

30. (a) Find the speed  $v$  of the electron from  $r = m_e v / eB$ :  $v = rBe / m_e$ . Thus

$$\begin{aligned} K_{\max} &= \frac{1}{2} m_e v^2 = \frac{1}{2} m_e \left( \frac{rBe}{m_e} \right)^2 = \frac{(rB)^2 e^2}{2m_e} \\ &= \frac{(1.88 \times 10^{-4} \text{ T} \cdot \text{m})^2 (1.60 \times 10^{-19} \text{ C})^2}{2(9.11 \times 10^{-31} \text{ kg})(1.60 \times 10^{-19} \text{ J/eV})} \\ &= 3.10 \text{ keV} . \end{aligned}$$

- (b) Using the result of problem 3, the work done is

$$W = E_{\text{photon}} - K_{\max} = \frac{1240 \text{ eV} \cdot \text{nm}}{71 \times 10^{-3} \text{ nm}} - 3.10 \text{ keV} = 14 \text{ keV} .$$