(16)	**23.**	(30)	**24.**	(99)	**25.**	(10)	**26.**	(12)	**27.**	(ABC)
28.	(AC)	**29.**	(CD)	**30.**	(AB)	**31.**	(BCD)	**32.**	(BD)	**33.**	(AB)	**34.**	(C)
35.	(CD)	**36.**	(ABCD)	**37.**	(ACD)	**38.**	(BCD)	**39.**	(BD)	**40.**	(BD)		

CHEMISTRY

41.	(18)	**42.**	(40)	**43.**	(20)	**44.**	(12)	**45.**	(06)	**46.**	(04)	**47.**	(B)
48.	(CD)	**49.**	(BC)	**50.**	(ABD)	**51.**	(AB)	**52.**	(ABC)	**53.**	(ABD)	**54.**	(ABD)
55.	(BCD)	**56.**	(BD)	**57.**	(C)	**58.**	(BD)	**59.**	(BD)	**60.**	(ABC)		

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TARGET : JEE (MAIN+ADVANCED) 2018

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COURSE : VIJAY (01JR)

ANSWER KEY

CODE-2

PAPER-1

MATHEMATICS

1.	(D)	**2.**	(A)	**3.**	(A)	**4.**	(B)	**5.**	(B)	**6.**	(B)	**7.**	(A)
8.	(A)	**9.**	(3)	**10.**	(5)	**11.**	(8)	**12.**	(1)	**13.**	(0)	**14.**	(5)
15.	(7)	**16.**	(ABD)	**17.**	(ABCD)	**18.**	(ACD)						

PHYSICS

19.	(B)	**20.**	(A)	**21.**	(B)	**22.**	(B)	**23.**	(B)	**24.**	(A)	**25.**	(D)
26.	(D)	**27.**	(3)	**28.**	(1)	**29.**	(3)	**30.**	(8)	**31.**	(6)	**32.**	(2)
33.	(2)	**34.**	(A)	**35.**	(D)	**36.**	(B)						

CHEMISTRY

37.	(D)	**38.**	(A)	**39.**	(C)	**40.**	(A)	**41.**	(D)	**42.**	(B)	**43.**	(B)
44.	(C)	**45.**	(3)	**46.**	(2)	**47.**	(8)	**48.**	(6)	**49.**	(6)	**50.**	(5)
51.	(1)	**52.**	(ABD)	**53.**	(C)	**54.**	(ACD)						

PAPER-2

MATHEMATICS

1.	(14)	**2.**	(13)	**3.**	(11)	**4.**	(41)	**5.**	(65)	**6.**	(43)	**7.**	(CD)
8.	(ACD)	**9.**	(BC)	**10.**	(AB)	**11.**	(BD)	**12.**	(AB)	**13.**	(ACD)	**14.**	(AB)
15.	(AC)	**16.**	(ABCD)	**17.**	(ABC)	**18.**	(ABD)	**19.**	(ABCD)	**20.**	(AC)		

PHYSICS

21.	(16)	**22.**	(16)	**23.**	(30)	**24.**	(99)	**25.**	(10)	**26.**	(12)	**27.**	(BCD)
28.	(BD)	**29.**	(AD)	**30.**	(BC)	**31.**	(ACD)	**32.**	(AC)	**33.**	(BC)	**34.**	(A)
35.	(AD)	**36.**	(ABCD)	**37.**	(ABD)	**38.**	(ACD)	**39.**	(AC)	**40.**	(AC)		

CHEMISTRY

41.	(18)	**42.**	(40)	**43.**	(20)	**44.**	(12)	**45.**	(06)	**46.**	(04)	**47.**	(B)
48.	(BD)	**49.**	(AC)	**50.**	(ABC)	**51.**	(AC)	**52.**	(ABD)	**53.**	(ABC)	**54.**	(ABC)
55.	(ACD)	**56.**	(AD)	**57.**	(D)	**58.**	(AD)	**59.**	(AD)	**60.**	(ABD)		

Resonance®
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ADVANCED PATTERN CUMULATIVE TEST-3 (ACT-3)

TARGET : JEE (MAIN+ADVANCED) 2018

DATE : 31-12-2017

COURSE : VIJAY (01JR)

ANSWER KEY

CODE-3

PAPER-1

MATHEMATICS

1.	(A)	**2.**	(B)	**3.**	(D)	**4.**	(B)	**5.**	(D)	**6.**	(D)	**7.**	(D)
8.	(A)	**9.**	(3)	**10.**	(5)	**11.**	(8)	**12.**	(1)	**13.**	(0)	**14.**	(5)
15.	(7)	**16.**	(ABD)	**17.**	(ABCD)	**18.**	(ABD)						

PHYSICS

19.	(D)	**20.**	(C)	**21.**	(A)	**22.**	(D)	**23.**	(A)	**24.**	(D)	**25.**	(C)
26.	(C)	**27.**	(3)	**28.**	(1)	**29.**	(3)	**30.**	(8)	**31.**	(6)	**32.**	(2)
33.	(2)	**34.**	(D)	**35.**	(C)	**36.**	(A)						

CHEMISTRY

37.	(C)	**38.**	(B)	**39.**	(D)	**40.**	(B)	**41.**	(C)	**42.**	(A)	**43.**	(A)
44.	(D)	**45.**	(3)	**46.**	(2)	**47.**	(8)	**48.**	(6)	**49.**	(6)	**50.**	(5)
51.	(1)	**52.**	(ABD)	**53.**	(C)	**54.**	(ACD)						

PAPER-2

MATHEMATICS

1.	(14)	**2.**	(13)	**3.**	(11)	**4.**	(41)	**5.**	(65)	**6.**	(43)	**7.**	(BC)
8.	(ACD)	**9.**	(BD)	**10.**	(AB)	**11.**	(AD)	**12.**	(AD)	**13.**	(ACD)	**14.**	(BD)
15.	(AC)	**16.**	(ABCD)	**17.**	(ABC)	**18.**	(ACD)	**19.**	(ABCD)	**20.**	(BC)		

PHYSICS

21.	(16)	**22.**	(16)	**23.**	(30)	**24.**	(99)	**25.**	(10)	**26.**	(12)	**27.**	(ABC)
28.	(AC)	**29.**	(CD)	**30.**	(AB)	**31.**	(BCD)	**32.**	(BD)	**33.**	(AB)	**34.**	(C)
35.	(CD)	**36.**	(ABCD)	**37.**	(ACD)	**38.**	(BCD)	**39.**	(BD)	**40.**	(BD)		

CHEMISTRY

41.	(18)	**42.**	(40)	**43.**	(20)	**44.**	(12)	**45.**	(06)	**46.**	(04)	**47.**	(B)
48.	(CD)	**49.**	(BC)	**50.**	(ABD)	**51.**	(AB)	**52.**	(ABC)	**53.**	(ABD)	**54.**	(ABD)
55.	(BCD)	**56.**	(BD)	**57.**	(C)	**58.**	(BD)	**59.**	(BD)	**60.**	(ABC)		