Physics 3306

Provides an introduction to a wide variety of topics in classical (pre-quantum) physics as a bridge to prepare students for subsequent upper-level courses in physics. The topics covered include thermodynamics, fluid mechanics, mechanical waves, optics, radiation, electromagnetic phenomena, atoms, and laboratory techniques. Prerequisites: C- or better in PHYS 1106; and in PHYS 1304 or PHYS 1308.

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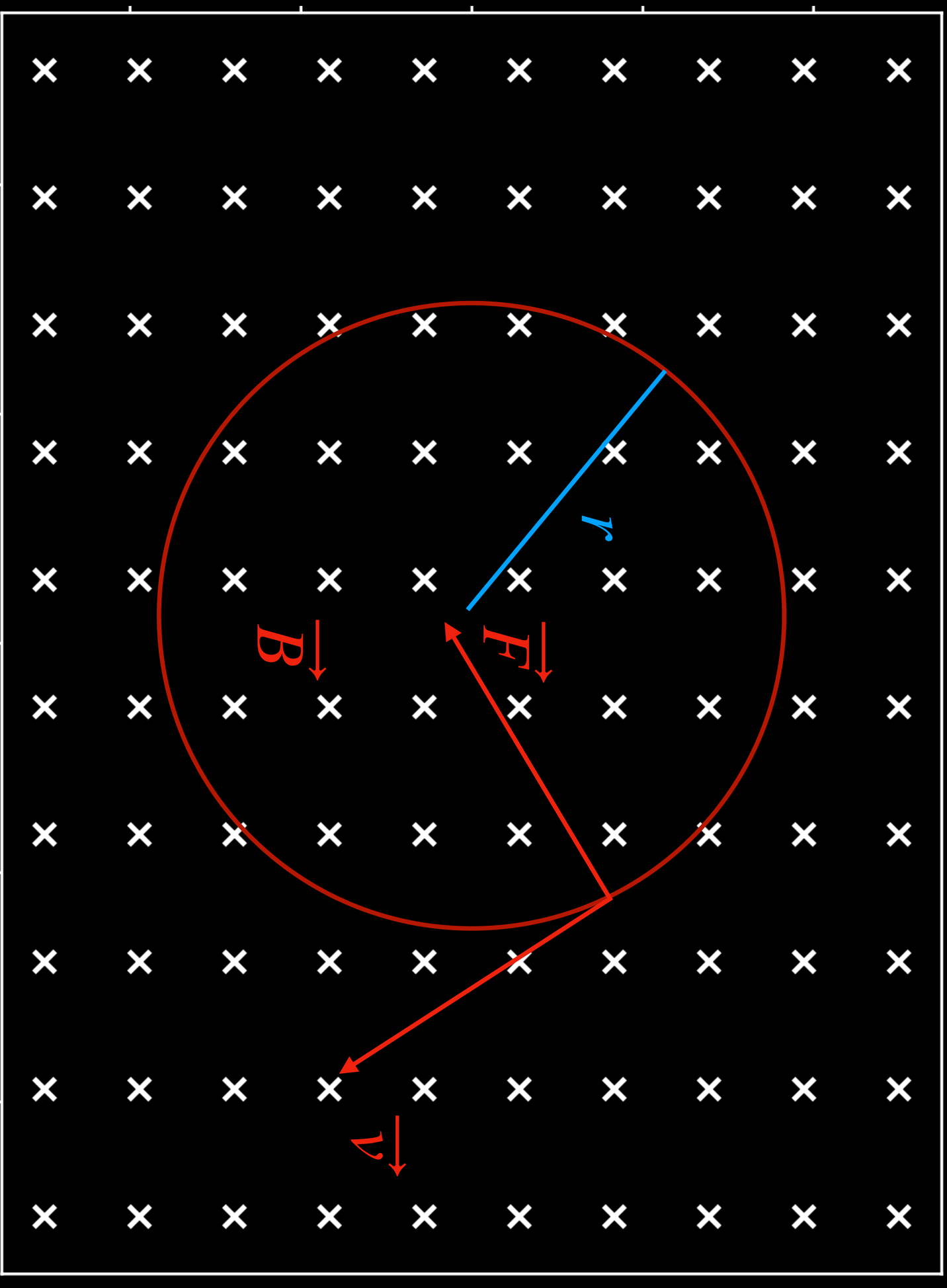
April 2nd, 2025

An electron moving with velocity v in a direction perpendicularly to a uniform magnetic field



An electron moving with velocity v in a direction perpendicularly to a uniform magnetic field

- An electron moving with velocity v in a direction perpendicularly to a uniform magnetic field B experiences a Lorentz Force F in a direction perpendicular to both the velocity and the magnetic filed:
  - $F = evB$, where e is the charge on an electron
- This gives rise to a centripetal force on the electron in a circular path with radius r, as given by:
  - $F = \frac{mv^2}{r}$, where m is the mass of the electron
- Now, $evB = \frac{mv^2}{r}$
- The velocity v depends on the accelerating voltage U of the electron gun, as given by:
  - $v^2 = \frac{2Ue}{m}$

An electron moving with velocity v in a direction perpendicularly to a uniform magnetic field

- Therefore, the specific charge of an electron is given by:
  - $\frac{e}{m} = \frac{2U}{B^2 r^2}$
- If we measure the radius of the circular orbit in each case for different accelerating voltages U and different magnetic fields B, then, according to the equation, the measured values can be plotted in a graph of $B^2 r^2$ versus $2U$ as a straight line through the origin, with slope $\frac{e}{m}$
- The magnetic field is given by: $B = \frac{\left(\frac{4}{5}\right)^{2/3} \mu_0 N I_H}{R}$


0 3 4 5 6 7 8 9 10 11 12 13 14 17 18 19 20