9 For a particular metal surface, it is observed that there is a minimum frequency of light below which photoelectric emission does not occur. This observation provides evidence for a particulate nature of electromagnetic radiation.

(a) State three further observations from photoelectric emission that provide evidence for a particulate nature of electromagnetic radiation.

1. .....

.....

2. .....

.....

3. .....

..... [3]

(b) Some data for the variation with frequency f of the maximum kinetic energy E_{MAX} of electrons emitted from a metal surface are shown in Fig. 9.1.

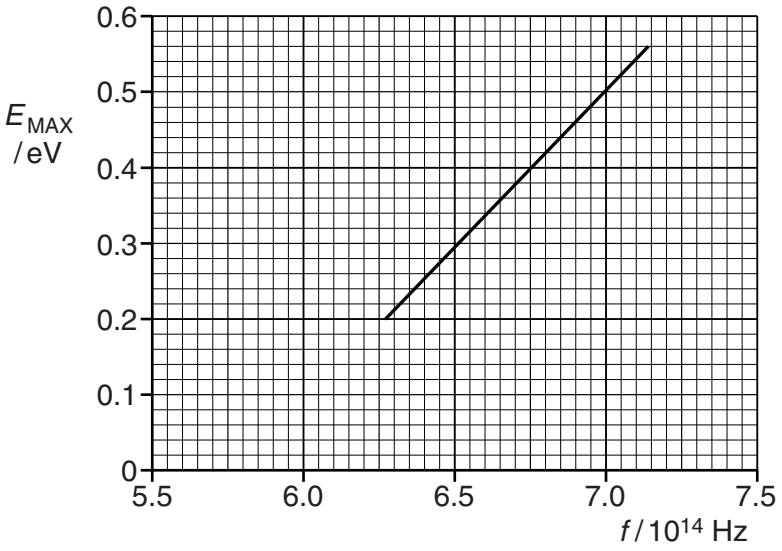

Fig. 9.1

(i) Explain why emitted electrons may have kinetic energy less than the maximum at any particular frequency.

.....

.....

..... [2]

(ii) Use Fig. 9.1 to determine

1. the threshold frequency,

threshold frequency = ... Hz [1]

2. the work function energy, in eV, of the metal surface.

work function energy = ... eV [3]