

- If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 4\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{c} = \hat{i} + \alpha\hat{j} + \beta\hat{k}$ are linearly dependent vector and $|\vec{c}| = \sqrt{3}$ then

(a) $\alpha = 1, \beta = -1$ (b) $\alpha = 1, \beta = \pm 1$ (c) $\alpha = -1, \beta = \pm 1$ (d) $\alpha = \pm 1, \beta = 1$
- A vector has components $2p$ and 1 with respect to a rectangular Cartesian system. The axes are rotated through an angle α about the origin in the anticlock wise sence. If the vector has component $p + 1$ and 1 with respect to the new system then

(a) $p = 1, -1/3$ (b) $p = 0$ (c) $p = -1, 1/3$ (d) $p = 1, -1$
- Let $\vec{a}, \vec{b}, \vec{c}$ be three unit vectors such that $|\vec{a} + \vec{b} + \vec{c}| = 1$ and $\vec{a} \perp \vec{b}$, if \vec{c} makes angles α, β with \vec{a}, \vec{b} respectively then $\cos \alpha + \cos \beta$ is is equal to

(a) $3/2$ (b) 1 (c) -1 (d) none of these
- Two vector $\vec{a} = \vec{i} + \frac{1}{\sqrt{3}}$ and $\vec{b} = \frac{\vec{i}}{\sqrt{3}} + \vec{j}$ are

(a) perpendicular to each other
 (b) parallel to each other
 (c) inclined to each other at an angle $\pi/3$
 (d) inclined to each other at an angle $\pi/6$
- A unit vector perpendicular to the plane passing through the points whose position vectors are $\vec{i} - \vec{j} + 2\vec{k}$, $2\hat{i} - \hat{k}$ and $2\hat{j} + \hat{k}$ is

(a) $2\hat{i} + \hat{j} + \hat{k}$ (b) $\frac{1}{\sqrt{16}}(2\hat{i} + \hat{j} + \hat{k})$ (c) $\frac{1}{\sqrt{6}}(\hat{i} + 2\hat{j} + \hat{k})$ (d) None of these
- Let $\vec{a}, \vec{b}, \vec{c}$ be three unit vectors and $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c} = 0$ if the angle between \vec{b} and \vec{c} is $\frac{\pi}{3}$ then $[[\vec{a}\vec{b}\vec{c}]] =$

(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{2}$ (c) 1 (d) None of these
- Let $\vec{a}, \vec{b}, \vec{c}$ be three distinct positive real numbers. If $\vec{p}, \vec{q}, \vec{r}$ lie in a plane where $\vec{p} = a\hat{i} - a\hat{j} + b\hat{k}$, $\vec{q} = \hat{i} + \hat{k}$ and $\vec{r} = c\hat{i} + c\hat{j} + b\hat{k}$ then b is

(a) the A.M. of a, c (b) the G.M. of a, c
 (c) the H.M. of a, c (d) equal to 0
- $[\vec{a}, \vec{b} + \vec{c}, \vec{a} + \vec{b} + \vec{c}]$ is equal to

(a) 0 (b) $2[\vec{a}\vec{b}\vec{c}]$ (c) $[\vec{a}\vec{b}\vec{c}]$ (d) None of these
- The three concurrent edges of parallelepiped represent the vectors $\vec{a}, \vec{b}, \vec{c}$ such that $[\vec{a}, \vec{b}, \vec{c}] = \lambda$ then the volume of the parallelopiped whose three concurrent edges are the three concurrent diagonals of three faces of the given parallelopiped is

(a) 2λ (b) 3λ (c) λ (d) None of these

10. Let a, b, c be three unit vectors such that $a \times (b \times c) = \frac{b+c}{\sqrt{2}}$ and the angles between ac and ab be α and β respectively then
 (a) $\alpha = \frac{3\pi}{4}, \beta = \frac{\pi}{4}$ (b) $\alpha = \frac{\pi}{4}, \beta = \frac{7\pi}{4}$ (c) $\alpha = \frac{\pi}{4}, \beta = \frac{3\pi}{4}$ (d) None of these
11. If ‘.’ and ‘x’ represent dot product and cross product respectively then which of the following is meaningless
 (a) $(\vec{a} \times \vec{b}) \cdot (\vec{b} \times \vec{d})$ (b) $(\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d})$ (c) $(\vec{a} \cdot \vec{b})(\vec{c} \times \vec{d})$ (d) $(\vec{a} \cdot \vec{b}) \times (\vec{c} \times \vec{d})$
12. Let $\vec{a}, \vec{b}, \vec{c}$ be three unit vector of which \vec{b} and \vec{c} are non parallel. Let the angle between a and b be α and that between \vec{a} and \vec{c} be β if $(\vec{b} \times \vec{c}) = \frac{1}{2}\vec{b}$ then
 (a) $\alpha = \frac{\pi}{3}, \beta = \frac{\pi}{2}$ (b) $\alpha = \frac{\pi}{2}, \beta = \frac{\pi}{3}$ (c) $\alpha = \frac{\pi}{6}, \beta = \frac{\pi}{3}$ (d) None of these
13. Let $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = \hat{i} + \hat{j}$, if \vec{c} is a vector such that $\vec{a} \cdot \vec{c} = |\vec{c}|$, $|\vec{c} - \vec{a}| = 2\sqrt{2}$ and the angle between $\vec{a} \times \vec{b}$ and \vec{c} is 30° then $|(\vec{a} \times \vec{b}) \times \vec{c}|$ is equal to
 (a) $2/3$ (b) $3/2$ (c) 2 (d) 3
14. Let \vec{a} and \vec{b} be two non-collinear unit vector. If $\vec{u} = \vec{a} - (\vec{a} \cdot \vec{b})\vec{b}$ and $\vec{v} = \vec{a} \times \vec{b}$ then $|\vec{v}|$ is
 (a) $|\vec{u}|$ (b) $|\vec{u}| + |\vec{u} \cdot \vec{a}|$ (c) $|\vec{u}| + |\vec{u} \cdot \vec{b}|$ (d) $|\vec{u}| + \vec{u} \cdot (\vec{a} + \vec{b})$
15. $[\vec{b} \cdot \vec{c}, \vec{b} \times \vec{c}] + (\vec{b} \cdot \vec{c})^2$ is equal to
 (a) $|\vec{b}|^2 \cdot |\vec{c}|^2$ (b) $(\vec{a} + \vec{c})^2$ (c) $|\vec{b}|^2 + |\vec{c}|^2$ (d) None of these
16. P is a point on the line through the point A whose position vector is \vec{a} and the line is parallel to the vector \vec{b} , if $PA = 6$ the position vector of P is
 (a) $\vec{a} + 6\vec{b}$ (b) $\vec{a} + \frac{6}{|\vec{b}|}\vec{b}$ (c) $\vec{a} - 6\vec{b}$ (d) $\vec{b} + \frac{6}{|\vec{a}|}\vec{a}$
17. The coplanar points A, B, C, D are $(2-x, 2, 2)$, $(2, 2-y, 2)$, $(2, 2, 2-z)$ & $(1, 1, 1)$ respectively then
 (a) $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$ (b) $x + y + z = 1$
 (c) $\frac{1}{1-x} + \frac{1}{1-y} + \frac{1}{1-z} = 1$ (d) None of these
18. If $AB = \vec{b}$ and $AC = \vec{c}$, then the length of the perpendicular from A to the line BC is
 (a) $\left| \frac{\vec{b} \times \vec{c}}{\vec{b} + \vec{c}} \right|$ (b) $\left| \frac{\vec{b} \times \vec{c}}{\vec{b} - \vec{c}} \right|$ (c) $\frac{1}{2} \left| \frac{\vec{b} \times \vec{c}}{\vec{b} - \vec{c}} \right|$ (d) None of these

19. The projection of the vector $\hat{i} + \hat{j} + \hat{k}$ on the line whose vector equation is $\vec{r} = (3+t)\hat{i} + (2t-1)\hat{j} + 3t\hat{k}$, t being the scalar parameter is
- (a) $\frac{1}{\sqrt{14}}$ (b) 6 (c) $\frac{6}{\sqrt{14}}$ (d) None of these
20. If the vertices of a tetrahedron have the position vector $\vec{0}, \hat{i} + \hat{j}, 2\hat{j} - \hat{k}$ and $\hat{i} + \hat{k}$ then the volume of tetrahedron is
- (a) $1/6$ (b) 1 (c) 2 (d) None of these

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