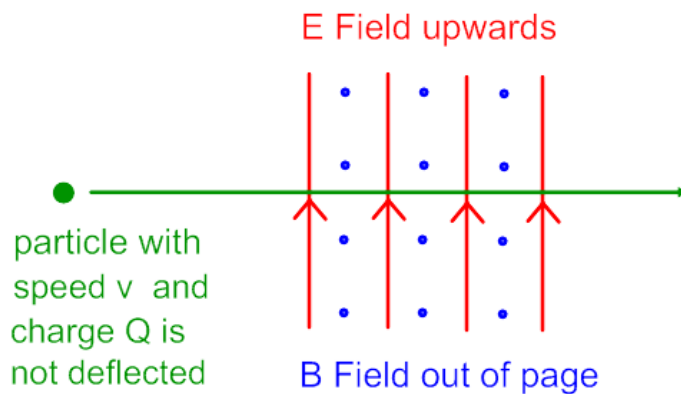


# Mass Spectrometer

- The velocity selector has an electric and magnetic field such that only particles moving at a particular velocity are not deflected.



Find an expression for this velocity,  $v$ , in terms of the electric field strength  $E$  and magnetic field strength  $B$ . Show that  $v$  does not depend on the charge,  $Q$ , of the particle.

If the  $E$  field is produced by two plates which are 1cm apart, what voltage should be applied to them to achieve a field strength of  $1000\text{NC}^{-1}$ ?

- Particles with charge  $Q$ , mass  $m$  and speed  $v$  are fired into a uniform magnetic field  $B$ .

They are deflected in a semi-circular path and hit a detector.

Derive an expression for the distance,  $d$ , between the point the particle enters the field and where it hits the detector, in terms of the quantities listed above.

