Vector and Unit and dimensions(Test-1)

SUBJECT-PHYSICS Duration time = 1 hr

1. Two vectors A and $\vec{B}$ inclined at an angleθ have a resultant $\vec{R}$ Which makes an angle α with A . If the directions of A and $\vec{B}$ are inter changed, the resultant will have the same.

(1) Direction (2) Magnitude

(2) Direction as well as magnitude (4) none of these

2. if $\hat{n}$ is a unit vector in the direction of the vector A , then

(1)* $\hat{n} = \frac{A}{|A|}$ (2) $\hat{n} = \frac{|A|}{A}$

(3) $\hat{n} = |A|A$ (4) $\hat{n} = A$

3. Which of the following pairs of vectors are parallel?

(1) $A = \hat{i} - 2\hat{j}; \vec{B} = \hat{i} - 5\hat{j}$ (2) $A = \hat{i} - 10\hat{j}; \vec{B} = 2\hat{i} - 5\hat{j}$
(3) $A = \hat{i} - 5j; B = \hat{i} - 10\hat{j}$ (4) $A = \hat{i} - 5j; B = 2\hat{i} - 10\hat{j}$

4. A unit vector is represented as $\left(0.8\hat{j} + b\hat{j} + 0.4\hat{k}\right)$ Hence the value of 'b' must be

(1) 0.4 (2) $\sqrt{0.6}$ (3) 0.2 (4) $\sqrt{0.2}$

5. The component of vector $A = 2\hat{i} + 3\hat{j}$ along the direction of $(\hat{i} - \hat{j})$ is

(1) $\frac{1}{\sqrt{2}}$ (2) $-\frac{1}{\sqrt{2}}$ (3) $\frac{1}{2}$ (2) $-\frac{1}{2}$

6. The magnitude of the x - component of vector A is 3 and the magnitude of vector A is 5. What is the magnitude of the y-component of vector A ?

(1) 3 (4) 4 (3) 5 (4) 8

7. If a vector A makes an angles α , β and γ respectively with the x, y and z axes respectively. **Then** $\sin^2\alpha + \sin^2\beta + \sin^2\gamma$ is equal to

(1) 0 (2) 1 (3) 2 (4) 3

8. The direction consines of $\hat{i}$ □ $\hat{j}$ □ $\hat{k}$ are

(1) 1, 1, 1 (2) 2, 2, 2

(3) $\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}$ (4) $\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}},$

9. Which of the following quantities is dependent of the choice of orientation of the coordinate axes?

(1) $A+B$ (2) $A_x + B_y$

(3) $|A+B|$ (4) Angle between $A and \vec{B}$

10. A unit vector in the direction of resultant vector of $A=-2\hat{i}+3\hat{j}+\hat{k}$ and $\vec{B}=\hat{i}+2\hat{j}-4\hat{k}$ is

(1) $\frac{-2\hat{i}+3\hat{j}+\hat{k}}{\sqrt{35}}$ (2) $\frac{\hat{i}+2\hat{j}-4\hat{k}}{\sqrt{35}}$

(3) $\frac{-\hat{i}+5\hat{j}-3\hat{k}}{\sqrt{35}}$ (4) $\frac{-3\hat{i}+\hat{j}+5\hat{k}}{\sqrt{35}}$

11. Out of the following the resultant of which cannot be 4 N?

(1) 2 N and 2 N (2) 2 N and 4 N

(3) 2 N and 6 N (4) 2 N and 8 N

12. If $|A+\vec{B}| = |A-\vec{B}|$, then the angle between A and $\vec{B}$ will be

(1) 30° (2) 45° (3) 60° (4) 90°

13. Two vectors are given by $A=(3\hat{i}+\hat{j}+3\hat{k})$ and $\vec{B}=(3\hat{i}+5\hat{j}-2\hat{k})$. Find the third vector C if $A+3\vec{B}-C=0$.

(1) $\left(12\hat{i}+14\hat{j}+12\hat{k}\right)$ (2) $\left(13\hat{i}+17\hat{j}+12\hat{k}\right)$

(3) $\left(12\hat{i}+16\hat{j}-3\hat{k}\right)$ (4) $\left(15\hat{i}+13\hat{j}+3\hat{k}\right)$

14. The components of the sum of two vectors $2\hat{i}+3\hat{j}$ and $2\hat{j}+3\hat{k}$ along x and directions respectively are

(1) 2 and 5 (2) 5 and 6 (3) 2 and 6 (4) 4 and 3

15. If $\vec{a}+b$ and $a+b=c$, then the angle included between $\vec{a}$ and b is

(1) 90° (2) 180° (3) 120° (4) zero

16. The (x, y, z) coordinates fo two points A and B are given respectively as (0, 4 –2) and (–2, 8, –4). The displacement vector from A to B is

(1) $-2\hat{i}+4\hat{j}-2\hat{k}$ (2) $2\hat{i}-4\hat{j}+2\hat{k}$

(3) $2\hat{i}+4\hat{j}-2\hat{k}$ (4) $-2\hat{i}-4\hat{j}-2\hat{k}$

17. A person moves 30 m north, then 30 m east, then $30\sqrt{2}$ south -west. His displacement from the original position is

(1) zero (2) 28 m towards south

(3) 10 m towards west (4) 15 m to towards east

18. A bird flies from (–3m, 4m, –3m) to (7m, –2m –3m) in the xyz- coordinates. The bird's displacement vector is given by

(1) $\left(4\hat{i}+2\hat{j}-6\hat{k}\right)$ (2) $\left(10\hat{i}-6\hat{j}\right)$

(3) $\left(4\hat{i}-2\hat{j}\right)$ (4) $\left(10\hat{i}+6\hat{j}-6\hat{k}\right)$

19. On an open ground, a motorist follows a track that turns to his left by an angle of 60° after every 500 m. Starting from a given turn, the displacement of the motorist at the third turn is

(1) 500 m (2) $500\sqrt{3}\,m$

(3) 1000 m (4) $1000\sqrt{3}\,m$

20. A particle starts moving from point (2, 10, 1). Displacement for the particle is $8\hat{i}-2\hat{j}+\hat{k}$. The final coordinates of the particle is

(1) (10, 8, 2) (2) (8, 10, 2)

(3) (2, 10, 8) (4) (8, 2, 10)

21. The angle between A = $\hat{i}+\hat{j}$ and B = $\hat{i}-\hat{j}$ is

(1) 45° (2) 90° (3) – 45° (4) 180°

22. A body, constrained to move in the Y - direction is subjected to a force given by $\vec{F}=\left(-2\hat{i}+15\hat{j}+6\hat{k}\right)N$. What is the work done by this force in moving the body a distance 10 m along the Y-axis.

(1) 20 J (2) 150 J (3) 160 J (4) 190 J

23. Vector which is perpendicular to $(a\cos\theta\hat{i}+b\sin\theta\,\hat{j})$ is

(1) $b\sin\theta\hat{i}-a\cos\theta\hat{j}$ (2) $\frac{1}{a}\sin\theta\hat{i}-\frac{1}{b}\cos\theta\hat{j}$

(3) $5\hat{k}$ (4) All of these

24. If $\hat{i}$, $\hat{j}$ *and* $\hat{k}$ represent unit vectors along the x, y and z-axes respectively. then the angle θ between the vectors $\hat{i}+\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}$ is equal to

(1) $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (2) $\sin^{-1}\left(\sqrt{\frac{2}{3}}\right)$

(3) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (4) 90°

25. The sum of the magnitudes of two forces acting at point is 18 and the magnitude of their resultant is 12. if the resultant is at 90° with the force of smaller magnitude, what are the, magnitudes of forces.

(1) 12, 5 (2) 14, 4 (3) 5, 13 (4) 10, 8

26. IF $\vec{A}\times\vec{B}=\vec{B}\times A$, then the angle between A and B is

(1) $\pi/2$ (2) $\pi/3$ (3) π (4) $\pi/4$

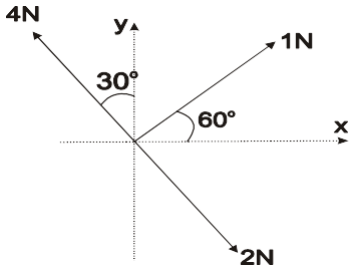
27. The position co-ordinates of a particle moving in a 3D coordinate system is given by x = $a\cos\omega t$, $y = a\sin\omega t$ and $z = a\omega t$, the speed of the particle is

(1) $\sqrt{3}a\omega$ (2) $2a\omega$ (3) $\sqrt{2}a\omega$ (4) $a\omega$

28. If the sum of two - unit vectors is a unit vector, then magnitude of difference is

(1) $\sqrt{2}$ (2) $\sqrt{3}$ (3) $1/\sqrt{2}$ (4) $\sqrt{5}$

29. Three forces acting on a body are shown in the figure. To have the resultant force only along the y-direction,the magnitude of the minimum additional force needed is



(1) $\frac{\sqrt{3}}{4}N$ (2) $\sqrt{3}N$ (3) 0.5 N (4) 1.5 N

30. The value of $(\vec{A}+\vec{B})\times(\vec{A}-\vec{B})$ is

(1) 0 (2) $A^2 - B^2$ (3) $\vec{B}\times\vec{A}$ (4) $2(\vec{B}\times\vec{A})$

31. The angle between the vectors $\vec{A}$ and $\vec{B}$ is θ. The value of the triple product $\vec{A}\cdot(\vec{B}\times\vec{A})$ is

(1) A^2B (2) Zero (3) $A^2B\sin\theta$ (4) $A^2B\cos\theta$

32. $\vec{A}$ and $\vec{B}$ are two vectors and θ is the between them, if $|\vec{A}\times\vec{B}| = \sqrt{3}(\vec{A}.\vec{B})$ the value of θ is

(1) 60^o (2) 45^o (3) 30^o (4) 90^o

33. The unit vector parallel to the resultant of the vectors $A = 4\hat{i}+3\hat{j}+6\hat{k}$ and $\hat{B} = -\hat{i}+3\hat{j}-8\hat{k}$ is

(1) $\frac{1}{7}(3\hat{i}+6\hat{j}-2\hat{k})$ (2) $\frac{1}{7}(3\hat{i}+6\hat{j}+2\hat{k})$

(3) $\frac{1}{49}(3\hat{i}+6\hat{j}-2\hat{k})$ (4) $\frac{1}{49}(3\hat{i}-6\hat{j}+2\hat{k})$

34. If $A = 4\hat{i}-3\hat{j}$ and $\vec{B} = 6\hat{i}+8\hat{j}$ then magnitude and direction of $A+B$ will be

(1) $5, \tan^{-1}(3/4)$ (2) $5\sqrt{5}, \tan^{-1}(1/2)$ (3) $10, \tan^{-1}(5)$ (4) $25, \tan^{-1}(3/4)$

35. Two vectors $(a\cos\omega t)\hat{i}(a\sin\omega t)\hat{j}$ are such that $A+B = A-B$, Then

(1) $\vec{A}.\vec{B} = 0$ (2) $\vec{A}\times\vec{B} = 0$ (3) $A = 0$ (4) $\vec{B} = 0$

36. An equation is given as : $\left(P+\frac{a}{V^2}\right)=b\frac{\theta}{V}$ where P = Pressure, V = Volume & θ = Absolute temperature, If a and b are constants, then dimensions of a will be

(1) $\left[\left[ML^5T^{-2}\right]\right]$ (2) $\left[\left[M^{-1}L^5T^2\right]\right]$ (3) $\left[\left[ML^{-5}T^{-1}\right]\right]$ (4) $\left[\left[ML^5T^1\right]\right]$

37. Of the following quantities, which one has dimension different from the remaining three?

(1) Energy per unit volume (2) Force per unit area

(3) Product of voltage and charge per unit volume (4) Angular momentum.

38. The dimensional formula of pressure is

(1) $[MLT^{-2}]$ (2) $[ML^{-1}T^2]$ (3) $[ML^{-1}T^{-2}]$ (4) $[MLT^2]$

39. The dimensional formula of torque is

(1) $[ML^2T^{-2}]$ (2) $[MLT^{-2}]$ (3) $[ML^{-1}T^{-2}]$ (4) $[ML^{-2}T^{-2}]$

40. The dimensional formula for angular momentum is

(1) $[M^0L^2T^{-2}]$ (2) $[ML^2T^{-1}]$ (3) $[MLT^{-1}]$ (4) $[ML^2T^{-2}]$

41. A force defined by $F=\alpha t^2+\beta t$ acts on a particle at a given time t. The factor which is dimensionless, if α and β are constants, is:

(1) $\beta t/\alpha$ (2) $\alpha t/\beta$ (3) $\alpha\beta t$ (4) $\alpha\beta/t$

42. Plane angle and solid angle have:

(1) Dimensions but no units (2) No units and dimensions

(3) Both units and dimenstions (4) Units but no dimensions

43. A particle starting from the origin (0, 0) moves in a straight line in the (x, y) plane. Its coordinates at a later time are $(\sqrt{3},3)$. The path of the particle makes with the x-axis an path of the particle makes with the x-axis an angle of

(1) 45^o (2) 60^o (3) 0^o (4) 30^o

44. A body of 3 kg moves in the XY plane under the action of a force given by $6t^2\hat{i}+4t\,\hat{j}$. Assuming that the body is at rest at time t = 0, the velocity of body at t = 3 s is

(1) $6\hat{i}+6\hat{j}$ (2) $18\hat{i}+6\hat{j}$ (3) $18\hat{i}+12\hat{j}$ (4) $12\hat{i}+18\hat{j}$

45. The position vector of a particle is $(a\cos\omega t)\hat{i}\,(a\sin\omega t)\,\hat{j}$. The velocity of the particle is

(1) directed towards the origin (2) directed away from the origin

(3) parallel to the position vector (4) perpendicular to the position vector