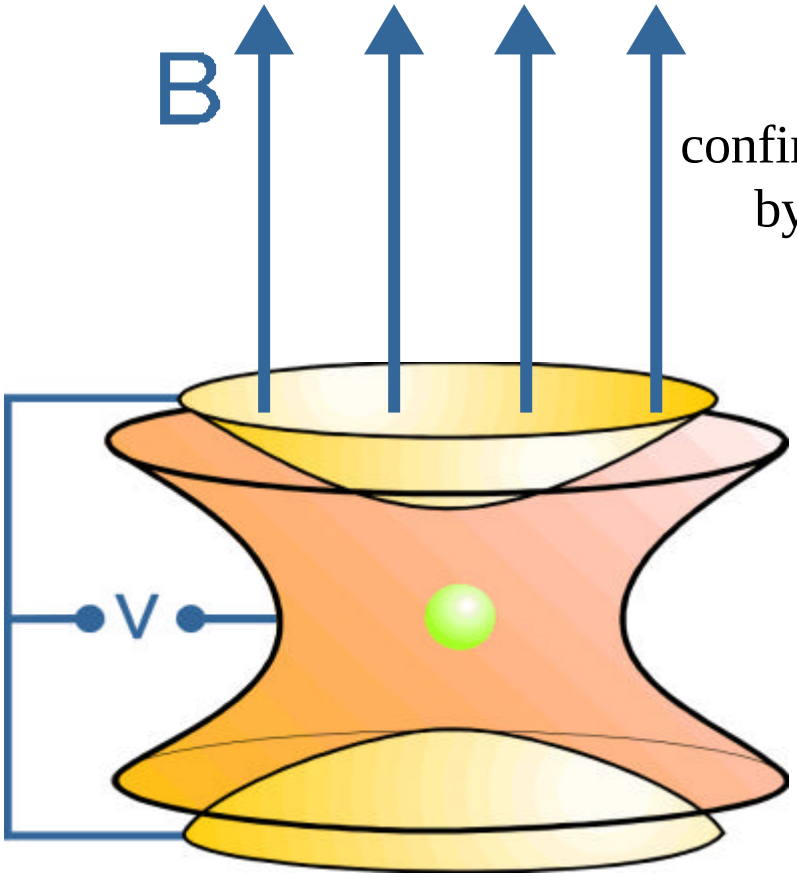
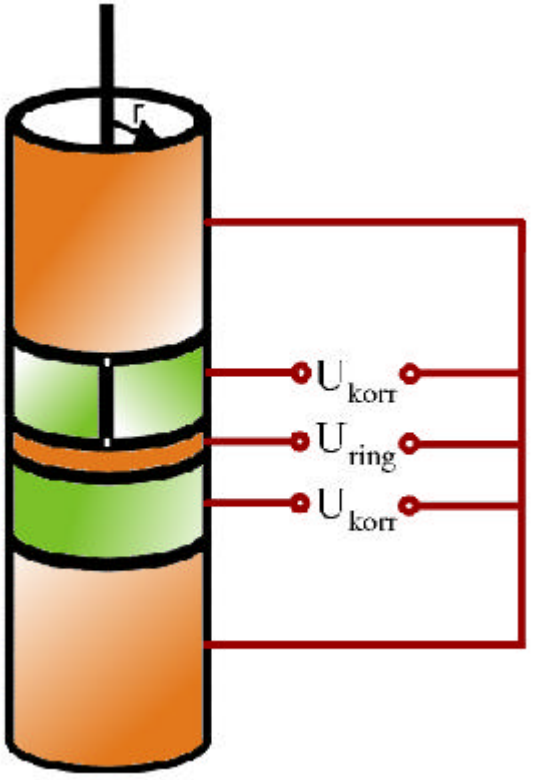
Atomic Mass of the Electron: Principle of the Penning Trap



confinement in radial direction
by strong homogeneous
magnetic field



confinement in axial directi
by electrostatic field

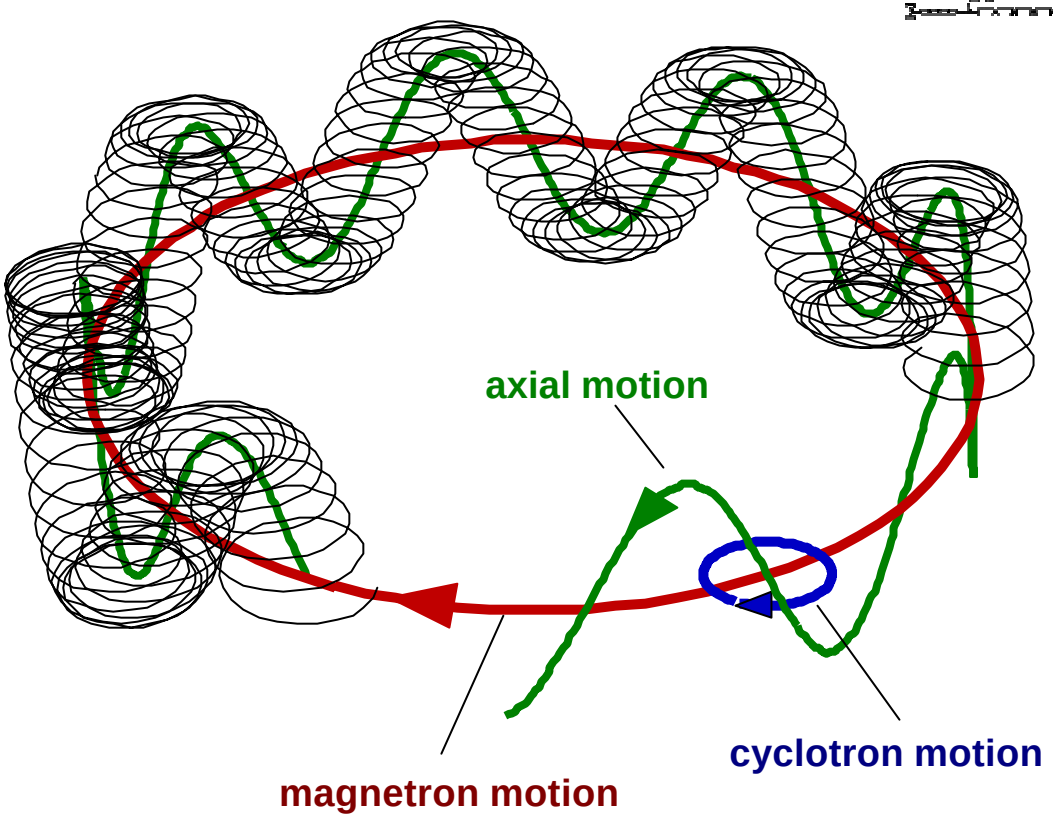
Particle Motion in the PenningTrap

axial motion:
oscillation in E-field

$$w_z = \sqrt{\frac{qV_0}{md^2}}$$

magnetron motion:
E x B drift, w_-

cyclotron motion w_+



$$w_c^2 = w_+^2 + w_z^2 + w_-^2 = \left(\frac{q}{m}B\right)^2$$