1. The radius of the circular section of the sphere $|\vec{r}| = 5$ by the plane $\vec{r}.(\vec{i}+\vec{j}+\vec{k}) = 4\sqrt{3}$ is

(a) 2 (b) 6 (c) 3 (d) 4

2. The image (or reflection) of the point (1, 2, –1) in the plane $\vec{r}.(3\vec{i}-5\vec{j}+4\vec{k})$ ia

(a) $\left(\frac{73}{25}, \frac{-6}{5}, \frac{39}{25}\right)$ (b) $\left(\frac{73}{25}, \frac{6}{5}, \frac{39}{25}\right)$ (c) (–1, –2, 1) (d) none of these

3. The distance between the line $\vec{r} = 2\vec{i} - 2\vec{j} + 3\vec{k} + 3\vec{k} + \lambda(\vec{i} - \vec{j} + 4\vec{k})$ and the plane $\vec{r}.(\vec{i}+5\vec{j}+\vec{k}) = 5$ is

(a) $\frac{10}{3\sqrt{3}}$ (b) $\frac{10}{3}$ (c) $\frac{10}{9}$ (d) none of these

4. The line of intersection of the planes $\vec{r}.(3\vec{i}-\vec{j}+\vec{k}) = 1$ and $\vec{r}.(\vec{i}+4\vec{j}-2\vec{k}) = 2$ is parallel to the vector

(a) $-2\vec{i}+7\vec{j}+13\vec{k}$ (b) $2\vec{i}+7\vec{j}-13\vec{k}$ (c) $-2\vec{i}-7\vec{j}+13\vec{k}$ (d) $2\vec{i}+7\vec{j}+13\vec{k}$

5. The length of the perpendicular from the origin to the plane passing thro three noncollinear points $\vec{a}, \vec{b}, \vec{c}$ is

(a) $\frac{(\vec{a}\ \vec{b}\ \vec{c})}{|\vec{a}x\vec{b}+\vec{b}x\vec{c}+\vec{c}x\vec{a}|}$ (b) $\frac{2(\vec{a}\vec{b}\vec{c})}{|\vec{a}x\vec{b}+\vec{b}x\vec{c}+\vec{c}x\vec{a}|}$

(c) $[\vec{a}\ \ \vec{b}\ \ \vec{c}]$ (d) none of these

6. The S.D. between the line $\vec{r} = (5\vec{i}+7\vec{j}+3\vec{k}) + \lambda\ (5\vec{i}-16\vec{j}+7\vec{k})$ and r = $(9\vec{i}+13\vec{j}+15\vec{k})$ + $\lambda(3\vec{i}+8\vec{j}-5\vec{k})$ **is**

(a) 10 units (b) 12 units (c) 14 units (d) none of these

7. The equation of the sphere circumscribing the tetrahedrom whose faces are x = 0, y = 0, z = 0 and x/a + y/b + z/c = 1 is

(a) $x^2 + y^2 + z^2 = a^2 + b^2 + c^2$ (b) $x^2 + y^2 + z^2 - ax - by - cz = 0$

(c) $x^2 + y^2 + z^2 - 2\,ax - 2\,by - 2\,cz = 0$ (d) none of these

8. The number of spheres of radius r and touching the co–ordinate axes is

(a) 4 (b) 6 (c) 8 (d) none of these

9. The position vector of the centre of the circle $|\vec{r}| = 5$, $\vec{r}.(\vec{i}+\vec{j}+\vec{k}) = 3\sqrt{3}$ is

(a) $\vec{i}+\vec{j}+\vec{k}$ (b) $3(\vec{i}+\vec{j}+\vec{k})$ (c) $\sqrt{3}(\vec{i}+\vec{j}+\vec{k})$ (d) none of these

10. The equation $|\vec{r}|^2 - \vec{r}.(2\vec{i} + 4\vec{j} - 2\vec{k}) - 10 = 0$ represents a

(a) plane (b) straight line (c) sphere (d) none of these

11. The equation $|\vec{r}|^2 - 2(\vec{r}.\vec{a}) + \lambda = 0$ represents a

(a) plane (b) straight line (c) sphere (d) none of these

12. If α, β, γ are the angles which a half ray makes with the positive directions of the axes, then $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is equal to

(a) 1 (b) 2 (c) 0 (d) – 1

13. The projection of line joining (3, 4, 5) and (4, 6, 3) on the line joining (– 1, 2, 4) and (1, 0, 5) is

(a) 4/3 (b) 2/3 (c) 8/3 (d) 1/3

14. For every point (x, y, z) on xy–plane

(a) x = 0 (b) y = 0 (c) z = 0 (d) x = 0, z = 0

15. Angle between diagonals of a cube are

(a) $\frac{\pi}{3}$ (b) $\frac{\pi}{4}$ (c) $\cos^{-1}\left(\frac{1}{3}\right)$ (d) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

16. Two lines with direction cosines $< l_1, m_1, n_1 >$ and $< l_2, m_2, n_2 >$ are at right angles if

(a) $l_1 = l_2, m_1 = m_2, n_1 = n_2$ (b) $\frac{l_1}{l_2} = \frac{m_1}{m_2} = \frac{n_1}{n_2}$

(c) $l_1l_2 + m_1m_2 + n_1n_2 = 0$ (d) $l_1l_2 + m_1m_2 + n_1n_2 = 1$

17. The equations of the line thro' the point (2, 3, – 5) and equally inclined to the axis are

(a) $x - 2 = y - 3 = z + 5$ (b) $\frac{x-1}{2} = \frac{y-1}{3} = \frac{z-1}{5}$

(c) $\frac{x}{2} = \frac{y}{3} = \frac{z}{-5}$ (d) none of these

18. The curves $y = |x|^3 + |x|^2 + 2$ and $y = x^3 + 3x^2 + 2$ have the same graph for

(a) $x > 0$ (b) $x \geq 0$ (c) all x except 0 (d) all x

19. The line $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ is parallel to the plane

(a) $2x + y - 2z = 0$ (b) $3x + 4y + 5z = 7$

(c) $x + y + z = 2$ (d) $2x + 3y + 4z = 0$

20. The angle between the lines x = 1, y = 2 and y = – 1 and z = 0 is

(a) 90° (b) 30° (c) 60° (d) 0°

21. The foot of perpendicular from (α, β, γ) on y–axis is

(a) (α, 0, 0) (b) (0, β, 0) (c) (0, 0, γ) (d) (0, 0, 0)

22. For every point P (x, y, z) on the xy–plane,

(a) x = 0 (b) y = 0 (c) z = 0 (d) none of these

23. The locus of a point P (x, y, z) which moves in such a way that z = c (constant), is a

(a) line parallel to z–axis (b) plane parallel to xy–plane

(c) line parallel to y–axis (d)line parallel to x–axis

24. A parallelopiped is formed by planes drawn through the points (2, 3, 5) and (5, 9, 7), parallel to the coordinate planes. The length of a diagonal of the parallelopiped is

(a) 7 (b) $\sqrt{38}$ (c) $\sqrt{155}$ (d) none of these

25. The xy–plane divides the line joining the points (– 1, 3, 4) and (2, – 5, 6)

(a) internally in the ratio 2 : 3 (b) externally in the ratio 2 : 3

(c) internally in the ratio 3 : 2 (d) externally in the ratio 3 : 2

26. The points A (5, – 1, 1), B (7, – 4, 7), C (1, – 6, 10) and D (– 1, – 3, 4) are the vertices of a

(a) parallelogram (b) rectangle

(c) rhombus (d) square

27. The equation $12x^2 - 2y^2 - 6z^2 - 2xy - 8yz + 6zx = 0$ represents

(a) a pair of straight lines (b) a pair of planes

(c) a sphere (d) a pair of planes passing through the origin

28. The image of the point P (1, 3, 4) in the plane $2x - y + z + 3 = 0$ is

(a) (3, 5, – 2) (b) (– 3, 5, 2) (c) (3, – 5, 2) (d) (3, 5, 2)

29. The line $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{1}$ intersects the curve $xy = c^2$, $z = 0$ if c =

(a) ± 1 (b) ± 1/3 (c) $\pm\sqrt{3}$ (d) none of these

30. The centre of the circle given by $\vec{r}(\hat{i}+2\hat{j}+2\hat{k}) = 5$ and $|\vec{r}-(\hat{j}+2\hat{k})| = 4$ is

(a) (0, 1, 2) (b) (1, 3, 4)

(c) (– 1, 3, 4) (d) none of these

31. Ratio in which the xy–plane divides the join of (1, 2, 3) and (4, 2, 1) is

(a) 3 : 1 internally (b) 3 : 1 externally

(c) 1 : 2 internally (d) 2 : 1 externally

32. If $\vec{r}$ is a vector of magnitude 21 and has DRs 2, – 3, 6, then $\vec{r}$ is equal to

(a) $6\hat{i}-9\hat{j}+18\hat{k}$ (b) $6\hat{i}+9\hat{j}+18\hat{k}$

(c) $6\hat{i}-9\hat{j}-18\hat{k}$ (d) $6\hat{i}+9\hat{j}-18\hat{k}$

33. If a line makes angles α, β, γ, δ with four diagonals of a cube, then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta$ is equal to

(a) 1/3 (b) 2/3 (c) 4/3 (d) 8/3

34. The locus of a point which moves so that the difference of the squares of its distances from two given points is constant, is a

(a) straight line (b) plane (c) sphere (d) none of these

35. The equation of the plane containing the lines $\vec{r} = \vec{a}_1 + \lambda\vec{a}_2$ and $\vec{r} = \vec{a}_2 + \lambda\ \ \vec{a}_1$ is

(a) $[\vec{r}\ \ \vec{a}_1\vec{a}_2 = 0$ (b) $[\vec{r}\ \ \vec{a}_1\vec{a}_2 = \vec{a}_1.\vec{a}_2$

(c) $[\vec{r}\ \ \vec{a}_2\ \ \vec{a}_1] = \vec{a}_1.\vec{a}_2$ (d) none of these

36. The distance between the line $\vec{r} = 2\hat{i}-2\hat{j}+3\hat{k} + \lambda\ (\hat{i}-\hat{j}+4\hat{k})$ and the plane $\vec{r}.(\hat{i}+5\hat{j}+\hat{k}) = 5$ is

(a) $\frac{10}{3\sqrt{3}}$ (b) $\frac{10}{3}$ (c) $\frac{10}{9}$ (d) none of these

37. The value of λ for which the lines

$$\frac{x-1}{1}=\frac{y-2}{\lambda}=\frac{z+1}{-1} \text{ and } \frac{x+1}{-\lambda}=\frac{y+1}{2}=\frac{z-2}{1}$$

(a) 0 (b) 1 (c) – 1 (d) none of these

38. The angles between the lines $\frac{x-2}{3}=\frac{y+1}{-2}$, z = 2 and $\frac{x-1}{1}=\frac{2y+3}{3}=\frac{z+5}{2}$ is

(a) $\pi/2$ (b) $\pi/3$

(c) $\pi/6$ (d) none of these

39. The DCs of the line 6x – 2 = 3y + 1 = 2z – 2 are

(a) $\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}$ (b) $\frac{1}{\sqrt{14}},\frac{2}{\sqrt{14}},\frac{3}{\sqrt{14}}$

(c) 1, 2, 3 (d) none of these

40. The image (or reflection) of the point (1, 2, –1) in plane $\vec{r}.(3\hat{i}-5\hat{j}+4\hat{k}) = 5$ is

(a) $\left(\frac{73}{25},\frac{-6}{5},\frac{39}{25}\right)$ (b) $\left(\frac{73}{25},\frac{6}{5},\frac{39}{25}\right)$

(c) (–1, –2, 1) (d) none of these

41. Angle between the line $\vec{r}=(2\hat{i}-\hat{j}+\hat{k}) + \lambda\ (-\hat{i}+\hat{j}+\hat{k})$ and the plane $\vec{r}.(3\hat{i}+2\hat{j}-\hat{k}) = 4$ is

(a) $\cos^{-1}\left(\frac{2}{\sqrt{42}}\right)$ (b) $\cos^{-1}\left(\frac{2}{\sqrt{42}}\right)$

(c) $\sin^{-1}\left(\frac{2}{\sqrt{42}}\right)$ (d) $\cos^{-1}\left(\frac{-2}{\sqrt{42}}\right)$

42. The lines $\vec{r}=\vec{a}_1+\lambda\vec{b}_1$ and $\vec{r}=\vec{a}_2+\mu\vec{b}_2$ are coplanar if

(a) $\vec{a}_1\times\vec{a}_2=0$ (b) $\vec{b}_1\times\vec{b}_2=0$

(c) $(\vec{a}_2-\vec{a}_1)\times(\vec{b}_1\times\vec{b}_2) = 0$ (d) $[\vec{a}_1\vec{b}_1\vec{b}_2]=[\vec{a}_2\vec{b}_1\vec{b}_2]$

43. Equation of a line passing through (1, – 2, 3) and parallel to the plane 2x + 3y + z + 5 = 0 is

(a) $\frac{x-1}{-1}=\frac{y+2}{1}=\frac{z-3}{-1}$
(b) $\frac{x-1}{2}=\frac{y+2}{3}=\frac{z-3}{1}$

(c) $\frac{x+1}{-1}=\frac{y-2}{1}=\frac{z-3}{-1}$
(d) none of these

44. The shortest distance between the lines $\vec{r}=(5\hat{i}+7\hat{j}+3\hat{k})+\lambda(5\hat{i}-16\hat{j}+7\hat{k})$

and $\vec{r}=9\hat{i}+13\hat{j}+15\hat{k}+\mu(3\hat{i}+8\hat{j}-5\hat{k})$

(a) 10 units (b) 12 units (c) 14 units (d) none of these

45. The equation of the plane containing the line $\frac{x+1}{-3}=\frac{y-3}{2}=\frac{z+2}{1}$ and the point (0, 7, –7) is

(a) x + y + z = 1
(b) x + y + z = 2

(c) x + y + z = 0
(d) none of these

46. If one end of a diameter of the sphere $x^2 + y^2 + z^2 - 2x - 2y - 2z + 2 = 0$ is

(a) $\left(1-\frac{1}{\sqrt{2}},\frac{1}{2},\frac{1}{2}\right)$
(b) $\left(-1-\frac{1}{\sqrt{2}},-\frac{3}{2},-\frac{3}{2}\right)$

(c) $\left(1-\frac{1}{\sqrt{2}},-\frac{1}{2},-\frac{1}{2}\right)$
(d) none of these