

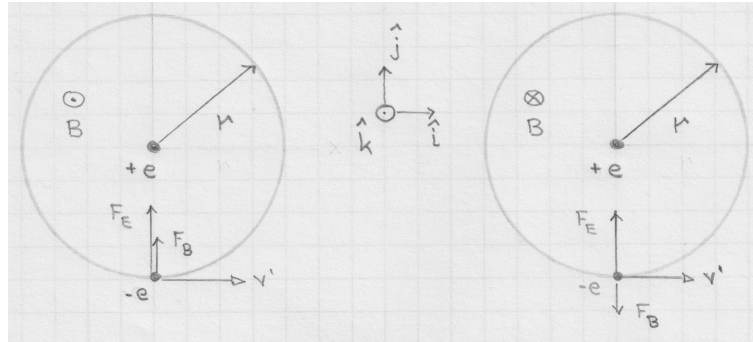
[lex121] Diamagnetic response of electron in circular orbit

Consider an electron in circular motion around a stationary proton under the influence of the Coulomb attraction as shown. Effects of radiation are ignored for argument's sake. Turning on a magnetic field perpendicular to the plane of the orbit has the effect of changing the orbital magnetic moment of the electron.

Show that the radius of the electron remains the same, but that its speed either increases or decreases in such a way that the change of orbital magnetic moment is

$$\delta\mu_{\text{orb}} \hat{\mathbf{k}} = \mp \frac{e^2 r^2 B}{4m_e} \hat{\mathbf{k}},$$

with the direction producing a negative feedback in accordance with Lenz's rule.



Solution: