Oxford Cambridge and RSA

# A Level Physics A

**H556/02** Exploring physics

# Question Set 6

**1(a)** Electromagnetic radiation is incident on a negatively charged zinc plate. Electrons are emitted from the surface of the plate when a weak intensity ultraviolet source is used. Electrons are not emitted at all when an intense visible light from a lamp is used.

Explain these observations.

**[4]**

**(b)** The **maximum** wavelength of the electromagnetic radiation incident on the surface of a metal which causes electrons to be emitted is $2.9 \times 10^{-7}$ m.

Calculate the maximum kinetic energy of electrons emitted from the surface of the metal when each incident photon has energy of 5.1 eV.

maximum kinetic energy = ..... J **[3]**

**(c)** Electromagnetic radiation of constant wavelength is incident on a metal plate. Photoelectrons are emitted from the metal plate. Fig. 19.1 shows an arrangement used to determine the maximum kinetic energy of electrons emitted from a metal plate.

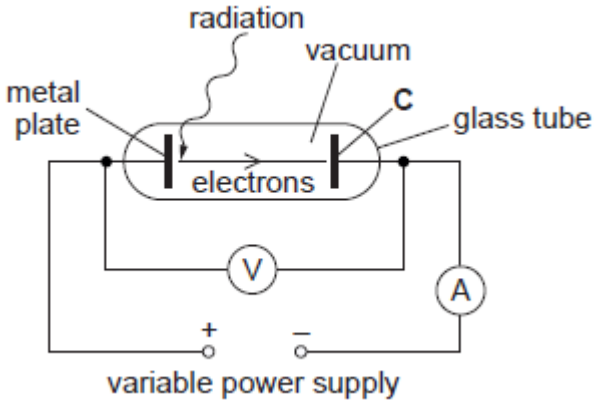


**Fig. 19.1**

The metal plate and the electrode **C** are both in a vacuum. The electrode **C** is connected to the negative terminal of the variable power supply.
Fig. 19.2 shows the variation of current $I$ in the circuit as the potential difference $V$ between the metal plate and **C** is increased from 0 V to 3.0 V.

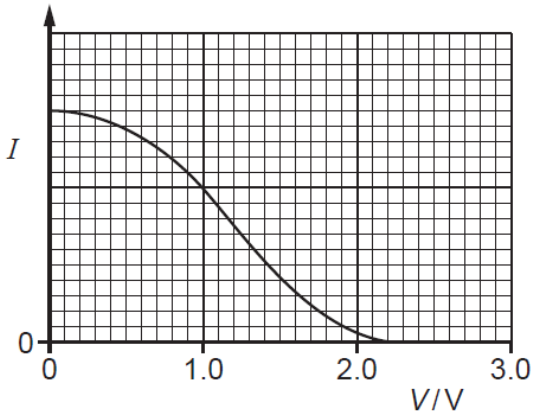


**Fig. 19.2**

Explain why the current decreases as $V$ increases and describe how you can determine the maximum kinetic energy of the emitted electrons.

**[3]**

## Total Marks for Question Set 6: 10