

2001 HIGHER SCHOOL CERTIFICATE EXAMINATION

Physics

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Centre Number

Section I – Part B (continued)

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Student Number

Marks

Question 24 (6 marks)

Sir William Bragg and his son Sir Lawrence Bragg shared the Nobel prize for physics in 1915 for their work on X-ray diffraction and crystal structure analysis.

- (a) Describe ONE way in which an understanding of crystal structure has impacted on science. 2

Crystal Structures has made the environment of science stronger because crystal shape is the strongest shape to stand withstand forces.

- (b) Outline the methods of X-ray diffraction used by the Braggs to determine the structure of crystals. 4

They shoot X-ray particles into the crystal to find out their crystal lattice and the structural design of that crystal. The Xray that turns information about what structure the crystal is like and to see how strong that crystal is. (tiny airpockets).

Question 25 (6 marks)

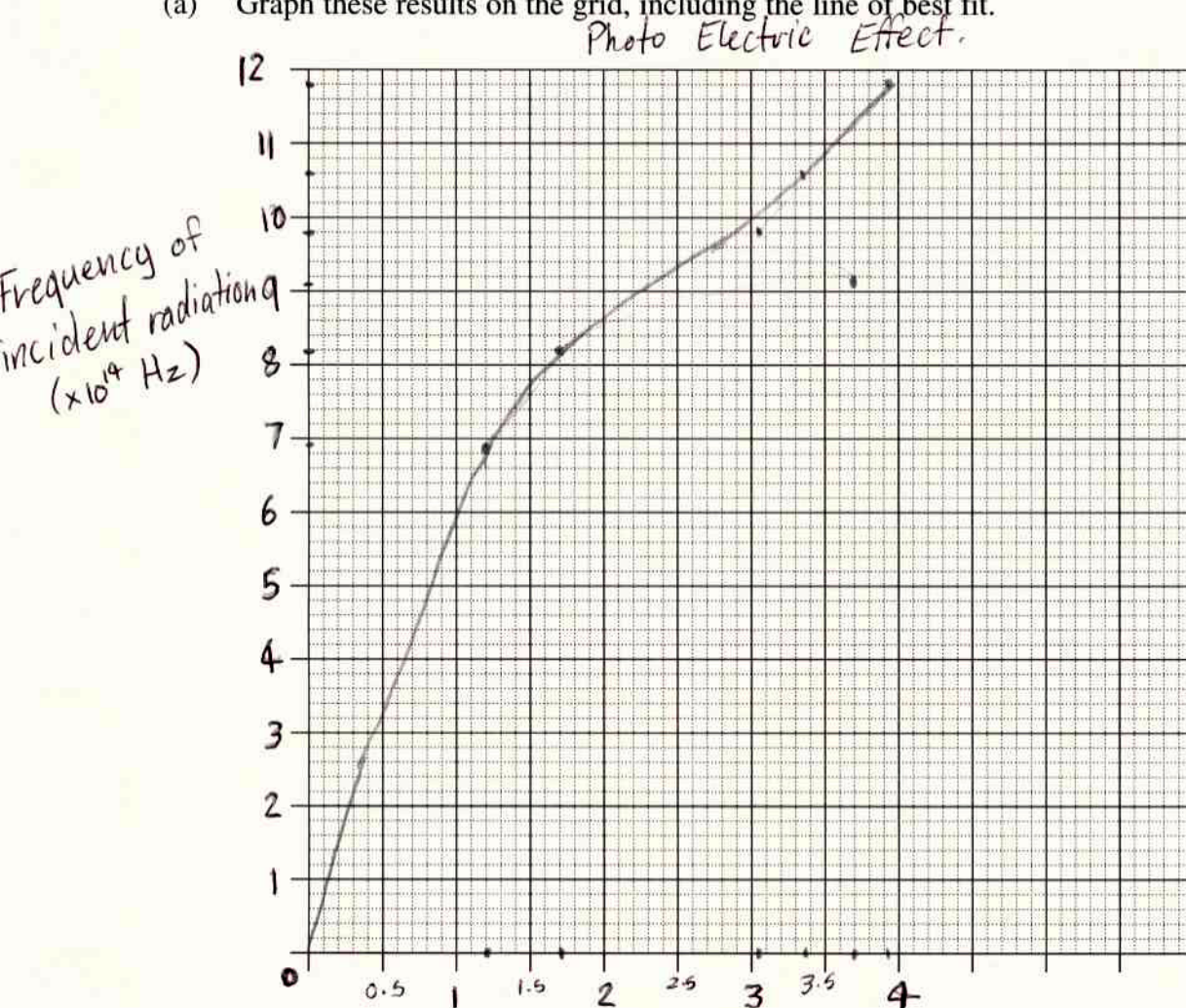
A student carried out an experiment on the photoelectric effect. The frequency of the incident radiation and the energy of the photoelectrons were both determined from measurements taken during the experiment.

The results obtained are shown in the table:

Frequency of incident radiation ($\times 10^{14}$ Hz)	Energy of photoelectrons ($\times 10^{-19}$ J)
6.9	1.22
8.2	1.70
9.1	3.70
9.9	3.05
10.6	3.38
11.8	3.91

- (a) Graph these results on the grid, including the line of best fit.

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Question 25 continues on page 23

*Energy of Photoelectrons
 - 22 - ($\times 10^{-19}$ J)*

Question 25 (continued)

(b) How could the reliability of the experiment be improved?

2

If more measurements were taken the graph would be more accurate because the point would be closer

Question 26 (8 marks)

In the context of semiconductors, explain the concept of *electrons* and *holes*.

8

The concept of electrons and holes in the context of semiconductors is that electrons are negative and the holes will add into semiconductors where the position of electrons needed. ~~low temp~~ They attracted each other. The electrons in semiconductor are negative and the holes shows positive so the holes will shows positive. The semiconductors are used widely in many machine that human required. The electrons and holes are including in semiconductors therefore, the semiconductor works ~~propably~~ properly.