A proton with energy 1 MeV move perpendicular to the earth B field of 0.5 gauss or 0.00005T find radius & frequency of orbit?

Solution:

$E = \frac{mv^2}{2} \rightarrow v = \sqrt{\frac{2E}{m}}$ – non-relativistic case, as energy is much less that mass of the proton.

According to 2ⁿᵈ Newtons law: $F = ma \rightarrow qBv = \frac{mv^2}{r} \rightarrow r = \frac{mv}{qB} = \frac{m}{qB}\sqrt{\frac{2E}{m}} = \frac{\sqrt{2mE}}{qB}$

$r = \frac{\sqrt{2*1.67*10^{-27}*1.6*10^{-13}}}{1.6*10^{-19}*5*10^{-5}} = 2.9 * 10^3 m$ – radius of the orbit

$\vartheta = \frac{\omega}{2\pi} = \frac{v}{2\pi r} = \frac{1}{r}\sqrt{\frac{E}{2m}} = \frac{1}{2.9*10^3}\sqrt{1.6 * \frac{10^{-13}}{2*1.67*10^{-27}}} = 2.4 * 10^2 \, Hz$ - frequency

Answer:
$2.9 * 10^3 m, 2.4 * 10^2 \, Hz$