18 (a) In an experiment to demonstrate the photoelectric effect, ultraviolet light is incident on a metal plate.

(i) Photoelectrons are released from the plate with a maximum speed of $3.51 \times 10^5\,m\,s^{-1}$.

Calculate the energy of these photoelectrons in eV.

(3)

Energy = ... eV

(ii) The table shows typical values of work function for four different metals.

Metal	Work function / 10^{-19} J
Magnesium	5.89
Aluminium	6.53
Zinc	6.88
Iron	7.20

The ultraviolet light used in the experiment had a wavelength of 310 nm.

Deduce which of the metals was most likely to have been used as the metal plate.

(4)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(b) Photoelectrons are only emitted from a given metal surface if the frequency of the incident radiation is above a particular value.

Explain why.

(4)

(c) A student makes the following statement.

'It does not matter what the value of the work function is for a particular metal. Photoelectrons can always be released if the intensity of the incident light is high enough.'

Criticise the student's statement.

(2)

(Total for Question 18 = 13 marks)