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

....

....

.... [2]

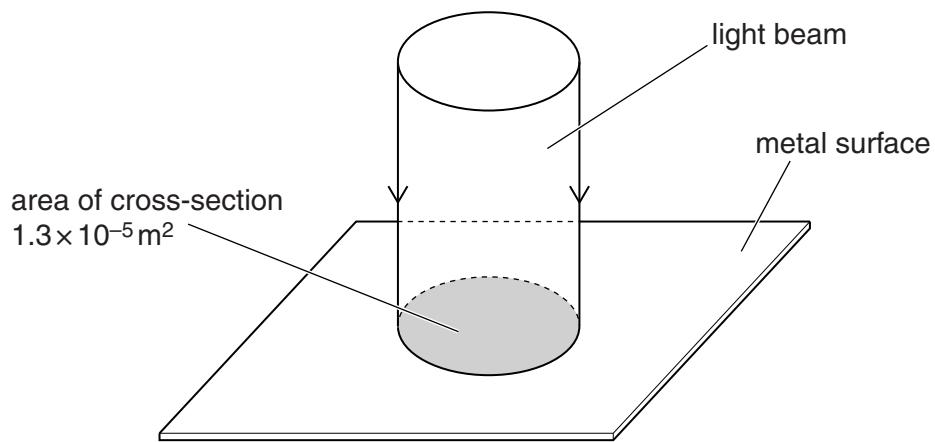**(b)** A beam of light is incident normally on a metal surface, as illustrated in Fig. 8.1.

Fig. 8.1

The beam of light has cross-sectional area $1.3 \times 10^{-5}\,m^2$ and power $2.7 \times 10^{-3}\,W$.
The light has wavelength $570\,nm$.

The light energy is absorbed by the metal and no light is reflected.

(i) Show that a photon of this light has an energy of $3.5 \times 10^{-19}\,J$.

[1]

(ii) Calculate, for a time of 1.0 s,

1. the number of photons incident on the surface,

number = ... [2]

2. the change in momentum of the photons.

change in momentum = ...kg m s^{-1} [3]

(c) Use your answer in **(b)(ii)** to calculate the pressure that the light exerts on the metal surface.

pressure = ... Pa [2]