

- 6 (a) Electromagnetic radiation is incident on a metal surface.  
)

It is observed that there is a minimum frequency of electromagnetic radiation below which emission of electrons does not occur.

This observation provides evidence for a particulate nature of electromagnetic radiation.

State **two** other observations associated with photoelectric emission that provide evidence for a particulate nature of electromagnetic radiation.

1. ....

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.....

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2. ....

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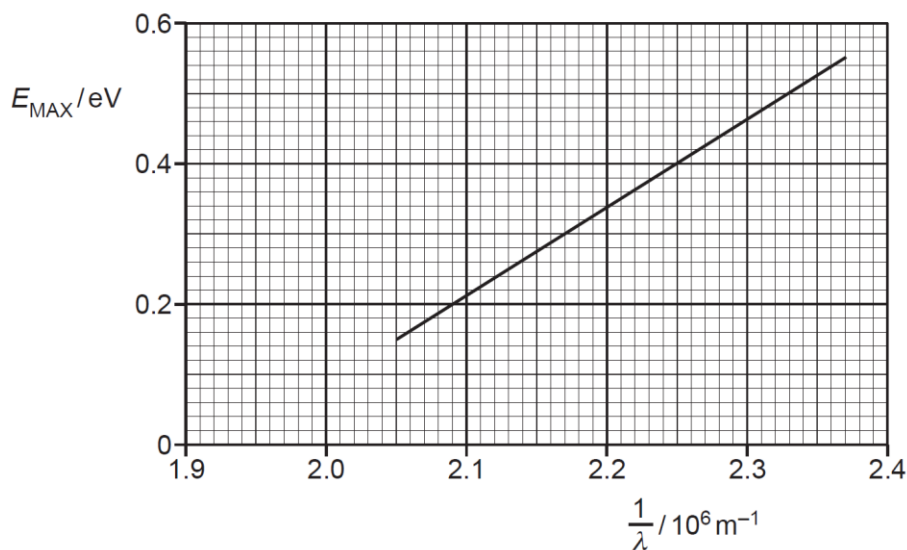
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[2]

- (b) The maximum kinetic energy  $E_{\text{MAX}}$  of electrons emitted from a metal surface is determined for different wavelengths  $\lambda$  of the electromagnetic radiation incident on the surface.

The variation with  $\frac{1}{\lambda}$  of  $E_{\text{MAX}}$  is shown in Fig. 6.1.



**Fig. 6.1**

- (i) Use Fig. 6.1 to determine the threshold frequency  $f_0$ .

$$f_0 = \dots\dots\dots \text{ Hz [2]}$$

- (ii) Use Fig. 6.1 to determine a value for the Planck constant  $h$ .

Explain your working.

$$h = \dots\dots\dots \text{ J s [4]}$$

- (c) The electromagnetic radiation is now incident on a metal with a larger work function energy than the metal in (b).

On Fig. 6.1, sketch the variation with  $\frac{1}{\lambda}$  of  $E_{\text{MAX}}$ .

[2]

[Total: 10]

### Section B

Answer **one** question from this Section in the spaces provided.