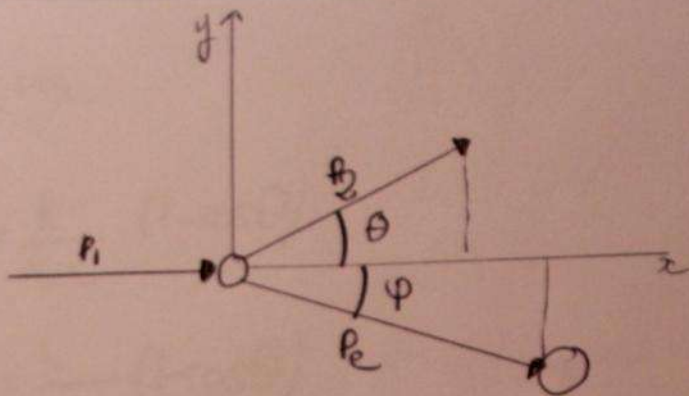


1A12

1/



$$E_{\text{initial}} = E_{\text{final}}$$

$$p_1 = p_2 + p_e$$

$$\begin{cases} p_{1x} = p_{2x} + p_{ex} \\ p_{1y} = p_{2y} + p_{ey} \end{cases}$$

$$\Leftrightarrow \begin{cases} p_1 = \cos(\theta) \cdot p_2 + \cos(\varphi) p_e \\ 0 = \sin(\theta) p_2 - \sin(\varphi) p_e \end{cases}$$

$$2) \begin{cases} \cos(\varphi) = \frac{p_1 - p_2 \cos(\theta)}{p_e} \\ \sin(\varphi) = \frac{p_2 \sin(\theta)}{p_e} \end{cases}$$

$$\text{or } \sin^2(\varphi) + \cos^2(\varphi) = 1$$

$$\text{dunc } \left(\frac{p_2 \sin(\theta)}{p_e} \right)^2 + \left(\frac{p_1 - p_2 \cos(\theta)}{p_e} \right)^2 = 1$$

$$p_2^2 \sin^2(\theta) + p_1^2 + p_2^2 \cos^2(\theta) - 2p_1 p_2 \cos(\theta) = p_e^2$$

$$p_1^2 + p_2^2 - 2p_1 p_2 \cos(\theta) = p_e^2 \quad \text{or } p_1 = \frac{h v_1}{c} \quad p_2 = \frac{h v_2}{c}$$

$$\frac{h^2 v_1^2}{c^2} + \frac{h^2 v_2^2}{c^2} - 2 \frac{h^2 v_1 v_2}{c^2} \cos(\theta) = p_e^2$$

$$h^2 (v_1^2 + v_2^2) - 2 h v_1 v_2 \cos(\theta) = p_e^2 c^2$$

(4)

3/ on suppose $v_1 = v_2$

$$\Delta\lambda = \lambda - \lambda' = \frac{h}{m_e c} \cdot (1 - \cos\theta)$$

$$\frac{c}{v_1} - \frac{c}{v_2} = \frac{h}{m_e c} (1 - \cos\theta)$$

$$\frac{c(v_2 - v_1)}{v_1 v_2} = \frac{h}{m_e c} (1 - \cos\theta)$$

$$v_2 - v_1 = \frac{(v_1 v_2) h (1 - \cos\theta)}{m_e c^2}$$

 $v_1 = v_2$

$$\Delta v = \frac{v_1 h (\cos\theta - 1)}{m_e c^2} \quad \text{car } v_1 \approx v_2.$$

4) Δv (pour $\theta = 90^\circ$)

$$\Delta v = \frac{v_1 h (\cos 90^\circ - 1)}{m_e c^2}$$

$$\Delta v = \frac{h (-1)}{m_e c^2}$$

$$\Delta v = \frac{-h}{m_e \lambda_1 c} = \frac{-h v_1}{m_e c^2}$$

$$\frac{\Delta v}{v_1} = \frac{-h}{m_e c^2} \quad \text{avec } \lambda_1 = 0,1 \text{ nm}.$$