

1) a) given that,

$$\text{kinetic Energy } E_k = 22.5 \text{ eV}$$

$$= (22.5 \times 1.602 \times 10^{-19}) \text{ J}$$

$$= 3.6045 \times 10^{-18} \text{ J}$$

$$E_k = \frac{1}{2} m v^2$$

$$\Rightarrow 2E_k = m v^2$$

$$\Rightarrow v = \sqrt{\frac{2E_k}{m}}$$
$$= \sqrt{\frac{2 \times 3.6045 \times 10^{-18}}{9.1 \times 10^{-31}}}$$

$$= 2.81 \times 10^6 \text{ m s}^{-1}$$

here's

$$\text{mass of } e^-, m = 9.1 \times 10^{-31}$$

$$q = 1.6 \times 10^{-19} \text{ C}$$

Again,

magnetic force = centripetal force

$$\Rightarrow q B v r \sin \theta = \frac{m v^2 \sin \theta}{r}$$

$$\Rightarrow r = \frac{m(v \sin \theta)^2}{qBv \sin \theta} = \frac{mv \sin \theta}{qB \sin \theta}$$

$$= \frac{9.1 \times 10^{-31} \times (2.81 \times 10^6) \sin 70}{1.6 \times 10^{-19} \times 5 \times 10^{-4} \times \sin 70}$$

$$= \cancel{3.40 \times 10^{-2}} = 3 \times 10^{-2} \text{ m}$$

$$T = \frac{2\pi r}{v \sin \theta}$$

$$= \frac{2\pi \times 3.0 \times 10^{-2}}{2.81 \times 10^6 \sin 70}$$

$$= 7.1 \times 10^{-8} \text{ sec}$$

b) hence,

$$\begin{aligned}V' &= V \cos \theta \\&= 2.81 \times 10^6 \cos 90 \\&= 9.61 \times 10^5 \text{ ms}^{-1}\end{aligned}$$

$$\begin{aligned}P &= V'T \\&= 9.61 \times 10^5 \times 7.1 \times 10^{-8} \\&= 6.82 \times 10^{-2}\end{aligned}$$

c) From "a" \rightarrow

$$V = 2.81 \times 10^6 \text{ ms}^{-1}$$

magnetic force = Centripetal Force

$$\Rightarrow qvB \sin \theta = \frac{mv^2 \sin \theta}{r}$$

$$\Rightarrow r = \frac{mv \sin \theta}{qB}$$

$$= \frac{9.1 \times 10^{-31} \times (2.81 \times 10^6) \sin 90^\circ}{1.6 \times 10^{-19} \times 5 \times 10^{-4}}$$

$$= 0.03185 \text{ m}$$

$$\begin{aligned} &= V'' = V \cos \theta \\ &= 2.81 \times 10^6 \cos 90 \\ &= 0 \end{aligned}$$

$$\begin{aligned} P &= V'' T \\ &= 0 \times T \\ &= 0 \end{aligned}$$