

- 3 (a) A photon of wavelength $940.0 \times 10^{-12} \text{ m}$ collides with an isolated stationary electron, as illustrated in Fig. 3.1.

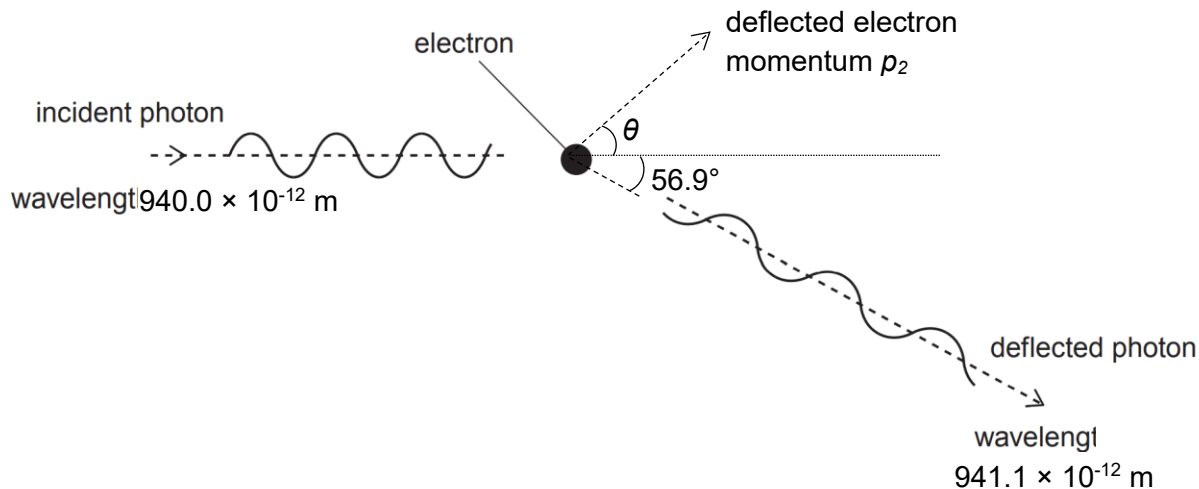


Fig. 3.1

The photon is deflected elastically by the electron.
The wavelength of the deflected photon is $941.1 \times 10^{-12} \text{ m}$.

- (i) Without making any calculations, sketch in the space below a vector triangle to show conservation of momentum. Label the triangle with the initial momentum p_1 of incident photon, the final momentum p_2 of electron, and the final momentum p_3 of the deflected photon.

[2]

- (ii) Calculate the final momentum p_3 of the deflected photon.

$$p_3 = \dots\dots\dots \text{ N s [1]}$$

(iii) Calculate the kinetic energy of the deflected electron.

$$\text{kinetic energy} = \dots\dots\dots \text{ J [2]}$$

(iv) Using your answer in **(a)(i)**, or otherwise, determine p_2 and θ .

$$p_2 = \dots\dots\dots \text{ N s}$$

$$\theta = \dots\dots\dots ^\circ \text{ [3]}$$

