

## SECTION C

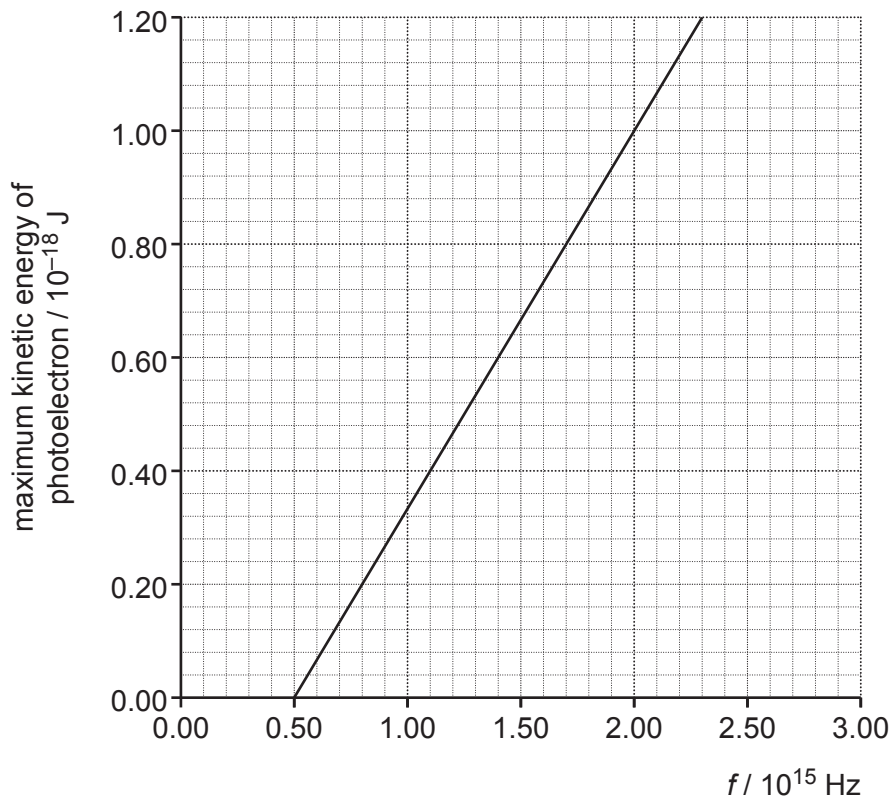
Answer **all** the questions.

This section is based on the Advance Notice article, which is an insert.

7 In 1905, Einstein explained the photoelectric effect using the equation

maximum kinetic energy of photoelectrons emitted from a surface =  $hf - \phi$

where  $h$  is the Planck constant,  $f$  is the frequency of light incident on the surface and  $\phi$  is the work function of the surface. Fig. 7.1 shows this relationship for the metal rubidium.



**Fig. 7.1**

(a) (i) Use the graph in Fig. 7.1 to find the work function of the metal.

work function = ..... J [2]

- (ii) Explain the meaning of the term *work function* and explain why Einstein's equation gives the **maximum** kinetic energy of the electrons emitted for a particular frequency of incident light (lines 14 – 17 in the Article).

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..... [2]

- (b) Add a second line to the graph of Fig. 7.1 for a metal surface with a work function which is double that of the work function for rubidium. [2]

11 An electron is travelling at a speed of  $3.1 \times 10^5 \text{ ms}^{-1}$ .

What is its kinetic energy in electronvolts?

- A  $4.4 \times 10^{-20} \text{ eV}$
- B  $8.8 \times 10^{-7} \text{ eV}$
- C  $0.27 \text{ eV}$
- D  $500 \text{ eV}$

Your answer

[1]

- 9 Electrons accelerated through a potential difference  $V$  pass through a thin layer of graphite. The beam forms a diffraction pattern of rings on a fluorescent screen. When  $V$  is made larger the diameter of the rings get smaller and they also become brighter.

Which **one** of the following statements about this experiment is correct?

- A The power delivered to the fluorescent screen decreases as  $V$  increases.
- B The diameter of the diffraction rings is independent of the interatomic spacings in graphite.
- C The wavelength of the electrons decreases as their kinetic energy increases.
- D The momentum of the electrons decreases as  $V$  increases.

Your answer

[1]

- 10 Which **one** of the following statements about photons is correct?

The probability of arrival of a photon at a position

- A is proportional to the amplitude of the waves arriving at that position.
- B is greater if the phasor amplitudes for paths from the source to that position “curl up” when they are added.
- C is proportional to the (resultant phasor amplitude)<sup>2</sup> for all photon paths from the source to that position.
- D is proportional to the phasor amplitude for the photon path straight from the source to that position.

Your answer

[1]