9 **(a)** State what is meant by the photoelectric effect.

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..... [2]

(b) The photoelectric effect is investigated in two stages using the circuit shown in Fig. 9.1.

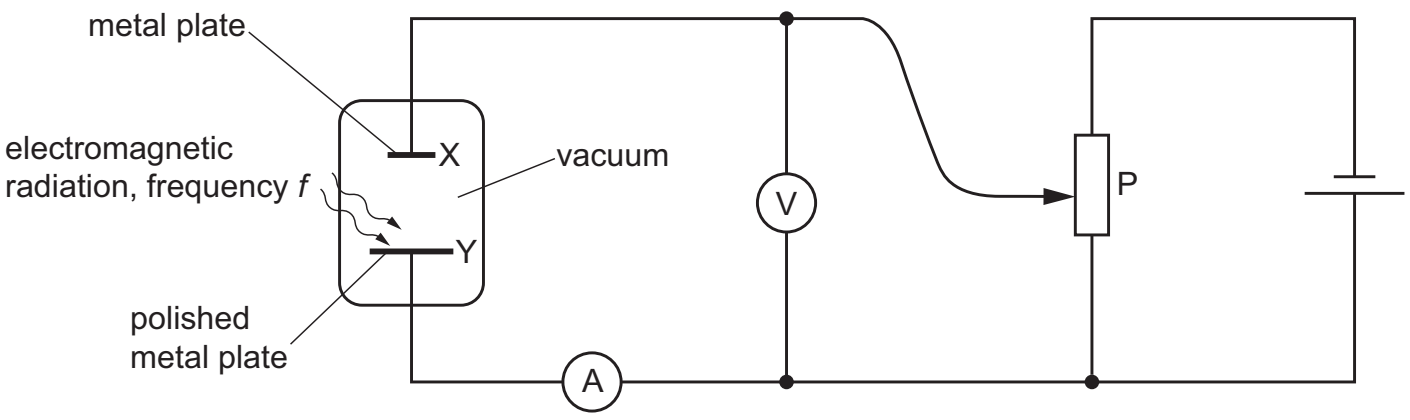

Fig. 9.1

The polished metal plate Y is illuminated with electromagnetic radiation of frequency f and constant power.

In stage 1 of the investigation, frequency f is set to a constant value of 2.5×10^{15} Hz. The current I in the ammeter is varied by adjusting the potentiometer P. Fig. 9.2 shows the variation of I with the voltmeter reading V. There is a value V_S of V at which the current just falls to zero.

In stage 2 of the investigation, stage 1 is repeated for different values of frequency. As frequency f is varied, the voltmeter reading V_S at which the current just falls to zero is measured. Fig. 9.3 shows the variation of V_S with f.

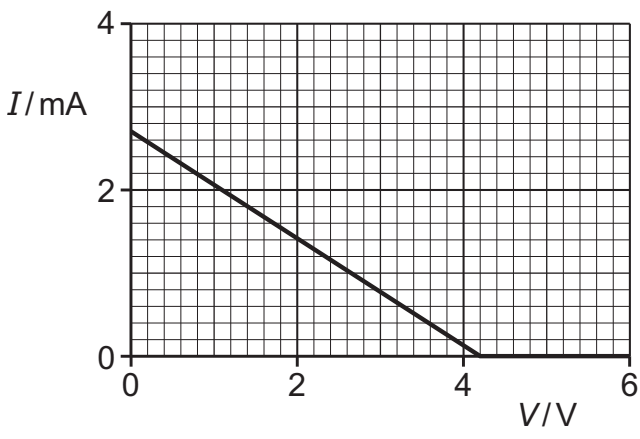

Fig. 9.2

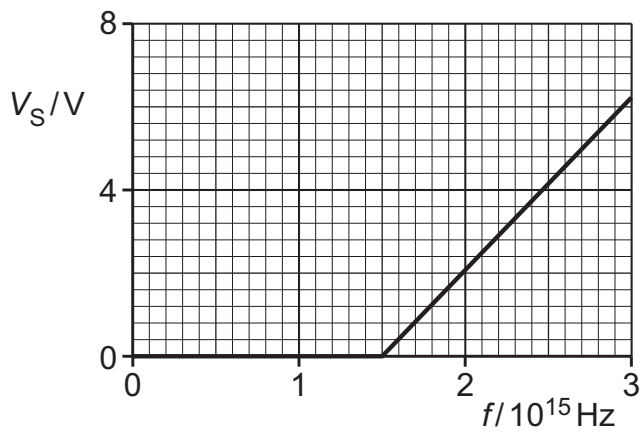

Fig. 9.3

(i) Explain, with reference to photons, why V_S depends on the frequency of the incident electromagnetic radiation.

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..... [3]

(ii) State **three** quantitative conclusions that can be drawn from the results in Fig. 9.2 and Fig. 9.3. Use the space for any working.

1 .....

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2 .....

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3 .....

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[3]

[Total: 8]