PHYSICS

1. Given $\vec{P} \cdot \vec{Q} = 0$, then $|\vec{P} \times \vec{Q}|$ is
   a) $|\vec{P}||\vec{Q}|$
   b) Zero
   c) 1
   d) $\sqrt{PQ}$

2. If two vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $-4\hat{i} - 6\hat{j} + \lambda\hat{k}$ are parallel to each other then value of λ will be :
   (a) 1   (b) - 1
   (c) 2   (d) - 2

3. Five equal forces of 10 N each are applied at one point and all are lying in one plane. If the angles between them are equal, the resultant force will be :
   (a) Zero   (b) 10 N
   (c) 20 N   (d) $10\sqrt{2}$ N

4. There are two force vectors, one of 5 N and other of 12 N . At what angle the two vectros be added to get resultant of 17 N, 7 N and 13 N respectively?
   (a) 0°, 180° and 90°   (b) 0°, 90° and 180°
   (c) 0°, 90° and 90°   (d) 108°, 0° and 90°

5. Which pair of the following forces will never give resultant force of 2 N ?
   (a) 2 N and 2 N   (b) 1 N and 1 N
   (c) 1 N amd 3 N   (d) 1 N and 4 N

6. The sum of two forces acting at a point is 16 N. If the resultant force is 8 N and its direction is perpendicular to minimum force then forces are :
   (a) 6 N and 10 N   (b) 8 N and 8 N
   (c) 4 N and 12 N   (d) 2 N and 14 N

7. Two forces 3 N and 2 N are at an angle θ such that the resultant is R. The first force is now increased to 6 N and the resultant becomes 2R. The value of θ is:
   (a) 30°   (b) 60°
   (c) 90°   (d) 120°

8. If the resultant of two forces of magnitude p and 2p is perpendicular to p, then the angle between the forces is :
   (a) $\dfrac{2\pi}{3}$ (b) $\dfrac{3\pi}{4}$
   (c) $\dfrac{4\pi}{5}$ (d) $\dfrac{5\pi}{6}$

9. If $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{B} = 4\hat{i} + 3\hat{j} + 2\hat{k}$, then angle between $\vec{A}$ and $\vec{B}$ is
   a) $sin^{-1}(25/29)$ b) $sin^{-1}(29/25)$
   c) $cos^{-1}(25/29)$ d) $cos^{-1}(29/25)$

10. If the resultant of two forces of magnitudes P and Q acting at a point at an angle of 60° is $\sqrt{7}Q$, then P/Q is :
    (a) 1   (b) 3/2
    (c) 2   (d) 4

11. Three forces P, Q & R are acting at a point in the plane. The angle between P & Q and Q & R 150° and 120° respectively, then for equilibrium, forces P, Q and R are in the ratio :
    (a) 1 : 2 : 3   (b) 1 : 2 : $\sqrt{3}$
    (c) 3 : 2 : 1   (d) $\sqrt{3}$: 2 : 1

12. The component of vectors $\vec{A} = 2\hat{i} + 3\hat{j}$ along the vector $\hat{i} + \hat{j}$ is :

(a) $\dfrac{5}{\sqrt{2}}$ (b) $10\sqrt{2}$

(c) $5\sqrt{2}$ (d) 5

13. The projection of vectors $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$ along the vector $\vec{B} = 4\hat{i} - 4\hat{j} + 7\hat{k}$ is :

(a) $\dfrac{19}{9}$ (b) $\dfrac{38}{9}$

(c) $\dfrac{8}{9}$ (d) $\dfrac{4}{9}$

14. The three vectors $\vec{A} = 3\hat{i} - 2\hat{j} + \hat{k}, \vec{B} = \hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{C} = 2\hat{i} + \hat{j} - 4\hat{k}$ form :

(a) An equilateral triangle   (b) An isosceles triangle
(c) A right angled triangle   (d) No triangle

15. If A = 5 units, B = 6 units and $\left|\vec{A} \times \vec{B}\right| = 15$ units, then what is the angle between $\vec{A}$ and $\vec{B}$?

(a) 30°   (b) 60°
(c) 90°   (d) 120°

16. Component of vector $\hat{i} + \sqrt{3}\,\hat{j}$ on perpendicular to vector $\left(\sqrt{3}\hat{i} + \hat{j}\right)$:

(a) $\dfrac{\sqrt{3}}{2}$ (b) $\dfrac{1}{2}$

(c) 1 (d) can't calculate

17. The value of p so that vectors

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

and $(3\hat{i} + p\hat{j} + 5\hat{k})$ are coplanar should be :

(a) $\dfrac{22}{3}$ (b) $\dfrac{18}{3}$

(c) $-\dfrac{22}{3}$ (d) 2

18. The component of a vector :
(a) Is always less than vector
(b) May be less than or equal to vector
(c) May be greater than vector
(d) Both (b) and (c)

19. Two vectors $\vec{A}$ and $\vec{B}$ lies in a plane, another vector $\vec{C}$ lies outside this plane, then the resultant of these vectors i.e., $\vec{A} + \vec{B} + \vec{C}$:
(a) Can be zero
(b) Cannot be zero
(c) Lies in the plane containing $\vec{A}$ and $\vec{B}$
(d) Lies in the plane containing $\vec{B}$ and $\vec{C}$

20. If $\vec{P} \times \vec{Q} = \vec{P} \times \vec{R}$ then which of the following is correct?

(a) $\vec{Q}$ must be equal to $\vec{R}$

(b) $\left|\vec{Q}\right|$ must be equal to $\left|\vec{R}\right|$

(c) There may be infinite solution for the equation
(d) Only one solution is possible

21. If $\hat{n} = a\hat{i} + b\hat{j}$ is perpendicular to the vector $(i + j)$ then the value of a and b may be :

(a) 1, 0   (b) -2, 0

(c) 3, 0   (d) $\dfrac{1}{\sqrt{2}}, -\dfrac{1}{\sqrt{2}}$

22. If $\left|\hat{a} - \hat{b}\right| = \sqrt{2}$ then calculate the value of $\left|\hat{a} + \sqrt{3}\hat{b}\right|$.

(a) 2   (b) 3
(c) 4   (d) 5

23. If $\left|\hat{a} + \hat{b}\right| = 2$ then what is the value of $\left|\hat{a} - \hat{b}\right|$?

(a) 2   (b) 0
(c) 4   (d) 5

24. If the resultant of n forces of different magnitudes acting at a point is zero, then the minimum value of n is :
(a) 1   (b) 2
(c) 3   (d) 4

25. If the sum of two unit vectors is a unit vector, then magnitude of difference is :

(a) $\sqrt{2}$ (b) $\sqrt{3}$
(c) $1/\sqrt{2}$ (d) $\sqrt{5}$

26. The vector $\vec{P} = a\hat{i} + a\hat{j} + 3\hat{k}$ and $\vec{Q} = a\hat{i} - 2\hat{j} - \hat{k}$ are perpendicular to each other. The positive value of a is :
(a) 3   (b) 2
(c) 1   (d) zero

27. For what value of a, $\vec{A} = 2\hat{i} + a\hat{j} + \hat{k}$ will be perpendicular to $\vec{B} = 4\hat{i} - 2\hat{j} - \hat{k}$

a) 4
b) zero
c) 3
d) 1

28. The maximum and minimum mgnitude of the resultant of two given vectors are 17 units and 7 unit respectively. If these two vectors are at right angles to each other, the magnitude of their resultant is :

(a) 14
(b) 16
(c) 18
(d) 13

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 :
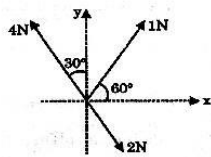
(a) $\dfrac{\sqrt{3}}{4}$ N
(b) $\sqrt{3}$N
(c) 0.5 N
(d) 1.5 N

30. The magnitude of vectors $\vec{A}, \vec{B}$ and $\vec{C}$ are 3 , 4 and 5 units respectively. If $\vec{A} + \vec{B} = \vec{C}$ the angle between $\vec{A}$ and $\vec{B}$ is :

(a) $\pi/2$
(b) $cos^{-1}(0.6)$
(c) $tan^{-1}(7/5)$
(d) $\pi/4$

31. Which of the following is a unit vector ?

(a) $cos\,\theta\hat{i} + sin\,\theta\hat{j}$

(b) $\dfrac{1}{\sqrt{2}} sin\,\theta\hat{i} + \dfrac{1}{\sqrt{2}} cos\,\theta\hat{j} + \dfrac{1}{\sqrt{2}} \hat{k}$

(c) $\dfrac{1}{\sqrt{2}}\hat{i} + \dfrac{1}{\sqrt{2}}\hat{j}$

(d) All of the above

32. Given, two vectors $\vec{A} = -4\hat{i} + 4\hat{j} + 2\hat{k}$ and $\vec{B} = 2\hat{i} - \hat{j} - \hat{k}$. The angle made by $(\vec{A} + \vec{B})$ with $\hat{i} + 2\hat{j} - 4\hat{k}$ is :

(a) 30°
(b) 45°
(c) 60°
(d) 90°

33. A vector perpendicular to $\hat{i} + \hat{j} + \hat{k}$ is :

(a) $\hat{i} - \hat{j} + \hat{k}$
(b) $\hat{i} - \hat{j} - \hat{k}$
(c) $-\hat{i} - \hat{j} - \hat{k}$
(d) $3\hat{i} + 2\hat{j} - 5\hat{k}$

34. If $\vec{A} = -3\hat{i} + 4\hat{j}$ and $\vec{B} = 6\hat{i} - 8\hat{j}$ then which of the following is correct ?

(a) $\vec{A} \times \vec{B} = 0$
(b) $\vec{A}.\vec{B} = 0$
(c) $\dfrac{|\vec{A}|}{|\vec{B}|} = \dfrac{1}{2}$
(d) $\vec{A}$ and $\vec{B}$ are parallel

35. A vector is represented by $3\hat{i} + \hat{j} + 2\hat{k}$. Its length in XY-plane is :

(a) 2
(b) $\sqrt{14}$
(c) $\sqrt{10}$
(d) $\sqrt{5}$

36. The square of resultant of two equal forces is three times their product. Angle between the force is :

(a) π
(b) $\dfrac{\pi}{2}$
(c) $\dfrac{\pi}{4}$
(d) $\dfrac{\pi}{3}$

37. Out of the following set of forces, the resultant of which cannot be zero :

(a) 10, 10, 10
(b) 10, 10, 10
(c) 10, 20, 20
(d) 10, 20, 40

38. 50 coplanar forces each equal to 10N act on a body. Each force makes angle $2\pi/50$ with the preceding force. What is the resultant of the forces?

(a) 1000N
(b) 500N
(c) 250N
(d) zero

39. If $\vec{A} = 3\hat{i} + 4\hat{j}$ then $\hat{A}$ is :

(a) $\hat{i} + 4\hat{j}$
(b) $\hat{i} + \hat{j}$
(c) $\dfrac{3\hat{i} + 4\hat{j}}{5}$
(d) 1

40. The vector joining the points A (1,1,-1) and B (2,-3,4) and pointing from A to B is :

(a) $-\hat{i} + 4\hat{j} - 5\hat{k}$
(b) $\hat{i} + 4\hat{j} - 5\hat{k}$
(c) $\hat{i} - 4\hat{j} + 5\hat{k}$
(d) $-\hat{i} - 4\hat{j} - 5\hat{k}$