

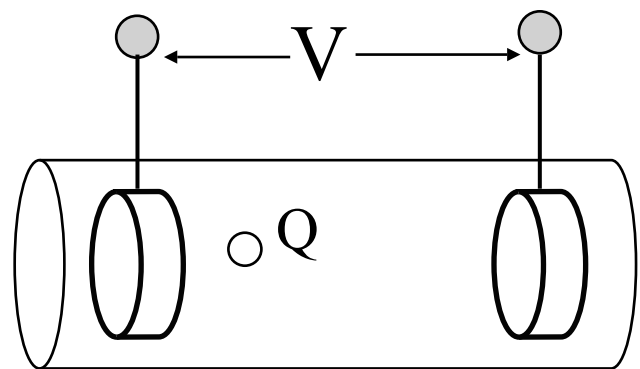
Why do we need particle accelerators?

1. Basically to get charged particles near each other and to collide them together. The particles need energy to overcome the electrostatic repulsion between like charged particles.
2. The more energy a particle has the more detail it can reveal in collisions
3. Colliding particles together with higher and higher enough energies can create much heavier particles to be studied.

Basic principle

A charged particle **accelerates** between two metal electrodes if there is a potential difference between the electrodes.

Work done on electric charge Q by the electric field gives the electric charge kinetic energy.



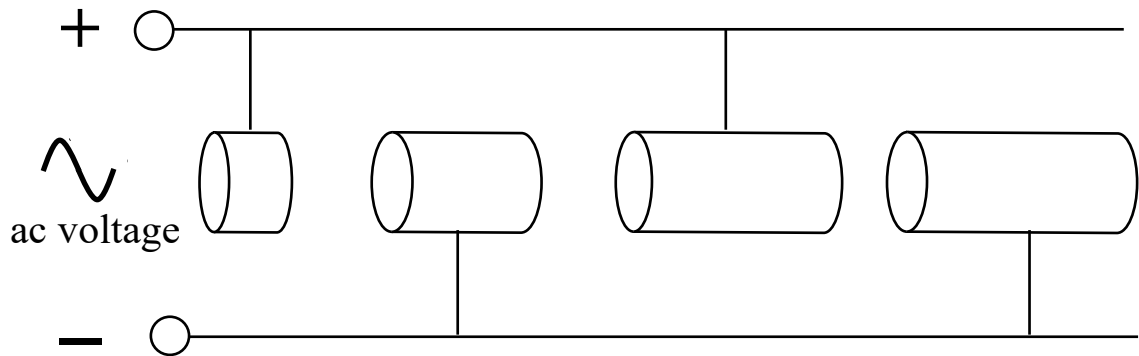
$$E_w = QV$$

$$\frac{1}{2} mv^2 = QV$$

Linear Accelerator

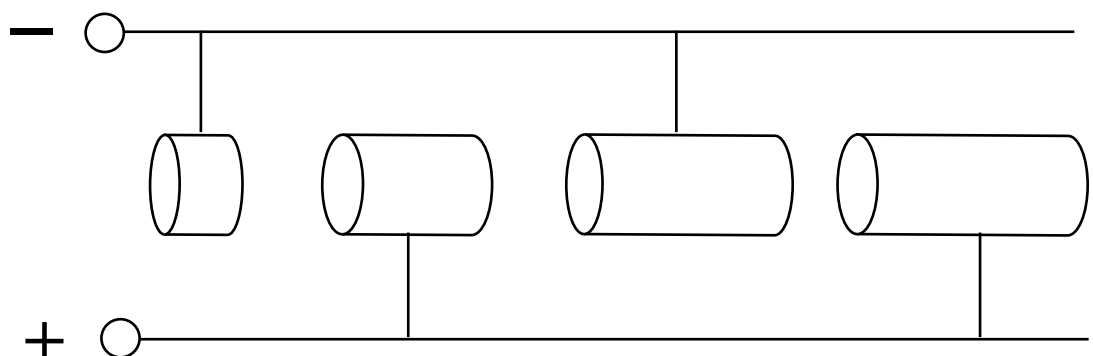
This is the simplest particle accelerator. A charged particle is accelerated through a series of electrodes. Each electrode is connected to an alternating voltage supply.

The electric field is between the electrodes.



By changing the voltage polarity the charged particle is continuously accelerated through each of the gaps.

The length of the electrodes increases because the charged particle becomes faster and the time the charged particle spends in each electrode must be the same to give the same increase in speed.



Cyclotron

A cyclotron is a machine which is designed to accelerate massively charged particles to high energy levels so that they can bombard targets

How does it work?

