

- 10 (a)** Briefly describe two phenomena associated with the photoelectric effect that cannot be explained using a wave theory of light.

1. ....

.....

2. ....

.....

[2]

- (b)** The maximum energy  $E_{\text{MAX}}$  of electrons emitted from a metal surface when illuminated by light of wavelength  $\lambda$  is given by the expression

$$E_{\text{MAX}} = hc \left( \frac{1}{\lambda} - \frac{1}{\lambda_0} \right)$$

where  $h$  is the Planck constant and  $c$  is the speed of light.

- (i)** Identify the symbol  $\lambda_0$ .

.....[1]

- (ii) The variation with  $\frac{1}{\lambda}$  of  $E_{\text{MAX}}$  for the metal surface is shown in Fig. 10.1.

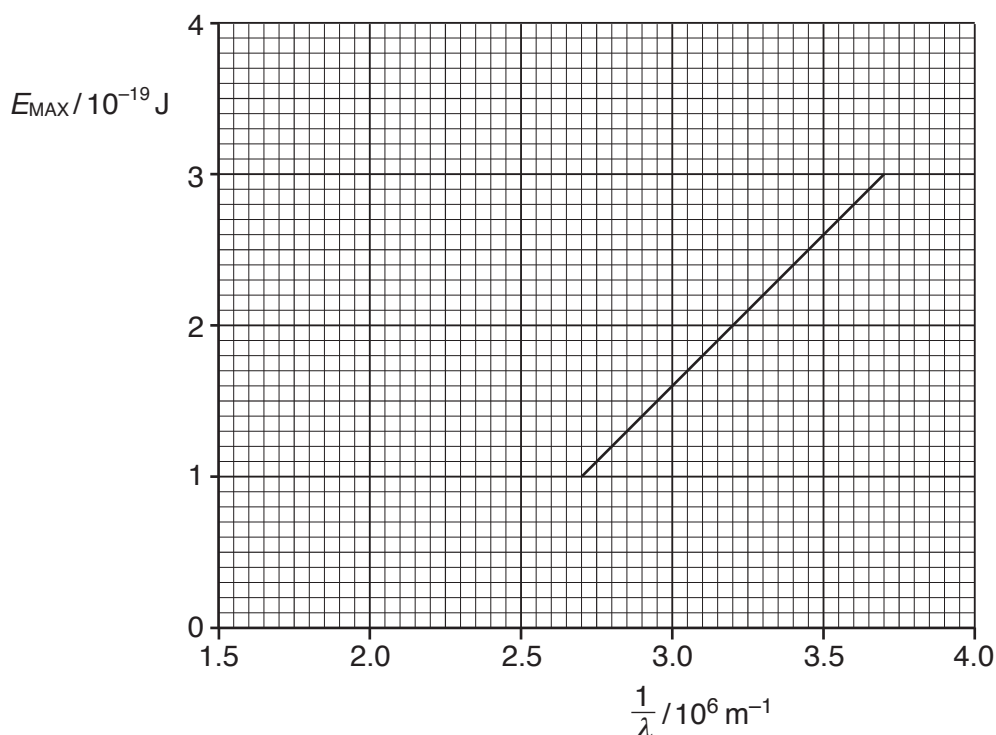


Fig. 10.1

1. Use Fig. 10.1 to determine the magnitude of  $\lambda_0$ .

$$\lambda_0 = \dots\dots\dots \text{ m [1]}$$

2. Use the gradient of Fig. 10.1 to determine a value for the Planck constant  $h$ .

$$h = \dots\dots\dots \text{ Js [3]}$$

- (c) The metal surface in (b) becomes oxidised.  
Photoelectric emission is still observed but the work function energy is increased.

On Fig. 10.1, draw a line to show the variation with  $\frac{1}{\lambda}$  of  $E_{\text{MAX}}$  for the oxidised surface. [2]

[Total: 9]