

14 The work functions of four metals are shown in the table.

Metal	Work function / J
potassium	3.62×10^{-19}
magnesium	5.89×10^{-19}
tungsten	7.18×10^{-19}
iron	7.41×10^{-19}

(a) State what is meant by work function.

(1)

(b) When light with a frequency of 6.32×10^{15} Hz is incident on a metal, photoelectrons are released with a maximum kinetic energy of 3.60×10^{-18} J.

Determine which of the four metals the light is incident on.

(3)



(c) Ultraviolet radiation is incident on a potassium plate. If the radiation behaved as a wave, there would be a time delay before electrons were emitted from the plate.

- (i) Calculate the time taken for a potassium atom to absorb enough energy to release an electron.

intensity of ultraviolet radiation = 38.0 mW m^{-2}

area over which a potassium atom absorbs energy = $8.10 \times 10^{-20} \text{ m}^2$

(3)

Time taken =

- (ii) In practice, electrons are emitted from the plate as soon as the ultraviolet radiation is incident on the plate.

Explain how this provides evidence for the particle nature of electromagnetic radiation.

(2)