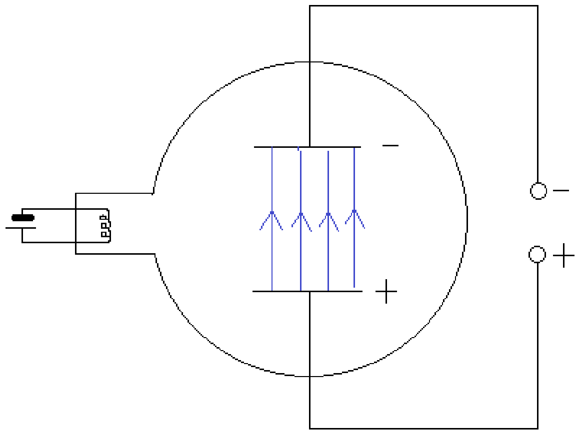
TURNING POINTS

1-2 Deflection of an electron beam

1. Diagram:



   (a) Electric field direction is from the bottom plate to top plate.
   (b) Force on an electron is in the opposite direction i.e. towards the bottom plate
   (c) Acceleration is in the same direction as the force i.e. towards the bottom plate

2. The field acts downwards therefore the force on the electron is upwards as the force is applied and the electron accelerates in this direction (F=ma). It therefore curves upwards with an increasing speed.
   (As the force is constant in magnitude and direction the beam curves in a parabolic path).

3. The field is perpendicular to the direction of motion of the charged beam of electrons. The electrons experience a force (direction given by Fleming's LH rule, remembering that the flow of electrons is in the opposite direction to that of conventional current). This force is perpendicular to both their motion and the field. As the force is not in the direction of the motion the electron's speed is not increased although their direction of travel is changed. A perpendicular force that alters the direction but does not change the linear velocity and produces acceleration means the beam moves in a circle.

4. $v = 2.8 \times 10^{7}$ ms^{-1}, $B = 3.2 \times 10^{-3}$ T

   The beam is not deflected so $F_{magnetic} = F_{electric}$

$$Bev = eE$$
$$Bv = E$$

   $E = 3.2 \times 10^{-3} \times = 2.8 \times 10^{7} = 8.96 \times 10^{4}$ Vm^{-1} $= 9.0 \times 10^{4}$ Vm^{-1} to 2 sf