PHYSICS

BOOKS - BETTER CHOICE PUBLICATION

FORCE ON A CHARGE

Very Short Answer Type Questions

1. What is the principle of cyclotron?

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2. Write an expression for the force expereinced by a charged particle moving in a uniform magnetic field B.

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3. How much force will be experienced by a charge in a uniform electric field ?

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4. State unit of magnetic field intensity.

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5. Define one Tesla.

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6. Under what conditions is the force acting on a charge moving through a uniform magnetic field is maximum?

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7. What is the direction of force acting on a charged particle q, moving with a velocity in a uniform magnetic field?

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8. A charged particle moves with velocity $\overrightarrow{v}$ in a uniform magnetic field $\overrightarrow{B}$. The magnetic force experienced by the particle is

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9. Can neutron be accelerated in a cyclotron? Why?

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Very Short Answer Type Questions Most Expected Questions

1. What is magnetic Lorentz force?

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2. When a charged particle moves perpendicular to a magnetic field, then

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3. What is the work done by a magnetic field on a moving charge?

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4. What will be nature of the followed by electric charge when it enters in electric field normally ?

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5. What is the magnitude of force experience by a stationary charge exposed to a uniform magnetic field ?

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6. What do you mean by cyclotrone frequency ?

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7. A charged particle enters the uniform electric field normally. What will be the nature of path followed by the particle ?

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8. A charged particle moving at right angle to a unifrom magnetic field follows:

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9. A charged particle moving at right angle to a unifrom magnetic field follows:

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Short Answer Type Questions

1. Cyclotron is not suitable for accelerating electrons.' Explain why.

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2. An electron is not deflected in passing through a certain region of space.can we be sure that there is no magnetic field in that region.

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3. An electron is not deflected in passing through a certain region of space.can we be sure that there is no magnetic field in that region.

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Short Answer Type Questions Most Expected Questions

1. An electron and a proton moving with same speed enter the same magnetic field region at

right angles to the direction of the field. For which of the two particles will the radius of the circular path be smaller?

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2. A charged particle is released from rest in a region of steady and uniform electric and magnetic fields which are parallel to each other . What will be the nature of the path followed by the charged particle?

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3. A proton moving in a straight line enters a strong magnetic field in a direction parallel to the field. What will be the change in its speed and the direction of motion on moving the magnetic field?

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Long Answer Type Questions

1. Discuss the motion of charged particle in uniform magnetic field, when its moves at an angle θ with the direction of magnetic field. Prove that its path is helical. Calculate the pitch of helical path. What will be the nature of path if $\theta = 90^\circ$

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2. What is cycotron? With the help of a labelled diagram explain construction, working

and theory of it. Write its one limitation.

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3. What is cycotron? With the help of a labelled diagram explain construction, working and theory of it. Write its one limitation.

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4. Explain the principle, construction and working of a cyclotron with the help of a

labelled diagram. State its two limitations.

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5. (a) An electric charge in electric field at right angle to the direction of electric field what is the nature of path followed :

(b) With the help of a labelled diagram, give the principle, construction and theory of cyclotrone.

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Numerical Problems

1. An electron (with charge $1.6 \times 10^{-19} C$) moving at right angles to a uniform magnetic field completes a circular orbit in 10^{-6} sec. Calculate the vlaue of magnetic field. Given mass of electron $= 9 \times 10^{-31} kg$.

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2. A particle carrying a charge $5\mu C$ is moving with a velocity $\overrightarrow{v} = \left(4\hat{i} + 3\hat{k}\right) ms^{-1}$ in a

magnetic field $\overrightarrow{B} = \left(3\hat{k} + 4\hat{i}\right) Wbm^{-2}$.

Calculate the force acting on the particle.

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3. A particle carrying a charge $8\mu C$ is moving with velocity $\overrightarrow{v} = \left(2\hat{j} - 3\hat{k}\right) ms^{-1}$ in a magnetic field $\overrightarrow{B} = \left(2\hat{j} - 3\hat{k}\right) wbm^{-2}$

Find the force acting on the particle.

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4. A particle carrying a charge $3\mu C$is moving with velocity $\overrightarrow{v} = \left(6\hat{j} + 2\hat{i}\right)ms^{-1}$ in a magnetic field $\overrightarrow{B} = \left(2\hat{i} + 6\hat{j}\right)wbm^{-2}$. Find the force acting on the particle.

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5. A proton enters into a magnetic field or intensity $5 \times 10^{-2}T$ with velocity 10^5m/s at an angle of 30° with the field. Calculate the

mangitude of force acting on the proton due to this field.

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6. An electron eneters a magnetic field of 5 T intensity with velocity of $5 \times 10^6 ms^{-1}$ at an angle of 30° with the field. Find the magnitude of the force acting on the electron.

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7. A particle carrying a charge $3 \cdot 2 \times 10^{-19}$C enters into a magnetic field of intensity $\sqrt{2} \times 10^{-2} T$ with velocity $10^{5} ms^{-1}$ at an angle 45° with the field. Calculate the magnitude of force acting on the particle due to the field.

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8. An ion of mass 1.8×10^{-27} kg carrying a charge $2 \times 10^{-16} C$ after being accelerated

through a potential difference of 200 V enters a uniform magnetic field of intensity $2 \times 10^{-3} T \perp r$ to the direction of motion. Calculate the radius of the path described by the ion.

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9. An ion of mass 1.8×10^{-27} kg carrying a charge $2 \times 10^{-16} C$ after being accelerated through a potential difference of 200 V enters a uniform magnetic field of intensity

$2 \times 10^{-3} T \perp r$ to the direction of motion. Calculate the radius of the path described by the ion.

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10. An ion of mass 1.8×10^{-27} kg carrying a charge $2 \times 10^{-16} C$ after being accelerated through a potential difference of 200 V enters a uniform magnetic field of intensity $2 \times 10^{-3} T \perp r$ to the direction of motion.

Calculate the radius of the path described by the ion.

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11. An ion carrying a charge $3 \cdot 2 \times 10^{-19}$ C is revolving in circular path in a magnetic field of intensity 2×10^{-4} Tesla. Calculate the frequency of revolution if the mass of ion is $7 \cdot 0 \times 10^{-27}$ kg .

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12. An ion carrying a charge $6 \cdot 4 \times 10^{-19} C$ is revolving in circular path in a magnetic field of intensity 4×10^{-4} Tesla. Calculate the frequency of revolution if the mass of ion is $2 \cdot 8 \times 10^{-26}$ kg.

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13. An ion of mass $2 \cdot 8 \times 10^{-26}$ kg carrying a charge of $3 \cdot 2x10^{-19}$ C is revolving in a circular path in a magnetic field of intensity

8×10^{-4} Tesla. Calculate thr frequency of revolution.

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14. Find the flux density of the magnetic field to cause $62.5eV$ electron to move in a circular path of radius 5 cm. Given $m = 9.1 \times 10^{-31}kg, e = 1.6 \times 10^{-19}C$

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