**Date : 25-11-2024** **JEE Main - 6** **Solution**

**Max. Marks: 300**

# KEY SHEET

## PHYSICS

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

## CHEMISTRY

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 26) | **2** | 27) | **3** | 28) | **4** | 29) | **3** | 30) | **1** |
| 31) | **1** | 32) | **1** | 33) | **4** | 34) | **3** | 35) | **1** |
| 36) | **4** | 37) | **1** | 38) | **2** | 39) | **4** | 40) | **3** |
| 41) | **1** | 42) | **1** | 43) | **1** | 44) | **1** | 45) | **3** |
| 46) | **4** | 47) | **75** | 48) | **3** | 49) | **0** | 50) | **80** |

## MATHEMATICS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 51) | **4** | 52) | **1** | 53) | **1** | 54) | **1** | 55) | **4** |
| 56) | **3** | 57) | **2** | 58) | **1** | 59) | **2** | 60) | **1** |
| 61) | **4** | 62) | **1** | 63) | **1** | 64) | **3** | 65) | **2** |
| 66) | **3** | 67) | **3** | 68) | **4** | 69) | **1** | 70) | **3** |
| 71) | **2** | 72) | **16** | 73) | **2** | 74) | **7** | 75) | **8** |

# SOLUTIONS
# PHYSICS

1. As no external force is acting on system so, $P_i = P_f$

$0.2\times10 = 10\times v \Rightarrow v = 0.2 m/\sec$

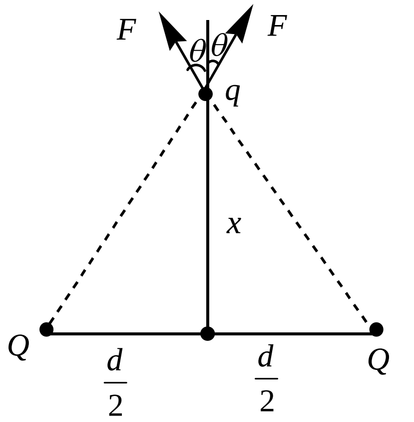
$Loss\,in\,K.E. = \frac{1}{2}\times(0.2)\times10^2 - \frac{1}{2}\times10(0.2)^2$

$= \frac{1}{2}\times10\times(0.2)[10-0.2] = 9.8J$

2. $T\alpha\Delta l \quad [\because T = K\Delta l]$

$\therefore \frac{T_1}{T_2} = \frac{l_1 - l_0}{l_2 - l_0} or, T_1l_2 - T_2l_0 = T_2l_1 - T_2l_0 \therefore l_0 = \frac{T_2l_1 - T_1l_2}{T_2 - T_1}$

3. We have, from the given figure




$F_{net} = 2F\cos\theta$ $F_{net} = 2\frac{KQq}{x^2 + \frac{d^2}{4}}.\frac{x}{\left(x^2+\frac{d^2}{4}\right)^{1/2}}$ $F_{net} = \frac{2KQqx}{\left(x^2+\frac{d^2}{4}\right)^{3/2}}$

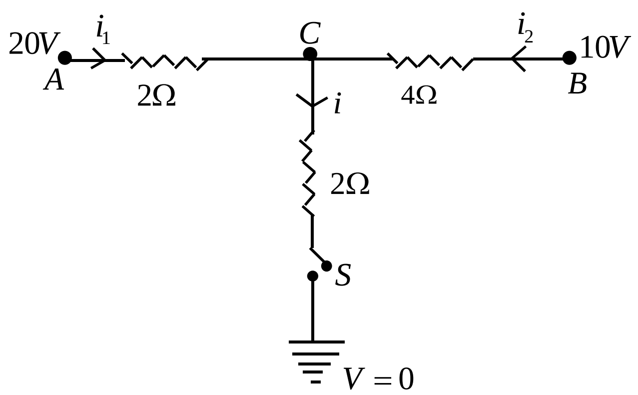
For maximum $F_{net} = \frac{dF_{net}}{dx} = 0$

$\Rightarrow x\times -\frac{3}{2}\left(x^2+\frac{d^2}{4}\right)^{-5/2}.2x + \left(x^2+\frac{d^2}{4}\right)^{-3/2} = 0$

$\Rightarrow \left(x^2+\frac{d^2}{4}\right)^{-5/2}\left[3x^2 + x^2 + \frac{d^2}{4}\right] = 0 \Rightarrow 2x^2 = \frac{d^2}{4} \Rightarrow x^2 = \frac{d^2}{8} \Rightarrow x = \frac{d}{2\sqrt{2}}$

4. Let voltage at $C = xV$

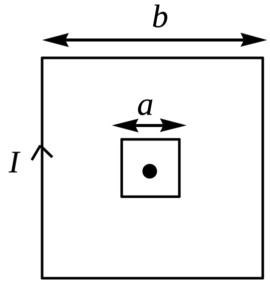
From kirchhoff's current law,



$KCL: i_1 + i_2 = i$

$$\frac{20-x}{2} + \frac{10-x}{4} = \frac{x-0}{2} \Rightarrow x = 10 \therefore i = \frac{V}{R} = \frac{X}{R} = \frac{10}{2} = 5A$$

5. Magnetic field at centre due to each side




$$= \frac{\mu_0 I}{4\pi \frac{b}{2}} \left(\sin 45^\circ + \sin 45^\circ\right)$$

Field due to all 4 sides

$$= B = \frac{\mu_0}{4\pi} \frac{I}{\frac{b}{2}} \left(\sin 45^\circ + \sin 45^\circ\right) 4$$

$$= B = \left[\frac{\mu_0}{4\pi} \frac{I}{\frac{b}{2}} \times 2 \sin 45\right] \times 4 = 2\sqrt{2} \frac{\mu_0}{\pi} \frac{I}{b}$$

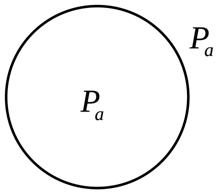
Flux through small square will be

$$\Rightarrow \phi = 2\sqrt{2} \frac{\mu_0}{\pi} \frac{I}{b} \times a^2$$

Coefficient of mutual induction, $Mi_b = \phi_a$ is given as

$$M = \frac{\phi}{I} = \frac{2\sqrt{2}\mu_0 a^2}{\pi b} = \frac{\mu_0}{4\pi} 8\sqrt{2} \frac{a^2}{b}$$

6. Inside pressure must be $\frac{4T}{r}$ greater than outside pressure in bubble. This excess pressure is provided by charge on bubble.




$$\frac{4T}{r} = \frac{\sigma^2}{2\varepsilon_0} \quad \frac{4T}{r} = \frac{Q^2}{16\pi^2 r^4 \times 2\varepsilon_0} \qquad \ldots\left[\sigma = \frac{Q}{4\pi r^2}\right]$$

$$Q = 8\pi r\sqrt{2rT\varepsilon_0}$$

7. Let $m_1 + m_2 = m = cons\tan t \, and \, m_1 = x \Rightarrow m_2 = m - x$

$$a = \frac{x-(m-x)}{m} g \quad T = \frac{2x(m-x)}{m} g \Rightarrow T = \frac{m}{2g}\left(g^2 - a^2\right)$$

8. SI unit of $\sigma = \frac{w}{m^2 k^4}$

SI unit of $b = mk$

$\sigma b^4 = \frac{w}{m^2k^4} \times m^4k^4 = mL^4T^{-3}$

9. Mass of the body will not be zero.
10. The current element can exert force on another element.
11. Kinetic energy of gas molecule depends only on absolute temperature.
12. $i = \frac{V}{x_c} = V(2\pi fc)$
13. With increase in temperature, the number density increases but relaxation time decreases.
14. $\mu = \tan i_c \Rightarrow 1.5 = \tan i_c$

    $i_c = \tan^{-1}(1.5)$
15. Here, $u = 10\sqrt{2} m/s, \theta = 45^\circ, v = \sqrt{125} m/s$

    At any instant t, velocity is given by

    $v = \sqrt{v_x^2 + v_y^2} = \sqrt{(u\cos\theta)^2 + (u\sin\theta - gt)^2}$

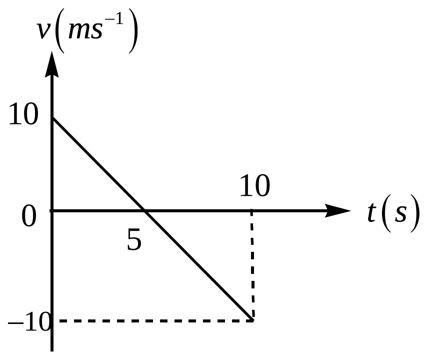
    $\Rightarrow \sqrt{125} = \sqrt{\left(10\sqrt{2} \times 1/\sqrt{2}\right)^2 + \left(10\sqrt{2} \times 1/\sqrt{2} - 10t\right)^2}$

    $\Rightarrow 125 = 100(t^2 - 2t + 2) \Rightarrow t^2 - 2t + 0.75 = 0$

    $\therefore t_1 = 0.5s \; and \; t_2 = 1.5s \; \therefore t_2 - t_2 = 1.0s$
16. At $t = 10, v = 10\left(1 - \frac{10}{5}\right) = -10ms^{-1}$

    Displacement from t = 0 to 10

    = Area (from t = 0 to 5) – Area from (t = 5 to 10)= 0.




Since, particle started from origin, its x-coordinate at t = 10 s is zero

17. $P^2/\rho = const.$

    As $\rho$ change to $\rho/2$ , P changes to $P/\sqrt{2}$

    $\therefore$ (a) is wrong

    $$T = \frac{PV}{nR} = \frac{Pm}{n\rho R} = \frac{\sqrt{c\rho}m}{n\rho R} = \frac{\sqrt{c}m}{nR} \times \frac{1}{\sqrt{\rho}}$$

    As $\rho$ change to $\rho/2$ , T changes to $\sqrt{2}T$

    (b) is correct and (c) is wrong.

    $P = \frac{nRT}{V} = \frac{nRT}{m}\rho = \frac{nRT}{m} \times \frac{P^2}{c}$

    $\Rightarrow PT = const.$

    Hence, graph on PT diagram is hyperbola.

$\therefore$ (d) is correct

18. Let $S_A, S_B$ and $S_C$ be the specific heats of liquids A, B and C respectively.

Then, $mS_A(15-10) = mS_B(25-15)$

$\Rightarrow S_A = 2S_B$

$mS_B(30-25) = mS_C(40-30)$

$\Rightarrow S_B = 2S_C$

Let the temperature on mixing A and C be T.

Then, $mS_A(T-10) = mS_C(40-T)$

$2S_B(T-10) = (S_B/2)(40-T)$

$\Rightarrow 4(T-10) = 40-T \quad \therefore T = 16^\circ C$

19. $K = U \text{ and } K + U = E \Rightarrow U = E/2$

$\frac{1}{2}kx^2 = \frac{1}{2}\left(\frac{1}{2}kA^2\right) \therefore kA/\sqrt{2}$

20. Given

$R = 200\Omega, C = 15.0\mu F = 15.0\times10^{-6} F$

$V = 220V, v = 50Hz$

a) In order to calculate the current, we need the impedance of the circuit. It is

$Z = \sqrt{R^2 + X_C^2} = \sqrt{R^2 + (2\pi vC)^{-2}}$

$\sqrt{(200\Omega)^2 + (2\times3.14\times50\times15.0\times10^{-6} F)^{-2}}$

$\sqrt{(200\Omega)^2 + (212.3\Omega)^2}$

$= 291.67\Omega$

Therefore, the current in the circuit is

$I = \frac{V}{Z} = \frac{220V}{291.5\Omega} = 0.755A$

21. Velocity at the lowest point of inclined plane

$V = \sqrt{\frac{2gh}{1+\frac{K^2}{R^2}}}$

$\left(\frac{K^2}{R^2}\right)_{Ring} = 1 \& \left(\frac{K^2}{R^2}\right)_{Solid\ cylinder} = \frac{1}{2}$

$\frac{V_R}{V_C = \sqrt{\frac{2gh}{1+1}}} / \sqrt{\frac{2gh}{1+\frac{1}{2}}} = \sqrt{\frac{3}{2}\times\frac{1}{2}} = \frac{\sqrt{3}}{2}$

$\therefore x = 3$

22. $m = \frac{f}{f+u}; As, m_1 = -m_2$

$\frac{f}{f-10} = \frac{-f}{f-20} \Rightarrow f = 15cm$

23. $$C=\frac{\epsilon_0 A}{d-t\left(1-\frac{1}{K}\right)}=\frac{\epsilon_0 A}{d-\frac{3d}{4}\left(1-\frac{1}{5}\right)}$$

$$=\frac{\epsilon_0 A}{d-\frac{3d}{4}\left(\frac{4}{5}\right)}=\frac{\epsilon_0 A}{\frac{2d}{5}}=\frac{5\epsilon_0 A}{2d}=\frac{5c_0}{2}$$

24. $$i=\frac{\epsilon_{net}}{R_{net}}=\frac{128}{16}=8A$$

$\therefore V=\epsilon+ir$ $\therefore V=8+8\times 05$ $V=12V$

25. $$F=\frac{\mu_0 i_1 i_2 l}{2\pi d}=\frac{2\times10^{-7}\times8\times5\times10^{-1}}{4\times10^{-2}}=20\times10^{-6}$$

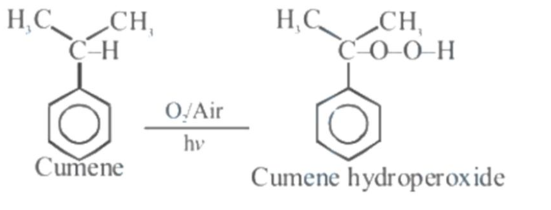
$F=2\times10^{-5}N$

# CHEMISTRY

26. Ten d-electrons

27. $0.25 = \frac{W_1}{62} \times \frac{1000}{500}$ $\quad 0.25 = \frac{W_2}{62} \times \frac{1000}{250}$ $\quad W_1 = 2W_2$

28.




29. Reactions — Reagent used

(A) Hoffmann degradation — $Br_2 / NaOH$

(B) Clemenson reduction — $Zn - Hg / HCl$

(C ) Cannizaro reaction — $conc.KOH / \Delta$

(D) Reimer-Tiemann reaction — $CHCl_3, NaOH / H_3O^+$

30. In aqueous medium basic strength is dependent on electron density on nitrogen as well as solvation of cation formed after accepting $H^+$. After considering all these factors overall basic strength order is $Me_2NH > MeNH_2 > Me_3N > NH_3$

31. Conceptual

32. Bond energy of $F_2$ less than $Cl_2$ due to lone pair
Lone pair repulsions.
Bond energy order $Cl_2 > Br_2 > F_2 > I_2$

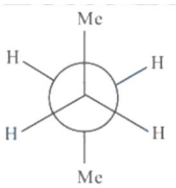
33. $[Co(NH_3)_5Cl]Cl_2$
Oxidation number of $Co$ is +3.
So primary valency is 3.
It is an octahedral complex so secondary valency 6
Or Co-ordination number 6.

34. Blue green colour is due to formation of $Cu(BO_2)_2$

$$CuSO_4 \xrightarrow{\Delta} CuO + SO_3$$

$$CuO + B_2O_3 \rightarrow Cu(BO_2)_2$$

35.

Conformation  has lowest


Van der waal and torsional strain. Hence it must be most stable.

36.

$$aA + bB \rightarrow P\ ,\quad Rate = \frac{1}{a}\frac{\Delta[A]}{\Delta t} = -\frac{1}{b}\frac{\Delta[B]}{\Delta t} = K[A]^m[B]^n$$

$$if\ [A] = 1M\ and\ [B] = 1M, Rate = K$$

37. (A) $E = E^0_{cell} + \frac{0.059}{2}\log\frac{[Cu^{2+}]}{[Zn^{2+}]}$

Since $E_{cell} = E^0_{cell} - \frac{0.0591}{2}\log\frac{[Zn^{2+}]}{[Cu^{2+}]}$

$= 1.10 - \frac{0.059}{2}\log\frac{0.1}{1} = 1.13V$

38. (b) For a non-ideal solution with negative deviation,
$\Delta H_{mix}$=-ve
$\Delta V_{mix}$=-ve

39.

$2\ C_2H_2(g) + 5\ O_2(g) \rightarrow 4\ CO_2(g) + 2\ H_2O(l) \qquad (i)$

$\Delta H^0 / kJ = -2600\,kJ$

$C(s) + O_2(g) \rightarrow CO_2(g) \qquad \Delta H^0 / kJ = -390\,kJ \qquad (ii)$

$2\ H_2(g) + O_2(g) \rightarrow 2\,H_2O(l) \qquad \Delta H^0 / kJ = -572\,kJ \qquad (iii)$

$\Delta_r H$ for $2C(s) + H_2(g) \rightarrow C_2H_2$ can be calculated by

$\Delta_r H = -(-1300) + 2(-390) + \times(-572/2)$

$\Delta_r H = 234$

40. $K_2Cr_2O_7 + 14HCl \rightarrow 2CrCl_3 + 3Cl_2 + 7H_2O + 2KCl$

$nCr_2O_7^{2-}$= $49 \times 0.96 \times \frac{1}{294} = 0.16$ wHCl=325×1.15×0.301=112.5 g nHCl= $\frac{112.5}{36.5} = 3.08$

Limiting reagent is dichromate.$wCl_2$=31×0.16×71=35.01 g

# MATHEMATICS

51. $\bigcup_{i=1}^{50} X_i = \bigcup_{i=1}^{n} Y_i = T \quad \because n(X_i) = 10, n(Y_i)$

$So, \bigcup_{i=1}^{50} X_i = 500, \bigcup_{i=1}^{n} Y_i = 5n \Rightarrow \frac{500}{20} = \frac{5n}{6} \Rightarrow n = 30$

52.

$\int_a^b f(x)dx = \int_a^b f(a+b-x)dx$

$I_1 = \int_{\sin^2 t}^{1+\cos^2 t} xf(x(2-x))dx = 2\int_{\sin^2 t}^{1+\cos^2 t} f(x(2-x)) - I_1$

$\Rightarrow 2I_1 = 2\int_{\sin^2 t}^{1+\cos^2 t} f(x(2-x))dx \Rightarrow 2I_1 = 2I_2 \Rightarrow \frac{I_1}{I_2} = 1$

53.

$x\left(y^2.e^{xy} + e^{\frac{x}{y}}\right)dy = y\left(e^{\frac{x}{y}} - y^2.e^{xy}\right)dx$

$\Rightarrow y^2(xdy + ydx)e^{xy} = e^{\frac{x}{y}}(ydx - xdy)$

$\Rightarrow e^{xy}d(xy) = e^{x/y}\frac{ydx - xdy}{y^2} = e^{\frac{x}{y}}.d\left(\frac{x}{y}\right)$

$\Rightarrow e^{xy} = e^{\frac{x}{y}+c}$

54. you can have W,W,B or W, B,W or B,W,W

Required probability= $\frac{3}{4}.\frac{2}{4}.\frac{3}{4} + \frac{3}{4}.\frac{2}{4}.\frac{1}{4} + \frac{1}{4}.\frac{2}{4}.\frac{1}{4} = \frac{9}{32} + \frac{3}{32} + \frac{1}{32} = \frac{13}{32}$

55. $|AB| \geq |PA - PB|$

So $PA - PB$ is maximum when P is collinear with AB.

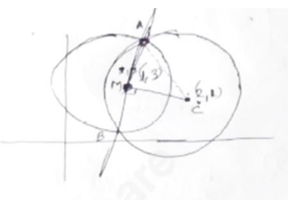
Equation of $AB \Rightarrow y - 1 = \frac{-1}{2}(x - 0)$ $\qquad \Rightarrow x + 2y = 2 \rightarrow (i)$

& solve with $4x + 3y + 9 = 0 \rightarrow (ii)$

(i) & (ii) $\qquad P = \left(\frac{-24}{5}, \frac{17}{5}\right)$

56. $AB = 4$

M is the midpoint



$AM = 2 \qquad MA^2 + CM^2 = (CA)^2 \quad 4 + 5 = (CA)^2$

$CA = 3$

57. Number of arrangement $= (3! \times 3! \times 4!) \times 3! = (3!)^3\, 4!$

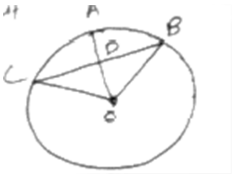
58. Replacing $f(x)$ by $x$, we $f(x) = x^2$ $\Rightarrow f(f(f(f(x)))) = x^{16}$ also $\left(f(x^4)\right)^2 = x^{16}$

59. Let $f(x) = ax^2 + x + c - a$ $\quad f(1) = c + 1 > 0 \quad (\because c > -1)$

Given expression is positive for every $x \in R$

So, $f\left(\frac{1}{2}\right) > 0 \Rightarrow \frac{a}{4} + \frac{1}{2} + c - a > 0 \Rightarrow 4c - 3a + 2 > 0 \quad \Rightarrow 4c + 2 > 3a$.

60. A, B, C lie on the circle with centre $(0, \sqrt{3})$ and radius 1 unit




$|DO| = \frac{3|AO|}{4} \quad |AD| = \frac{|AO|}{4}$

$|AO| = |BO| = |CO| = 1$ using phythagoras theorem

$\Delta BDO \quad BD = \frac{\sqrt{7}}{4}$

using phythagoras theorem in $\Delta BAD$

$|AB| = |Z_1 - Z_2| = \frac{1}{\sqrt{2}}$

61.

$\sin^{-1} x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

$\Rightarrow -\frac{3\pi}{4} \le \left(\sin^{-1} x - \frac{\pi}{4}\right) \le \frac{\pi}{4}$

$0 \le \left(\sin^{-1} x - \frac{\pi}{4}\right)^2 \le \frac{9}{16}\pi^2 \qquad ........(i)$

*Statement II is true*

$(\sin^{-1} x)^3 + (\cos^{-1} x)^3 = a\pi^3$

$\Rightarrow (\sin^{-1} x + \cos^{-1} x)\left[(\sin^{-1} x + \cos^{-1} x)^2 - 3\sin^{-1} x \cos^{-1} x\right] = a\pi^3$

$\Rightarrow \frac{\pi^2}{4} - 3\sin^{-1} x \cos^{-1} x = 2a\pi^2$

$\Rightarrow \left(\sin^{-1} x - \frac{\pi}{4}\right)^2 = \frac{\pi^2}{12}(8a - 1) + \frac{\pi^2}{16}$

$\Rightarrow \left(\sin^{-1} x - \frac{\pi}{4}\right)^2 = \frac{\pi^2}{48}(32a - 1)$

*Putting this value in equation* $(i)$

$\Rightarrow 0 \le 32a - 1 \le 27$

$\frac{1}{32} \le a \le \frac{7}{8}$

*Statement 1 is false*

62. $r=\left[\frac{51\times 3x}{4+3x}\right]=\left[\frac{51\times\frac{3}{4}}{4+\frac{3}{4}}\right]=8$

63. A satisfies the equation $x^3-5x^2+6x-2=0$

Since $a_0A^n+a_1A^{n-1}+....+a_{n-1}A+a_nI=0 \; as \; a_n\neq 0$

So if we multiply both sides by $A^{-1}$, we get the inverse of matrix

64. $(\alpha,\beta)=\left[\frac{\sum_{n=1}^{2023} n}{2023},\frac{\sum_{n=1}^{2023} n^2}{2023}\right]=\left(1012,\frac{(2024)(4047)}{6}\right)=(1012,1365188)$

65. $\lim_{h\to 0}\frac{f(c+h)-f(c)+f(c)-f(c-h)}{h}$

$\lim_{h\to 0}\frac{f(c+h)-f(c)}{h}+\lim_{h\to 0}\frac{f(c-h)-f(c)}{-h}$

$f'(c)+f'(c)$

$=2f'(c).\;\left(f \textit{ is differentiable}\right)$

(2) is false

66. Let the two unknown items be x and y, then

$Mean=4\Rightarrow\frac{1+2+6+x+y}{5}=4$

$x+y=11$

And variance = 5.2

$\frac{1^2+2^2+6^2+x^2+y^2}{5}-(mean)^2=5.2$

$41+x^2+y^2=5\left[5.2+(4)^2\right]$

$41+x^2+y^2=106$

$x^2+y^2=65$ ………….(ii)

Solving Equations (i) and (ii) for x and y, we get

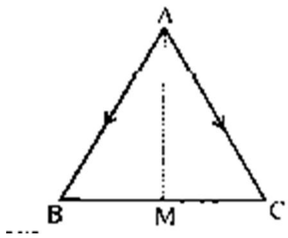
$x=4,y=7 or x=7,y=4$

67. We have,

$\overline{AB}+\overline{BC}+\overline{CA}=0\Rightarrow\overline{BC}=\overline{AC}-\overline{AB}$

Let M be mid point of BC

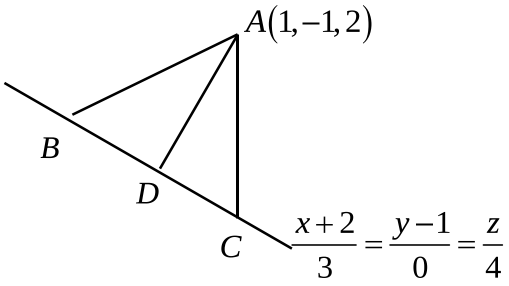
Now, $\overline{BM}=\frac{\overline{AC}-\overline{AB}}{2}\left(\because\overline{BM}=\frac{\overline{BC}}{2}\right)$




Also, we have

$\Rightarrow \overline{AB}+\frac{\overline{AC}-\overline{AB}}{2}=\overline{AM} \qquad \Rightarrow \frac{\overline{AB}+\overline{AC}}{2}=4\hat{i}-\hat{j}+4\hat{k} \qquad \Rightarrow \overline{AM}=\sqrt{33}$

68. Let a point D on BC= $(3\lambda,-2,1,4\lambda)$




$\overrightarrow{AD}=(3\lambda-3)\hat{i}+2\hat{j}+(4\lambda-2)\hat{k}$

$\because \overrightarrow{AD}\perp\overrightarrow{BC}, \therefore \overrightarrow{AD}.\overrightarrow{BC}=0$

$\Rightarrow (3\lambda-3)+3+2(0)+(4\lambda-2)4=0$

$\Rightarrow \lambda=\frac{17}{25}$

$Hence, D=\left(\frac{1}{25},1,\frac{68}{25}\right)$

$|\overrightarrow{AD}|=\sqrt{\left(\frac{1}{25}-1\right)^2+(2)^2+\left(\frac{68}{25}-2\right)^2}$

$=\sqrt{\frac{(25)^2+4(25)^2+(18)^2}{25}}=\sqrt{\frac{3400}{25}}=\frac{2\sqrt{34}}{5}$

$Area\ of\ triangle=\frac{1}{2}\times|\overrightarrow{BC}|\times|\overrightarrow{AD}|$

$=\frac{1}{2}\times5\times\frac{2\sqrt{34}}{5}=\sqrt{34} \qquad [\because BC=5]$

69. Since, ordinate is 3

So, $y=3\Rightarrow x=2$

$Point\ of\ contact\ is\ (2,3)$

$Given\ equation\ of\ parabola\ (y-2)^2=(x-1)$

$Diff.w.r.t.x,$

$2(y-2)y^1=1$

$\Rightarrow y^1=\frac{1}{2(y-2)}$

$\Rightarrow y^1(2,3)=\frac{1}{2}\Rightarrow\frac{y-3}{x-2}=\frac{1}{2}\Rightarrow x-2y+4=0$

$Equation\ of\ tangent\ to\ the\ given\ parabola\ is,$

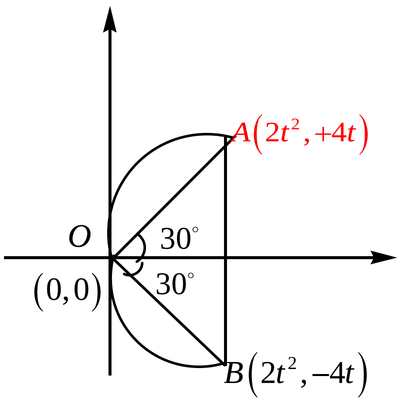
$x-2y+4=0$

$Required\ area\ of\ the\ bounded\ region$

$=\int_0^3\left((y-2)^2+1-(2y-4)\right)dy$

$=9\ sq.units$

70.




$Let\ A=(2t^2,4t)\ and\ B=(2t^2,-4t)$

$For\ equilateral\ triangle\ (\angle AOM=30^0)$

$\tan 30^0=\frac{4t}{2t^2}\Rightarrow\frac{1}{\sqrt{3}}=\frac{4t}{2t^2}\Rightarrow t=2\sqrt{3}$

$Area=\frac{1}{2}.8(2\sqrt{3}).2.24=192\sqrt{3}.$

71.

$Given,\ f(x)=|x^2-2x-3|.e^{|9x^2-12x+1|}$

$f(x)=|(x-3)(x+1)|.e^{(3x-2)^2}$

$$f(x)=\begin{cases}(x-3)(x+1).e^{(3x-2)^2} & ; x\in(3,\infty)\\ -(x-3)(x+1).e^{(3x-2)^2} & ; x\in[-1,3]\\ (x-3)(x+1).e^{(3x-2)^2} & ; x(-\infty,-1)\end{cases}$$

$Hence\ at\ x=-1,3\ \ f(x)=0$

$Clearly, non-differentiable\ at\ x=-1\ \&\ x=3.$

72. $\sigma^2\ge 0,\frac{1}{n}\sum x_i^2-(\bar{x})^2\ge 0$

73. $\bar{a}.\bar{b}+\bar{b}.\bar{c}+\bar{c}.\bar{a}=(\bar{a}.\bar{b}+\bar{b}.\bar{c}-\bar{c}.\bar{a})+2\bar{c}.\bar{a}=\frac{3}{2}+2\cos\frac{2\pi}{3}=\frac{3}{2}-1=\frac{1}{2}$

74. Centre is (2,1). Length of major axis=4
Equation of major axis is x=2
Ends of major axis A(2,5), $A^1$(2,-3)
P(2,6) is outside ellipse
M=PA+A $A^1$=9
m=PA=1
$\therefore M-2m=7$

75. If a circle a rectangular hyperbola then arithmetic mean of point of intersections is the midpoint of centre of hyperbola and circle, $|g+f|=8$