WEEKLY TEST TARGET - JEE - TEST - 26
SOLUTION Date 24-11-2019

[PHYSICS]

1.. As the image formed by a convex mirror is always virtual or erect,

so $m = -(v/u) = +(1/n)$ or $v = -\frac{u}{n}$

$\therefore \quad \frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ or $-\frac{n}{u} + \frac{1}{u} = \frac{1}{+f}$

or $\frac{-(n-1)}{u} = \frac{1}{f}$

or $u = -(n-1)\,f$

i.e., object is infront of mirror at a distance $(n-1)\,f$.

2.

Object distance $u = -40$ cm,

Focal length $f = -20$ cm

According to mirror formula

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

or $\frac{1}{v} = \frac{1}{-20} - \frac{1}{(-40)} = \frac{1}{-20} + \frac{1}{40}$

$\frac{1}{v} = \frac{-2+1}{40} = -\frac{1}{40}$ or $v = -40$ cm

Negative sign shows that image is infront of concave mirror. The image is real.

Magnification, $m = \frac{-v}{u} = -\frac{(-40)}{(-40)} = -1$

3.

$f = 15$ cm, $m = 2$

$m = 2 = \frac{\text{size of the image}}{\text{size of the object}}$

$= \frac{v}{u}$

or $v = 2u$

For concave mirror,

$\frac{1}{15} = \frac{1}{f} = \frac{1}{u} - \frac{1}{v} = \frac{1}{u} - \frac{1}{2u}$

or $2u = 15$

or $u = 7.5$ cm.

4.

From mirror equation,

$$\frac{1}{f}=\frac{1}{v}+\frac{1}{u}=-\frac{1}{20}-\frac{1}{10} \quad ...(i)$$

$$=-\frac{3}{20}$$

$\therefore$ $$\frac{1}{v'}=-\frac{3}{20}+\frac{1}{9.9}$$

or $v'=-20.4$ cm

i.e., shift is 0.4 cm away from the mirror.

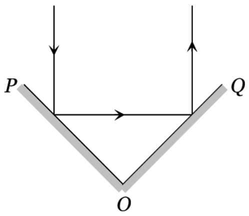
5.

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

$v=3u$, $u=20$ cm and both v and u are –ve.

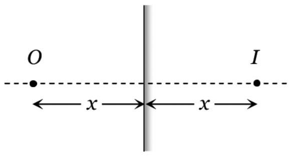
6. (d) $\delta=(360-2\theta)=(360-2\times 60)=240^o$

7. (b) Incident ray and finally reflected ray are parallel to each other means $\delta=180^o$



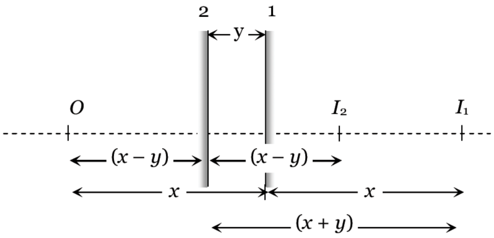
From $\delta=360-2\theta \Rightarrow 180=360-2\theta \Rightarrow \theta=90^o$

8. (c) Suppose at any instant, plane mirror lies at a distance x from object. Image will be formed behind the mirror at the same distance x.



When the mirror shifts towards the object by distance 'y' the image shifts $=x+y-(x-y)=2y$

So speed of image = 2 × speed of mirror



9.

$$\mu = \frac{\sin[(A+\delta_m)/2]}{\sin(A/2)}$$

or $$\sqrt{2} = \frac{\sin[(A+\delta_m)/2]}{\sin(60°/2)}$$

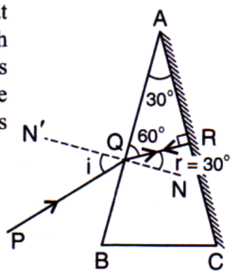
$\therefore$ $$\sin[(A+\delta_m)/2] = \sqrt{2}\times\frac{1}{2} = \frac{1}{\sqrt{2}}$$

$\therefore$ $$[(A+\delta_m)/2] = 45°$$

or $$2\,i/2 = 45° \quad \therefore \quad i = 45°.$$

10.

It is clear from the figure that the ray will retrace the path when the refracted ray QR is incident normally on the polished surface AC. Thus angle of refraction $r = 30°$.



We know that;

$$\mu = \sin i/\sin r$$

$\therefore$ $\sin i = \mu \sin r$

$$= \sqrt{2}\times\sin 30°$$

$$= \sqrt{2}\times\frac{1}{2}$$

$$= (1/\sqrt{2})$$

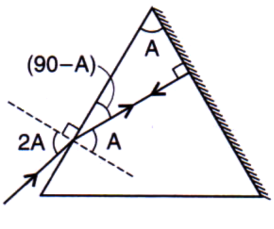
$\therefore$ $i = 45°$.

11.

Given: $i = 2A$

From figure,

$r = A$



$\therefore$ $$\mu = \frac{\sin i}{\sin r}$$

$$= \frac{\sin 2A}{\sin A} = 2\cos A.$$

12.

$\theta = 2\delta$

with $\delta = (i_1 + i_2) - A$

Here, $i_1 = 0$, $A = 30°$ and $1.44 \sin r_2 = 1 \sin i_2$

As $r_2 = 30°$, so

$$i_2 = \sin^{-1}(0.72)$$

$$\therefore\ \theta = 2\delta = 2[(i_1+i_2) - A] = 2[\sin^{-1}(0.72) - 30°].$$

13.

$${}^a\mu_g = \frac{3}{2}, \quad {}^a\mu_w = \frac{4}{3}$$

$\therefore$ $${}^w\mu_g = \frac{{}^a\mu_g}{{}^a\mu_w} = \frac{(3/2)}{(4/3)} = \frac{9}{8}$$

If θ is the critical angle for glass-water interface, then

$${}^w\mu_g = \frac{1}{\sin\theta} \quad \text{or} \quad \sin\theta = \frac{8}{9}$$

or $$\theta = \sin^{-1}(8/9).$$

14.

$A + \delta = i + e$ or $30° + 30° = 60° + e$

i.e., $e = 0°$

20.

For a prism, $\delta_m = ({}^a\mu_g - 1)A$

where A = angle of prism.

$\therefore \quad \delta_{air} = \left(\frac{3}{2} - 1\right) A = \frac{A}{2}$

Now, $\delta_{water} = ({}^w\mu_g - 1)A = \left(\frac{{}^a\mu_g}{{}^a\mu_w} - 1\right) A$

$= \left(\frac{9}{8} - 1\right) A = \frac{A}{8}.$

$\therefore \quad \frac{\delta_{water}}{\delta_{air}} = \frac{A/8}{A/2} = 1/4$

15.

$$\mu = \frac{\sin[(A + \delta_m)/2]}{\sin(A/2)} = \frac{\sin\left[\frac{60°+38°}{2}\right]}{\sin(60°/2)}$$

$$= \frac{\sin 49°}{\sin 30°} = \frac{0.7547}{0.5000} = 1.5094$$

16. Number of images $= \left(\frac{360}{\theta} - 1\right) = \left(\frac{360}{60} - 1\right) = 5$

17.

$\mu = \sqrt{3}, \quad \delta_m = A$

$$\mu = \frac{\sin\left(\frac{A + \delta_m}{2}\right)}{\sin\frac{A}{2}}$$

or $$\sqrt{3} = \frac{\sin\left(\frac{A + A}{2}\right)}{\sin\frac{A}{2}} = \frac{\sin A}{\sin\frac{A}{2}} = 2\cos\frac{A}{2}$$

$\therefore \quad \cos\frac{A}{2} = \frac{\sqrt{3}}{2} = \cos 30°$

$\therefore \quad A = 60°$

18.

In the case of minimum deviation,

$$\mu = \frac{\sin\left(\frac{A + \delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

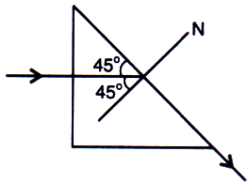
Here, $\delta_m = A$

$$\therefore \quad \mu = \frac{\sin A}{\sin\left(\frac{A}{2}\right)} = 2\cos\left(\frac{A}{2}\right)$$

$A = 2\cos^{-1}(\mu/2).$

19.

$$\mu = \frac{1}{\sin C}$$
$$= \frac{1}{\sin 45^\circ}$$
or $\mu = \sqrt{2}$
or $\mu = 1.414.$



20.

For total internal reflection, $i > i_c$

or $\sin i > \sin i_c$ or $\sin 45° > \frac{1}{\mu}$

or $\mu > \sqrt{2}$ or $\mu > 1.414.$

21. (c) Number of images $= \left(\frac{360}{\theta} - 1\right) = \left(\frac{360}{60} - 1\right) = 5$

22. The walls will act as two mirrors inclined to each other at $90°$ and so will form $\left(\frac{360}{90} - 1\right) = 4 - 1$ *i.e.* 3 images of the person. Now these images with person will act as objects for the ceiling mirror and so ceiling mirror will form 4 images further. Therefore total number of images formed $= 3 + 3 + 1 = 7$

Note : He can see. 6 images of himself.

23. **In two images man will see himself using left hand**

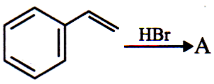
24 $n = \left(\frac{360}{\theta} - 1\right) \Rightarrow n = \left(\frac{360}{72} - 1\right) = 4$

25. $n = \frac{360}{45} - 1 = 7$

[CHEMISTRY]

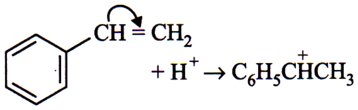
26. **(d)** $CH_3-C\equiv CH \xrightarrow{Na} CH_3-C\equiv C-Na^+ \xrightarrow[S_N2]{CH_3-CH_2-I}$

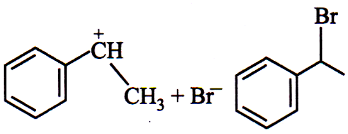
$CH_3-C\equiv C-CH_2-CH_3$

27. **(c)** 

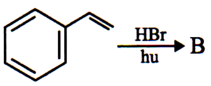
Formation of A is an electrophilic addition reaction

(i) $HBr \rightarrow H^+ + Br^-$

(ii) 

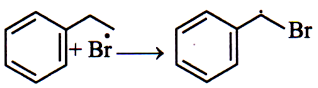


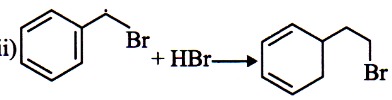
(A)



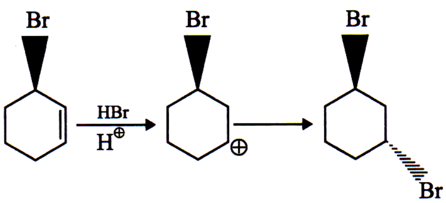
Formation of B is a free radical addition reaction

(i) $HBr \xrightarrow{h\nu} \dot{H} + \dot{B}r$

(ii) 

(iii) 

28. **(a)**



trans-1, 3 dibromocyclohexane

29. **(b)** Alkyl halide is best converted to alkene by mean of elimination reaction in form of dehydrohalogenation.

$$R-CH_2-CH_2-X \xrightarrow{\text{dehydrohalogenation}} R-CH=CH_2$$

30. **(a)** $CH_3-\underset{CH_3}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{C}}(Br)CH_3 \xrightarrow{MeO^- K^+} X$

$CH_3-\underset{CH_3}{\underset{|}{CH}}-\underset{CH_3}{\underset{|}{C}}(Br)CH_3 \xrightarrow{Et_3CO^- K^+} Y$

X = $(CH_3)_2C=C(CH_3)_2$ (Saytzeff)

Y = $(CH_3)_2CH(CH_3)C=CH_2$ (Hoffmann)

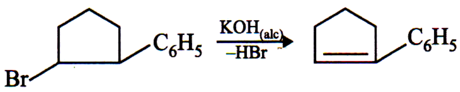
31.

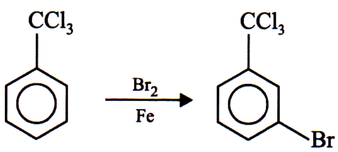
32. **(a)** Alkyl halides give alkane when react with sodium in ether. This is called Wurtz reaction.

$$R-Cl+2Na+R-Cl \xrightarrow{ether} \underset{alkane}{R-R}+2NaCl$$

33. **(d)** Debromination is a trans-elimination reaction. meso-2, 3-Dibromobutane on debromination gives trans-2-butene.

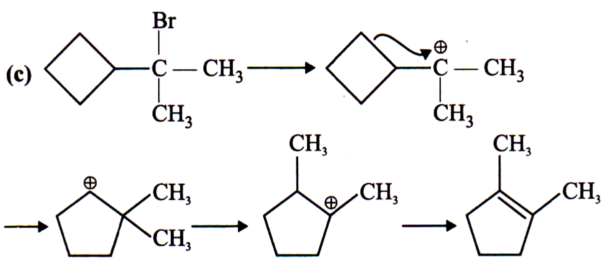
34. **(a)** $(CH_3)_3C-MgCl+D_2O \longrightarrow (CH_3)_3C-D+Mg(OD)Cl$
as R of Grignard's reagent will take proton and form alkane.

35. **(c)** 

36. **(a)** 

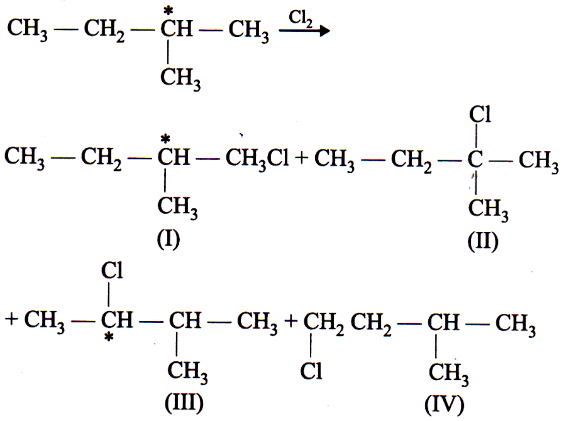
As $-CCl_3$ is a *m*-directing group.

37. **(b)** $CH_3Br+KCN \xrightarrow[-KBr]{KCN} \underset{(A)}{CH_3CN} \xrightarrow{H_3O+} \underset{B}{CH_3COOH} \xrightarrow{LiAH} \underset{\substack{ethylacohol \\ (C)}}{CH_3CH_2OH}$

38. **(c)** 

39. **(a)** According to stability of carbocation

40. **(b)** 2–methylbutane on monochlorination gives 4 isomers, among which I and II are chiral in nature.



Hence, 2 chiral compounds are formed in the above reaction.

41.

42. (a) $\underset{\text{Propene}}{CH_3-CH=CH_2}+H_2 \xrightarrow[300^\circ C]{Ni} \underset{\text{Propane}}{CH_3-CH_2-CH_3}$

43. (a) As the number of branches increases, surface area decreases, due to which Vander Waal forces of attraction decreases. Hence, boiling point also decreases.

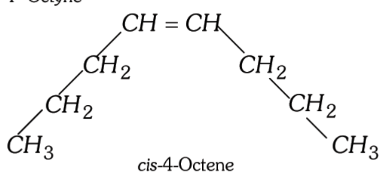
44. (a) $R-COOK+2H_2O \xrightarrow{\text{Electrolysis}} \underset{\text{Alkane}}{R-R}+CO_2+2KOH+H_2$

45. (b) $CH_3COONa+NaOH \xrightarrow{CaO} CH_4+Na_2CO_3$

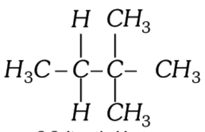
46. $CH_3-CH_2-CH_2-C\equiv CH \xrightarrow{NaNH_2}$

$CH_3-CH_2-CH_2-C\equiv C-Na \xrightarrow{CH_3CH_2CH_2Br}$

$\underset{\text{4–Octyne}}{CH_3-CH_2-CH_2-C\equiv C-CH_2-CH_2-CH_3} \xrightarrow[Pd]{H_2}$



cis-4-Octene

47. 

2,2 dimethyl butane

48.

49.

50. $\text{Ratio}=\dfrac{\sigma\,\text{bonds}}{\pi\,\text{bonds}}=\dfrac{12}{3}=4$

[MATHEMATICS]

51. (d) $x = 3 \pm \left(\frac{-2}{\sqrt{17}}\right)(\sqrt{17}),\ y = -6 \pm \left(\frac{3}{\sqrt{17}}\right)(\sqrt{17})$

and $z = 10 \pm \left(\frac{-2}{\sqrt{17}}\right)(\sqrt{17})$.

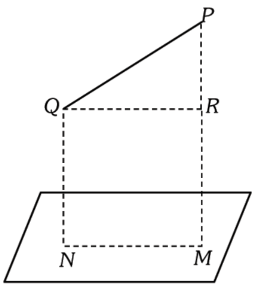
Hence the required co-ordinates are $(1, -3, 8)$ or $(5, -9, 12)$.

52. (a) Centroid $\equiv \left(\frac{\Sigma x}{4}, \frac{\Sigma y}{4}, \frac{\Sigma z}{4}\right) = (1, 2, -1)$

$\Rightarrow a = 1, b = 5, c = -9$; $\therefore \sqrt{a^2 + b^2 + c^2} = \sqrt{107}$.

53. (c) Given plane is $x + y + z - 3 = 0$. From point P and Q draw PM and QN perpendicular on the given plane and $QR \perp MP$.

$|MP| = \frac{0+1+0-3}{\sqrt{1^2+1^2+1^2}} = \frac{-2}{\sqrt{3}}$, $|NQ| = \frac{-2}{\sqrt{3}}$



$|PQ| = \sqrt{(0-0)^2 + (0-1)^2 + (1-0)^2} = \sqrt{2}$

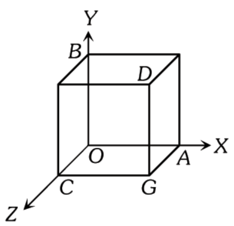
$|RP| = |MP| - |MR| = |MP| - |NQ| = 0$

$\therefore |NM| = |QR| = \sqrt{PQ^2 - RP^2} = \sqrt{(\sqrt{2})^2 - 0} = \sqrt{2}$.

54. (b) Let the cube be of side 'a'

$O(0, 0, 0), D(a, a, a), B(0, a, 0), G(a, 0, a)$

Then equation of OD and BG are $\frac{x}{a} = \frac{y}{a} = \frac{z}{a}$ and $\frac{x}{a} = \frac{y-a}{-a} = \frac{z}{a}$ respectively.



Hence, angle between OD and BG is

$$\cos^{-1}\left(\frac{a^2 - a^2 + a^2}{\sqrt{3a^2}.\sqrt{3a^2}}\right) = \cos^{-1}\left(\frac{1}{3}\right).$$

Note: Students should remember this question as a fact.

55. (a) Line passing through the point (1, 2, –4) is $\frac{x-1}{l}=\frac{y-2}{m}=\frac{z+4}{n}$

Now, according to question, $3l-16m+7n=0$ and $3l+8m-5n=0$

Hence required line is, $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6}$.

56. (d) We have, $\frac{x-1}{1}=\frac{y+3}{-\lambda}=\frac{z-1}{\lambda}=s$

and $\frac{x-0}{1/2}=\frac{y-1}{1}=\frac{z-2}{-1}=t$

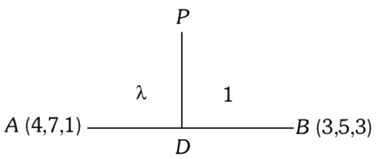
Since, lines are coplanar then

$$\begin{vmatrix} x_2-x_1 & y_2-y_1 & z_2-z_1 \\ l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \end{vmatrix}=0 \Rightarrow \begin{vmatrix} -1 & 4 & 1 \\ 1 & -\lambda & \lambda \\ 1/2 & 1 & -1 \end{vmatrix}=0$$

On solving, $\lambda=-2$.

57. (b) Let D be the foot of perpendicular drawn from $P(1,0,3)$ on the line AB joining (4, 7, 1) and (3, 5, 3).

If D divides AB in ratio $\lambda:1$ then $D=\left(\frac{3\lambda+4}{\lambda+1},\frac{5\lambda+7}{\lambda+1},\frac{3\lambda+1}{\lambda+1}\right)$ .....(i)



D.r's of PD are $2\lambda+3, 5\lambda+7, -2$

D.r's of AB are $-1,-2,2$

$\because\ PD\perp AB$; $\therefore\ -(2\lambda+3)-2(5\lambda+7)-4=0 \Rightarrow \lambda=\frac{-7}{4}$

Putting the value of λ in (i), we get the point $D\left(\frac{5}{3},\frac{7}{3},\frac{17}{3}\right)$.

58. (b) Any point on $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}=\lambda$ is,

$(2\lambda+1, 3\lambda-1, 4\lambda+1); \lambda\in R$

Any point on $\frac{x-3}{1}=\frac{y-k}{2}=\frac{z}{1}=\mu$ is,

$(\mu+3, 2\mu+k, \mu); \mu\in R$

The given lines intersect if and only if the system of equations (in λ and μ)

$2\lambda+1=\mu+3$ .....(i)

$3\lambda-1=2\mu+k$ .....(ii)

$4\lambda+1=\mu$ .....(iii)

has a unique solution.

Solving (i) and (iii), we get $\lambda=\frac{-3}{2}, \mu=-5$

From (ii), we get $\frac{-9}{2}-1=-10+k \Rightarrow k=\frac{9}{2}$.

59. (b) $\because\ PA^2 - PB^2 = k$

$\therefore\ [(x-2)^2 + (y-3)^2 + (z-4)^2]$

$-[(x+2)^2 + (y-5)^2 + (z+4)^2] = k$

or $-8x + 4y - 16z - 16 = k$, which is the equation of a plane.

60. (a) $l + 2m + 2n = 0,\ 3l + 3m + 2n = 0,\ l^2 + m^2 + n^2 = 1,$ we get l, m, n from these equations and then putting the values in $l(x-1) + m(y+3)\ + n(z+2) = 0,$ we get the required result.

Trick: Checking conversely,

$2(1) - 4(-3) + 3(-2) - 8 = 0,$

So, it passes through given point.

$1(2) + 2(-4) + 2(3) = 0,$

So, it is perpendicular to $x + 2y + 2z = 5$.

$3(2) + 3(-4) + 2(3) = 0,$

So, it is perpendicular to $3x + 3y + 2z = 8.$

61. (b) The plane by intercept form is $\frac{x}{1} + \frac{y}{1} + \frac{z}{c} = 1$.

D.r's of normal are $1, 1, \frac{1}{c}$ and of given plane are 1,1, 0. Now, $\cos\frac{\pi}{4} = \frac{1.1 + 1.1 + \frac{1}{c}.0}{\left(\sqrt{\frac{1}{c^2} + 2}\right)\sqrt{2}} \Rightarrow$

$$\frac{1}{\sqrt{2}} = \frac{2}{\left(\sqrt{\frac{1}{c^2} + 2}\right)\sqrt{2}}$$

$$\Rightarrow \frac{1}{c^2} + 2 = 4 \Rightarrow c^2 = \frac{1}{2} \Rightarrow c = \frac{1}{\sqrt{2}}$$

$\therefore$ D.r's of required normal are 1, 1, $\sqrt{2}$.

62. (c) Obviously, $4(2) + 4(3) - k(4) = 0 \Rightarrow k = 5$.

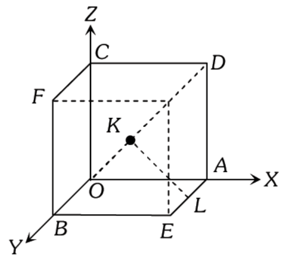
63. (b) We have, $P_1 = \left|\frac{3\times2 - 6\times3 + 2\times4 + 11}{\sqrt{3^2 + (-6)^2 + (2)^2}}\right| = 1$

$$P_2 = \left|\frac{3\times1 - 6\times1 + 2\times4 + 11}{\sqrt{3^2 + (-6)^2 + (2)^2}}\right| = \frac{16}{7}$$

So, equation whose roots are P_1 and P_2 is,

$$7P^2 - 23P + 16 = 0.$$

64. (d)



Requaried distance = KL

$$= \sqrt{\left(a-\frac{a}{2}\right)^2 + 0^2 + \left(0-\frac{a}{2}\right)^2} = \frac{a}{\sqrt{2}}.$$

65.

$p_1 = 0$ and $p_2 = 0$
Now $p_1 + \lambda p_2 = 0$ for $\lambda \in R$ represents the family of planes (excepts plane $p_2 = 0$)

66.

D.R. of the normal to the plane that that is perpendicular to the plane $2x - 2y + z = 0$ and $x - y + 2z = 4$ is given by $\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -2 & 1 \\ 1 & -1 & 2 \end{vmatrix} = -3\hat{i} - 3\hat{j}$ or $\hat{i} + \hat{j}$

so the required plane passing through $(1, -2, 1)$ is $(x - 1) + (y + 2) = 0$ or $x + y + 1 = 0$
Hence the distance of $(1, 2, 2)$ form this plane is $d = \frac{4}{\sqrt{2}} = 2\sqrt{2}$ units

67.

$L_1 = \vec{r}_1 = (1+s, -3-\lambda s, 1+\lambda s)$

So $A(\vec{a}) = (1,-3,1)$ **and** $(\vec{b}) = \hat{i} - \lambda\hat{j} + \lambda\hat{k}$

and $L_2 = \vec{r}_2 = \left(0 + \frac{t}{2}, 1+t, 2-t\right)$

so $C(\vec{c}) = (0,1,2)$ and $\vec{d} = \frac{\hat{i}}{2} + \hat{j} - \hat{k}$

Since L_1 and L_2 are coplanar

So $(\vec{a}-\vec{c}).(\vec{b}\times\vec{d}) = \begin{vmatrix} 1 & -4 & -1 \\ 1 & -\lambda & \lambda \\ \frac{1}{2} & 1 & -1 \end{vmatrix} = 0$

$\Rightarrow -\frac{5}{2}\lambda = 5$ so $\lambda = -2$

68.

The line y = z = 0 is $x - a$xis with D.R.s. < 1, 0, 0 >.
The plane through the intersection will be
$(2\lambda + 1)x + (3\lambda + 5)y + (\lambda - 2)z + (7 - \lambda) = 0$
Since it parallel to x-axis, $2\lambda + 1 = 0$, i.e., $\lambda = -1/2$

And hence the plane is $\frac{7}{2}y - \frac{5}{2}z + \frac{15}{2} = 0$

or $7y - 5z + 15 = 0$

69.

According to question $k.2 + k.1 - 36 = -k - 2k + 36$
$\Rightarrow 6k = 72 \Rightarrow k = 12$

70.

The line $L_1 : \frac{x}{1} = \frac{y}{1} = \frac{z}{1}$ has D.R's < 1, 1, 1>

and the line $L_2 : \frac{x-1}{1} = \frac{y-1}{1} = \frac{z-1}{d}$ has D.R.s < 1, 1, d >

Now D.R.s of the normal

$$= \begin{vmatrix} \hat{i} & \hat{j} & -\hat{k} \\ 1 & 1 & 1 \\ 1 & 1 & d \end{vmatrix} = (d-1)\hat{i} + (1-d)\hat{j} \equiv <1, -1, 0> \text{ or } <-1, 1, 0>$$

So D.C's the normal to the plane = $\pm\left(\frac{1}{\sqrt{2}}, \frac{-1}{\sqrt{2}}, 0\right)$

71. (a) Any point on the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ is $(r+3,\ 2r+4,\ 2r+5)$ which satisfies the plane.

So, $r + 3 + 2r + 4 + 2r + 5 = 17 \Rightarrow r = 1$.

$\therefore$ The point is (4, 6, 7).

Hence required distance is $\sqrt{1^2 + 2^2 + 2^2} = 3$.

72.

A general point on the line

$L_1 : \frac{x-1}{3} = \frac{y-2}{1} = \frac{z-3}{2} = \lambda$ ....(i)

will be $(3\lambda + 1, \lambda + 2, 2\lambda + 3)$ and similarly on

$L_2 : \frac{x-3}{1} = \frac{y-1}{2} = \frac{x-2}{3} = \mu$ ....(ii)

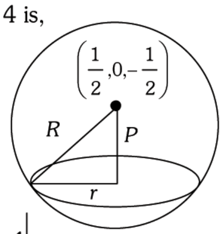
will be $(\mu + 3, 2\mu + 1, 3\mu + 2)$
From (i) and (ii) we get $\lambda = \mu = 1$ and point of intersection is $P(4, 3, 5)$. The plane passing through $P(4, 3, 5)$ which is at maximum distance from origin will have normal along $\overrightarrow{OP}$ i.e., $\vec{n} = 4\hat{i} + 3\hat{j} + 5\hat{k}$

Hence the plane will be $4(x - 4) + 3(y - 3) + 5(z - 5) = 0$
i.e., $4x + 3y + 5z = 50$

73. (c) $\sqrt{1+1+1}.\left(\frac{1-1+1+k}{\sqrt{3}}\right) = \pm 5$ or $k = \pm 5 - 1 = 4, -6$

74. There are eight octants, so sphere can be possible in eight octants.

75. Perpendicular distance to centre $\left(\frac{1}{2}, 0, -\frac{1}{2}\right)$ from $x + 2y - z = 4$ is,



$P = \frac{\left|\frac{1}{2} + \frac{1}{2} - 4\right|}{\sqrt{6}} = \sqrt{\frac{3}{2}}$ and radius of sphere $R = \sqrt{\frac{5}{2}}$,

So, $r = \sqrt{R^2 - P^2} = \sqrt{\frac{5}{2} - \frac{3}{2}} = 1$.