Studentpad

Vector 2022-23

Time : 90 Min	Phy : Vector	Marks : 120

01) The magnitude of a given vector with end points (4, - 4, 0) and (-2, -2, 0) must be
A) 4
B) $5\sqrt{2}$
C) 6
D) $2\sqrt{10}$

02) The length of second's hand in watch is 1 cm. The change in velocity of its tip in 15 seconds is
A) zero
B) $\frac{\pi}{30}\text{cm/s}$
C) $\frac{\pi\sqrt{2}}{30}\text{cm/s}$
D) $\frac{\pi}{30\sqrt{2}}\text{cm/s}$

03) If the sum of two unit vectors is a unit vector, then magnitude of difference is
A) $\sqrt{2}$
B) $1/\sqrt{2}$
C) $\sqrt{3}$
D) $\sqrt{5}$

04) If $|\vec{A}\times\vec{B}|=\sqrt{3}\vec{A}.\vec{B}$, then the value of $|\vec{A}+\vec{B}|$ is
A) $\left(A^2+B^2+\frac{AB}{\sqrt{3}}\right)^{1/2}$
B) $(A^2+B^2+AB)^{1/2}$
C) $(A^2+B^2+\sqrt{3}AB)^{1/2}$
D) $A+B$

05) The resultant of two vectors A and B is perpendicular to the vector A and its magnitude is equal to half the magnitude of vector B. The angle between A and B is
A) 120°
B) 135°
C) 150°
D) none of these

06) A boy walks uniformly along the sides of a rectangular park of size 400 m × 300 m, starting from one corner to the other corner diagonally opposite. Which of the following statement is incorrect?
A) His displacement is 500 m.
B) His displacement is 700 m.
C) He has travelled a distance of 700 m.
D) His velocity is not uniform throughout the walk.

07) A force of $(7\hat{i}+6\hat{k})$N makes a body move on a rough plane with a velocity of $(3\hat{j}+4\hat{k})\text{ms}^{-1}$. Calculate the power in watt
A) 24
B) 34
C) 45
D) 21

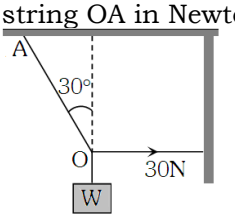
08) How many minimum number of non-zero vectors in different planes can be added to give zero resultant?
A) 5
B) 4
C) 3
D) 2

09) The position vectors of radius are $2\hat{i}+\hat{j}+\hat{k}$ and $2\hat{i}-3\hat{j}+\hat{k}$, while those of linear momentum are $2\hat{i}+3\hat{j}-\hat{k}$. Then the angular momentum is
A) $2\hat{i}-4\hat{k}$
B) $4\hat{i}-8\hat{j}$
C) $4\hat{i}-8\hat{k}$
D) $2\hat{i}-4\hat{j}+2\hat{k}$

10) A scooter going due east at 10 ms^{-1} turns right through an angle of 90°. If the speed of the scooter remains unchanged in taking turn, the change in the velocity of the scooter is
A) zero.
B) 10.0 ms^{-1} in southern direction.
C) 14.14 ms^{-1} in south-west direction.
D) 20.0 ms^{-1} south eastern direction.

11) Two trains along the same straight rails moving with constant speed 60 km/hr and 30 km/hr respectively towards each other. If at time $t=0$, the distance between them is 90 km, the time when they collide is
A) 4 hr
B) 3 hr
C) 2 hr
D) 1 hr

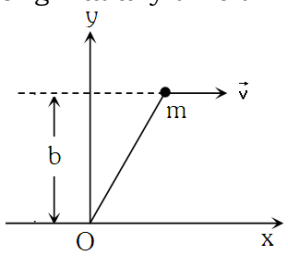
12) As shown in figure the tension in the horizontal cord is 30 N. The weight W and tension in the string OA in Newton are



A) $30\sqrt{3}, 30$
B) $30\sqrt{3}, 60$
C) $60\sqrt{3}, 30$
D) None of these

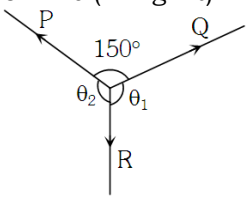
13) If for two vector $\vec{A}$ and $\vec{B}$, sum $(\vec{A}+\vec{B})$ is perpendicular to the difference $(\vec{A}-\vec{B})$, then the ratio of their magnitude is
A) 1
B) 2
C) 3
D) 4

14) If a particle of mass m is moving with constant velocity v parallel to x-axis in x-y plane as shown in fig., its angular momentum with respect to origin at any time t will be



A) $mvb\hat{k}$
B) $mvb\hat{i}$
C) $-mvb\hat{k}$
D) $mv\hat{i}$

15) P, Q and R are three coplanar forces acting at a point and are in equilibrium.
Given $\sin\theta_1 =$ 0.9659, P = 1.9318 kg wt, the value of R is (in kg wt)



A) $\frac{1}{2}$
B) 0.9659
C) 1
D) 2

16) y component of velocity is 20 and x component of velocity is 10. The direction of motion of the body with the horizontal at this instant is
A) 0°
B) 45°
C) $\tan^{-1}(1/2)$
D) $\tan^{-1}(2)$

17) If a body is in equilibrium under a set of non-collinear forces, then the minimum number of forces has to be
A) Two
B) Three
C) Four
D) Five

18) A thief is running away on a straight road on a jeep moving with a speed of 9 m/s. A police man chases him on a motor cycle moving at a speed of 10 m/s. If the instantaneous separation of jeep from the motor cycle is 100 m, how long will it take for the policemen to catch the thief?
A) 1 second
B) 49 seconds
C) 90 seconds
D) 100 seconds

19) The vectors $5i+8j$ and $2i+7j$ are added. The magnitude of the sum of these vector is
A) 38
B) 238
C) $\sqrt{274}$
D) 560

20) Two cars are moving in the same direction with the same speed 30 km/hr. They are separated by a distance of 5 km, the speed of a car moving in the opposite direction if it meets these two cars at an interval of 4 minutes, will be
A) 15 km/hr
B) 30 km/hr
C) 40 km/hr
D) 45 km/hr

21) A boat is moving with a velocity 3i + 4j with respect to ground. The water in the river is moving with a velocity -3i - 4j with respect to ground. The relative velocity of the boat with respect to water is
A) $5\sqrt{2}$
B) - 6i - 8j
C) 6i +8j
D) 8j

22) The vector sum of two forces is perpendicular to their vector differences. In that case, the forces
A) cannot be predicted.
B) are equal to each other.
C) are not equal to each other in magnitude.
D) are equal to each other in magnitude.

23) Any vector in an arbitrary direction can always be replaced by two (or three)
A) arbitrary vectors which have the original vector as their resultant.
B) mutually perpendicular vectors which have the original vector as their resultant.
C) parallel vectors which have the original vector as their resultant.
D) it is not possible to resolve a vector.

24) Two vector A and B are inclined at an angle θ. Now if the vectors are interchanged then the resultant turns through an angle β. Select one of the following relation which is true?

A) $\tan\frac{\alpha}{2}=\left(\frac{A-B}{A+B}\right)^2\tan\frac{\theta}{2}$

B) $\tan\frac{\alpha}{2}=\left(\frac{A-B}{A+B}\right)\tan\frac{\theta}{2}$

C) $\tan\frac{\alpha}{2}=\left(\frac{A-B}{A+B}\right)^2\cot\frac{\theta}{2}$

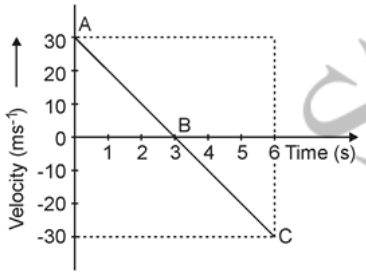
D) $\tan\frac{\alpha}{2}=\left(\frac{A-B}{A+B}\right)\cot\frac{\theta}{2}$

25) Which of the following is a scalar quantity?
A) Acceleration
B) Displacement
C) Electric field
D) Work

26) A man standing on a road hold his umbrella at 30° with the vertical to keep the rain away. He throws the umbrella and starts running at 10 km/hr. He finds that raindrops are hitting his head vertically, the speed of raindrops with respect to the road will be
A) 40 km/hr
B) 30 km/hr
C) 20 km/hr
D) 10 km/hr

27) A body is dropped from the roof of a multi-storeyed building. It passes the ceiling of the 15th strorey at a speed of $20\,ms^{-1}$. If the height of each storey is $4\,m$, what is the number of storeys in the building? (take $g=10\,ms^{-2}$ and neglect air resistance)

28) The velocity-time graph of a stone thrown vertically upward with an initial velocity of $30\,ms^{-1}$ is shown in below figure.
The velocity in the upward direction is taken as positive and that in the downward direction as negative. The maximum height to which the stone rises is _____ m.



29) A force is inclined at 60^0 to the horizontal. If its rectangular component in the horizontal direction is 50 N, then find the magnitude (in N) of the force in the vertical direction.

30) Two forces, each of magnitude F, have a resultant of the same magnitude F. What is the angle in degree between the two forces?