1. An electron in the beam of a TV picture tube is accelerated from rest by a potential difference of 30,000 V. Then it travels 20 cm to the screen. Suppose in this region there is a transverse magnetic field of the Earth, 5.0 x 10^{-5} T. Thus an electron moves in a circular arc.

1. (11) Find the radius of the circular arc and indicate the direction of revolution.

2. (12) What should be the direction and the magnitude of the electric field if the electron is to pass through this region undeflected?

\[
\frac{1}{2} m v^2 = e \Delta V
\]

\[
v = \sqrt{\frac{2 e \Delta V}{m}} = \sqrt{\frac{2 \times 1.6 \times 10^{-19} \times 3.10^4}{9 \times 10^{-31}}} = 103.10^{-5} m/s
\]

\[
R = \frac{mv}{eB} = \frac{9 \times 10^{-31} \times 10.0 \times 10^{-4}}{1.6 \times 10^{-19} \times 5 \times 10^{-5}} = 113.6 m
\]

\[
x = \frac{1}{2} R = \frac{1}{2} \times 113.6 = 56.8 m
\]

or neglecting by change of \( F_n \) (since 20 cm << 11.3 m),

\[
y = \frac{q v B t}{m} = \frac{9 \times 10^{-31} \times 0.03 \times 10^{-4} \times 0.5 \times 10^{-5}}{2 \times 3.10 \times 10^{-15}} = 1.7 m
\]

3. \( E \downarrow \) down

\[
F_n = - F_n
\]

\[
E = \nu B = 1.0 \times 10^{-4} \times 5 \times 10^{-5} = 5.15 \times 10^{-5} V/m
\]