A cyclotron consists of a flat, cylindrical vacuum chamber between the poles of an electromagnet, which generates a field in the z-direction. The chamber is divided into two D-shaped halves, between which a high-frequency voltage is applied. The positive ions emitted by the ion source in the gap between the chambers in the center of the setup are accelerated toward the negative chamber half. Since there is no electric field inside the chamber halves with metallic walls, in this magnetic field the ions describe a semicircle in the x-y plane whose radius is determined by the Lorentz force acting as a centripetal force and whose orbital period is independent of the radius. If the high frequency is chosen exactly such that the ions always arrive at the gap at a time when the correct polarity of the acceleration voltage is applied, their kinetic energy increases as they pass through the gap, and their velocity increases, and hence also the radius of the next semicircle. The ions therefore pass through a spiral-like path consisting of semicircles with growing radii until they reach the edge of the magnetic field where they can be extracted by an electric deflection field.