St. Lawrence High School

A Jesuit Christian Minority Institution

Term : 1st

Solution of Work Sheet – 9

Class – XI | Subject – Physics | Date – 24.06.20

Chapter – Vector | Topic –Direction cosine and unit vector

Choose the correct option for the following questions. $1 \times 15 = 15$

1. Chose the correct option –
   a. Only the magnitudes of $\hat{\imath}$, $\hat{\jmath}$ and $\hat{k}$ are 1.
   b. Magnitude of unit vector of any vector is 1
   c. Magnitude of any vector is 1
   d. None of these
   Ans: Magnitude of unit vector of any vector is 1
2. The vector joining two points (0, 3) and (- 3, 0) is –
   a. $-3\hat{\imath} + 3\hat{\jmath}$
   b. $3\hat{\imath} - 3\hat{\jmath}$
   c. $-3\hat{\jmath}$
   d. $-3\hat{\imath} - 3\hat{\jmath}$
   Ans: d. $-3\hat{\imath} - 3\hat{\jmath}$
3. The unit vector of $\overrightarrow{PQ}$, where the coordinates are P(1,2) and Q(2, -1) is –
   a. $\frac{\hat{\imath}-3\hat{\jmath}}{10}$
   b. $\frac{\hat{\imath}-3\hat{\jmath}}{-8}$
   c. $\frac{\hat{\imath}-3\hat{\jmath}}{\sqrt{10}}$
   d. $\sqrt{10}(\hat{\imath} - 3\hat{\jmath})$
   Ans: $\frac{\hat{\imath}-3\hat{\jmath}}{\sqrt{10}}$
4. The coordinates of two points are given as A $(-1, 2, 2)$ and B$(2, -1, -1)$. The vector $\overrightarrow{BA}$ will be then –
   a. $3\hat{\imath} - 3\hat{\jmath} - 3\hat{k}$
   b. $3\hat{\imath} + 3\hat{\jmath} - 2\hat{k}$
   c. $-3\hat{\imath} + 3\hat{\jmath} + 3\hat{k}$
   d. $-3\hat{\imath} + 3\hat{\jmath} - 3\hat{k}$
   Ans: c. $-3\hat{\imath} + 3\hat{\jmath} + 3\hat{k}$
5. The unit vector of the vector $\hat{\imath} + \hat{\jmath} + \hat{k}$ is –
   a. $\hat{\imath} + \hat{\jmath} + \hat{k}$
   b. $\frac{1}{3}(\hat{\imath} + \hat{\jmath} + \hat{k})$
   c. $\frac{1}{\sqrt{3}}(\hat{\imath} + \hat{\jmath} + \hat{k})$
   d. None of these
   Ans: c. $\frac{1}{\sqrt{3}}(\hat{\imath} + \hat{\jmath} + \hat{k})$

6. A constant vector makes $30°$ and $60°$ angles with X – axis and Y – axis respectively. What angle it makes with the Z – axis?
   a. $0°$
   b. $45°$
   c. $60°$
   d. $90°$
   Ans: d. $90°$
7. Two forces $3\hat{\imath} - \hat{\jmath} - 2\hat{k}$ N and $-3\hat{\imath} + \hat{\jmath} - 3\hat{k}$ N acts simultaneously on a body. The net force on the body is –
   a. 5 N along - ve Z – axis
   b. 5 N along +ve Z – axis
   c. $6\hat{\imath} - 2\hat{\jmath} + \hat{k}$ N
   d. $None$ of these
   Ans: a. 5 N along - ve Z – axis
8. The direction cosines of the position vector of the point $(1, 2, -3)$ is –
   a. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$
   b. $\cos\left(\frac{1}{\sqrt{14}}\right), \cos\left(\frac{2}{\sqrt{14}}\right), \cos\left(\frac{-3}{\sqrt{14}}\right)$
   c. $1, 2, -3$
   d. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{3}{\sqrt{14}}$
   Ans: a. $\frac{1}{\sqrt{14}}, \frac{2}{\sqrt{14}}, \frac{-3}{\sqrt{14}}$
9. What are the angles made by the vector $\hat{\imath} + \hat{\jmath} + \sqrt{2}\hat{k}$ with X, Y and Z axis respectively?
   a. $60°, 60°, 60°$
   b. $60°, 45°, 60°$
   c. $45°, 60°, 60°$
   d. $60°, 60°, 45°$
   Ans: d. $60°, 60°, 45°$
10. The vector of magnitude 9 unit along the direction of the vector $\hat{\imath} + 2\hat{\jmath} - 2\hat{k}$ is –
   a. $9(\hat{\imath} + 2\hat{\jmath} - 2\hat{k})$
   b. $\sqrt{9}(\hat{\imath} + 2\hat{\jmath} - 2\hat{k})$
   c. $\frac{1}{\sqrt{9}}(\hat{\imath} + 2\hat{\jmath} - 2\hat{k})$
   d. $9\sqrt{9}(\hat{\imath} + 2\hat{\jmath} - 2\hat{k})$
   Ans: b. $\sqrt{9}(\hat{\imath} + 2\hat{\jmath} - 2\hat{k})$
11. Three unit vectors $\hat{a}_1$, $\hat{a}_2$ and $\hat{a}_3$ are such that , $\hat{a}_1 + \hat{a}_2 + \hat{a}_3 = \vec{0}$. Then the angle between $\hat{a}_1$ and $\hat{a}_2$ can be –
   a. $30°$
   b. $60°$
   c. $90°$
   d. $120°$
   Ans: d. $120°$
12. A vector of magnitude 5unit is perpendicular to the Y – axis. Then the vector can be –
   a. $3\hat{\imath} + 4\hat{\jmath}$
   b. $5\hat{\imath}$
   c. $-5\hat{\imath}$
   d. Both b. and c.
   Ans: Both b. and c.

13. Choose the correct option –
    a. The unit vector of all the vectors of any magnitude along a particular direction are equal
    b. The unit vector of all the vectors of any magnitude along a particular direction are different
    c. The unit vector of a vector and its reverse vector are same
    d. None of these

    Ans: a. The unit vector of all the vectors of any magnitude along a particular direction are equal.

14. A vector lies in XY plane and makes 45° with +ve X-axis. Its unit vector will be –
    a. $\hat{\imath} + \hat{\jmath}$
    b. $\frac{1}{\sqrt{2}}(\hat{\imath} + \hat{\jmath})$
    c. $\sqrt{2}(\hat{\imath} + \hat{\jmath})$
    d. Cannot be predicted without the actual vector.

    Ans: b. $\frac{1}{\sqrt{2}}(\hat{\imath} + \hat{\jmath})$

15. For two non zero vectors $\vec{P}$ and $\vec{Q}$ of unequal magnitudes, $|\vec{P} + \vec{Q}| = |\vec{P} - \vec{Q}|$. What is the angle between two vectors?
    a. 0°
    b. 30°
    c. 45°
    d. 90°

    Ans: $d.\ 90°$

Name of the teacher – Soumitra Maity