

PHOTOELECTRIC CURRENT

KCSE QUICK REVISION

*Compilation of Possible Questions in Physics Likely to be examined in
KCSE.*

*A Special Analysis of Prediction Questions that may be Tested in KCSE from this
Topic in Form 4.*

PHYSICS

SERIES 1

For Marking Schemes

*Mr Isaboke **0746 222 000 / 0742 999 000***

MWALIMU CONSULTANCY

PHOTO ELECTRIC EFFECT

1. (a) Define the following:

- (i) Photoelectric effect
- (ii) threshold wavelength

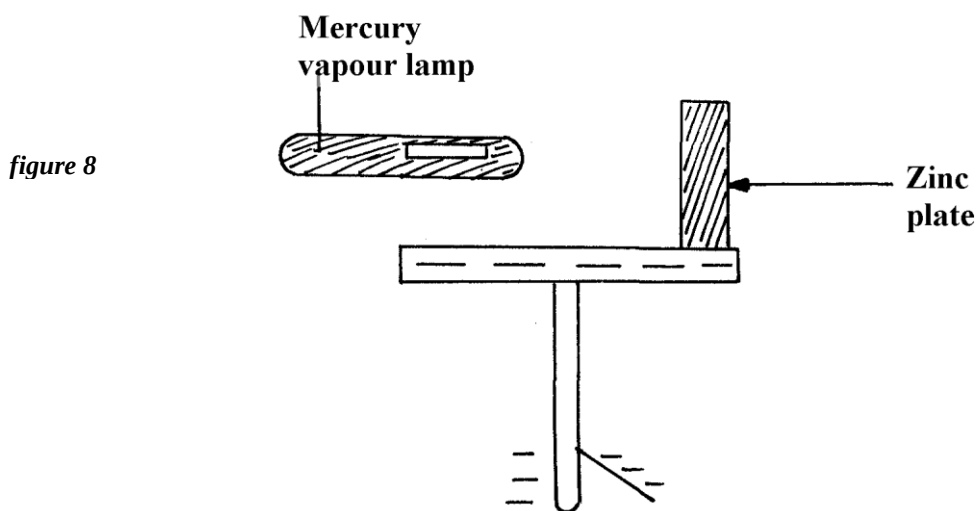
(b) The variation of frequency f with the maximum kinetic energy E_k of the emitted electrons is shown on the graph below:

Using the graph above, determine

- (i) the threshold frequency f_0 of the radiation
- (ii) the value of the Planck's constant h
- (iii) the work function, W_0

(c) On the same graph in (b) above, draw a line to show the variation of frequency, f , with the maximum kinetic energy, E_k , of the emitted electrons from a second metal which has a lower work function than used in (b)

2. **Figure 8** below shows a mercury vapour lamp, which emits ultraviolet light held over a negatively charged electroscope:



- (i) What happens to the leaf after the lamp is switched on?
- (ii) Explain why it happens

(iii) If the experiment is repeated with equally bright red light held the same distance from the plate in place of the mercury vapour lamp, what effect would this have on the leaf?

Give a reason

- (iv) What does photoelectric effect suggest about the nature of light?

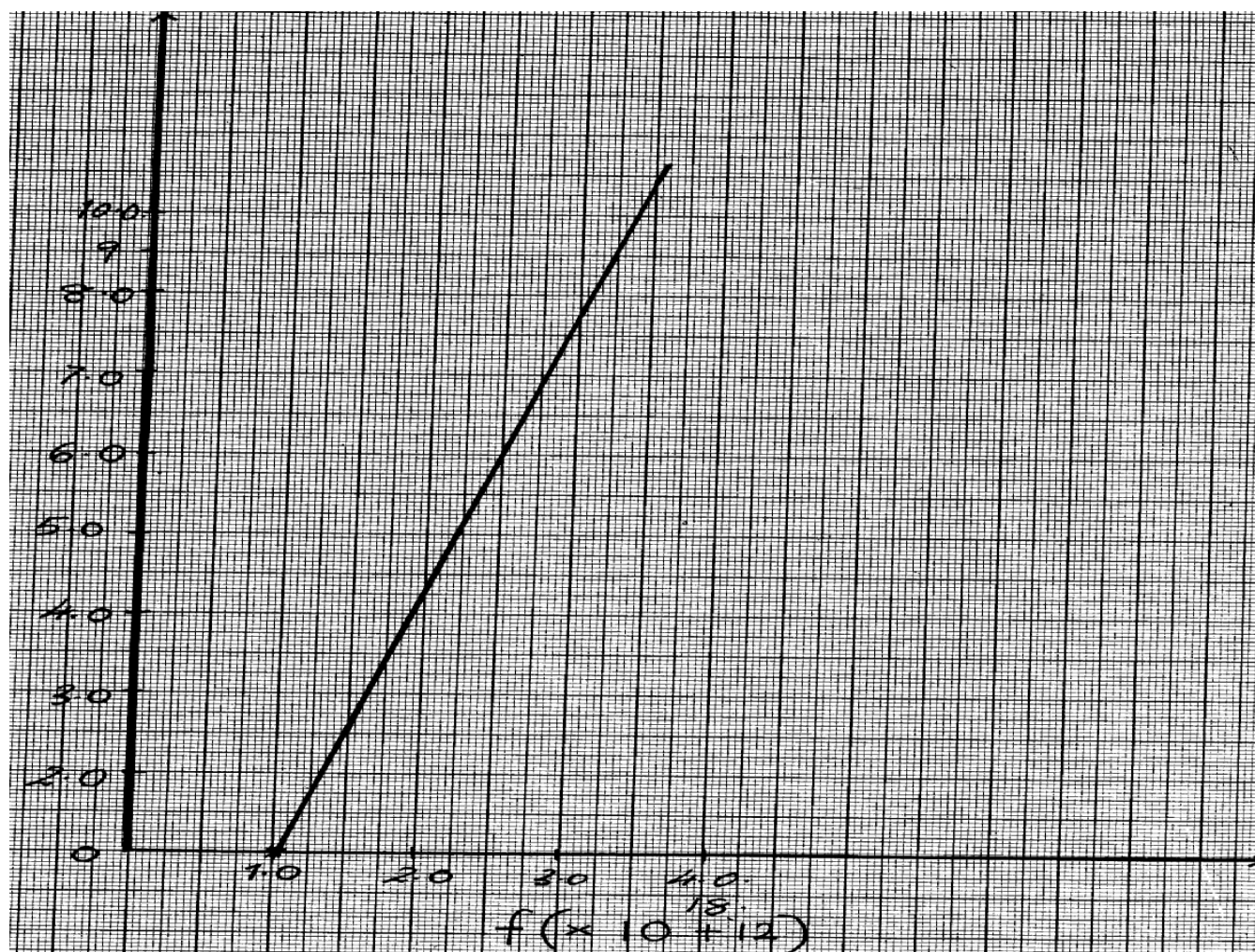
3. Calculate the wavelength of Green light whose energy is $3.37 \times 10^{-19} \text{ J}$.
($h = 6.63 \times 10^{-34} \text{ Js}$, $c = 3.0 \times 10^8 \text{ m/s}$)

4. a) Define the term *work function*
b) Name **one** factor that determines the velocity of photoelectrons produced on a metal surface when light shine on it
c) In a photoelectric effect experiment, a certain surface was illuminated with radiations of different wavelengths and stopping potential determined for each wavelength. The table below shows the results obtained.

Stopping potential , V_s	1.35	1.15	0.93	0.62	0.36
Wave length, ($\times 10^{-7}m$)	3.77	4.04	4.36	4.92	5.46

- i) On the grid provided plot a graph of stopping potential (Y –axis) against frequency
ii) From your graph determine:
a) The threshold frequency
b) The plank's constant, h
 $(e = 1.6 \times 10^{-19} \text{ Coulomb}, C = 3.0 \times 10^8 \text{ m/s})$
5. a) State the role of the Grid in a cathode ray tube
b) Explain why a magnetic field is used in the TV deflection system instead of an electric field
c) The time base of a CRO is 25ms/div while its gain is 2.5V/div. Use this information to answer the questions that follow:
i) Calculate the frequency of the signal
ii) What is the peak voltage of the signal
6. The graph below shows the relation between the stopping potential, V_s and the frequency of radiation when a certain surface is illuminated with light of different frequencies
From the graph determine:-
(i) The threshold frequency
(ii) The value of plank's constant ($e = 1.6 \times 10^{-19}C$)
(III) The work function of the material
- 7a) State **one** reason why a C.R.O is a more accurate voltmeter than a moving coil voltmeter
(b)The diagram below represents a cathode ray oscilloscope (CRO)
i) Name the parts labeled **A** and **B**
ii) What are the functions of **C** and **D**?
iii) State how electrons are produced

8. a) What is meant by the term photo electric effect
b) In an experiment using a photo cell, ultra violet light of varying frequency strikes a metal surface. The maximum Kinetic energy (KE max) of the frequency **F** is measured. The graph below shows how the maximum kinetic energy varies with frequency **F**



K.E max (
 $\times 10^{-19}$ kJ)

Use the graph to determine:-

- i) Threshold frequency **F**
- ii) The plank's constant, **h**
- iii) Work function of the metal

9. (a) The diagram fig 9 below shows a photo cell; connected in a circuit:-
fig. 9

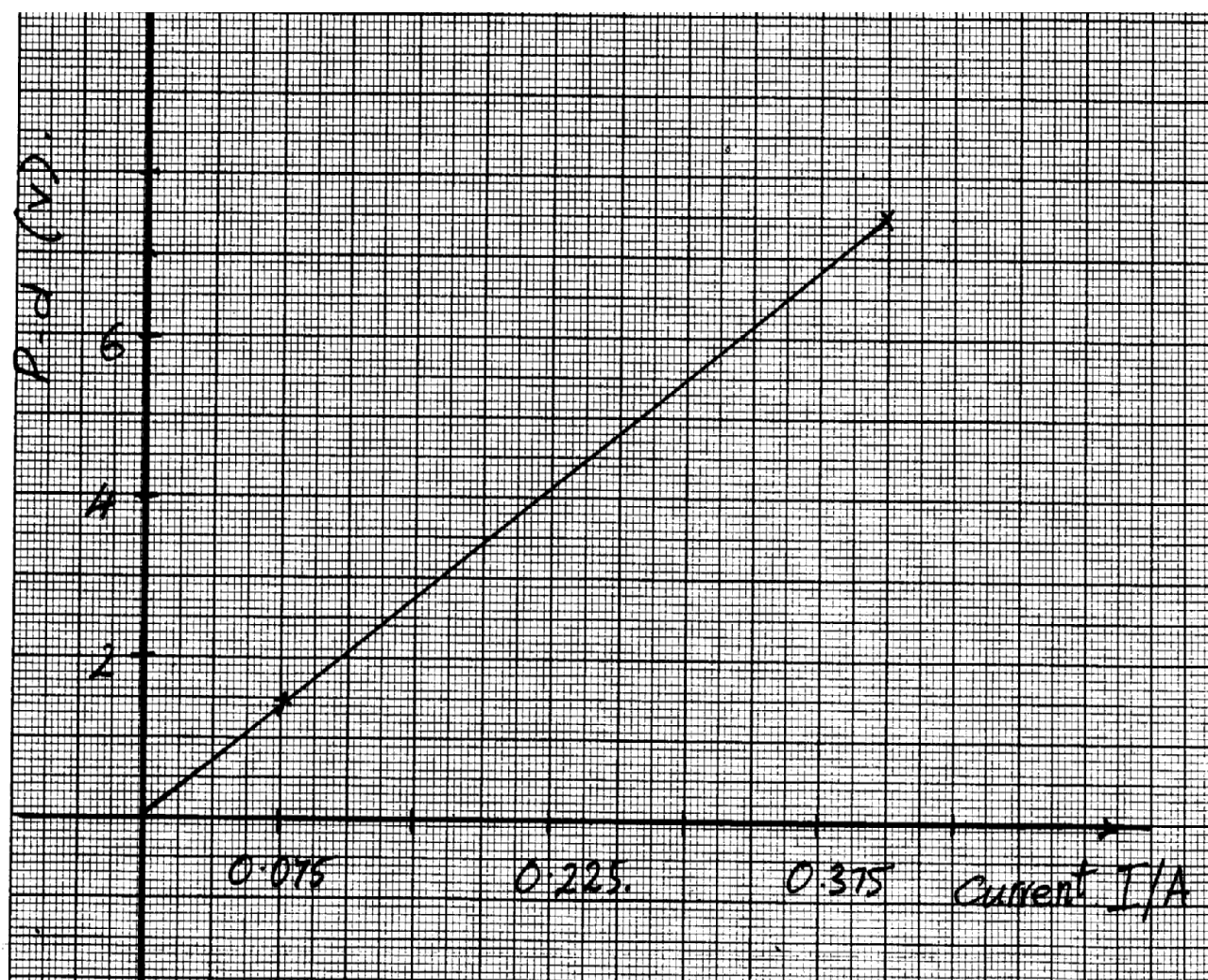
(i) Complete the diagram by indicating the correct polarities in the gap for current to flow in the circuit

(ii) State and explain the effect of using light of different wave lengths on the amount of current flowing in the circuit given that the distance of the source of light remains the same

(b) Two fixed resistors one of 100Ω and the other of unknown resistance are connected in parallel.

The combination is placed in a circuit and current passing through the combination was

measured for various p.d. The graph in figure 10 below drawn to scale shows the results:-



- (i) From the graph, calculate the total resistance of the combination
- (ii) Determine the value of the unknown resistance
- (c) (i) Explain the cause of eddy currents and how they are minimized in a transformer
- (ii) A transformer with 4200 turns in the primary coil operates a 240V mains supply and gives an output of 8.0V. Determine the number of turns in the secondary coil (assuming it is 10% efficient)

10. State **one** factor that affects photoelectric effect

11. a) i) What is photoelectric effect?

ii) You are provided with the following; a photo cell; a source of 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

b) In a photoelectric effect experiment, a certain surface was illuminated with radiation of different frequencies and stopping potential determined for each frequency. The following results were obtained:

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 a graph of stopping potential (Y-axis) against frequency

ii) Determine plank's constant, h and the work function of the surface given that

$$eV_s = hf - hf_0, \text{ where } hf_0 = \phi = 1.6 \times 10^{-19} \text{ J}$$

c) A surface whose work function $\phi = 6.4 \times 10^{-19} \text{ J}$ is illuminated with light of frequency $3.0 \times 10^{15} \text{ Hz}$. Find the minimum K.E of the emitted photo electrons (use value of h obtained in **b(ii)** above)

For Marking Schemes/Answers

Contact Mr Isaboke

0746-222-000

OR

0742-999-000

FOR THE FOLLOWING;

- ✓ **ONLINE TUITION**
- ✓ **REVISION NOTES**
- ✓ **SCHEMES OF WORK**
- ✓ **SETBOOKS VIDEOS**
- ✓ **TERMLY EXAMS**
- ✓ **QUICK REVISION KITS**
- ✓ **KCSE TOPICALS**
- ✓ **KCSE PREMOCKS**
- ✓ **TOP SCHOOLS PREMOCKS**
- ✓ **JOINT PREMOCKS**
- ✓ **KCSE MOCKS**
- ✓ **TOP SCHOOLS MOCKS**
- ✓ **JOINT MOCKS**
- ✓ **KCSE POSTMOCKS**
- ✓ **TOP SCHOOLS PREDICTIONS**
- ✓ **KCSE PREDICTIONS**
- ✓ **KCSE REVEALED SETS**

CALL/TEXT/WHATSAPP

0746 222 000 / 0742 999 000

mwalimuconsultancy@gmail.com

This is a Copyright Property of Mwalimu Consultancy Ltd.

***POWERED
BY
MR ISABOKE***