1

IIT-JAM   BIOTECHNOLOGY

VECTORS AND SCALARS

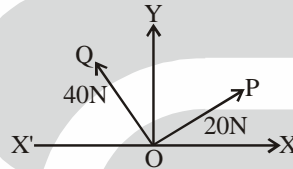## PART-A: IIT-JAM PREVIOUS YEARS QUESTION

1. A particle is in equilibrium under the action of three forces P, Q and R. If the angle between P and Q is 120° and that between Q and R is 135°, then the ratio of their magnitudes $P : Q : R$ is

    (a) $2:\sqrt{3}+1:\sqrt{6}$ (b) $2:\sqrt{3}+1:\sqrt{2}$ (c) $\sqrt{6}:\sqrt{3}+1:2$ (d) $2:\sqrt{6}:\sqrt{3}+1$

    [JAM-2005]

2. The resultant of two forces of 20N and 40N is acting vertically at 'O' as shown in the following figure. If the angle XOP is 30°, then the angle X'OQ is: **[JAM-2006]**

    (a) $\cos^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$ (b) $\cos^{-1}\left(\dfrac{\sqrt{3}}{4}\right)$ (c) $\sin^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$ (d) $\sin^{-1}\left(\dfrac{\sqrt{3}}{4}\right)$

3. If the vectors $\vec{a} = \hat{i} + \hat{j} - \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} - \hat{k}$ and $\vec{c} = 2\hat{i} + 2\hat{j} + p\hat{k}$ are coplanar, then the value of p is

    (a) –2   (b) –1   (c) 1   (d) 2   **[JAM-2008]**

4. The angle between two linear transmembrane domains defined by the following vectors

    $$\vec{a} = \hat{i} + \hat{j} - \hat{k}$$ **[JAM-2014]**

    $$\vec{b} = \hat{i} - \hat{j} + \hat{k}$$

    is

    (a) $\cos^{-1}(-1/3)$ (b) $\cos^{-1}(1/3)$ (c) $\sin^{-1}(-1/3)$ (d) $\sin^{-1}(1/3)$

5. Consider two vectors $\mathbf{P}$ and $\mathbf{Q}$ of equal magnitude. If the magnitude of $\mathbf{P} + \mathbf{Q}$ is two-times larger than that of $\mathbf{P} - \mathbf{Q}$, then the angle between them is   **[JAM-2016]**

    (a) 107°   (b) 117°   (c) 127°   (d) 137°

6. Let $\vec{a} = 4\hat{i} - 2\hat{j} + 6\hat{k}$ and $\vec{b} = 7\hat{i} + \hat{j} - 12\hat{k}$. If $\vec{a} \times \vec{b} = \alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$, then the value of $\alpha + \beta + \gamma$ equals _____.

    [JAM-2019]

PART-B: JNU BIOTECHNOLOGY PREVIOUS YEARS QUESTION

1. The vectors A and B are such that $|A + B| = |A - B|$, then the angle between the two vectors will be

   (a) 0º   (b) 60º   (c) 90º   (d) 180º **[JNU Biotech-2003]**

2. Two force vectors of equal magnitude act in such a way that their resultant vector has a magnitude equal to the magnitude of either of the original forces. The angle (in degrees) between the original forces is

   (a) 90   (b) 30   **[JNU Biotech-2016]**

   (c) 45   (d) 120

PART-C: JNU LIFE SCIENCES PREVIOUS YEARS QUESTION

1. All of the following are vector quantities EXCEPT   **[JNU Life Sc.-2006]**

   (a) force   (b) velocity   (c) acceleration   (d) power

PART-D: TIFR PREVIOUS YEARS QUESTION

1. The minimum number of unequal non-zero length vectors which can add up to give a zero resultant is

   (a) two   (b) three   (c) four   (d) five   **[TIFR-2016]**

2. Two forces of 7 Newtons each acting at 45 degrees to each other will have a resultant of approximately

   (a) 6 Newtons   (b) 8 Newtons   **[TIFR-2018]**

   (c) 10 Newtons   (d) 13 Newtons

Answer Key

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1. (a)   **2.** (b)   **3.** (a)   **4.** (b)   **5.** (*)

6. (126)

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1. (c)   **2.** (d)

JNU LIFE SCIENCES

1. (d)

TIFR

1. (b)   **2.** (d)

Note: The asterisk sign '*' represents that the question(s) has/have one of the following issues:
(i) Wrong options
(ii) Insufficient information