

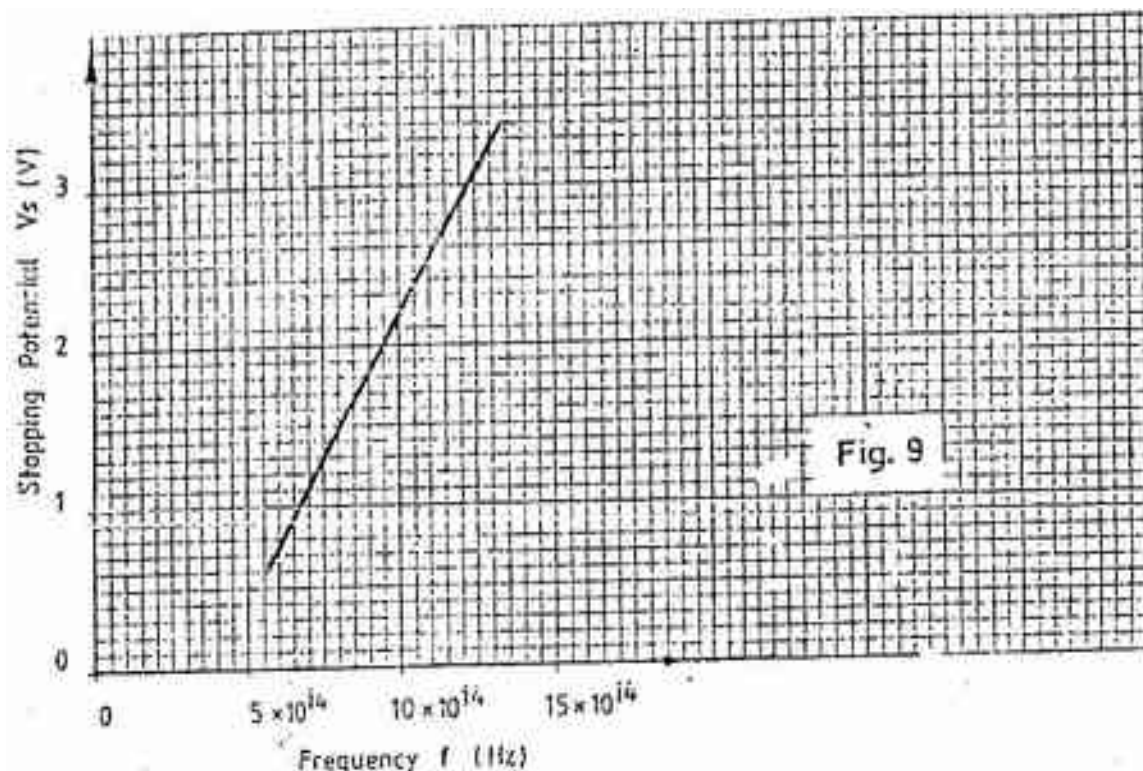
NAME  
SCHOOL

INDEX NUMBER  
DATE

## PHOTO ELECTRIC EFFECT

1. 1995 Q29 P1

In an experiment on photo- electricity using metal X, the graph shown in figure 9 was obtained. Use the graph to answer questions 2 and 3.



1. Determine the minimum frequency  $f_0$  below which no photoelectric emission occurs (2 marks)

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2. Sketch on the same axes, a graph for a metal, Y whose work function is higher than metal X (1mark)

2. 1996 Q7a,b P2

(a) Describe with the aid of a diagram an experiment set up for observing photoelectric effect

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(b) Table 2 shows the relationship between the wavelength,  $\lambda$  of a radiation falling on the surface and the energy,  $k$  of the emitted electrons

$\lambda(\text{ m}) \times 10^{-7}$	2.0	1.5	1.0	0.5
$K(\text{ J}) \times 10^{-19}$	10	13	20	40

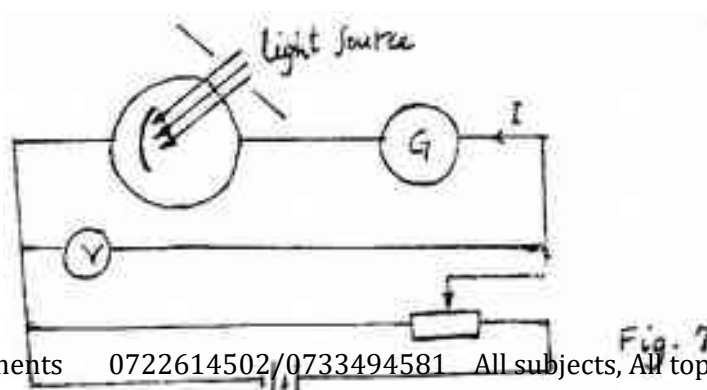
a. Plot a graph of energy  $k$  (  $y$  – axis) against the frequency,  $f$ , of the incident light

b. Determine the work function  $\Phi$  of the surface used (5 marks)  
 Speed of light,  $c = 3.00 \times 10^8 \text{ ms}^{-1}$  planks constant  $h = 6.663 \times 10^{-34} \text{ JS}$

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3. 1999 Q7 P2

a) Figure 7 shows a photoelectric cell circuit:



The intensity of the light can be varied.

- i) Describe how the circuit may be used to show how the current  $I$  varies with the potential difference  $V$  across the cell.

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- ii) Sketch on the same axis graphs of  $I$  versus  $V$  for three different values of light intensity  $E_1, E_2$  and  $E_3$  such that  $E_3 > E_2 > E_1$

**4. 2002 Q34 P1**

Light of a certain wavelength strikes the surface of a metal. State what determines the maximum kinetic energy of the electron emitted.

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**5. 2003 Q35 P1**

The work function of a certain material is 3.2 eV. Determine the threshold frequency for the material. (1 electron Volt (eV) =  $1.6 \times 10^{-19}$  J) and Planck's Constant  $h = 6.62 \times 10^{-34}$  Js)

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**6. 2004 Q34 P1**

The work function of a certain material is 3.2 eV. Determine the threshold frequency for the material. (1 electron Volt (eV) =  $1.6 \times 10^{-19}$  J) and Planck's Constant  $h = 6.62 \times 10^{-34}$  Js)

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7. 2004 Q7 P2

a) i) What is photoelectric effect? (1mark)

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ii) You are provided with the following:

a photocell, a source uv light, a rheostat, a source of e.m.f, a millimeter, a voltmeter and connecting wires.

Draw a circuit diagram to show how photoelectric effect may be demonstrated in the laboratory. (1mark)

b) In a photoelectric effect experiment, a certain surface was illuminated with radiation of different frequencies and the stopping potential determined for each frequency.

Table 2 shows the results obtained.

Table 2

Frequency, $f$ ( $\times 10^{14}$ HZ)	7.95	7.41	6.88	6.10	5.49
Stopping Potential, $V_s$ (V)	1.35	1.15	0.93	0.62	0.36

- (i) Plot the graph of the graph of stopping potential (y-axis) against frequency.
- (ii) Determine Planks Constant,  $h$ , and the work function,  $\phi$ , of the surface given that  $eV_s = hf - hf_0$  where  $e = 1.6 \times 10^{-19}$  coulomb and  $hf = \phi$   $f_0$  is the lowest frequency that can cause photoelectric effect. (5marks)

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- c) A surface whose work function  $\theta = 6.4 \times 10^{-19}$  joules is illuminated with light of frequency  $3.0 \times 10^{15}$  Hz

Find the maximum Kinetic energy of the emitted photoelectrons (Use the Value of H obtained in b(ii) (3marks)

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8. 2006 Q10,11 P2

10. What is meant by the term work function? (1 mark)

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11. If the frequency of the illuminating radiation is just equal to the threshold frequency of the surface, explain why no photoelectric effect is observed (2 marks)

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9. 2007 Q11,12 P2

11. The graph in **figure 8** shows the variation of photoelectric current with applied voltage when a surface was illuminated with light of a certain frequency. Use the information in the figure to answer questions 11 and 12.

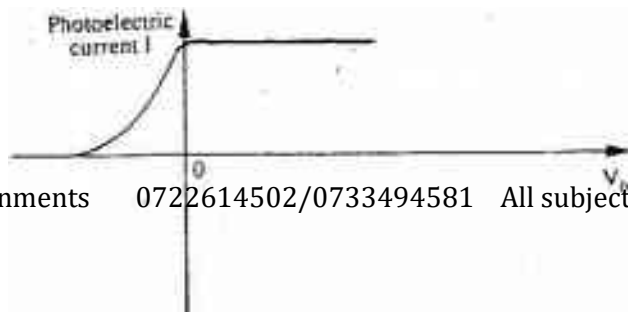


Figure 8

On the same axes, sketch the graph when light of higher intensity but same frequency is used to illuminate the surface. (1 mark)

12. Explain your answer in 11 above (1 mark)

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**10. 2009 Q18 P2**

(a) It is observed that when ultra-violet radiation is directed onto clean zinc plate connected to the cap of a negatively charged leaf electroscope, leaf falls.  
(i) explain this observation. (2marks)

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(ii) State why this observation does not occur if the electroscope is positively charged.

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(iii) Explain why the leaf of the electroscope does not fall when infra-red radiation tested onto the zinc plate (1 mark)

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(b) State the effect on the electrons emitted by the photoelectric when;  
(i) The intensity of incident radiation I increase (1mark)

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(ii) The frequency of the incident radiation is increased

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(c.)The maximum wavelength of light required to cause photoelectric emission on a metal surface is  $8.0 \times 10^{-7} \text{m}$ .The metal surface is irradiated with light of frequency  $8.5 \times 10^{14} \text{ Hz}$ .

**Determine;**

(i) the threshold frequency (2marks)

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(ii) the work function of the metal in electron volts (3marks)

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(iii)The maximum kinetic energy of the electrons. (2marks)

Take:  $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$   
Speed of light =  $3.0 \times 10^8 \text{ Js}$   
Planks constant,  $h = 6.663 \times 10^{-34} \text{ Js}$

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**11. 2011 Q14 P2**

State the meaning of the term “threshold frequency” as used in photoelectric emission (1mark)

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**12. 2012 Q18b P2**

Light of frequency  $7.5 \times 10^{14} \text{ Hz}$  strikes a metal surface whose work function is  $4.0 \times 10^{-19} \text{ J}$ . Determine the kinetic energy of the emitted photoelectrons. (take planks constant  $h = 6.63 \times 10^{-34} \text{ Js}$ ) (4marks)

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