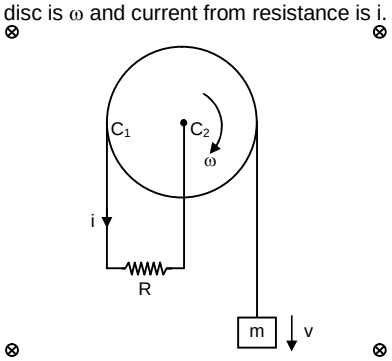
HINTS & SOLUTIONS

PAPER-1

PART- I (PHYSICS)

1. Consider a perfectly .....

Sol. Let at any time t, velocity of block is v, angular velocity of disc is ω and current from resistance is i.



Writing energy equation

$$mgv = mv\frac{dv}{dt} + I\frac{\omega d\omega}{dt} + i^2R$$

$$v = \omega a, \qquad I = \frac{ma^2}{2}$$

$$\frac{dv}{dt} = a\frac{d\omega}{dt}$$

$$i = \frac{B\omega a^2}{2R} = \frac{Bva}{2R}$$

$$mgv = mv\frac{dv}{dt} + \frac{ma^2}{2}\frac{v}{a}\frac{1}{a}\frac{dv}{dt} + \frac{B^2a^2}{4R}v^2$$

$$\frac{3m}{2}\frac{dv}{dt} = mg - \frac{B^2a^2}{4R}v$$

$$\frac{dv}{dt} = \frac{2g}{3} - \frac{B^2a^2}{6mR}v$$

Let $\frac{2g}{3} = \alpha$

$$\frac{B^2a^2}{6mR} = \beta \;;\; \frac{dv}{dt} = \alpha - \beta v$$

$$\int_0^v \frac{dv}{\alpha - \beta v} = \int_0^t dt \Rightarrow v = \frac{\alpha}{\beta}(1 - e^{-\beta t})$$

$$= \frac{4mgR}{B^2a^2}\left(1 - r^{-\left(\frac{B^2a^2}{6mR}\right)t}\right)$$

$$\frac{dv}{dt} = \alpha e^{-\beta t} \Rightarrow \frac{dv}{dt} = \frac{2g}{3}e^{-\beta t}$$

2. A uniform wire .....

Sol. $\Delta T_1 = T_0 - T_1$ $\quad \Delta T_2 = T_0 - T_2$ $\quad \Delta T_3 = T_0 - T_3$

$$f = \frac{1}{2\ell_0}\sqrt{\frac{y\alpha\Delta T_1}{\mu}} = \frac{2}{2\ell_0}\sqrt{\frac{y\alpha\Delta T_2}{\mu}} = \frac{3}{2\ell_0}\sqrt{\frac{y\alpha\Delta T_3}{\mu}}$$

$$\sqrt{\Delta T_1} = 2\sqrt{\Delta T_2} = 3\sqrt{\Delta T_3}$$

$\Delta T_1 = 4\,\Delta T_2 = 9\Delta T_3 \Rightarrow T_1 < T_2 < T_3$

$T_0 - T_1 = 4\,(T_0 - T_2) \quad \Rightarrow T_0 - T_1 = 4T_0 - 4T_2$

$4T_2 - T_1 = 3T_0$

$4\,(T_0 - T_2) = 9\,(T_0 - T_3) \Rightarrow 9T_3 - 4T_2 = 5T_0$

3. A particle moving .....

Sol. Let initial velocity is u and constant acceleration is a.

given

$$s_{6-7} = s_7 - s_6 = \left(7u + \frac{1}{2}a(49)\right) - \left(6u + \frac{1}{2}a(36)\right)$$

$$= u + \frac{13}{2}a = 20 \Rightarrow 2u + 13a = 40$$

$$s_{8-9} = s_9 - s_8 = \left(9u + \frac{1}{2}a(81)\right) - \left(8u + \frac{1}{2}a(64)\right)$$

$$= 4 + \frac{17}{2}a = 24 \Rightarrow 2u + 17a = 48$$

$\Rightarrow a = 2m/s^2$ and $u = 7m/s$

$$s_{9-10} = s_{10} - s_9 = (10u + \frac{1}{2}a(100)) - (9u + \frac{1}{2}a(81))$$

$$= u + \frac{19}{2}a = 26m$$

4. Consider the .....

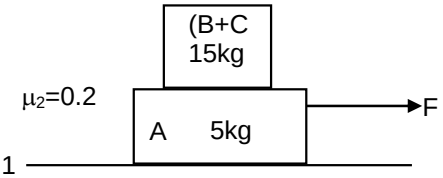
Sol. $(f_{AG})_{max} = 15N$

$(f_{AB})_{max} = 20N$

$(f_{BC})_{max} = 15N$

(A & B)

If force is applied on block A B and C will always move together.



Maximum value of F for which there is no slipping b/w the block is

$F_{max} = 15\,(2) + 15 = 45$ N

maximum possible friction b/w B and C = 10 N

(C & D)

If force is applied on block C, A and B will never move. Maximum value of F for which there is no slipping b/w blocks is $F_{max} = 15N$

Maximum possible value of friction force between A and B is 15N.

5. Imagine a light .....

Sol. $\frac{mv^2}{r} = \frac{k}{r^3} \Rightarrow v\alpha\frac{1}{r}$

$T = \frac{2\pi r}{V} \Rightarrow T\alpha\frac{r}{V} \Rightarrow T\alpha r^2$

6. Which of the .....

Sol. **(A & D)**

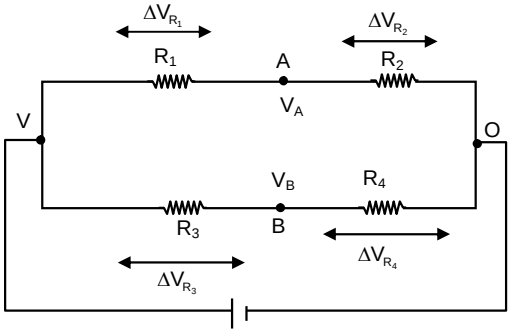
For a force to be conservative work done along any two path (If initial & final position are same) must be same.

(C) Electric field just outside the conductor must be perpendicular to the conductor surface for this charge may or may not be distributed uniformly.

(D) When a conducting plate is oscillated between the magnetic pole pieces, eddy currents are produced due to which plate is damped. This phenomenon is called electro magnetic damping.

7. Consider the given .....

Sol. Let R_5 is not connected between A and B



$V - V_A = \Delta V_{R_1} \Rightarrow V_A = V - \Delta V_{R_1} = V - \left(\frac{V}{R_1+R_2}\right)R_1$

$= V\left(\frac{R_1+R_2-R_1}{R_1+R_2}\right) = \frac{VR_2}{R_1+R_2} = \frac{V}{\left(\frac{R_1}{R_2}\right)+1}$

$V - V_B = \Delta V_{R_3} \Rightarrow V_B = V - \Delta V_{R_3}$

$= V - \left(\frac{V}{R_3+R_4}\right)R_3 = V\left(\frac{R_3+R_4-R_3}{R_3+R_4}\right)$

$= \frac{VR_4}{R_3+R_4} = \frac{V}{\left(\frac{R_3}{R_4}\right)+1}$

Now if R_5 is connected between A and B

Current will flow from A to B if $V_A > V_B$

$\frac{V}{\left(\frac{R_1}{R_2}\right)+1} > \frac{V}{\left(\frac{R_3}{R_4}\right)} \Rightarrow \frac{R_3}{R_4} > \frac{R_1}{R_2}$

Current will flow from B to A if $V_A < V_B$

$\frac{V}{\left(\frac{R_3}{R_2}\right)+1} > \frac{V}{\left(\frac{R_1}{R_2}\right)+1} \Rightarrow \frac{R_1}{R_2} > \frac{R_3}{R_4}$

8. The equation of .....

Sol. $Y = A\sin(\omega t - \vec{k}.\vec{r})$

$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

$\vec{k}.\vec{r} = (3x + 2y - z)\pi.$

$\vec{k} = (3\hat{i} + 2\hat{j} - \hat{k})\pi.$

$|\vec{k}| = \pi\sqrt{9+4+1} = \pi\sqrt{14}$

$|\vec{k}| = \frac{2\pi}{\lambda} \Rightarrow \lambda = \frac{2\pi}{|\vec{k}|} = \frac{2\pi}{\pi|14|} = \sqrt{\frac{2}{7}}\ m$

unit vector in the direction of wave propagation = $\frac{3\hat{i}+2\hat{j}-\hat{k}}{\sqrt{14}}$

9. A converging lens .....

Sol. $m = \frac{f}{f+u} = \frac{200}{200-150} = 4$

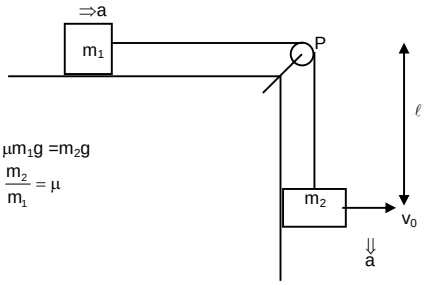
$\frac{x_i}{x_0} = \frac{y_i}{y_0} = 4$

$v = -600$ cm, $z_i = -450$ cm

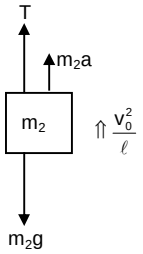
Area of similar triangles is proportional to square of corresponding sides.

10. In the arrangement .....

Sol.



Lets observe the motion of m_2 from am observer fixed at P (point on string)



$T + m_2a - m_2g = \frac{m_2v_0^2}{\ell}$ .....(1)

for m_1

$T - \mu m_1 g = m_1 a$ .....(2)

from (1) and $m_1a + \mu m_1 g - m_2 a - m_2 g = \frac{m_2 v_0^2}{\ell}$

$a = \frac{m_2\frac{v_0^2}{\ell}}{(m_1+m_2)} = \left(\frac{\mu}{1+\mu}\right)\frac{v_0^2}{\ell}$

ROC of m_2

$T - m_2 g = \mu m_1 g + \left(\frac{\mu m_1}{1+\mu}\right)\frac{v_0^2}{\ell} - m_2 g$

$= \left(\frac{\mu m_1}{1+\mu}\right)\frac{v_0^2}{\ell} = m_2\frac{v_0^2}{R}$

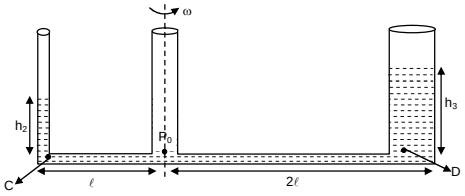
$R = \left(\frac{m_2}{\mu m_1}\right)(1+\mu)\ell = \ell(1+\mu)$

11. With a rise of .....

Sol. With the increase in temperature surface tension of water decreases, Viscosity of water decreases and Viscosity of air increases.

12. Length of arms .....

Sol.



$P_C = P_0 + \frac{1}{2}\rho\omega^2\ell^2 = P_0 + Pgh_2 \Rightarrow \omega^2\ell^2 = 2gh_2$

$P_D = P_0 + \frac{1}{2}\rho\omega^2(4\ell^2) = P_0 + Pgh_3 \Rightarrow 2\rho\omega^2\ell^2 = gh_3$

$\Rightarrow \frac{h_3}{h_2} = 4 \Rightarrow h_3 = 4h_2$

Volume conservation

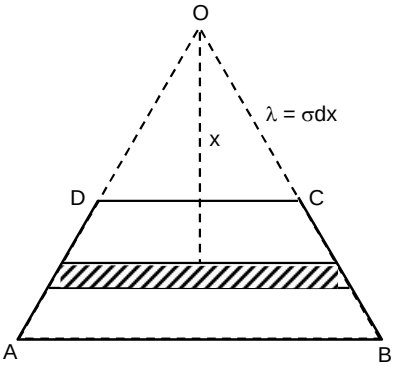
$Ah + 2Ah + 3Ah = Ah_2 + 3Ah_3$

$h_2 + 3h_1 = 6h$

$\Rightarrow h_2 = \frac{6h}{13}$ $\qquad h_3 = \frac{24h}{13}$

13. Consider a uniformly .....

Sol.



$dE = 2\left(\frac{1}{4\pi\varepsilon_0}\right)\frac{\sigma dx}{x}\left(\frac{1}{2}\right)$

$\frac{\sigma}{4\pi\varepsilon_0}\frac{dx}{x}$

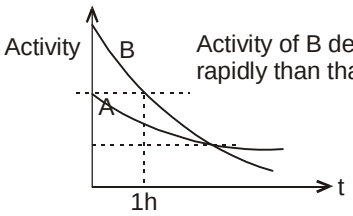
$E = \frac{\sigma}{4\pi\varepsilon_0}\int_{y_0}^{2y_0}\frac{dx}{x}$

$= \frac{7\sigma}{44\varepsilon_0}\ \ell n\sqrt{2}$.

14. At t = 0, a sample .....

Sol. As $\frac{1}{\lambda} = \frac{t_{1/2}}{\ell n 2} \Rightarrow t_{(1/2)\ A} > t_{(1/2)B}$

Activity curves are $(T_{1/2\ (A)} > T_{1/2\ (B)})$



15. The emissive power of .....

Sol. Since , e = a = 0.2 (Since, a = (1 – r – t) = 0.2 for the body B)

$E = (100)(0.2) = 20\ W/m^2$

Power emitted = e.A = 20 × 10 = 200 Watt

16. An ideal monatomic .....

Sol. TV^{a-1} = const.

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

$a = \frac{3}{2}$

$C = C_V - \frac{R}{a-1}$

$C = C_V - 2R$

As V increases, temperature decreases hence internal energy decreases.

17. A car moves .....

Sol. Frequency of horn directly heard by observer $\frac{v + v_0}{v + v_c}f$

Frequency of echo = $\frac{v}{v + v_c}f$

Frequency of echo of horn as heard by observer.

$$\frac{v}{v - v_c}f.\ \left(\frac{v + v_0}{v}\right)$$

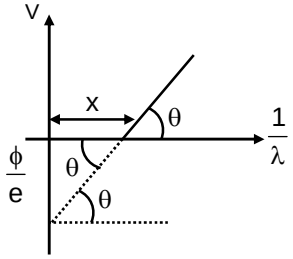
Frquency of Beats :

$= (v + v_0)\ f\ \left\{\frac{1}{v - v_c} - \frac{1}{v + v_c}\right\} = \frac{2v_c(v + v_0)}{(v^2 - v_c^2)}f$

18. The graph between .....

Sol. $eV = \frac{hc}{\lambda} - \phi$

$V = \frac{hc}{e}\left(\frac{1}{\lambda}\right) - \frac{\phi}{e}$



$\tan\theta = \frac{hc}{e}$

$\tan\theta = \frac{\phi}{ex}$

$\phi = ex\tan\theta$

$\phi_1 : \phi_2 : \phi_3 = 3 : 2 : 1$

19. The electron in.....

Sol. Time period $T_n = \frac{2\pi r_n}{V_n}$

$T \propto \frac{n^2}{1/n}$ i.e., $T \propto n^3$

$n_1 = 2n_2$

Hence, $n_1 = 2n_2$

Choice (b) and (c) are wrong.

20. Select correct .....

Sol. $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

f is positive

$m = \frac{f}{f-u}$

PART- II (CHEMISTRY)

21. If $\left(\frac{\partial Z}{\partial P}\right)_T = \frac{1}{RT}\left(b - \frac{a}{RT}\right) + \frac{2a}{(RT)^3}\left(2b - \frac{a}{RT}\right)P + ...$

Sol. Given equation is derivative of Virial equation (in terms of pressure) with respect to pressure.

22. Which of following represents equilibrium .....

Sol. P and T condition decides equilibrium for such equilibria (not amount).

23. Salt AB undergoes anionic hydrolysis .....

Sol. B^- + $H_2O \longrightarrow$ HB + OH^-

c(1–h) ch ch

c = 0.1 M

ch = 10^{-5}

h = 10^{-4}

$K_h = ch^2 = 10^{-9}$

$K_{a(HB)} = 10^{-5}$

K_b of $B^- = 10^{-9}$

$pH = \frac{1}{2}(5 - (-1)) = 3$

24. Colemanite $\xrightarrow{Na_2CO_3}$ x $\xrightarrow{HCl}$ .....

Sol. $Ca_2B_6O_{11} + Na_2CO_3 \longrightarrow \underset{(X)}{Na_2B_4O_7} \xrightarrow{HCl}$

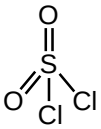
$\underset{(Y)}{H_3BO_3} \xrightarrow{\Delta} \underset{(Z)}{B_2O_3} \xrightarrow{Mg} \underset{(W)}{B}$

Decahydrated Borax is $Na_2[B_4O_5(OH)_4].8H_2O$

So it has 20 O–H bonds.

25. Which is/are correct about SO_2Cl_2 .....

Sol.



2 ($p\pi$–$d\pi$) bonds

No ($p\pi$–$p\pi$) bonds

$P_4 + 10SO_2Cl_2 \longrightarrow 4PCl_5 + 10SO_2$

$SO_2Cl_2 + H_2O \longrightarrow H_2SO_4 + HCl$

26. Alternate tetrahedral void in FCC .....

Sol. In ZnS, S^{2-} occupy FCC lattice points and Zn^{2+} alternate tetrahedral voids.

27. Which of the following is/are correct .....

Sol. Silver solution is an example of Lyophobic sol.

28. For the cell reaction .....

Sol. $E^o_{cell} = E^o_{RP(RHS)} - E^o_{RP(LHS)}$

$= -0.76 - (-1.36) = 0.6$

$\Delta_r G^o = -RT \ln K_{eq}$;

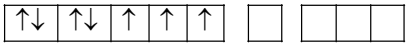
or $\log K_{eq} = \frac{nFE^o}{RT \times 2.303} = \frac{2 \times 0.6}{0.06} = 20$

$\Rightarrow \frac{2 \times 0.6}{0.06} \Rightarrow 20;\ K_f = 10^{20}$

29. Select the correct option(s) .....

Sol. (A) In $\left[Co(SCN)_4\right]$, Co^{2+} is present

$\underline{Co^{2+}} : 3d^7\ 4s^0$:



$3d^7$ 4s 4p

Hybridization is sp^3

as $SCN^{\ominus}$ is weak field ligand.

no. of unpaired electrons = 3

$\mu = \sqrt{n(n+2)}$ B. M. (spin only)

$= \sqrt{15}$ B.M.

(C) $Ni(CO)_4 : sp^3$ hybridized CO is strong field

$\underline{Ni^0} : 3d^8\ 4s^2$

$\left[Co(CO)_4\right]^- : Co : 3d^8\ 4s^2 : sp^3$ hybridized.

30. Following metal cation gives .....

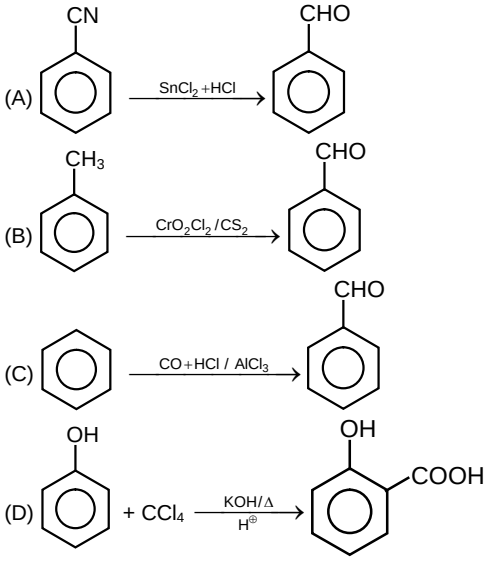
Sol. Al, Cr and Zn oxide are Amphoteric in nature.

31. Consider the given reactions .....

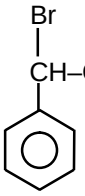
Sol. Oxidation state of N in HNO_3 is +5. It is reduced to NO_2, N_2O, NO_2 and NO respectively in the given reactions. n-factors are 1, 4, 1, 3 respectively.

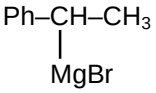
33. In which of the following reactions .....

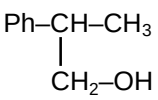
Sol.

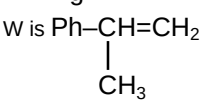


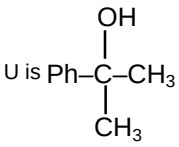
34. Observe the following reaction .....

Sol. X is 

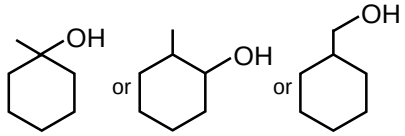
Y is 

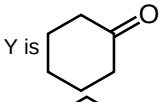
Z is 

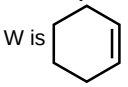
W is 

U is 

35. Observe the following reaction .....

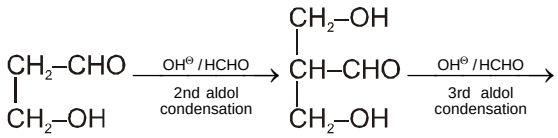
Sol. Y is 

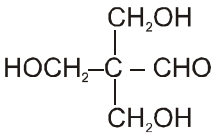
Y is 

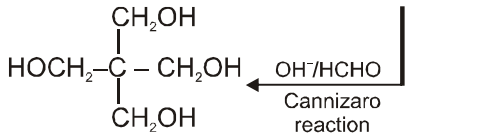
W is 

36. Observe the following reaction .....

Sol. $CH_3–CHO + HCHO \xrightarrow[\text{1st aldol condensation}]{OH^{\ominus}}$







37. Which of the following sequence .....

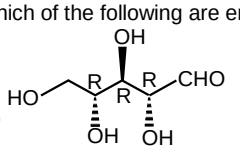
Sol. (A) $C_6H_6 \xrightarrow{Br_2/Fe} C_6H_5Br \xrightarrow{Na/ether} C_6H_5–C_6H_5$

(fitting reaction)

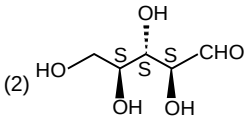
(B) $C_6H_6 \xrightarrow[H_2SO_4]{HNO_3} C_6H_5NO_2 \xrightarrow[HNO_2]{Sn+HCl} C_6H_5N_2^+$

$\xrightarrow[NaOH]{C_6H_6}$ Ph–Ph (Gomberg reaction)

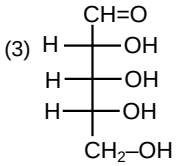
39. Which of the following are enantiomers .....

Sol. (1) 

D-Ribose

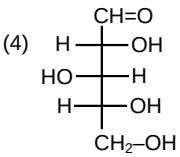
(2) 

L-Ribose

(3) 

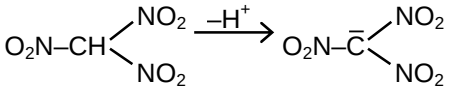
(2R,3R,4R)

D-Ribose

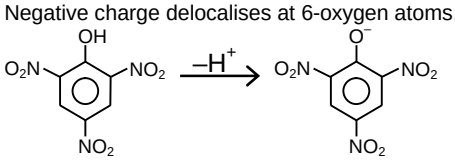
(4) 

(2R,3S,4R)

40. "Trinitromethane is as much acidic .....

Sol. 

Negative charge delocalises at 6-oxygen atoms.



Negative charge delocalises at 7-oxygen atoms.

I-effect does not requires conjugation because it operates through σ-bond.

PART- III (MATHEMATICS)

41. If $\vec{a}$ and $\vec{b}$ non.....

Sol. (A) $\vec{a}\times\vec{b} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$

Take dot with $\hat{i}$.

$\left[\vec{a}\ \vec{b}\ \hat{i}\right] = a_1$

Similarly $a_2 = \left[\vec{a}\ \vec{b}\ \hat{j}\right]$ $a_3 = \left[\vec{a}\ \vec{b}\ \hat{k}\right]$

(B) take $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$

(C) $\left|\vec{\mu}\right| = \sqrt{\left|\hat{a}\right|^2 + \left(\hat{a}\,.\,\hat{b}\right)^2\left|\hat{b}\right|^2 - 2\left(\hat{a}\,.\,\hat{b}\right)\left(\hat{a}\,.\,\hat{b}\right)}$

$\left|\vec{\mu}\right| = \sqrt{1+\left(\hat{a}\,.\,\hat{b}\right)^2 - 2\left(\hat{a}\,.\,\hat{b}\right)^2} = \left|\sin\theta\right|$

$\vec{v} = \left|\sin\theta\right|$

(D) $\vec{c}\,.\,\vec{a} = 0$ (obvious)

42. The number of .....

Sol. If z = 1
so x, y = 1
x,y $\rightarrow$ {1,2}
number of ways = 2^2
z = 3
x, y $\in$ {1,2,3}
number of ways = 3^2
Similarly n^2
$1^2 + 2^2$ …….n^2

43. The number of .....

Sol. If equal side have length n, then the number of triangles will be 2n – 1.
So if equal side does not exceed 1008, no. of triangles
= 1 + 3 + 5 +…1008 terms = $(1008)^2$
if equal side does exceed 1008, no. of triangles = 2016 + 2016 + 2016 +…1008 terms = $2(1008)^2$

44. If E_1 and E_2 are .....

Sol. $P(E_1) = \frac{1}{4}$

$P(E_2/E_1) = \frac{P(E_1 \cap E_2)}{P(E_1)} = \frac{1}{2}$

$P(E_1 \cap E_2) = \frac{1}{8}$

$P(E_1/E_2) = \frac{P(E_1 \cap E_2)}{P(E_2)} = \frac{1}{4}$

$P(E_2) = \frac{1}{2}$

$P(E_1) \cdot P(E_2) = P(E_1 \cap E_2)$

45. $\lim_{n\to\infty} \frac{n}{3}\left\{\left(\frac{3}{n}+\frac{9}{n^2}\right)^2+\left(\frac{3}{n}+\frac{18}{n^2}\right)^2 .....\right\}$

Sol. $\lim_{n\to\infty} \sum_{r=1}^{n} \frac{n}{3}\left(\frac{3}{n}+\frac{9r}{n^2}\right)^2$

$\lim_{n\to\infty} \sum_{r=1}^{n} \frac{n}{3}.\frac{9}{n^2}\left(1+\frac{3r}{n}\right)^2$

$\lim_{n\to\infty} \sum_{r=1}^{n} \frac{3}{n}\left(1+\frac{3r}{n}\right)^2$

$3\int_0^1 (1+3x)^2\, dx$

$\left(\frac{\cancel{3}(1+3x)^3}{\cancel{3}.3}\right)_0^1$

$\frac{64}{3}-\frac{1}{3}=21$

46. If the roots of the .....

$$p-1$$

Sol. $x^3 + ax^2 + bx + c = 0 \leftarrow p$

$$p+1$$

$a = -3p$

$b = p(p-1) + p(p+1) + (p-1)(p+1)$

$c = -p(p-1)(p+1)$

$\frac{a^2}{b+1} = \frac{9p^2}{p^2-\cancel{p}+p^2+\cancel{p}+p^2-\cancel{1}+\cancel{1}}$

$= 3$

47. $\sum_{n=1}^{\infty} \tan^{-1}\left(\frac{4n}{n^4+5}\right) =$ .....

Sol $\sum_{n=1}^{\infty} \tan^{-1}\left(\frac{4n}{n^4+5}\right) = \sum_{n=1}^{\infty} \tan^{-1}\left(\frac{4n}{1+\left(n^2+2\right)^2-4n^2}\right)$

$= \sum_{n=1}^{\infty} \tan^{-1}\left(\frac{4n}{1+\left(n^2+2n+2\right)\left(n^2-2n+2\right)}\right)$

$\sum_{n=1}^{\infty}\left[\tan^{-1}\left(n^2+2n+2\right)-\tan^{-1}\left(n^2-2n+2\right)\right]$

$= 2\tan^{-1}(\infty) - \tan^{-1}1 - \tan^{-1}2 = \frac{3\pi}{4} - \tan^{-1}2$

$= \frac{\pi}{4} + \tan^{-1}\frac{1}{2}$

48. If A^5 is null square .....

Sol. $(I + A + A^2 + ... + A^n)(I - A) = I$

$\Rightarrow I - A^{n+1} = I \Rightarrow A^{n+1} = 0$

as A^5 is null matrix $\Rightarrow$ n + 1 can be any number greater than or equal to 5. $\Rightarrow$ n = 4

49. If $x = \frac{1^2}{1}+\frac{2^2}{3}+\frac{3^2}{5}+.....$

Sol. $x - y = 1^2\left(\frac{1}{1}-\frac{1}{3}\right)+2^2\left(\frac{1}{3}-\frac{1}{5}\right).....1001^2\left(\frac{1}{2001}-\frac{1}{2003}\right)$

$= \frac{1^2.2}{1.3}+\frac{2^2.2}{3.5}.....+\frac{2.1001^2}{2001.2003}$

$\frac{x-y}{2} = \left(\frac{1^2}{1.3}+\frac{2^2}{3.5}.....\frac{1001^2}{2001.2003}\right)$

$T_r = \frac{r^2}{(2r-1)(2r+1)}$

$= \frac{1}{4}\left(\frac{4r^2+1-1}{(2r-1)(2r+1)}\right)$

$= \frac{1}{4}\left(1+\frac{1}{(2r-1)(2r+1)}\right)$

$= \frac{1}{4}(1)+\left(\frac{1}{(2r-1)}-\frac{1}{(2r+1)}\right)\frac{1}{8}$

$\sum_{r=1}^{1001} T_r = \frac{1}{4}(1001)+\frac{1}{8}\left(1-\frac{1}{2003}\right)$

$\frac{x-y}{2} = \frac{1001}{4}+\frac{2002}{2003.8}$

$x - y = \frac{1001}{2}+\frac{1001}{2.2003}$

$[x - y] = 500$

50. Let a differentiable.....

Sol. We have $2|f(x) - f(y)| \le |x - y|$

$\Rightarrow \left|\frac{f(x)-f(y)}{x-y}\right| \le \frac{1}{2} \Rightarrow |f'(x)| \le \frac{1}{2}$

But $f'(x) \ge \frac{1}{2}$. So $f'(x) = \frac{1}{2}$ so the curve is $y = \frac{x}{2} + c$

51. The function f(x) .....

Sol. $f(x) = 2 + \frac{3}{x-2}$ is bijective

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

$\lim_{x\to 0^+} f(e^{1/x}) = 2$

52. If r_1 and r_2 are .....

Sol. Let any point (r cos θ, r sin θ) in xy plane
We have to maximize & minimize r
$5r^2\cos^2\theta + 5r^2\sin^2\theta + 6r^2\sin\theta\cos\theta - 8 = 0$
$5r^2 + 3r^2\sin 2\theta - 8 = 0$

$$r^2 = \frac{8}{5+3\sin 2\theta}$$

$r_{max} = 2$
$r_{min} = 1$
$r_1 + r_2 = 3$

53. $\int \frac{dx}{ax^2+bx+c}$ =.....

Sol.

$$\int \frac{dx}{ax^2+bx+c} = \frac{1}{a}\int \frac{dx}{\left(x+\frac{b}{2a}\right)^2 - \frac{b^2-4ac}{4a^2}}$$

$$= k_1 \tan^{-1}\frac{x+A}{B} + C \text{ if } \frac{b^2-4ac}{4a^2} < 0$$

54. A plane cuts the .....
एक समतल, आयताकार .....

Sol. (0,0,0)B C(1,1,0)
A(1,–1,0)

z = 0 is one of the plane perpendicular to
x + y = 0, x – y = 0, x = 1
Now the triangle formed is take one vertex on z-axis i.e., (0, 0, k), then $1^2 + 1^2 + k^2 = 2^2$
$\Rightarrow k = \pm\sqrt{2}$

Now the direction ratio of plane having point (0, 0, $\sqrt{2}$), (1, 1, 0) and (1, –1, 0) is ($\sqrt{2}$, 0, 1)

and the direction ratio of plane having point (0, 0, $-\sqrt{2}$), (1, 1, 0) and (1, –1, 0) is ($-\sqrt{2}$, 0, 1)

55. Consider the circle .....

Sol. $x^2 + (ax^2 - b)^2 = 1 \Rightarrow a^2x^4 + (1-2ab)x^2 + (b^2-1) = 0$
$\Rightarrow a^2t^2 + (1-2ab)t + (b^2-1) = 0$
$\Rightarrow f(t) = 0$
$D = 4a^2 - 4ab + 1$

$a > b > 1 \quad \Rightarrow D > 0, f(0) > 0$ and $\frac{2ab-1}{2a^2} > 0$

$\Rightarrow$ $t_1 > 0, t_2 > 0 \Rightarrow$ four distinct real values of x

$b < -1 \quad \Rightarrow$ D > 0, f(0) > 0 and $\frac{2ab-1}{2a^2} < 0$

$\Rightarrow$ $t_1 < 0, t_2 < 0 \Rightarrow$ no real value of x
$-1 < b < 1 \Rightarrow f(0) < 0 \quad \Rightarrow t_1 > 0, t_2 < 0$
$\Rightarrow$ two distinct real values of x

56. If $\sqrt{\alpha_1 - 1} + 2\sqrt{\alpha_2 - 4} + ...$

Sol. $2\sqrt{\alpha_1-1} + 4\sqrt{\alpha_2-4} + 6\sqrt{\alpha_3-9} + 8\sqrt{\alpha_4-16}$
$= (\alpha_1 - 1) + 1 + (\alpha_2 - 4) + 4 + (\alpha_3 - 9) + 9 + (\alpha_4 - 16) + 16$

$$\Rightarrow \left(\sqrt{\alpha_1-1}-1\right)^2 + \left(\sqrt{\alpha_2-4}-2\right)^2 + \left(\sqrt{\alpha_3-9}-3\right)^2 + \left(\sqrt{\alpha_4-16}-4\right)^2 = 0$$

$$\Rightarrow \sqrt{\alpha_1-1} = 1,\ \sqrt{\alpha_2-4} = 2,\ \sqrt{\alpha_3-9} = 3,\ \sqrt{\alpha_4-16} = 4$$

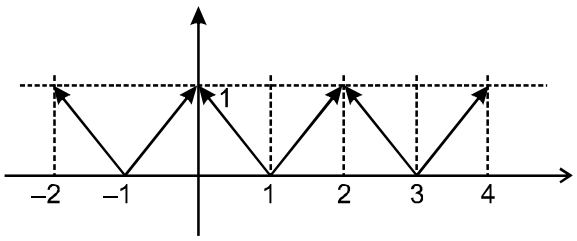
$$\Rightarrow \alpha_1 = 2,\ \alpha_2 = 8,\ \alpha_3 = 18,\ \alpha_4 = 32$$

57. Which of the following .....

Sol. $\sin 82\frac{1^\circ}{2} = \cos 7\frac{1^\circ}{2}$
$\sin 127\frac{1^\circ}{2} = \cos 37\frac{1^\circ}{2}$ $\sin 97\frac{1^\circ}{2} = \cos 7\frac{1^\circ}{2}$

58. Let f : R $\to$ R, f(x) .....

Sol.



x – [x] = {x}
x – [x + 1] = {x} – 1

$$\int_{-2}^{4} f(x)dx = 6.\frac{1}{2}(1.1) = 3$$

59. Let $\begin{vmatrix} 1+x & x & x^2 \\ x & 1+x & x^2 \\ x^2 & x & 1+x \end{vmatrix}$ = ...

Sol. Since it is an identity the value of L.H.S and R.H.S are equal for all values of x
put x = 0 $\Rightarrow \alpha_1\alpha_2\alpha_3\alpha_4 = 6$

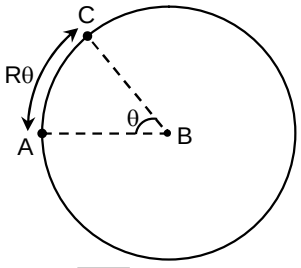
60. If a chord of the circle .....

Sol. Let chord be P = (5, 5)
Q = (–2, –2)

PAPER-2
PART- I (PHYSICS)

1. Two men A .....

Sol. Let they meet at C.

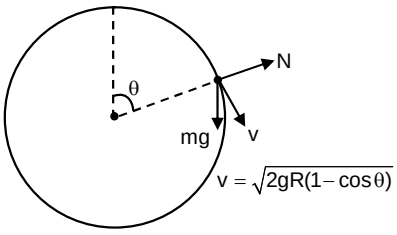


$$\frac{R}{v} = \sqrt{\frac{2R\theta}{a}}$$

$$v = R\sqrt{\frac{a}{2R\theta}} = \sqrt{\frac{aR}{2\theta}}$$

2. Two beads each .....

Sol.

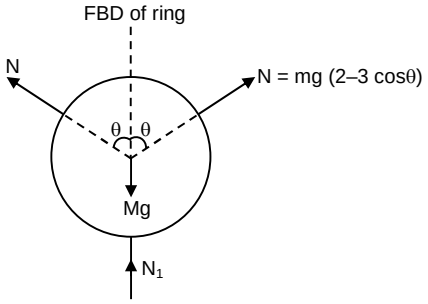


$mg\cos\theta - N = \frac{mv^2}{R} = 2mg(1-\cos\theta)$

$N = 3mg\cos\theta - 2mg \Rightarrow mg(3\cos\theta - 2)$

for $\cos\theta > \frac{2}{3}$ N = Positive

$\cos\theta < \frac{2}{3}$ N = Negative



$N_1 + 2N\cos\theta = Mg$

$N_1 = Mg - 2mg\cos\theta(2 - 3\cos\theta)$

Ring will loose contact if

$2mg(2\cos\theta - 3\cos^2\theta) = Mg$

$4mg\cos\theta - 6mg\cos^2\theta = Mg$

$6mg\cos^2\theta - 4mg\cos\theta + Mg = 0$

$\cos\theta = \frac{4mg \pm \sqrt{16m^2g^2 - 24mMg^2}}{12mg} = \frac{2m \pm \sqrt{4m^2 - 6mM}}{6m}$

for the situation to occur

$4m^2 - 6mM \geq 0$

$2m \geq 3M$

$\frac{m}{M} \geq \frac{3}{2}$

3. Two cells of emf.....

Sol. $\varepsilon_1 = 300\,\alpha$ .....(i)

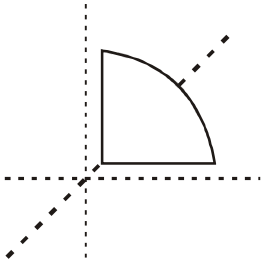
$-\varepsilon_2 + \varepsilon_1 = 100\,\alpha$ .....(ii)

where, α is the potential gradient

$\therefore \quad \frac{\varepsilon_2}{\varepsilon_1} = \frac{2}{3}.$

4. A convex lens .....

Sol. Each part will have different principal axis therefore number of images formed will be 4.



5. Two converging .....

Sol.

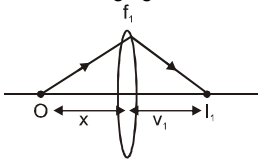


Image -1

$u_1 = -x$

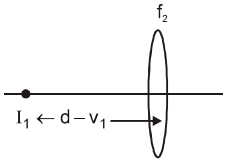
$\frac{1}{v_1} - \frac{1}{-x} = \frac{1}{f_1}$

$v_1 = \frac{x\ f_1}{x - f_1}$

$m_1 = \frac{v_1}{u_1} = \frac{v_1}{-x} = -\left(\frac{f_1}{x - f_1}\right)$

Image -2

$u_2 = -(d - v_1)$



$\frac{1}{v_2} - \frac{1}{-(d - v_1)} = \frac{1}{f_2} \quad ; \quad v_2 = \frac{(d - v_1)f_2}{d - v_1 - f_2}$

$m_2 = \frac{v_2}{-(d - v_1)} = -\left(\frac{f_2}{d - v_1 - f_2}\right)$

m_1

$m_2 = \left(\frac{f_1}{x - f_1}\right)\left(\frac{f_2}{d - \frac{x\ f_1}{(x - f_1)} - f_2}\right) = \frac{f_1 f_2}{x(d - f_1 - f_2) - df_1 + f_1 f_2}$

Since m is independent of x

$\Rightarrow \quad (d - f_1 - f_2) = 0 \Rightarrow d = f_1 + f_2$

$\Rightarrow \quad m = -\frac{f_2}{f_1}$

6. Magnetic field at .....

Sol. $\frac{\mu_0 I_1}{2\pi \times 10cm} = \frac{\mu_0(2)}{2\times(5cm)}$

$\Rightarrow \frac{I_1}{2\pi} = 2$

$I_1 = 4\pi$

7. In the AC circuit .....

Sol. $\tan\phi = \frac{X_L - X_C}{R}$

8. A uniform cylinder .....

Sol. $E = -mgX + \frac{1}{2}mv^2\left(1 + \frac{1}{2}\right) + \frac{K}{2}(\ell_0 + 2x)^2$

$\frac{dE}{dX} = -mg + \frac{m}{2}\cdot 2V\frac{dV}{dX}\cdot\frac{3}{2} + \frac{K}{2}2(\ell_0 + 2x)\cdot 2 = 0$

$$\frac{d^2X}{dt^2} = -\frac{8K}{3m}x$$

Alternative Sol.

$$\frac{1}{2}k(2r\theta)^2 - mgr\theta + \frac{1}{2}\left(\frac{mr^2}{2} + mr^2\right)\omega^2 = C$$

$$\frac{1}{2}\ k4r^2\ 2\theta\ \dot{\theta}\ -mgr\ \dot{\theta}\ + \frac{3mr^2}{4}\ 2\omega\ \alpha = 0$$

$$\alpha = -\frac{8k}{3m}\theta + \text{constant}$$

$$\therefore\ T = 2\pi\sqrt{\frac{3m}{8k}}$$

9. A photon strikes .....

Sol. Energy required to just remove the electron = 13.6 eV

$\therefore$ Energy required = 13.6 + 16.4 = 30 eV

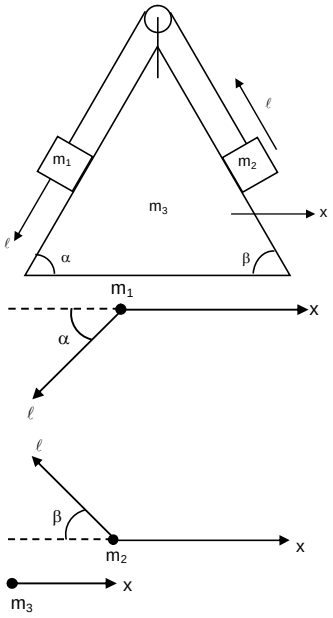
If E be the photon energy 25%

E = 30 eV, E = 120eV = 24 × 5 eV.

X = 5 **Ans.**

10. In the arrangement .....

Sol.



$m_1(x - \ell\cos\alpha) + m_2(x - \ell\cos\beta) + m_3 x = 0$

$x(m_1 + m_2 + m_3) = (m_1\cos\alpha + m_2\cos\beta)\ell$

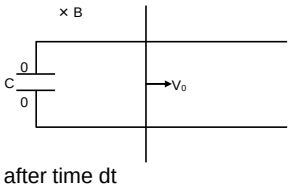
$$x = \frac{(m_1\cos\alpha + m_2\cos\beta)(\ell)}{m_1 + m_2 + m_3}$$

11. Final velocity .....

12. Total energy .....

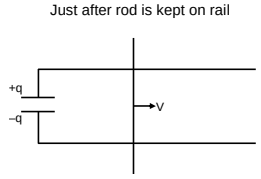
Just before rod is kept on rail

Sol.



after time dt

Just after rod is kept on rail



$q = CVB\ell \qquad i = \frac{q}{dt} = \frac{CVB\ell}{dt}$

Force on rod $f = i\ell B$

Impulse of force on rod = $fdt = CVB^2\ell^2$

Using impulse momentum theorem for rod

$mV_0 - B^2\ell^2 C\ V = mV$

$$V = \frac{mV_0}{m + B^2\ell^2 C} = \frac{mV_0}{m + 2m} = \frac{V_0}{3}$$

Initially energy $\varepsilon_i = \frac{1}{2}mV_0^2$

Final energy $\varepsilon_f = \frac{1}{2}mV^2 + \frac{C^2B^2\ell^2}{2C}V^2$

$$= \frac{1}{2}m\left(\frac{V_0}{3}\right)^2 + \frac{1}{2}(2m)\left(\frac{V_0}{3}\right)^2$$

$$= \frac{1}{18}mV_0^2 + \frac{2}{18}mV_0^2$$

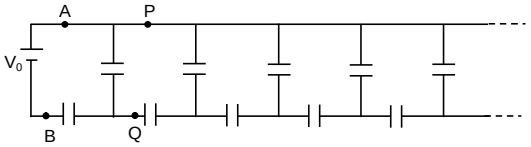
$$= \frac{1}{6}mV_0^2$$

Heat loss $= \frac{1}{2}mV_0^2 - \frac{1}{6}mV_0^2 = \frac{1}{3}mV_0^2$

13. The equivalent .....

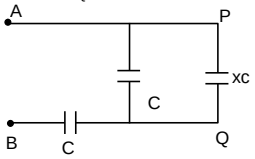
14. Total heat loss .....

Sol.



Lets find equivalent capacitance b/w A and B. Let $C_{AB} = xC$

then $C_{PQ} = xC$



$$C_{AB} = \frac{C(x+1)C}{C + (x+1)C} = xC$$

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

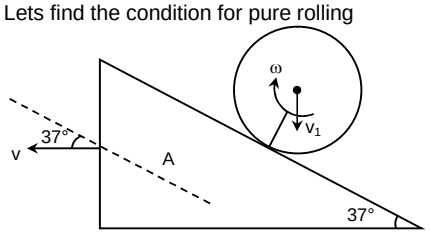
$$x^2 + x - 1 \Rightarrow x = \frac{-1 \pm \sqrt{1+4}}{2}$$

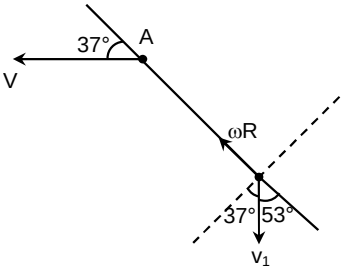
$$x = \left(\frac{\sqrt{5}-1}{2}\right) \qquad C_{AB} = \left(\frac{\sqrt{5}-1}{2}\right)C$$

Heat produced $H_1 = \frac{1}{2}C_{AB}V_0^2 = \left(\frac{\sqrt{5}-1}{4}\right)CV_0^2$

15. If at certain instant .....

Sol. Lets find the condition for pure rolling





$v\sin37 = v_1\cos37°$

$v_1 = v\tan37 = \frac{3}{4}v$

$\omega R - v_1\sin37 = v\cos 37$

$\omega R - \left(\frac{3}{4}v\right)\left(\frac{3}{5}\right) = \frac{4}{5}v$

$\omega R - \frac{9}{20}v = \frac{16}{20}v$

$\Rightarrow \omega R = \frac{25}{20}v = \frac{5}{4}v$

$\omega = \frac{5v}{4R}$

$$K = \frac{1}{2}mv^2 + \frac{1}{2}(2m)v_1^2 + \frac{1}{2}\left(\frac{mR^2}{2}\right)w^2$$

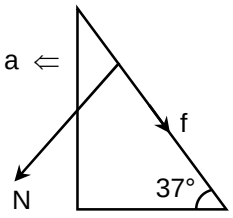
$$= \frac{1}{2}mv^2 + m\left(\frac{9}{16}v^2\right) + \frac{1}{4}mR^2\left(\frac{25v^2}{16R^2}\right)$$

$$= \frac{1}{2}mv^2 + \frac{9mv^2}{16} + \frac{25mv^2}{64} = \left(\frac{32+36+25}{64}\right)mv^2$$

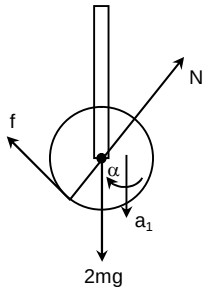
$$= \frac{93}{64}mv^2$$

16. Acceleration of .....

Sol.



N sin37° – f cos37° = ma



.....(1)

$2mg - N\cos 37° - f\sin 37° = 2ma_1 = 2m\left(\frac{3a}{4}\right)$ .....(2)

$f \times R = I\alpha = \left(\frac{mR^2}{2}\right) \times \left(\frac{5a}{4R}\right)$ .....(3)

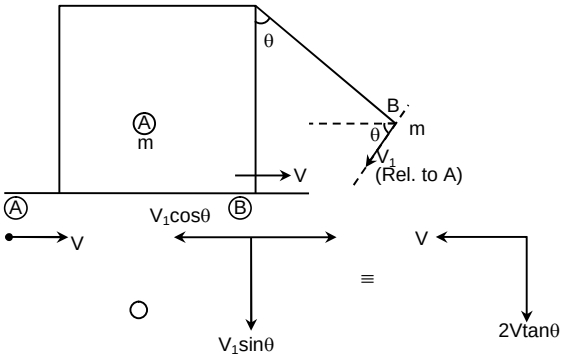
After solving

$f = \frac{5ma}{8}$, $N = \frac{5ma}{2}$, $a = \frac{16g}{31}$

17. Speed of the block .....

18. Normal reaction offered .....

Sol.



Applying conservation of linear momentum.

$mV = m(V_1\cos\theta - V) \Rightarrow V_1 = \frac{2V}{\cos\theta}$ $\boxed{V_1 = \frac{2V}{\cos\theta}}$

Applying conservation of mechanical energy

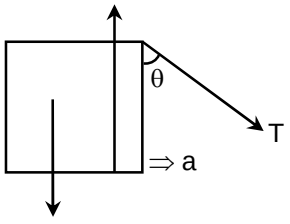
$$mg\,\ell\cos\theta = \frac{1}{2}mV^2 + \frac{1}{2}m(V^2 + 4V^2\tan^2\theta)$$

$$= \frac{1}{2}mV^2(2 + 4\tan^2\theta) = mV^2(1 + 2\tan^2\theta)$$

$$V = \sqrt{\frac{g\ell\cos\theta}{1+2\tan^2\theta}}$$

$$V_1 = 2\sqrt{\frac{g\ell}{\cos\theta(1+2\tan^2\theta)}} = 2\sqrt{\frac{g\ell\cos\theta}{1+\sin^2\theta}}$$

FBD of A



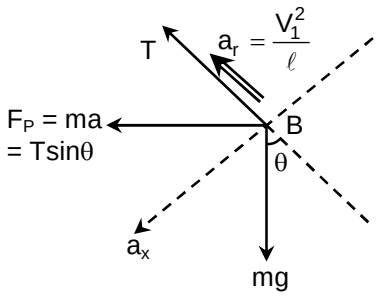
$N = T\cos\theta + mg$

$T\sin\theta = ma$

$N = T\cos\theta + mg$

$T\sin\theta = ma$

Motion of B w.r.t. A



$$T + T\sin^2\theta - mg\cos\theta = \frac{mV_1^2}{\ell}$$

$$T(1+\sin^2\theta) = mg\cos\theta + \frac{m}{\ell}\left(4.\frac{g\ell\cos\theta}{1+\sin^2\theta}\right)$$

$$T(1+\sin^2\theta) = mg\left(\cos\theta + \frac{4\cos\theta}{1+\sin^2\theta}\right)$$

$$T(1+\sin^2\theta) = mg\cos\theta\left(\frac{5+\sin^2\theta}{1+\sin^2\theta}\right)$$

$$T = mg\cos\theta\left(\frac{5+\sin^2\theta}{(1+\sin^2\theta)^2}\right)$$

$$N = T\cos\theta + mg = mg\left(1+\frac{\cos^2\theta(5+\sin^2\theta)}{(1+\sin^2\theta)^2}\right)$$

19. Maximum percentage .....

Sol. For maximum error in g :

$$g = \frac{AB}{A+B} \Rightarrow \frac{1}{g} = \frac{1}{A} + \frac{1}{B} \Rightarrow \frac{dg}{g^2} = \frac{dA}{A^2} + \frac{dB}{B^2}$$

$$\frac{dg}{g} = g\left(\frac{dA}{A^2} + \frac{dB}{B^2}\right)$$

$$\left(\frac{dg}{g}\right)_{max} = 2\left(\frac{0.12}{(6)^2} + \frac{0.15}{(3)^2}\right) = 4\%$$

20. Maximum percentage .....

Sol. $f = \frac{AB}{C+D}$

$$\left(\frac{df}{f}\right) = \frac{dA}{A} + \frac{dB}{B} + \frac{d(C+D)}{C+D} = \frac{0.12}{6} +$$

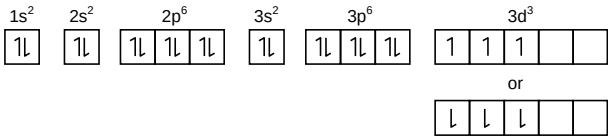
$$\frac{0.15}{3} + \frac{0.04}{2+4} + \frac{0.12}{2+4}$$

$$\left(\frac{df}{f}\right)_{max} = 9.67\%$$

PART- II (CHEMISTRY)

21. Total number of electrons in $_{24}Cr^{3+}$ .....

Sol.



22. One mole of a substance is cooled at the rate .....

Sol. $\Delta S_{fusion} = \frac{\Delta H}{T} = \frac{[0.4\times10^3]\times30}{400} = 30 \text{ J mole}^{-1}\text{ K}^{-1}$

23. How many of the following compounds .....

Sol. $BaCO_3 \xrightarrow{\Delta} BaO + CO_2$ (acidic gas)

$MgCO_3 \xrightarrow{\Delta} MgO + CO_2$ (acidic gas)

$NH_4HCO_3 \xrightarrow{\Delta} NH_3 + H_2O + CO_2$ (acidic gas)

$(NH_4)_2CO_3 \xrightarrow{\Delta} 2NH_3 + H_2O + CO_2$ (acidic gas)

$2Mg(NO_3)_2 \xrightarrow{\Delta} 2MgO + 4NO_2$ (acidic) $+ O_2$

$MgCl_2.6H_2O \xrightarrow{\Delta} MgO + 2HCl$ (acidic gas) $+ 5H_2O$

$CaSO_4 \xrightarrow{\Delta} CaO + SO_3$ (acidic)

$(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + 4H_2O$

$SrCO_3 \xrightarrow{\Delta} SrO + CO_2$ (acidic)

24. A first order reaction is completed .....

Sol. $K = \frac{2.303}{2}\log\frac{100}{80} \Rightarrow K = \frac{2.303}{2}\log\frac{5}{4}\text{ min}^{-1}$

$K = \frac{2.303}{2} \times 0.1\text{ min}^{-1}$

$t_{½} = \frac{0.693}{K} = 6\text{ min}$

25. Suppose that at time t the state .....

Sol. $\Psi = (2/\pi C^2)^{3/4} e^{-(x^2+y^2+z^2)/C^2}$

$|\Psi|^2\, dx\, dy\, dz = (2/\pi C^2)^{3/2} e^{-2(x^2+y^2+z^2)/C^2}\, dx\, dy\, dz$

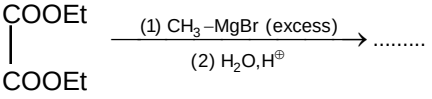
$=$

$[2/(4\pi nm^2)]^{3/2} e^{-2[(1.2)^2+(-1)^2+(0)^2]/4} (0.004\text{ nm})^3$

$= 1.200 \times 10^{-9}$

Ans. $y = 9$

27.



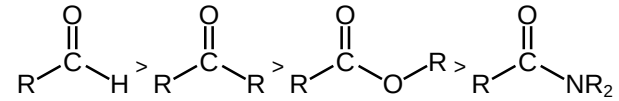
Sol.

28. How many of the following compound .....

Sol. Acetal and sucrose do not give any precipitation with tollen's reagent.

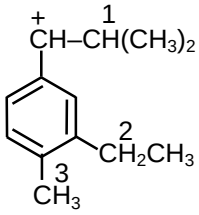
29. How many of the following favours .....

Sol. Reactivity order towards Grignard reagent is as follows



Only (i), (iv), (vi) and (vii) undergoes nucleophilic addition reaction.

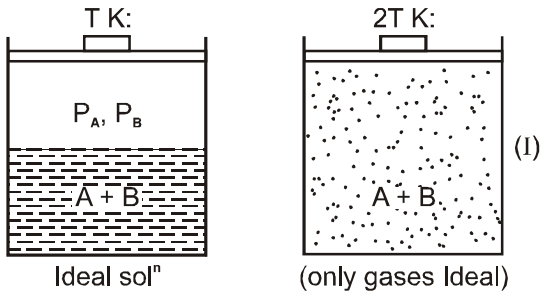
30. How many hyperconjugable H-atoms .....

Sol. 

Total hyperconjugable H-atoms = 6

31. If partial vapour pressure of A is twice .....

Sol. **(A)**



$(A \xrightarrow{k} B)$

$\frac{n_A}{n_B} = \frac{P_A}{P_B} = 2$; Total V.P. = 2 atm;

$PV = nRT \Rightarrow \quad 2 \times 8.21 = (n_{\mathbf{A}} + n_{\mathbf{B}}) \times 0.0821 \times 50$

$\Rightarrow \quad n_{\mathbf{A}} + n_{\mathbf{B}} = 4$

32. Vapours of A and B are passed into a .....

Sol. **(B)** $\frac{n_A}{n_B} = \frac{2}{1}$

$$\underset{8/3}{A} \xrightarrow{k} \underset{4/3}{B}$$

t = 5 min $\quad \frac{8}{3} - x \qquad \frac{4}{3} + x = \frac{8}{3} \Rightarrow \quad x = \frac{4}{3}$

$= 4/3 \qquad \Rightarrow \quad t = t_{\mathbf{1/2}} = 5$ min

$\Rightarrow$ At t = 10 min

$$\underset{2/3}{A} \xrightarrow{k} \underset{10/3}{B}$$

$\Rightarrow \quad P = \frac{4 \times 0.0821 \times 100}{8.21} = 4$ atm

33. $KOH + O_3 \longrightarrow [X] + O_2 + H_2O$ .....

Sol. $2KOH + 5O_3 \longrightarrow 2KO_3$ (orange coloured) $+ 5O_2 + H_2O$.

34. Which of the following statement is .....

Sol. (A) Correct statement (B) $2NO_2 + O_3 \longrightarrow N_2O_5 + O_2$

(C) O_3^- is paramagnetic.

(D) $2\,I_2 + 9[O_3] \longrightarrow I_4O_9$ (yellow solid) $+ 9\,O_2$

35. Salt (A) contains .....

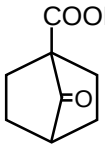
36. The orange solution is .....

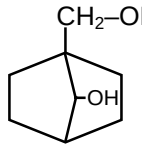
Sol. **(35, 36)**

(A) = Bi^{3+}, (B) = BiI_3 (black), (C) = BiOI (orange), (D) = $[BiI_4]^-$, (E) = $Bi(C_6H_3O_3)$ (yellow)

BiI_4^- is orange complex.

38. Choose the correct option.....

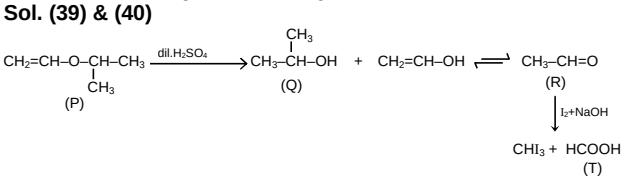
Sol. P is 

Q is 

39. P will be .....

40. Which amongs the following .....

Sol. (39) & (40)



PART- III (MATHEMATICS)

41. If $(1 + x + x^2)^{3n+1}$ .....

Sol. $(1 + x + x^2)^{3n+1} = a_0 + a_1x + a_2x^2 + \ldots\ldots\ldots\ldots a_{6n}x^{6n} + a_{6n+1}x^{6n+1} + a_{6n+2}x^{6n+2}$

putting $x = \omega$ and ω^2, we get

$(1+ \omega + \omega^2)^{3n+1} = 0 = a_0 + a_1\omega + a_2\omega^2 + a_3 + \ldots\ldots + a_{6n} + a_{6n+1}\omega + a_{6n+2}\omega^2$ ....(1)

$(1+ \omega^2 + \omega^4)^{3n+1} = 0 = a_0 + a_1\omega^2 + a_2\omega + a_3 + \ldots\ldots\ldots + a_{6n+1}\omega^2 + a_{6n+2}\omega$ ....(2)

Adding (1) and (2), we get

$$\sum_{r=0}^{2n} \left(2a_{3r} - \left(a_{3r+1} + a_{3r+2}\right)\right) = 0.$$

42. $f : R \to R$ be a twice.....

Sol. Given inequality can be written as :

$f''(x) - 2f'(x) \geq 3\,(f'(x) - 2f(x))$

Let $f'(x) - 2f(x) = g(x)$

$\Rightarrow g'(x) - 3g(x) \geq 0$ multiply e^{-3x}

$\Rightarrow \frac{d}{dx}(g(x)e^{-3x}) \geq 0 \Rightarrow g(x)e^{-3x}$ is non-decreasing.

Now $g(0) = f'(0) - 2f(0) = -2$

$f'(x) - 2f(x) \geq -2e^{3x}, \forall\ x \geq 0,\ e^{-2x}$

$\Rightarrow \frac{d}{dx}(f(x)e^{-2x}) \geq -2e^{x}, \forall\ x \geq 0$

$\Rightarrow \frac{d}{dx}(f(x)e^{-2x} + 2e^{x}) \geq 0$

$\Rightarrow f(x)e^{-2x} + 2e^{x} \geq 3$

$\Rightarrow f(x) \geq 3e^{2x} - 2e^{3x}, \forall\ x \geq 0$

comparing ah(bx) – bh(ax) with $3e^{2x} - 2e^{3x}$ we get

$h(x) = e^x$, a = 3, b = 2

$\Rightarrow$ (a + b) h(0) = 5

43. If number of values .....

Sol. $(z^3) = (\overline{(\omega^7)}) \Rightarrow |z|^3 = |\overline{\omega}|^7 = |\omega|^7$ or $|z|^{15} = |\omega|^{35}$ ...(i)

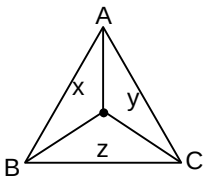
Again $z^5 \cdot \omega^{11} = 1\ |z|^5 \cdot |\omega|^{11} = 1$ or $|z|^{15}\ |\omega|^{33} = 1$ ...(ii)

From (i) and (ii) $\Rightarrow |z| = |\omega| = 1$

Again $-(\overline{\omega})^{35} = \frac{1}{\omega^{33}} \Rightarrow (\overline{\omega})^2 = -1 = i^2 \Rightarrow \omega = i$ or $-i$

44. Let O be an interior.....

Sol.



$\overrightarrow{OA} + \overrightarrow{2OB} + \overrightarrow{3OC} = \vec{0}$ .....(i)

Let x, y, z be the area of triangle OAB,OBC and OCA respectively and area (ΔABC) = A

$\Rightarrow x + y + z = A$ ..... (ii)

Taking cross product with $\overrightarrow{OA}$ on the both sides (i) and then take modulus on both sides, we get

, $\frac{x}{y} = \frac{3}{2} \Rightarrow x = \frac{3}{2}y$

$\frac{x}{y} = \frac{3}{2} \Rightarrow x = \frac{3}{2}y$

similarly, $\frac{x}{z} = 3$ and $\frac{y}{z} = 2 \Rightarrow z = \frac{y}{2}$

$\therefore$ from (ii) , $y\left(\frac{3}{2}+1+\frac{1}{2}\right) = A \Rightarrow \frac{A}{y} = 3$

45. In ΔABC, if .....

Sol. $\frac{c+a}{12} = \frac{a+b}{14} = \frac{b+c}{18} = \frac{s}{11}$

$b + c = \frac{18}{11}s$

$\Rightarrow 2s - a = \frac{18}{11}s$

$\Rightarrow s - a = \frac{7}{11}s$

$r_1 = \frac{\Delta}{s-a} = \frac{11\Delta}{7s} = \frac{11}{7}r$

$a + c = \frac{12s}{11}$

$2s - b = \frac{12s}{11}$

$s - b = \frac{s}{11}$

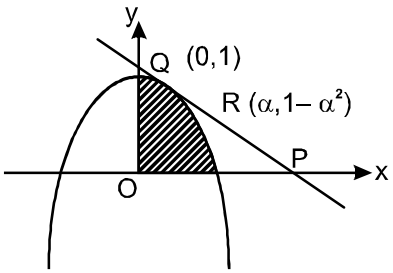
$r_2 = \frac{\Delta}{s-b} = \frac{11\Delta}{s} = 11r$

$\Rightarrow \frac{7r_1 - r_2}{11} = \frac{11r - 11r}{11r} = 0$

46. If the tangent to .....

Sol. A_1 = area under the curve and axes

$= \int_0^1 (1-x^2)dx = \left[x - \frac{x^3}{3}\right]_0^1 = \frac{2}{3}$ ...(i)



now $y = 1 - x^2$

$\therefore$ $y' = -2x$

$\therefore$ $y'(\alpha, 1-\alpha^2) = -2\alpha$

Equation of tangent to the curve $y = 1 - x^2$

$\Rightarrow (y - (1-\alpha^2)) = -2\alpha(x - \alpha)$

$\Rightarrow 2\alpha x + y = \alpha^2 + 1$

$\therefore$ $P \equiv \left(\frac{\alpha^2+1}{2\alpha}, 0\right)$; $Q \equiv (0, \alpha^2 + 1)$

A = Area of triangle POQ = $\frac{1}{2}$ (OP) (OQ) = $\frac{1}{4}\frac{(\alpha^2+1)^2}{\alpha}$

$\therefore$

$\frac{dA}{d\alpha} = \frac{1}{4}\frac{\alpha 2(\alpha^2+1)2\alpha - (\alpha^2+1)^2}{\alpha^2} = \frac{1}{4}\frac{3\alpha^4 + 2\alpha^2 - 1}{\alpha^2}$

For maximum / minimum $\frac{dA}{d\alpha} = 0$

$\Rightarrow 3\alpha^4 + 2\alpha^2 - 1 = 0$ $\alpha^2 = \frac{1}{3}$ $\Rightarrow \alpha = \pm\frac{1}{\sqrt{3}}$

Since $0 < \alpha < 1 \Rightarrow \alpha = \frac{1}{\sqrt{3}}, \frac{d^2A}{d\alpha^2} > 0$

Hence A is minimum.

$$A = \frac{1}{4}\frac{\left(\frac{1}{3}+1\right)^2}{\frac{1}{\sqrt{3}}} = \frac{4}{3\sqrt{3}} \qquad \ldots(ii)$$

Since $A = kA_1$ (given)

$$\Rightarrow \quad \frac{4}{3\sqrt{3}} = \frac{2}{3}k \Rightarrow k = \frac{2}{\sqrt{3}}$$

47. If the differential .....

Sol. $\frac{dy}{dx}(\cos y - \sin y) + (\cos y + \sin y)\, e^{-x} = e^{e^{-x}}$

$\cos y + \sin y = u$

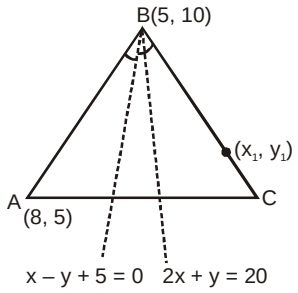
$$\Rightarrow \quad \frac{du}{dx} + e^{-x}u = e^{e^{-x}} = x$$

$$\Rightarrow \quad e^{-e^{-t}} = t$$

$$\Rightarrow \quad t.\, e^{e^{-t}} = 1$$

48. The vertex A of triangle .....

Sol.



Point of the intersection of $x - y + 5 = 0$ and $2x + y = 20$ gives the co-ordinate of vertex B i.e. (5,10)

Image of point A with respect to $x - y + 5 = 0$ lies on the line BC.

$$\frac{x_1 - 8}{1} = \frac{y_1 - 5}{-1} = -2\left(\frac{8 - 5 + 5}{1 + 1}\right)$$

$x_1 = 0, \quad y_1 = 13$

$\therefore$ co-ordinate of image (0, 13)

equation of line BC $y - 10 = \frac{13 - 10}{0 - 5}(x - 5)$

$$-5y + 50 = 3x - 15$$

$$3x + 5y = 65$$

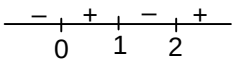
Let co-ordinates of point C is $\left(t, \frac{65 - 3t}{5}\right)$, mid-point of A and C is $\left(\frac{8 + t}{2}, \frac{90 - 3t}{10}\right)$ lies on the line $2x + y = 20$, hence satisfies the line $2\left(\frac{8 + t}{2}\right) + \frac{90 - 3t}{10} = 20$

$$7t = 30 \quad \Rightarrow \quad t = \frac{30}{7}$$

Hence co-ordinates of point C is $\left(\frac{30}{7}, \frac{73}{7}\right)$

49. Let f(x) be a function.....

Sol. $f'(x) = x(x^2 - 3x + 2) = x(x - 1)(x - 2)$ the sign scheme for $f'(x)$ is as below



$\therefore$ $f'(x) \le 0$ in $1 \le x \le 2$ and $f'(x) \ge 0$ in $2 \le x \le 5$

$\therefore$ f(x) is decreasing in [1, 2] and increasing in [2, 3]

maximum f(x) = the greatest among {f(1), f(3)}

$$f(1) = \int_1^1 x(x^2 - 3x + 2)\, dx = 0, \; f(3)$$

$$= \int_1^3 x(x^2 - 3x + 2)\, dx = 2$$

$\therefore$ maximum f(x) = 2

50. Three numbers .....

{1, 2, ..., 10} से .....

Sol. Let E_1 be the event getting minimum number 3 and E_2 be the event getting maximum number

7 Then $P(E_1)$ = P(getting number 3 and other two from number 4 to 10)

$$= \frac{{}^1C_1 \times {}^7C_2}{{}^{10}C_3} = \frac{7}{40}$$

$P(E_2)$ = P(getting one number 7 and other two from number

1 to 6) = $\frac{{}^1C_1 \times {}^6C_2}{{}^{10}C_3} = \frac{1}{8}$

$P(E_1 \cap E_2)$ = P(getting one number 3, second number 7 and

third from 4 to 6)

$= \frac{{}^1C_1 \times {}^1C_1 \times {}^3C_1}{{}^{10}C_3} = \frac{1}{40}$

$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2) = \frac{11}{40}$

So k = 6

$P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2) = \frac{11}{40}$

So k = 6

51. The value of .....

Sol. line are in same plane so

$$\begin{vmatrix} 1 & -1 & -1 \\ 2 & 3 & \lambda \\ 3 & 2 & 3 \end{vmatrix} = 0 \Rightarrow 1(9 - 2\lambda) + 1(6 - 3\lambda) - 1(-5) = 0$$

$20 - 5\lambda = 0 \Rightarrow \lambda = 4$

So $\sin^{-1}\sin 4 = \sin^{-1}\sin(\pi - 4) = \pi - 4$

52. Angle between .....

Sol. normal vector to plane containing lines is

$$\vec{n} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & -1 \\ 3 & 2 & 3 \end{vmatrix} = \hat{i} + 6\hat{j} - 5\hat{k}$$

So angle between planes

$\cos\theta = \frac{4 + 6 - 10}{\sqrt{21}\sqrt{62}} = 0 \Rightarrow \theta = \frac{\pi}{2}$

53. Let $F(x) = \int_{\sin x}^{\cos x} e^{(1+\sin^{-1}t)^2}$ .....

Sol. $F'(x) = e^{(1+\sin^{-1}(\cos x))^2} \cdot (-\sin x) - e^{(1+x)^2} \cdot \cos x$

$F'(0) = -e = F'\left(\frac{\pi}{2}\right)$

Since F'(x) is continuous and differentiable and

$F'(0) = F'\left(\frac{\pi}{2}\right)$

Hence Rolle's theorem is applicable for y = F'(x) in $\left[0, \frac{\pi}{2}\right]$

$\therefore \exists$ some $c \in \left(0, \frac{\pi}{2}\right)$ s.t. F''(c) = 0

54. If a function y = f(x) .....

Sol. Differentiating the equation w.r. to x, we get

$2f(x)f'(x) = (f(x))^2 + (f'(x))^2$

$\Rightarrow (f(x) - f'(x))^2 = 0 \Rightarrow f'(x) = f(x)$

$\Rightarrow \frac{f'(x)}{f(x)} = 1 \Rightarrow \ell n f(x) = x + c$

but x = 0, $f(0) = \sqrt{m^2}$ $m \in R^+$

$\therefore c = \ln m$

$\therefore \ln f(x) = x + \ln m \Rightarrow \ln\left(\frac{f(x)}{m}\right) = x$

$\Rightarrow f(x) = me^x$, $m \in R^+$

$f'(x) > 0 \ \forall \ x \in R$

55. The probability of .....

56. If white ball is .....

Sol. P(i)αi

P(i) = Ki

P(1) = K, P(2) = 2K, ... P(6) = 6 K

K + 2K + ... + 6K = 1

K(1 + 2 + ... + 6) = 1

$K = \frac{1}{21}$

$P(1) = \frac{1}{21}$, $P(2) = \frac{2}{21}$, ... $P(6) = \frac{6}{21}$

$P(\text{Prime number}) = \frac{2}{21} + \frac{3}{21} + \frac{5}{21} = \frac{10}{21}$

$P(\text{not prime}) = \frac{11}{21}$

$P(B) = \frac{10}{21} \times \frac{3}{5} + \frac{11}{21} \times \frac{2}{5} = \frac{52}{105}$

$P(w) = \frac{10}{21} \times \frac{2}{5} + \frac{11}{21} \times \frac{3}{5} = \frac{53}{105}$

$P\left(\frac{\text{urnB}}{w}\right) = \frac{\frac{33}{105}}{\frac{53}{105}} = \frac{33}{53}$

57. If |P| = 1, |Q| = 1 .....

Sol. (adj P^{-1}) . adj B (adj Q^{-1})

$= (P^{-1})^{-1}$ adj B $(Q^{-1})^{-1}$ = PAQ

58. If A and P are .....

Sol. $(PAP)^T = P^T A^T P^T$

$= (-P)(-A)(-P) = -PAP$

59. f(x) is equal .....

Sol. $f'(x) = f(x) + \int_0^2 f(x)\,dx$

let $\int_0^2 f(x)\,dx = k \Rightarrow f'(x) - f(x) = k$

$\Rightarrow e^{-x}f(x) = k\int e^{-x}\,dx \Rightarrow f(x) = ce^x - k$

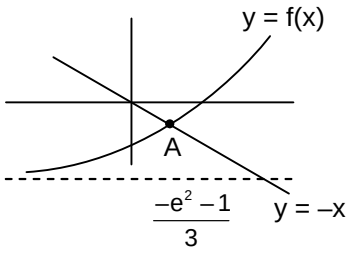
Since $\int_0^2 f(x)\,dx = k \Rightarrow k = \frac{c(e^2-1)}{3}$

& $f(0) = \frac{4-e^2}{3} \Rightarrow c = 1, k = \frac{e^2-1}{3}$

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

60. The number of .....

Sol.



Number of solutions of $f(x) + x = 0$

$\Rightarrow f(x) = -x$

point A is only solution

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DATE : 14-05-2017

COURSE : VIJETA (ADP), VIJAY (ADR), VIVEK (JCC)

ANSWER KEY

CODE-0

PAPER-1

PART- I (PHYSICS)

1.	(ABC)	**2.**	(BCD)	**3.**	(AC)	**4.**	(BC)	**5.**	(AD)	**6.**	(AD)	**7.**	(BC)
8.	(AC)	**9.**	(BCD)	**10.**	(AC)	**11.**	(ABD)	**12.**	(ABC)	**13.**	(BC)	**14.**	(AD)
15.	(ACD)	**16.**	(ABC)	**17.**	(BCD)	**18.**	(AC)	**19.**	(AD)	**20.**	(AC)		

PART- II (CHEMISTRY)

21.	(ABC)	**22.**	(ABCD)	**23.**	(ABCD)	**24.**	(BCD)	**25.**	(ABCD)	**26.**	(ACD)	**27.**	(ACD)
28.	(BC)	**29.**	(AC)	**30.**	(ABD)	**31.**	(AB)	**32.**	(AB)	**33.**	(ABC)	**34.**	(AB)
35.	(ABCD)	**36.**	(ABCD)	**37.**	(AB)	**38.**	(ABCD)	**39.**	(AC)	**40.**	(AB)		

PART- III (MATHEMATICS)

41.	(ABCD)	**42.**	(ABCD)	**43.**	(ABC)	**44.**	(ACD)	**45.**	(ABD)	**46.**	(BCD)	**47.**	(BCD)
48.	(ACD)	**49.**	(AB)	**50.**	(ABD)	**51.**	(ABD)	**52.**	(ABCD)	**53.**	(CD)	**54.**	(BC)
55.	(ABC)	**56.**	(ABD)	**57.**	(ABC)	**58.**	(ABC)	**59.**	(C)	**60.**	(AB)		

PAPER-2

PART- I (PHYSICS)

1.	(2)	**2.**	(3,6,9)	**3.**	(4, 8)	**4.**	(4)	**5.**	(3)	**6.**	(4)	**7.**	(1, 4)
8.	(4, 8)	**9.**	(5)	**10.**	(7)	**11.**	(C)	**12.**	(C)	**13.**	(A)	**14.**	(C)
15.	(A)	**16.**	(B)	**17.**	(C)	**18.**	(B)	**19.**	(B)	**20.**	(C)		

PART- II(CHEMISTRY)

21.	(3,4)	**22.**	(3)	**23.**	(8)	**24.**	(1,2,3,4)	**25.**	(9)	**26.**	(5)	**27.**	(1)
28.	(7)	**29.**	(4)	**30.**	(6)	**31.**	(A)	**32.**	(B)	**33.**	(B)	**34.**	(D)
35.	(A)	**36.**	(A)	**37.**	(A)	**38.**	(B)	**39.**	(C)	**40.**	(B)		

PART- III (MATHEMATICS)

41.	0	**42.**	0,1,2,3,4	**43.**	3,5,7	**44.**	5,7,9	**45.**	0	**46.**	0,2,4,6,8
47.	1	**48.**	1,2,5	**49.**	0,1,2	**50.**	6,7,8,9	**51.**	(D)	**52.**	(B)
53.	(B)	**54.**	(A)	**55.**	(B)	**56.**	(D)	**57.**	(A)	**58.**	(B)
59.	(A)	**60.**	(B)								

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ANSWER KEY

CODE-1

PAPER-1

PART- I (PHYSICS)

1.	(ACD)	**2.**	(ABD)	**3.**	(AC)	**4.**	(AD)	**5.**	(BC)	**6.**	(BC)	**7.**	(AD)
8.	(AC)	**9.**	(ABD)	**10.**	(AC)	**11.**	(BCD)	**12.**	(ACD)	**13.**	(AD)	**14.**	(BC)
15.	(ABC)	**16.**	(ACD)	**17.**	(ABD)	**18.**	(AC)	**19.**	(BC)	**20.**	(AC)		

PART- II (CHEMISTRY)

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

PART- III (MATHEMATICS)

41.	(ABCD)	**42.**	(ABCD)	**43.**	(ABD)	**44.**	(BCD)	**45.**	(ABC)	**46.**	(ACD)	**47.**	(ACD)
48.	(ABD)	**49.**	(AC)	**50.**	(BCD)	**51.**	(ABC)	**52.**	(ABCD)	**53.**	(BC)	**54.**	(BD)
55.	(ACD)	**56.**	(ABC)	**57.**	(ABC)	**58.**	(ABD)	**59.**	(D)	**60.**	(AC)		

PAPER-2

PART- I (PHYSICS)

1.	(2)	**2.**	(3,6,9)	**3.**	(4, 8)	**4.**	(4)	**5.**	(3)	**6.**	(4)	**7.**	(1, 4)
8.	(4, 8)	**9.**	(5)	**10.**	(7)	**11.**	(A)	**12.**	(A)	**13.**	(C)	**14.**	(A)
15.	(B)	**16.**	(C)	**17.**	(A)	**18.**	(D)	**19.**	(D)	**20.**	(A)		

PART- II (CHEMISTRY)

21.	(3,4)	**22.**	(3)	**23.**	(8)	**24.**	(1,2,3,4)	**25.**	(9)	**26.**	(5)	**27.**	(1)
28.	(7)	**29.**	(4)	**30.**	(6)	**31.**	(C)	**32.**	(C)	**33.**	(C)	**34.**	(D)
35.	(C)	**36.**	(D)	**37.**	(B)	**38.**	(A)	**39.**	(D)	**40.**	(C)		

PART- III (MATHEMATICS)

41.	0	**42.**	0,1,2,3,4	**43.**	3,5,7	**44.**	5,7,9	**45.**	0	**46.**	0,2,4,6,8
47.	1	**48.**	1,2,5	**49.**	0,1,2	**50.**	6,7,8,9	**51.**	(D)	**52.**	(B)
53.	(B)	**54.**	(A)	**55.**	(B)	**56.**	(D)	**57.**	(A)	**58.**	(B)
59.	(A)	**60.**	(B)								

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ANSWER KEY

CODE-2

PAPER-1

PART- I (PHYSICS)

1.	(ABC)	**2.**	(BCD)	**3.**	(AC)	**4.**	(BC)	**5.**	(AD)	**6.**	(AD)	**7.**	(BC)
8.	(AC)	**9.**	(BCD)	**10.**	(AC)	**11.**	(ABD)	**12.**	(ABC)	**13.**	(BC)	**14.**	(AD)
15.	(ACD)	**16.**	(ABC)	**17.**	(BCD)	**18.**	(AC)	**19.**	(AD)	**20.**	(AC)		

PART- II (CHEMISTRY)

21.	(ABC)	**22.**	(ABCD)	**23.**	(ABCD)	**24.**	(BCD)	**25.**	(ABCD)	**26.**	(ACD)	**27.**	(ACD)
28.	(BC)	**29.**	(AC)	**30.**	(ABD)	**31.**	(AB)	**32.**	(AB)	**33.**	(ABC)	**34.**	(AB)
35.	(ABCD)	**36.**	(ABCD)	**37.**	(AB)	**38.**	(ABCD)	**39.**	(AC)	**40.**	(AB)		

PART- III (MATHEMATICS)

41.	(ABCD)	**42.**	(ABCD)	**43.**	(ABC)	**44.**	(ACD)	**45.**	(ABD)	**46.**	(BCD)	**47.**	(BCD)
48.	(ACD)	**49.**	(AB)	**50.**	(ABD)	**51.**	(ABD)	**52.**	(ABCD)	**53.**	(CD)	**54.**	(BC)
55.	(ABC)	**56.**	(ABD)	**57.**	(ABC)	**58.**	(ABC)	**59.**	(C)	**60.**	(AB)		

PAPER-2

PART- I (PHYSICS)

1.	(2)	**2.**	(3,6,9)	**3.**	(4, 8)	**4.**	(4)	**5.**	(3)	**6.**	(4)	**7.**	(1, 4)
8.	(4, 8)	**9.**	(5)	**10.**	(7)	**11.**	(C)	**12.**	(C)	**13.**	(A)	**14.**	(C)
15.	(A)	**16.**	(B)	**17.**	(C)	**18.**	(B)	**19.**	(B)	**20.**	(C)		

PART- II(CHEMISTRY)

21.	(3,4)	**22.**	(3)	**23.**	(8)	**24.**	(1,2,3,4)	**25.**	(9)	**26.**	(5)	**27.**	(1)
28.	(7)	**29.**	(4)	**30.**	(6)	**31.**	(A)	**32.**	(B)	**33.**	(B)	**34.**	(D)
35.	(A)	**36.**	(A)	**37.**	(A)	**38.**	(B)	**39.**	(C)	**40.**	(B)		

PART- III (MATHEMATICS)

41.	0	**42.**	0,1,2,3,4	**43.**	3,5,7	**44.**	5,7,9	**45.**	0	**46.**	0,2,4,6,8
47.	1	**48.**	1,2,5	**49.**	0,1,2	**50.**	6,7,8,9	**51.**	(D)	**52.**	(B)
53.	(B)	**54.**	(A)	**55.**	(B)	**56.**	(D)	**57.**	(A)	**58.**	(B)
59.	(A)	**60.**	(B)								

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ANSWER KEY

CODE-3

PAPER-1

PART- I (PHYSICS)

1.	(ACD)	**2.**	(ABD)	**3.**	(AC)	**4.**	(AD)	**5.**	(BC)	**6.**	(BC)	**7.**	(AD)
8.	(AC)	**9.**	(ABD)	**10.**	(AC)	**11.**	(BCD)	**12.**	(ACD)	**13.**	(AD)	**14.**	(BC)
15.	(ABC)	**16.**	(ACD)	**17.**	(ABD)	**18.**	(AC)	**19.**	(BC)	**20.**	(AC)		

PART- II (CHEMISTRY)

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

PART- III (MATHEMATICS)

41.	(ABCD)	**42.**	(ABCD)	**43.**	(ABD)	**44.**	(BCD)	**45.**	(ABC)	**46.**	(ACD)	**47.**	(ACD)
48.	(ABD)	**49.**	(AC)	**50.**	(BCD)	**51.**	(ABC)	**52.**	(ABCD)	**53.**	(BC)	**54.**	(BD)
55.	(ACD)	**56.**	(ABC)	**57.**	(ABC)	**58.**	(ABD)	**59.**	(D)	**60.**	(AC)		

PAPER-2

PART- I (PHYSICS)

1.	(2)	**2.**	(3,6,9)	**3.**	(4, 8)	**4.**	(4)	**5.**	(3)	**6.**	(4)	**7.**	(1, 4)
8.	(4, 8)	**9.**	(5)	**10.**	(7)	**11.**	(A)	**12.**	(A)	**13.**	(C)	**14.**	(A)
15.	(B)	**16.**	(C)	**17.**	(A)	**18.**	(D)	**19.**	(D)	**20.**	(A)		

PART- II(CHEMISTRY)

21.	(3,4)	**22.**	(3)	**23.**	(8)	**24.**	(1,2,3,4)	**25.**	(9)	**26.**	(5)	**27.**	(1)
28.	(7)	**29.**	(4)	**30.**	(6)	**31.**	(C)	**32.**	(C)	**33.**	(C)	**34.**	(D)
35.	(C)	**36.**	(D)	**37.**	(B)	**38.**	(A)	**39.**	(D)	**40.**	(C)		

PART- III (MATHEMATICS)

41.	0	**42.**	0,1,2,3,4	**43.**	3,5,7	**44.**	5,7,9	**45.**	0	**46.**	0,2,4,6,8
47.	1	**48.**	1,2,5	**49.**	0,1,2	**50.**	6,7,8,9	**51.**	(D)	**52.**	(B)
53.	(B)	**54.**	(A)	**55.**	(B)	**56.**	(D)	**57.**	(A)	**58.**	(B)
59.	(A)	**60.**	(B)								