

- 11 (a) State what is meant by a *photon*.

.....
..... [1]

- (b) Indium-123 ($^{123}_{49}\text{In}$) is radioactive.

A nucleus of indium-123 emits a γ -ray photon of energy 1.1 MeV.

Determine, for this γ -radiation,

- (i) the frequency,

frequency = Hz [2]

- (ii) the momentum of a photon.

momentum = N s [2]

- (c) The indium-123 nucleus is stationary before emission of the γ -ray photon.

Use your answer in (b)(ii) to estimate the recoil speed of the nucleus after emission of the photon.

speed = m s^{-1} [2]

[Total: 7]