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

1. ……

……

2. ……

……

3. ……

…… [3]

(b) The work function energies of some metals are shown in Fig. 7.1.

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

Fig. 7.1

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

(i) Explain what is meant by *work function energy*.

……

…… [1]

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

energy = ...eV [2]

(iii) Determine which metal or 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 7.6×10^{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]