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ANSWER KEY

DATE: 21-11-2018

COURSE
NUCLEUS

JEE-MAIN MOCK TEST-2
XII

TEST CODE				
1	1	2	6	7

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

HINTS & SOLUTIONS

PHYSICS

Q.1 Potential difference between plates remains same. Decrease in potential difference is counteracted by potential difference due to the extra distance.

$$t\left(E-\frac{E}{k}\right)=Ed$$

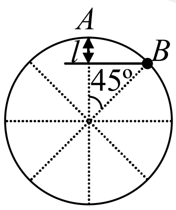
$$\Rightarrow \quad t\left(1-\frac{1}{k}\right)=d \quad \Rightarrow \quad k=\frac{t}{t-d}$$

E is original electric field, k dielectric constant of plate, t thickness of plate & d extra distance

Q.2 emf $=$ vBl

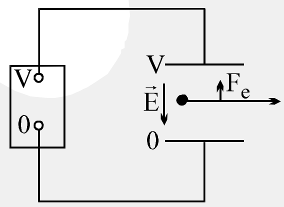
ℓ is length of component perpendicular to velocity

$l = R - R\cos 45^o$



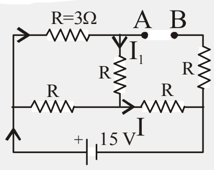
$$\text{emf}=vBR\left(1-\frac{1}{\sqrt{2}}\right)$$

Q.3



electrostatic force on electrons is opposite to direction of electric field

Q.4 In steady state, capacitor acts as an open circuit.



$I_1 = 1A;$

$V_A - I_1R - IR = V_B$

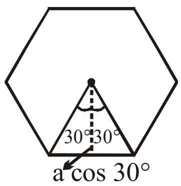
$\Rightarrow V_A - V_B = 12$

Q.5 Acceleration of $+3Q=\frac{3QE}{m}$ $(\downarrow)$

Acceleration of $-2Q=\frac{2QE}{m}$ $(\uparrow)$

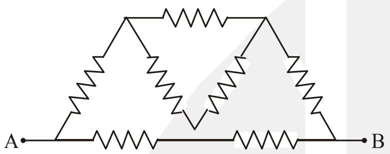
Q.6 $V = \frac{LdI}{dt}$

Q.7 $B_1 = \frac{\mu_0 i}{4\pi \times a\cos 30°}$



$B = 6B_1 = \frac{\mu_0 i}{2\pi a} \times \frac{1}{\sqrt{3}} \times 6^3 = \frac{\sqrt{3}\mu_0 i}{\pi a}$

Q.8 Due to symmetry,



$R_{eq} = \frac{8R}{7}$

Q.9 $E_1 = \frac{2kp}{r^3}$, $E_2 = \frac{kp}{(2r)^3}$

$E_1 = 16E_2$

Q.10 $V_A = V_{\text{at surface}} = V_B = V_C = V_O$
charge is on the outer surface hence V_{inside} remains constant.

Q.11 $V = \frac{Qd}{\epsilon_0 A}$, If A increases, V decreases.

Q.12 The maximum current is obtained at resonance where the net impedance is only resistive which is the resistance of the coil only. This gives the resistance of the coil as 10 ohm. Now, this coil along with the internal resistance of the cell gives a current of 0.5 A.

Q.13 $\rho(r) = A(r)^2$
Charge enclosed for sphere of radius R/2

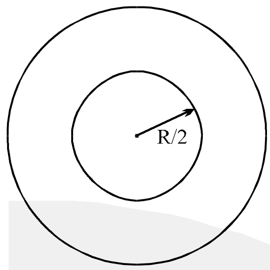
$$Q = \int (4\pi r^2)dr\,\rho(r) = 4\pi A \int_0^{R/2} r^4\,dr$$

$$= 4\pi A\left[\frac{v^5}{5}\right]_0^{R/2}$$

$$= \frac{4\pi A}{5 \times 32}(R^5) = \frac{\pi A}{40}R^5$$

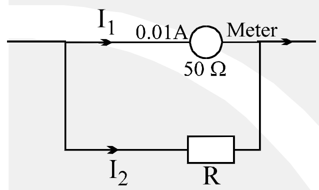
Applying Gauss's law for this sphere

$$4\pi(R/2)^2E = Q/\varepsilon_0 = \frac{\pi A}{40}R^5$$



$\Rightarrow \quad E = \frac{AR^3}{40\varepsilon_0}$

Q.14



$I_2 = 8A$ (app) as I_1 is very-very small
$r_g I_1 = I_2 R$

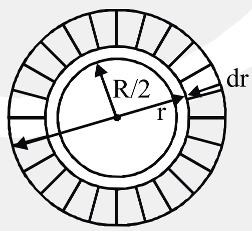
$$R = \frac{r_g I_1}{I_2} = \frac{0.01 \times 80}{8} = 0.062\ \Omega$$

Q.15 $P = \bar{\tau}\omega$

$\Delta P = \Delta\bar{\tau}\ \omega$

$$\Delta\bar{\tau} = \frac{500}{350} = 10/7 = 1.4\ \text{Nm}$$

Q.16



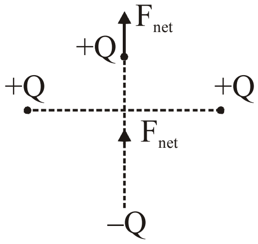
$dq = \sigma\,(2\pi r)\,dr$

$$dM = \frac{dq}{T}\pi r^2$$

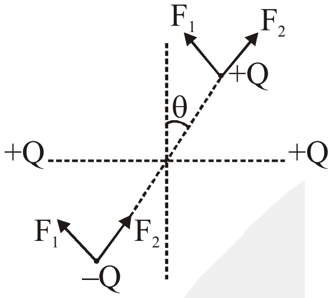
$$M = \int_{R/2}^{R} \frac{\sigma \,.\, 2\pi r \,.\, dr \,.\, \pi r^2}{2\pi/\omega}$$

$$M = \frac{15\pi\sigma\omega R^4}{64}$$

Q.17 In eq. position, no torque acts.



After displacing by angle θ, no torque acts. So, it is a position of neutral equilibrium.



Q.18 $P_{total} = \frac{V^2}{R_{eq}} = \frac{3V^2}{4R} = \frac{3}{4}\times 100 = 75\text{ W}$

Q.19 $S = \frac{1}{2}at^2$

$\Rightarrow S = \frac{1}{2}\frac{qE}{m}t^2 \qquad \Rightarrow \frac{Se}{Sp} = \frac{mp}{Se}$

$\Rightarrow Sp \simeq \frac{d}{2000}$

Q.20 When switch is closed, the circular turns of spring attract each other. Due to this, bottom end of wire looses contact with mercury and turns off. Afterwards, due to gravity, it falls down and turns on. This process repeats.

Q.21 $\varepsilon = -\frac{d\phi}{dt} = -A\frac{d_B}{dt} = -\pi R^2(6t^2 - 8t)$

$\varepsilon = -\int \vec{E}.d\vec{\ell}$

$\pi R^2(6 \times 4 - 8 \times 2) = E \times 2\pi r$

$E = \frac{R^2}{2r}(24 - 16) = \frac{R^2}{2\times 2R}(8)$

$E = 2R = \frac{2\times 5}{2\times 100} = \frac{1}{20}$ N/C

$F = qE = -1.6 \times 10^{-19} \times \frac{1}{20}$

$= -8 \times 10^{-21}$ N

Q.22 $E = \frac{nkQz}{(R^2+z^2)^{3/2}} \Rightarrow E_1 = \frac{nkQz}{(R^2+R^2)^{3/2}}$

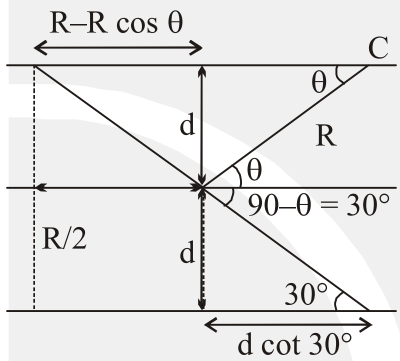
$\Rightarrow E_2 = \frac{nkQ(2R)}{[R^2+(2R)^2]^{3/2}}$

$\frac{E_1}{E_2} = \frac{1}{2\sqrt{2}}\cdot\frac{5\sqrt{5}}{2} = \frac{5\sqrt{5}}{4\sqrt{2}}$

Q.23 Perpendicular length is more so induced emf is more

Q.24 $\sin\theta = \frac{d}{R} = \frac{\sqrt{3}}{2}$

$\theta = 60°$



$x = \frac{R}{2} + \frac{R\sqrt{3}}{2} \times \sqrt{3} = 2R$

Q.25 Field due to +2e charge sphere at distance d from the centre $E = \frac{2ked}{R^3}$

Force on electron $F = eE = \frac{2ke^2d}{R^3}$

$F_c = \frac{ke^2}{4d^2}$

$\frac{2ke^2d}{R^3} = \frac{ke^2}{4d^2} \qquad \Rightarrow \qquad R^3 = 8d^3$

$\Rightarrow \qquad R = 2d$

Q.26 B_P is only because of single current.
B_Q is because of two currents in same direction.
B_R is because of two currents in opposite direction.

Q.27 As, $l_0 = \frac{E}{R_1} = 6A$

$\Rightarrow E = L\frac{dl_2}{dt} + R_2 l_2 \Rightarrow l_2 = l_0[1 - e^{-t/\tau^2}]$

Hence, $V_L = E - R_2 l_2 = 12e^{-5t}$ V

Q.28 $\frac{1}{2}mv_0^2 = \frac{(ze)(q)}{4\pi\in_0 r} \quad \Rightarrow \quad r \propto \frac{q}{m}$

Q.29 $V = L\left(\frac{di}{dt}\right)$

Q.30 $I_0 = \frac{V_0}{\sqrt{R^2 + \left(\frac{1}{\omega c} - \omega L\right)^2}}$

$I_0 \uparrow \omega \uparrow$ only possible if $\frac{1}{\omega C} > \omega L$.

CHEMISTRY

Q.31 Theory based

Q.32 Finkelstein reaction

$R - Cl \xrightarrow[\text{Acetone}]{\text{NaI}} R - I + NaBr$

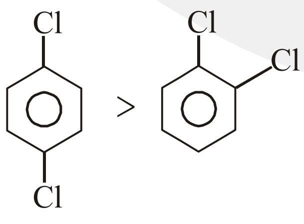
It is a halide exchange reaction, generally I^- (Nu) is used here.

Q.33 Lattice energy $\propto \frac{\text{charge}}{\text{size}}$

(1) $NaF \rightarrow Na^+F^-$
(2) $AlF_3 \rightarrow Al^{+3}\,3F^-$
(3) $AlN \rightarrow Al^{+3}N^{-3}$
(4) $MgF_2 \rightarrow Mg^{+2}\,2F^-$

Q.34 Solubility of Ag_2CO_3 will decrease in Na_2CO_3 and $AgNO_3$ due to common ion effect and will increase in NH_3 solution due to complex $[Ag(NH_3)_2]^+$ formation.

Q.35 Melting point :



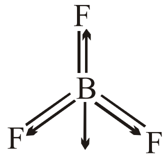
(Due to Packing)

Q.36 (1) $CO_2 \rightarrow \overleftrightarrow{O} = C = \overleftrightarrow{O}$ $\mu = 0$

(2) $BeCl_2 \rightarrow \overleftrightarrow{Cl}–Be–\overleftrightarrow{Cl}$ $\mu = 0$

(3) $COS \rightarrow \overleftrightarrow{S}=\overleftrightarrow{C}=O$ $\mu \neq 0$

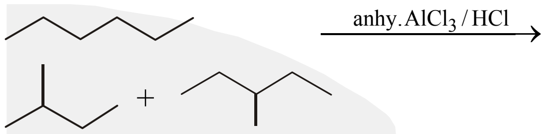
(4) $BF_3 \rightarrow$



$\mu = 0$(Trigonal planar

Q.37 Theory based

Q.38



Q.39 Bond energy $\propto$ Bond order and if Bond order is same the

Bond energy $\propto \frac{1}{\text{No. of AB}e^-\text{s}}$

$H_2^+ \rightarrow$ Bond order = 0.5 (AB e^- s = 0)
$H_2 \rightarrow$ Bond order = 1 (AB e^- s = 0)
$H_2^- \rightarrow$ Bond order = 0.5 (AB e^- s = 1)
So, order of bond energy is
$H_2^- < H_2^+ < H_2$

Q.40 Power of bulb = 64 watt = 64 J/sec

$E_{photon} = \frac{1240}{310}$ eV $= 4$ eV

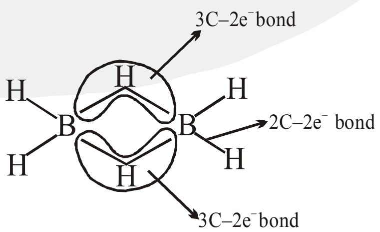
Number of photons emitted in 1 sec

$= \frac{64}{4 \times 1.6 \times 10^{-19}} = 10^{20}$

Current $= 10^{20} \times 1.6 \times 10^{-19} \times \frac{25}{100} = 4$ amp

Q.41 In Chlorobenzene chlorine acts as activating group and electrophile substitution occurs at ortho or para position.

Q.42 Diborane.



$3C - 2e^- = 2$
$2C - 2e^- = 4$

Q.43 $\Delta x = 0.529 \times 10^{-10} \times \frac{10}{100}$

$= 0.529 \times 10^{-11}$ m

$\Delta x . \Delta V = \frac{h}{4\pi m}$

$$\Delta V = \frac{6.63\times10^{-34}}{4\times3.14\times9.1\times10^{-31}\times0.529\times10^{-11}}$$

$\Delta V \approx 10^7$ m/s

Q.44 Acidified $KMnO_4$ and Jones reagent oxidised ethanol into ethanoic acid while CrO_3 in anhydrous medium convert into ethanol (acetaldehyde)

$$CH_3-CH_2-OH \xrightarrow[\text{anhydrous medium}]{CrO_3} \underset{\text{Acetaldehyde}}{CH_3-\overset{\overset{\displaystyle O}{\|}}{C}-H}$$

Q.45 (1) PCl_5 exists as $PCl_4^+ PCl_6^-$

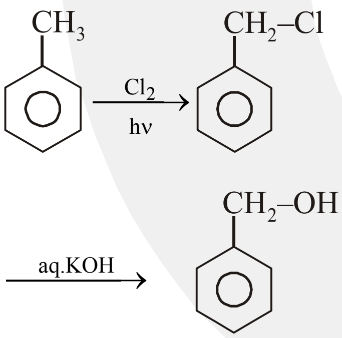
Q.46 Since ψ is not a function of angle therefore it must be a 's' orbital and for s-orbital, angular node = 0

For radial node

$\psi (r, \theta, \phi) = 0$

$4 - \frac{r}{a_0}$; $r = 4a_0$

Radial node = 1

Q.47 

Benzyl alcohol

Q.49 $NaCN(aq) + HCl \longrightarrow NaCl(aq) + HCN(aq)$

m moles	60 × 0.2	80 × 0.1
	12	8
	4	–
	–	8

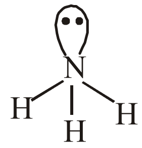
acidic buffer solution

$$pH = pK_a(HCN) + \log\frac{[NaCN]}{[HCN]}$$

$$pH = 10 - \log 5 + \log\left(\frac{4}{8}\right)$$

$= 10 - \log 5 - \log 2$

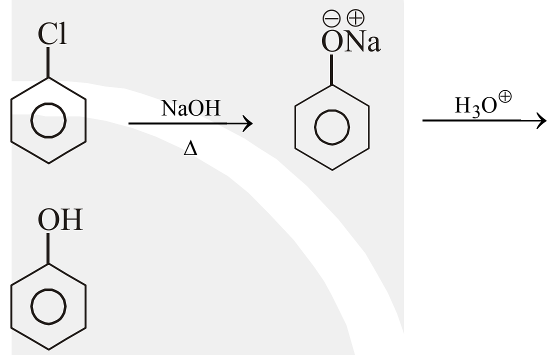
pH = 9; pOH = 5

Q.51 

Pyramidal, Bond angle = 107°

Q.52 Theory based.

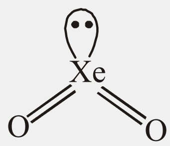
Q.53 Dow process

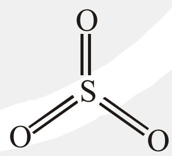


Product is phenol

Q.54 (1) NO_2^+ $O = \overset{+}{N} = O$ Linear shape

(2) CO_2 $O = C = O$, Linear

(3) XeO_3  , Pyramidal

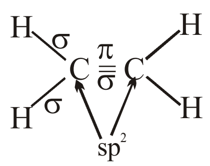
(4) SO_3  , Trigonal planar

Q.55 Theory based.

Q.56 At 413 K (140°C) product is diethyl ether

$$C_2H_5OH \xrightarrow[413\,K]{H_2SO_4} C_2H_5-O-C_2H_5$$

Q.57 For example : Ethene



Q.58 $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$;
$K_P = 4 \times 10^{24}\ atm^{-1}$

Initial pressure	2	1	2
Pressure at eq^m	$2-2x \simeq 2y$	$1-x \simeq y$	$2+2x \simeq 4$

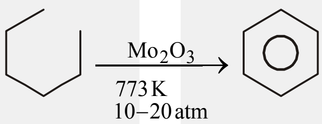
$\because$ K_P is ver large that means at eq^m almost reactants converted in product

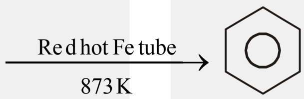
$$K_P = \frac{(4)^2}{(2y)^2(y)^1}$$

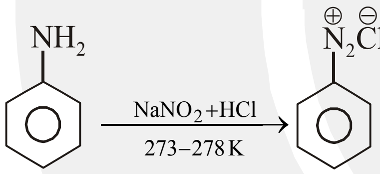
$$4 \times 10^{24} = \frac{4^2}{2y^2 \times y^1}$$

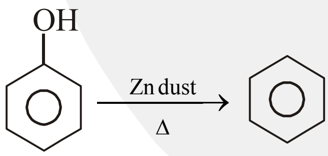
$y \simeq 10^{-8}$

$P_{SO_2(g)}$ at eq^m $= 2y$
$= 2 \times 10^{-8}$

Q.59 (1) n-hexane 

(2) $HC \equiv CH$ 

(3) 

(4) 

Q.60 HCl is polar covalent gas so its solubility in water is high.
So, it should not be collected over water.

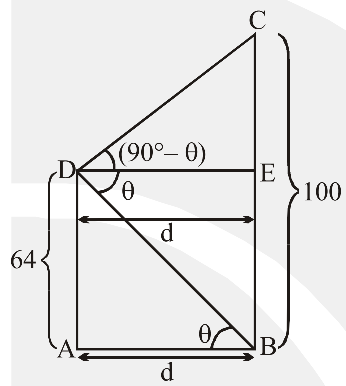
MATHEMATICS

Q.61

p	q	r	~ p	~ q	(~ p ⇒ ~ q)	(~ p ⇒ ~ q)∨r
F	T	F	T	F	F	F

Q.62 In ΔDAB, $\tan\theta = \frac{64}{d} \Rightarrow d = 64\cot\theta$ ....(1)

In ΔCDE, $\tan(90° - \theta) = \frac{36}{d}$
.......(2)



$\therefore$ (1) × (2)

$\Rightarrow$ $64 \times 36 = d^2$

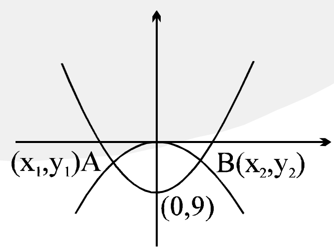
$\Rightarrow$ $d = 48$. **Ans.**]

Q.63 Satisfied condition of reflexive and transitive

Q.64 solving $x^2 - 9 = kx^2$
$x^2(k-1) + 0.x + 9 = 0$

$x_1 + x_2 = 0$ & $x_1 x_2 = \frac{9}{k-1}$

now, $|x_1 - x_2| = 10 = \sqrt{(x_1+x_2)^2 - 4x_1x_2}$



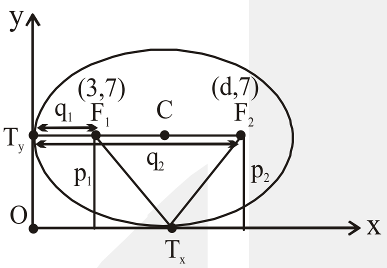
$$100 = \frac{36}{1-k}$$

$$100 - 100k = 36 \Rightarrow k = \frac{64}{100} = \frac{16}{25} \quad \text{Ans]}$$

Q.65 We have $q_1q_2 = 3d = b^2$

and $p_1p_2 = 49 = b^2$

Hence $3d = 49 \Rightarrow \sqrt{3d} = \sqrt{49} = 7$ **Ans.**



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Q.66 We have $A(A+I) = -2I$

$\Rightarrow \quad |A(A+I)| = |-2I|$

$\Rightarrow \quad |A||A+I| = 4 \neq 0$

Thus, $|A| \neq 0$

$\Rightarrow$ A is non singular

$\Rightarrow$ A is correct

Also, $A\left(-\frac{1}{2}(A+I)\right) = I$

$\Rightarrow \quad A^{-1} = -\frac{1}{2}(A+I)$

$\Rightarrow$ D is correct

Also $A = 0$ does not satisfy the given eqaution $\Rightarrow$ $A \neq 0$

again $\left.\begin{aligned} A^2 + A + 2I = 0 \\ (A^T)^2 + A^T + 2I = 0 \end{aligned}\right]$ subtract again

will $A^T = B$

$(A^2 - B^2) + (A - B) = 0$

$(A - B)(A + B + I) = 0$

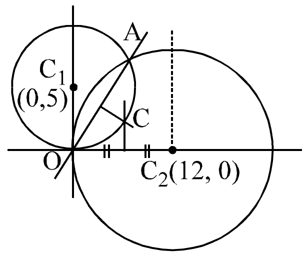
$\not\Rightarrow \quad A - B = 0 \quad$ or $\quad A + B + I = 0$

Q.67 slope of (1) and (2) is $\cot\theta \Rightarrow$ (1) and (2) are parallel and slope of (3) is $\tan\theta$

$\Rightarrow$ no solution.

Using $R_2 \to R_2 - (2\cos\theta)R_3$ and $R_1 \to R_1 + (2\sin\theta)R_3$, the value of determinat is 4.]

Q.68



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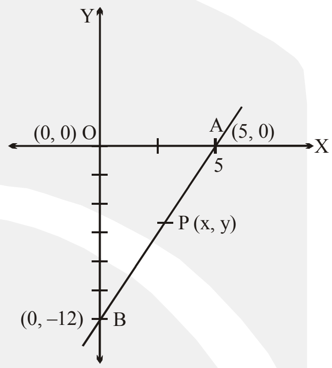
Q.69 The given equation denotes that
PA + PB = 13

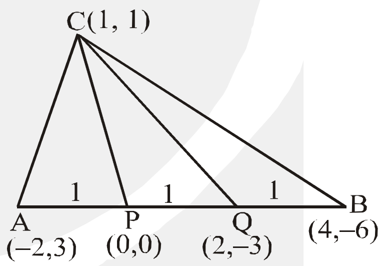
$$\sqrt{x^2 + (y+12)^2} + \sqrt{(x-5)^2 + y^2} = 13$$



$\therefore$ Point P lies on line segment AB

Q.70 As length of all the 3 triangles is same line

AP = PQ = QB
Hence equation of CP is $y - x = 0$



slope of CQ $= \frac{4}{-1}$

equation of line through origin and parallel to QC, is

$y - 0 = -4(x - 0)$

$y + 4x = 0$

Equation of the line pair

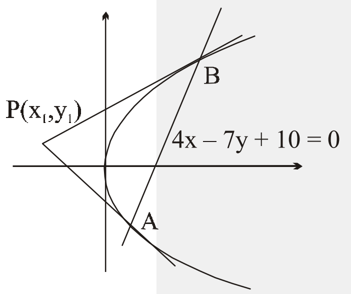
$(y - x)(y + 4x) = 0$

$\Rightarrow y^2 + 3xy - 4x^2 = 0$ **Ans.**]

Q.71 C.O.C. of $P(x_1, y_1)$ w.r.t. $y^2 = 4ax$ is

$yy_1 = 2(x + x_1)$ ....(1)

compare with



$4x - 7y + 10 = 0$ ....(2)

to get $(x_1, y_1) = \left(\frac{5}{2}, \frac{7}{2}\right)$.]

Q.72 The equation of the tangent is

$\frac{x}{a}\cdot\left(\frac{1}{2}\right) + \frac{y}{b}\left(\frac{\sqrt{3}}{2}\right) = 1$............(i)

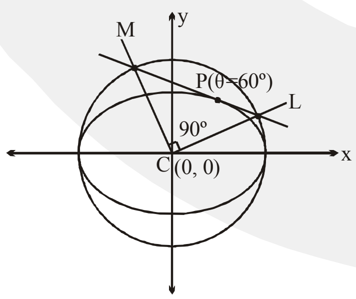
Auxiliary circle is $x^2 + y^2 = a^2$................(ii)

C is the centre.
Combined equation of CL, CM is obtained by homgenising (ii) with (i), i.e.,

$$x^2 + y^2 - a^2\left(\frac{x}{2a} + \frac{\sqrt{3}y}{2b}\right)^2 = 0$$

Since $\angle LCM = 90°$

$$\Rightarrow 1 - \frac{1}{4} + 1 - \frac{3a^2}{4b^2} = 0 \Rightarrow \frac{3a^2}{4b^2} = \frac{7}{4}$$



$\Rightarrow 7b^2 = 3a^2 \Rightarrow 7a^2(1 - e^2) = 3a^2$

Hence $e = \frac{2}{\sqrt{7}}$ Ans.]

Q.73 $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $x^2 = cy$

$\left(2\sqrt{2}, 4\right)$ satisfy both curves

$\frac{8}{a^2} - \frac{16}{b^2} = 1$, $8 = c.4 \Rightarrow c = 2$

$\frac{2x}{a^2} - \frac{2yy'}{b^2} = 0$

$$y'\Big|_{(2\sqrt{2},4)} = \frac{b^2}{a^2}\cdot\frac{2\sqrt{2}}{4} = \frac{b^2}{\sqrt{2}a^2}$$

$$\Rightarrow \frac{b^2}{\sqrt{2}a^2} = 2\sqrt{2} \Rightarrow b^2 = 4a^2$$

$$2x = 2y' \Rightarrow \frac{dy}{dx}\Big|_{(2\sqrt{2},4)} = 2\sqrt{2}$$

$$\therefore \frac{8}{a^2} - \frac{16}{4a^2} = 1 \Rightarrow a^2 = 4, \quad b^2 = 16$$

$a^2 + b^2 + c = 16 + 14 + 2 = 22$. **Ans.**]

Q.74 Lines are $x + y + 1 = 0$; $4x + 3y + 4 = 0$ and $x + \alpha y + \beta = 0$, where $\alpha^2 + \beta^2 = 2$

$$\begin{vmatrix} 1 & 1 & 1 \\ 4 & 3 & 4 \\ 1 & \alpha & \beta \end{vmatrix} = 0$$

$1(3\beta - 4\alpha) - 1(4\beta - 4) + 1(4\alpha - 3)$
$= 3\beta - 4\alpha - 4\beta + 4 + 4\alpha - 3$
$= -\beta + 1 = 0 \Rightarrow \beta = 1$
$\therefore \alpha = \pm 1$]

Q.75 Compute perpendicular distance from (1, 0) to the Radical axis of two circles]

Q.76 as $\alpha + \beta + \gamma = \pi$ so

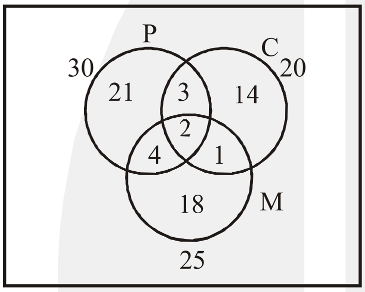
$$D = \begin{vmatrix} 0 & \sin\beta & \cos\gamma \\ -\sin\beta & 0 & \tan\alpha \\ -\cos\gamma & -\tan\alpha & 0 \end{vmatrix}$$

open through $R_1 = -\sin\beta(\cos\gamma\tan\alpha)$
$+ \cos\gamma(\sin\beta\tan\alpha) = 0$

Q.77 $A = \begin{pmatrix} 0 & \times & \times \\ \times & 0 & \times \\ \times & \times & 0 \end{pmatrix}$

Number of skew symmetric matrices
$= 3! \times 8 = 48$. **Ans.**
[As, diagonal element must be 0 and conjugate pair elements are additive inverse of each other in skew-symmetric matrix.]

Aliter: 1 can be put by 6 ways
– 1 can be put by 1 way
2 can be put by 4 ways
– 2 can be put by 1 way
3 can be put by 2 ways
– 3 can be put by 1 way
$\therefore$ Number of skew symmetric matrices
$= 6 \times 1 \times 4 \times 1 \times 2 \times 1 = 48$. **Ans.**]

Q.78 

$n(A \cup B \cup C)$
$\therefore (A \cup B \cup C)^C = 37$]

Q.79 Given,

$$82 = \frac{(27+x)+(31+x)+(89+x)+(107+x)+(156+x)}{5}$$

$\Rightarrow 82 \times 5 = 410 + 5x \Rightarrow 410 - 410 = 5x \Rightarrow x = 0$

$\therefore$ Required mean is ,

$$\bar{x} = \frac{130 + x + 126 + x + 68 + x + 50 + x + 1 + x}{5}$$

$$\bar{x} = \frac{375 + 5x}{5} = \frac{375 + 0}{5} = \frac{375}{5} = 75$$]

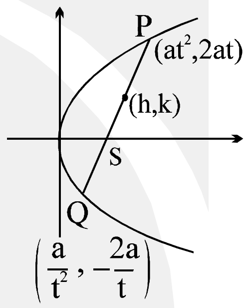
Q.80

p	q	$\sim p \vee q$	$\sim p \wedge \sim q$	$(\sim p \vee q) \wedge (\sim p \wedge \sim q)$
T	T	T	F	F
T	F	F	F	F
F	T	T	F	F
F	F	T	T	T

$\because$ neither tautology nor contradiction.]

Q.81 $2h = a\left(t_1^2 + t_2^2\right)$ ....(1)
and $2k = 2a(t_1 + t_2)$ ....(2)
and $t_1 t_2 = -1$
from (2)

$$k^2 = a^2\left[\frac{2h}{a} - 2\right]$$

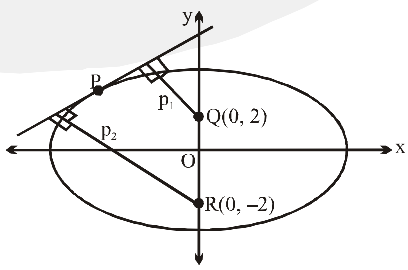


$y^2 = 2a(x - 2a)$
Put $a = 2$
Hence, $y^2 = 4(x - 4)$.]

Q.82 Let the tangent be $mx - y + \sqrt{8m^2 + 4} = 0$

$$p_1 = \left|\frac{\sqrt{8m^2+4} - 2}{\sqrt{1+m^2}}\right|;$$

$$p_2 = \left|\frac{\sqrt{8m^2+4} + 2}{\sqrt{1+m^2}}\right|$$



$$\Rightarrow \left(p_1^2 + p_2^2\right) = \frac{2(8m^2+4)+8}{(1+m^2)}$$

$$= \frac{16(1+m^2)}{(1+m^2)} = 16 \text{ **Ans.**]}$$

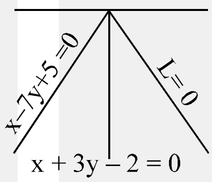
Q.83 Any point on hyperbola can be taken as $(3\sec\theta, 2\tan\theta)$ reflection of point $(3\sec\theta, 2\tan\theta)$ in line $y = x$ will be $(2\tan\theta, 3\sec\theta)$

$\therefore$ locus is $\frac{x^2}{4} - \frac{y^2}{9} = -1$

$\therefore$ eccentricity $= \sqrt{1+\frac{4}{9}} = \frac{\sqrt{13}}{3}$]

Q.84 $L \equiv x - 7y + 5 + \lambda(x + 3y - 2) = 0$

now equate perpendicular

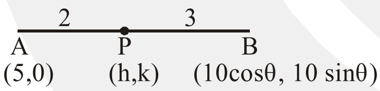


distance to get λ.]

Q.85 Let dividing point is P (h, k), then

$$h = \frac{2(10\cos\theta)+3(5)}{2+3} = 4\cos\theta + 3$$

and $k = \frac{2(10\sin\theta)+3(0)}{2+3} = 4\sin\theta$



$\therefore\ (h-3)^2 + k^2 = 16$

$\Rightarrow$ Locus of P (h, k) is $(x-3)^2 + y^2 = 16$, which is a circle. **Ans.**]

Q.86 $x + 2y + 2z = 1$ ....(1)

$x - y + 3z = 3$ ....(2)

$x + 11y - z = b$ ....(3)

From (1) and (2)

$z = 2 + 3y$ and $x = -8y - 3$

Put in equation (3)

$\Rightarrow b = -5$. **Ans.**]

Q.87 Equation of chord of contact with respect to point $(-4, 2)$ is

$\frac{-4x}{a^2} - \frac{2y}{b^2} = 1$ and with respect to point $(2, 1)$ is $\frac{2x}{a^2} - \frac{y}{b^2} = 1$.

Now, according to given condition,

$$\left(\frac{\frac{4}{a^2}}{\frac{-2}{b^2}}\right) \times \left(\frac{\frac{-2}{a^2}}{\frac{-1}{b^2}}\right) = -1 \Rightarrow \frac{b^4}{a^4} = \frac{1}{4}$$

$$\Rightarrow \frac{b^2}{a^2} = \frac{1}{2}1$$

Now, $e = \sqrt{1+\frac{b^2}{a^2}} = \sqrt{1+\frac{1}{2}} = \sqrt{\frac{3}{2}}$

Ans.]

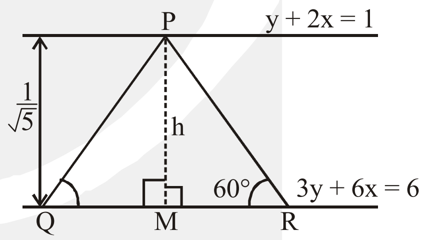
Q.88 As, trace A $= (x-2) + (x^2 - x + 3) + (x - 7)$
$= x^2 + x - 6$

Given, trace A $= 0 \Rightarrow x^2 + x - 6 = 0 =$
$(x + 3)(x - 2)$

$\therefore\ x = -3$ or 2. **Ans.**]

Q.89 The distance between the given parallel lines (h) is $\frac{2-1}{\sqrt5} = \frac{1}{\sqrt5}$

$\therefore$ Length of the side of the triangle is $= \frac{2h}{\sqrt3}$



Area of triangle $= \frac{\sqrt3}{4}\cdot\frac{4h^2}{3} = \frac{h^2}{\sqrt3} = \frac{1}{5\sqrt3}$.

Q.90 We know that if $y = \frac{x}{h}$ when $\sigma y = \frac{\sigma_x}{|h|}$

Therefore, the S.D. of new set of observations will be $\frac{4}{4} = 1$.]