An ion source is producing fully stripped C\(^{6+}\) ions which have a mass of 2.0 \(\times\) 10\(^{-26}\) kg. The ions are accelerated by a potential difference of 240 kV and pass horizontally into a region in which there is a uniform horizontal magnetic field pointing into the page of magnitude 40 mT. (a) What is the radius of the resulting motion? (b) Will the ions go clockwise or counterclockwise? (charge of a proton is 1.6 \(\times\) 10\(^{19}\) C)

\[
\frac{1}{2} m v^2 = qV
\]

\[
v = \left[ \frac{2qV}{m} \right]^{\frac{1}{2}}
\]

\[
R = \frac{mv}{qB} = \frac{m}{qB} \left[ \frac{2qV}{m} \right]^{\frac{1}{2}} = \frac{1}{B} \left[ \frac{2mV}{q} \right]^{\frac{1}{2}}
\]

\[
= \frac{1}{40 \times 10^{-3}} \left[ \frac{2 \left(2 \times 10^{-26}\right) \left(240 \times 10^3\right)}{6 \times 1.6 \times 10^{-19}} \right]^{\frac{1}{2}}
\]

\[
= 2.5 \text{ m}
\]