5 **(a)** State what is meant by a *photon*.

.....

.....[1]

(b) An X-ray photon of wavelength 965.0×10^{-12} m collides elastically with a stationary electron, as illustrated in Fig. 5.1.

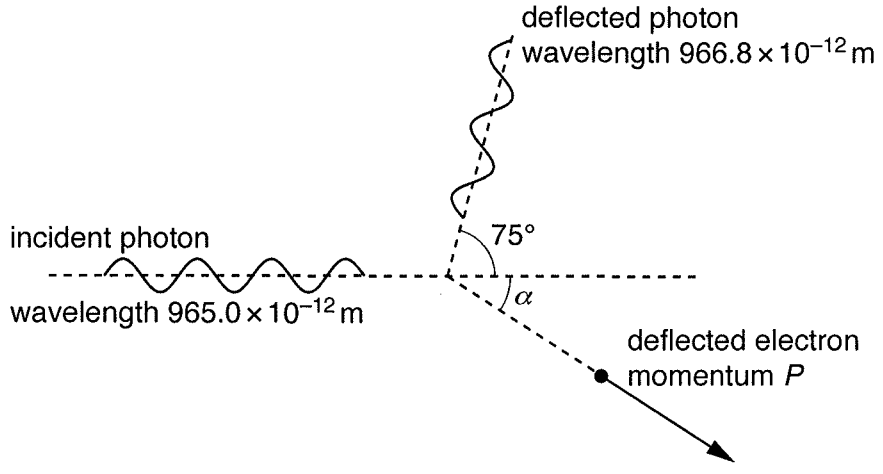

Fig. 5.1

The photon is deflected through an angle of 75° and has a wavelength of 966.8×10^{-12} m. The electron is deflected through angle α.

(i) Calculate the change in energy of the photon as it is deflected.

energy change = ... J [2]

(ii) Use conservation of energy to show that the momentum P of the deflected electron is 8.36×10^{-25} N s.

[2]

(c) Momentum is a vector quantity. By taking components of momentum at right-angles to the direction of the incident photon, calculate the angle α of deflection of the electron as shown in Fig. 5.1.
Explain your working.

angle α = ... ° [5]