11 (a) State **three** pieces of evidence provided by the photoelectric effect for a particulate nature of electromagnetic radiation.

1. .....

.....

2. .....

.....

3. .....

.....

[3]

(b) The work function energies of some metals are shown in Fig. 11.1.

	work function energy / eV
sodium	2.4
calcium	2.9
zinc	3.6
silver	4.3

Fig. 11.1

Each metal is irradiated with electromagnetic radiation of wavelength 380 nm.

(i) Calculate the energy, in eV, of a photon of electromagnetic radiation of wavelength 380 nm.

energy = ...eV [3]

(ii) Determine which metals will give rise to the emission of photoelectrons. Explain your answer.

.....

..... [2]

(c) Photons of wavelength 380 nm are incident normally on a metal surface at a rate of $7.6 \times 10^{14}\,s^{-1}$.
All the photons are absorbed in the surface and no photoelectrons are emitted.

Calculate the force exerted on the metal surface by the incident photons.

force = ... N [3]

[Total: 11]

[Turn over