Physics

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Board - CBSE	Class - 11	Topic – Motion in a Plane

Very Short Answer Type 1 Mark Questions

1.	Does a scalar quantity depend on the frame of reference chosen?
	Ans:
2.	A given quantity has both magnitude and direction. Is it necessarily a vector?
	Ans:
3.	When is the sum of two vectors (i) maximum and (ii) minimum?
	Ans:
4.	When can the addition of two vectors be zero?
	Ans:
5.	Under what condition the sum and difference of two vectors will be equal in magnitude?
	Ans:
6.	The magnitude of the resultant of two vectors of magnitudes 5 and 3 is 2. What is the angle between the two vectors?
	Ans:
7.	Can three vectors of different magnitudes be combined to give a zero resultant?
	Ans:
8.	What is the minimum number of forces acting on an object in a plane that can produce a zero-resultant force?
	Ans:
9.	What is the minimum number of forces of equal magnitude whose vector sum is zero?
	Ans:
10.	Does it make a sense to call a physical quantity a vector, when its magnitude is zero?
	Ans:
11.	Give an example of a zero vector.
	Ans:
12.	Is the division of vectors defined?

	Ans:
13.	Can the sum of two vectors be a scalar?
	Ans:
14.	Can any of the components of a given vector have greater magnitude than that of the vector itself?
	Ans:
15.	Under what condition is the scalar product of two non-zero vectors zero?
	Ans:
16.	Give one example of dot product of vectors. Also give its unit.
	Ans:
17.	What is the magnitude of the vector $2\,\hat{\imath} - 3\,\hat{\jmath} + \sqrt{3}\,\hat{k}$?
	Ans:
18.	Show that $\vec{A} \cdot \vec{A} = A^2$.
	Ans:
19.	Can the magnitude of the resultant vector of two given vectors be less than the magnitude of either vector?
	Ans:
20.	Two vectors of magnitudes 3 and 4 give a resultant of magnitude 2. What must be the dot product of these two vectors?
	Ans:

Short Answer Type 2 Mark Questions

1.	Distinguish between position and displacement vectors.
	Ans:
2.	Define (i) unit vector (ii) null vector (in) cross product of two vectors $\vec{A}$ and $\vec{B}$. .
	Ans:
3.	State and prove the polygon law of vector addition
	Ans:
4.	Suppose you have two forces $\vec{F}$ and $\vec{F}$. How would you combine them in order to have resultant force of magnitudes (a) Zero (b) $2\vec{F}$, and (c) $\vec{F}$?
	Ans:

5.	Give one example of dot product of vectors. Also give its unit
	Ans:
6.	Find the scalar and vector product of two vectors, $\vec{a} = (3\hat{i} - 4\hat{j} + 5\hat{k})$ and $\vec{b} = (-2\hat{i} + \hat{j} + 3\hat{k})$
	Ans:
7.	The angle between vectors A and B is 60°. What is the ratio of $\vec{A} . \vec{B}$ and $\lvert \vec{A} \times \vec{B} \rvert$?
	Ans:
8.	State parallelogram law of vector addition. Show that resultant of two vectors $\vec{A}$ and $\vec{B}$ inclined at an angle θ is R = $\sqrt{A_2 + B_2 + 2\,AB\cos\theta}$.
	Ans:
9.	A man moving in rain holds his umbrella inclined to the vertical even though the rain drops are falling vertically downwards. Why?
	Ans:
10.	Obtain an expression for the area of a triangle in terms of the cross product of two vectors representing the two sides of the triangle.
	Ans:
11.	Show that two-dimensional uniform velocity motion is equivalent to two one dimensional uniform velocity motion along two coordinate axes.
	Ans:
12.	Define uniform acceleration. Show that in two- dimensional motion with uniform acceleration, each rectangular component of velocity is similar to that of uniformly accelerated motion along one dimension.
	Ans:

Short Answer Type 3 Mark Questions

1.	Write an expression for the instantaneous position vector of an object having two-dimensional motion under uniform acceleration. Hence, show that a two dimensional uniformly accelerated motion is a combination of two rectangular uniformly accelerated motions.
	Ans:
2.	A projectile is fired with a velocity 'u' making an angle θ with the horizontal. Show that its trajectory is a parabola.
	Ans:
3.	A projectile is projected with velocity u making angle θ with horizontal direction, find:

	(a) Time of flight (b) Horizontal range
	Ans:
4.	Show that there are two angles of projection for which the horizontal range is same for a projectile.
	Ans:
5.	Show that there are two angles of projection for a projectile to have the same horizontal range. What will be the maximum heights attained in the two cases? Compare the two heights for $\theta = 30°$ and 60°.
	Ans:
6.	Find the angle of projection at which the horizontal range and maximum height of a projectile are equal.
	Ans:
7.	What is a projectile? Find its horizontal range and show it is maximum for an angle of 45°.
	Ans:
8.	A projectile is fired at an angle θ with the horizontal with velocity H. Deduce the expression for the maximum height reached by it.
	Ans:
9.	A projectile is fired with velocity 'u', making an angle θ with the horizontal from the surface of earth. Prove that the projectile will hit the surface of earth with same velocity and at the same angle.
	Ans:
10	Prove the following statement “For Elevations which exceed or fall short of 45° by equal amounts, the ranges are equal".
	Ans:
11.	Prove that the maximum horizontal range is four times the maximum height attained by the projectile when fired at an inclination so as to have maximum horizontal range.
	Ans:
12.	Justify the statement that a uniform circular motion is an accelerated motion.
	Ans:

Long Answer Type 5 Mark Questions

1.	What is meant by resolution of a vector? Prove that a vector can be resolved along two given directions in one and only one way.
	Ans:
2.	State the parallelogram law of vector addition and find the magnitude and direction of the resultant

	of two vectors P and Q inclined at an angle θ with each other. What happens, when $\theta = 0°$ and $\theta = 90°$?
	Ans:
3.	(a) Analytically, find the resultant R of two vectors $\vec{A}$ and $\vec{B}$ inclined at an angle θ. (b) Find the angle between two vectors P and Q if resultant of the vectors is given by $R^2 = P^2 + Q^2$.
	Ans:
4.	State triangle law of vector addition. Give analytical treatment to find the magnitude and direction of a resultant vector by using this law.
	Ans:
5.	A projectile is projected horizontally with a velocity u. Show that its trajectory is parabolic. And obtain expressions for: (i) Time of flight (ii) Horizontal range (iii) Velocity at any instant t.
	Ans:
6.	A projectile is fired upward at an angle θ with the horizontal with velocity u. Show that its trajectory is a parabola. Obtain expressions for (i) maximum height attained, (ii) time of flight and (iii) horizontal range. At what value of θ is the range maximum?
	Ans:
7.	A body is projected at an angle θ with the horizontal. (a) Obtain the condition for the maximum horizontal range. (b) Prove that the horizontal range of a projectile is same when fired at an angle θ and $(90° - \theta)$ with the horizontal. (c) Obtain an expression for velocity of projectile at any instant t.
	Ans:
8.	Define projectile. Show that the path of projectile is parabola. Find the angle of projection at which the horizontal range and maximum height of the projectile are equal.
	Ans:
9.	(a) Show that for two complementary angles of projection of a projectile thrown with the same velocity, the horizontal ranges are equal. (b) For what angle of projection of a projectile, is the range maximum? (c) For what angle of projection of a projectile, are the horizontal range and maximum height attained by the projectile equal?
	Ans:

10.	Define centripetal acceleration. Derive an expression for the centripetal acceleration of a body moving with uniform speed v along a circular path of radius r. Explain how it acts along the radius towards the centre of the circular path.
	Ans: