

8.02X Electricity and Magnetism

Practice Quiz #3b

Problem 1 (20 points) Lorentz-Force

The diagram below shows the trajectories of three charged particles moving in a uniform magnetic field of strength B . The field points into the plane of the paper. The particles are moving in the plane of the paper. The direction in which each particle is moving is shown by the arrows.

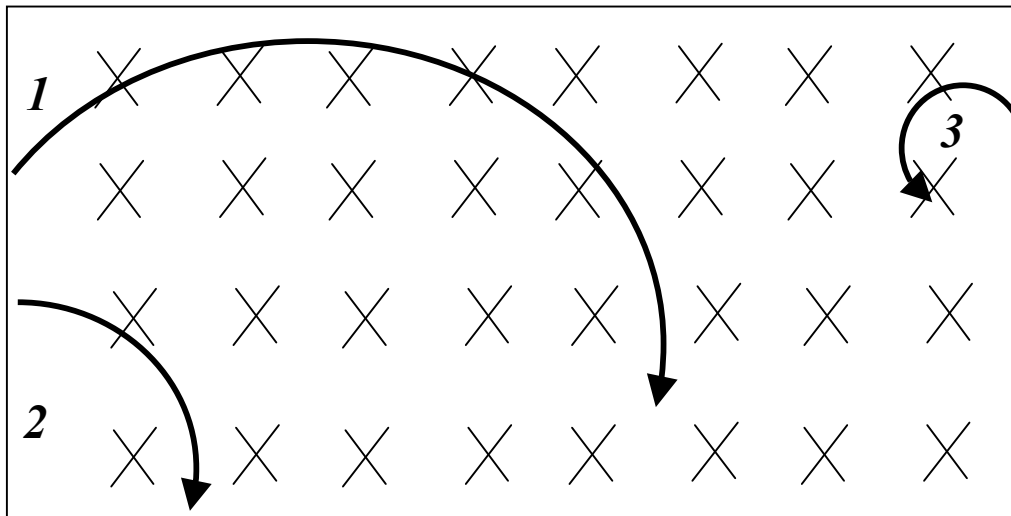
- (a) For each particle, find if the charge is positive or negative ($Q > 0$ or $Q < 0$).

Q1:

Q2:

Q3:

- (b) Assume all particles have the same momentum. Which particle has the greatest magnitude of charge $|Q|$? Explain your answer in a few sentences.



Problem 2 (20 points) Lorentz-Force

The diagram below shows the trajectories of three charged particles moving in a uniform magnetic field of strength B . The field points into the plane of the paper. The particles are moving in the plane of the paper. The direction in which each particle is moving is shown by the arrows.

- (a) For each particle, find if the charge is positive or negative ($Q > 0$ or $Q < 0$).

Q1: < 0

Q2: < 0

Q3: > 0

- (b) Assume all particles have the same momentum. Which particle has the greatest magnitude of charge $|Q|$? Explain your answer in a few sentences.

$$\text{Magnetic force} = qvB = \frac{mv^2}{R}$$

The greater charge has a smaller bending radius.

$|Q_3|$ is the greatest

