232/2

PHYSICS PAPER 2 MARKING SCHEME

(THEORY)

DECEMBER 2021.

TIME: 2HRS.

BUNAMFAN MOCK EXAMINATIONS

Kenya Certificate of Secondary Education

PHYSICS PAPER 2.

INSTRUCTIONS:

1. Write your name and admission number in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. This paper consists of TWO SECTIONS: A and B.
4. Answer all questions in section A and B in the spaces provided.
5. All working MUST be clearly shown.
6. Nonprogrammable silent electronic calculators and KNEC mathematical tables may be used.
7. Candidate should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

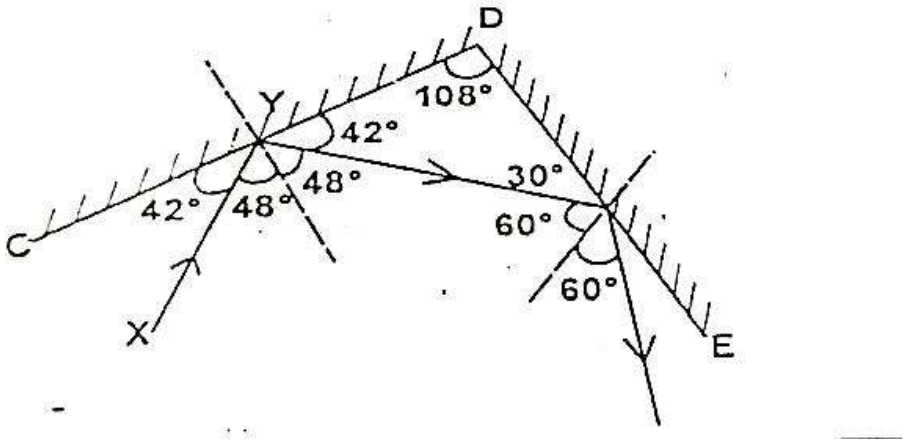
FOR EXAMINER'S USE ONLY.

SECTION	QUESTION	MAX SCORE	CANDIDATE'S SCORE
A	1-14	25	
B	15	12	
	16	10	
	17	11	
	18	12	
	19	10	
TOTAL SCORE		80	

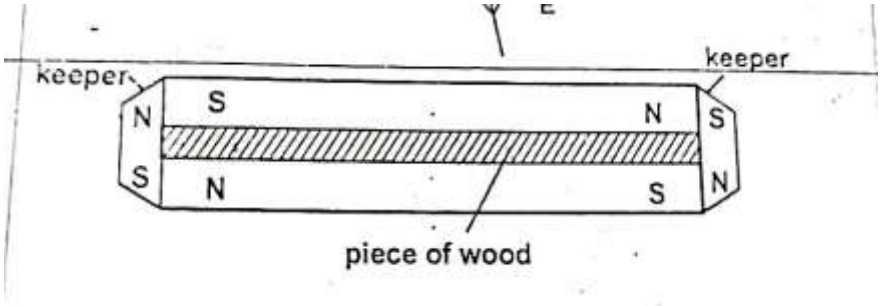
SECTION A (25MKS)

Answer All the questions in this section in the spaces provided.

1. Figure 1 shows a ray of light XY striking the mirror CD held at an angle of 108° to mirror DE. Complete the path of the ray XY and state the final angle of reflection. 3mks



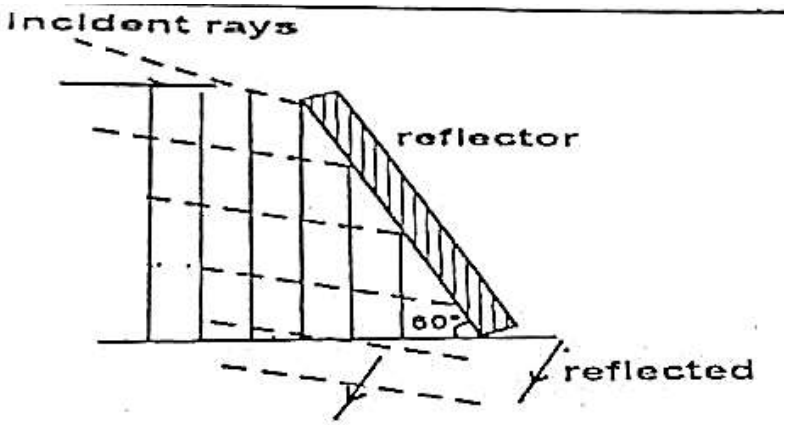
2. When storing a pair of bar magnets, it is advisable to put a keeper at each end.
   (a) Draw a diagram in the space below to show the above arrangement and label the poles of each magnet 1mk



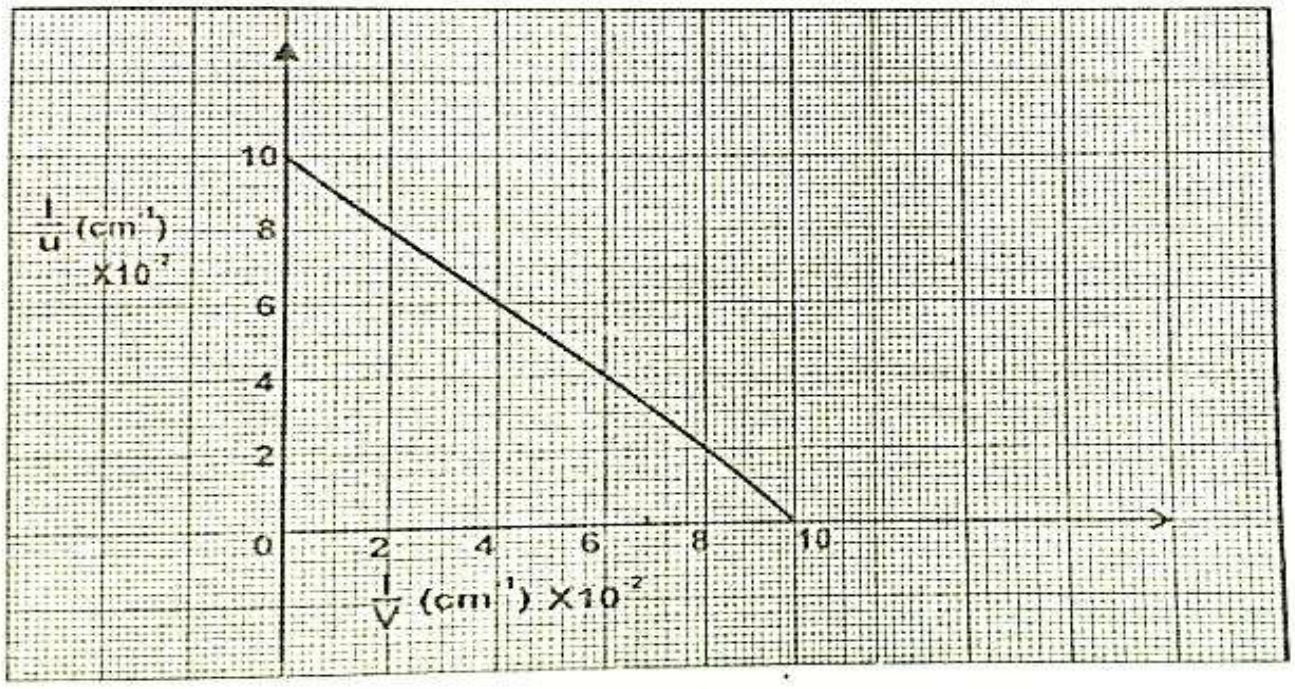
   (b) Explain briefly how the above arrangement can minimize the loss of magnetism in the bar magnets 1mk

The keeper in contact with a south pole of the magnet acquires a North pole while that in contact of the south pole acquires a south pole so that the dipoles in the magnet and the keepers form complete bloops hence dipoles retain their orientation

3. Figure 2 below shows plane waves incident on a plane reflector inclined at 60°C to the horizontal. Complete the diagram to show reflected waves 1mk



4. A student while investigating the focal length of a certain concave mirror, measured object and image distances and drew a graph 0f $^1/_u$ against $^1/_v$ shown below.

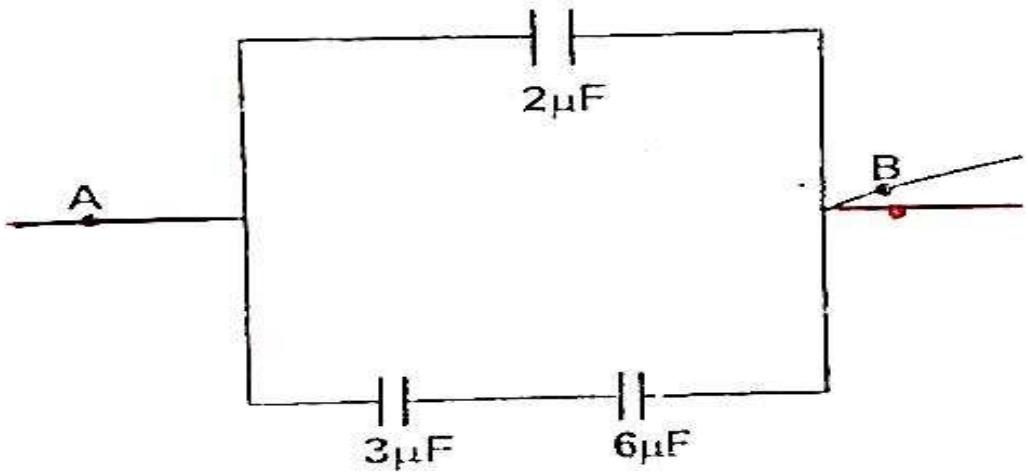


From the graph, determine the focal length 2mks

5. It is advisable to top up acid level of an accumulator with distilled water and not acid. Give a reason for this 1mk

   Water regulates the concentration while acid only increases concentration of the accumulator

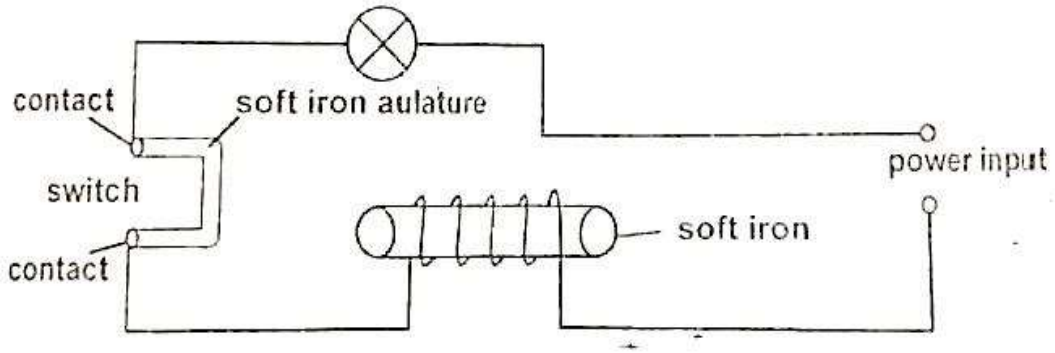
6. Find the combined capacitance between A and B of the arrangement shown in the figure below. 2mks



$$\frac{1}{6}+\frac{1}{3}=\frac{3}{6} \quad C_s = 2\mu F$$

$$C_r = 2+2 = 4\mu F$$

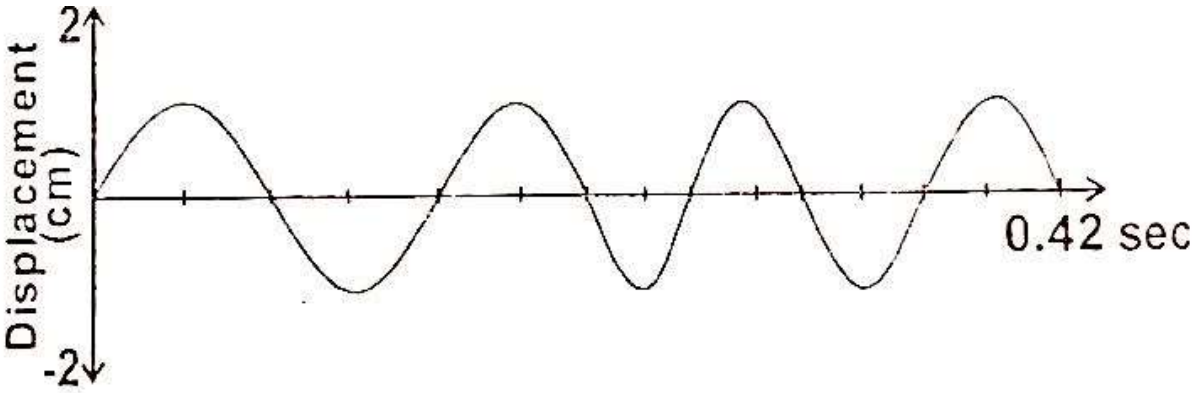
7. Figure 3 shows a simple circuit breaker.



   Explain briefly how it works 3mks

When excess current flows through the circuit, increased magnetic power makes the soft iron core to attract the soft iron armature thus opening the switch current flow.

8. Figure 4 shows a transverse wave.



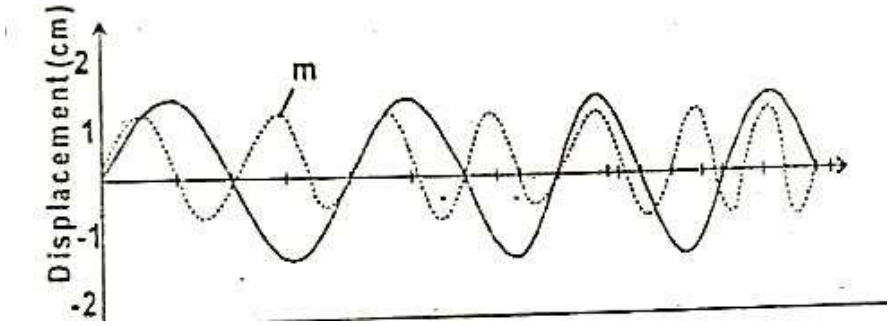
(a) Calculate the frequency of the wave 2mks

T= 0.42S =0.12

3.5cycles

$$\mathbf{f= \frac{1}{T} = \frac{1}{0.12} = 8.33Hz}$$

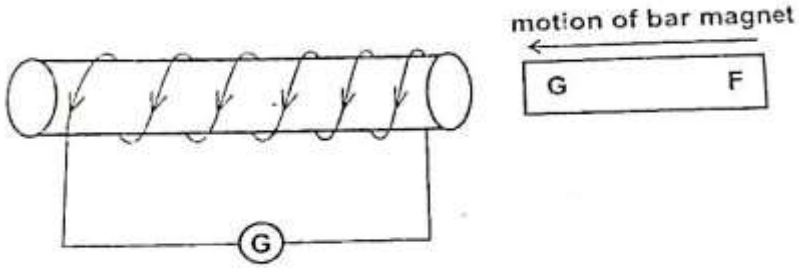
(b) Sketch another wave on the diagram that has double the frequency and half the amplitude 1mk



9. For an echo to be heard, the minimum distance between the obstacle and the observer must be 17m.If the minimum time for hearing an echo is 0.1 seconds, Determine the speed of sound in air 2mks

$$\mathbf{V= \frac{2d}{E} = \frac{2X\ 17}{0.1} = 340ms^{-1}}$$

10. Figure 5 shows a bar magnet FG being pushed into a coil connected to a Centre zero galvanometer. The current induced in the coil is shown.



State the polarity of F 1mk

South pole

11. Name one electromagnetic wave whose energy is higher than that of visible light 1mk

Uv, X rays and gammar rays

12. Below is part of radioactive decay series of uranium 238.

$$^{238}_{92}U \xrightarrow{a} {}^{234}_{90} \xrightarrow{b} {}^{234}_{91}Pa \xrightarrow{C} {}^{239}_{92}U \rightarrow {}^{230}_{90}Th$$

Identify isotopes from the series above 1mk

$^{238}_{92}U$ and $^{239}_{92}U$ $^{234}_{90}Th$ and $^{236}_{90}Th$

13. State how polarization is reduces in a simple cell 1mk

By addition of a depolarizer eg potassium dichromate

14. Explain why it is not advisable to use a 10A fuse for hair drier rated 2.5Kw, 240V. 2mks

$P=\frac{V}{I}$ $I=\frac{2500}{240}$ = 10.41A

Not suitable, fuse used must be slightly higher than 10.41A

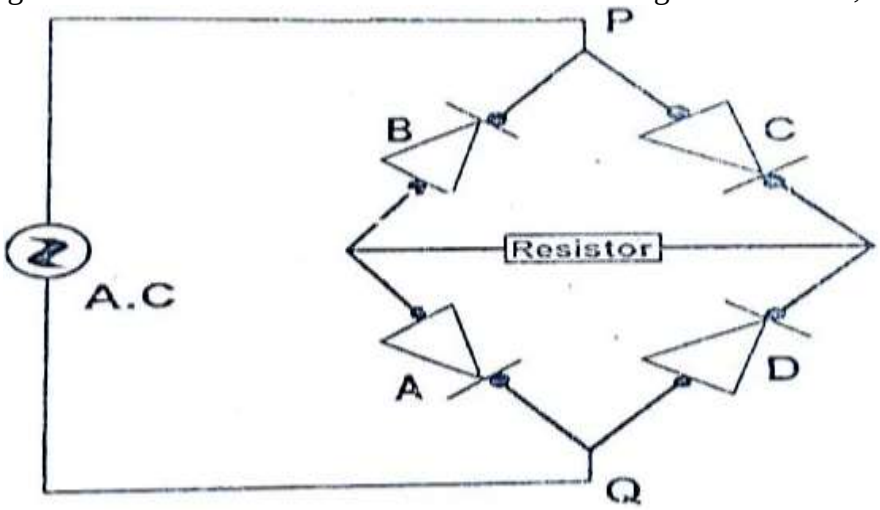
SECTION B (55 MARKS)

15.

(a) What is meant by the term "A.C rectification" 1mk

It is the process of changing alternating voltage to direct voltage

(b) Figure 6 shows one method of A.C rectification using four diodes A,B,C,D.



Explain how the A.C rectification is achieved in the above circuit 2mks

When P is positive the diodes C and A, are forward biased and the current flows through C resistor A and back to source. When Q is positive, diodes D and B, are forward biased and the current flows through Q, D, resistor B, P and back to the source.

(c) In a transformer, a voltage of 240V is to be stepped down to 24V. The primary current is found to be 1.5 A while the secondary current is 14A. Calculate:

(i) Power input 1mk

Power input = $I_p \times V_p = 1.5 \times 240 = 360$ watts

(ii) Power output 1mk

Power output = $I_s \times s = 14 \times 24 = 336$ watts

(iii) Power wasted 1mk

Power wasted = 360 – 336 = 24 watts

(iv) Efficiency of the transformer 3mks

$$= \frac{power\ output}{power\ input} \times 100\%$$

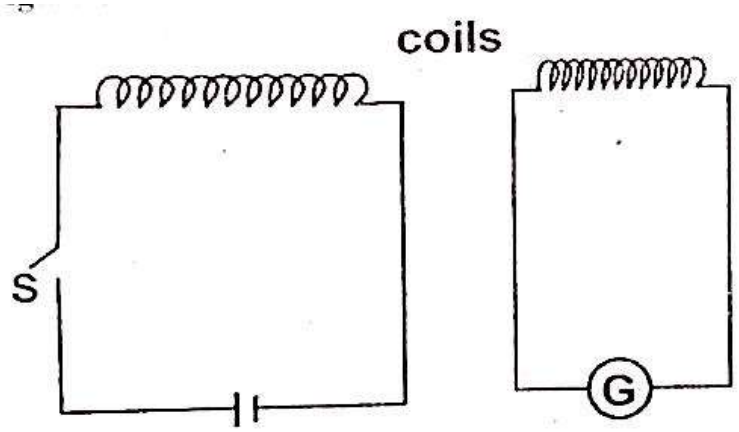
$$= \frac{336}{360} \times 100\% = 93.3\%$$

(d) State two ways in which the power in a transformer is wasted 2mks

Eddy currets, Hysteris, Copper losses, Flux leakage

16.

(a) Figure 7 below shows the circuits close to each other



When the switch is closed, the galvanometer shows a reading and then returns to zero.

(i) Explain the observation 2mks

When current flows, the change in current in the dc coil causes a flux which links with the coil in 2nd circuit thus an e.m.f is induced. When closed no more change in flux in dc hence no induced e.m.f

(ii) Give one adjustment that can be done to the arrangement so that:

(I) The galvanometer gives a bigger deflection in the same direction 1mk

Increasing turns in primary coil using more cells in the primary coil.

(II) The galvanometer deflects in opposite direction when the switch is closed 1mk

Reversing terminals of the battery

(b) In an X-ray tube, the electrons are accelerated by a p.d of 24000V. Assuming that 2% of energy produced is converted to X-rays. Determine the:

(i) Energy of the X-rays produced 3mks

$$\textbf{X ray enery} = \frac{2}{100} \times ev \quad = 2 \times 1.6 \times 10^{-19} \times 24000$$

$$= 768 \times 10^{-19}\ ev$$

$$1ev = 1.6 \times 10^{-19} J$$

$$\textbf{X ray energy} = 768J$$

(ii) Frequency of X-rays reduced (Take planks constant h= 6.6×10^{-34}Js and charge on an electron e= 1.6×10^{-19}C). 3mks

E=hf

$$\mathbf{f=\frac{E}{h}=\frac{768}{6.6\times10^{-34}}=116\times10^{-34}=1.16\times10^{32}Hz}$$

17.

(a) State the function of the grid of a cathode ray oscilloscope (CRO) 2mks

Grid controls brightness of the screen by limiting the number of electrons reaching the screen by repulsion

(b) State what is observed on the screen of a CRO when:

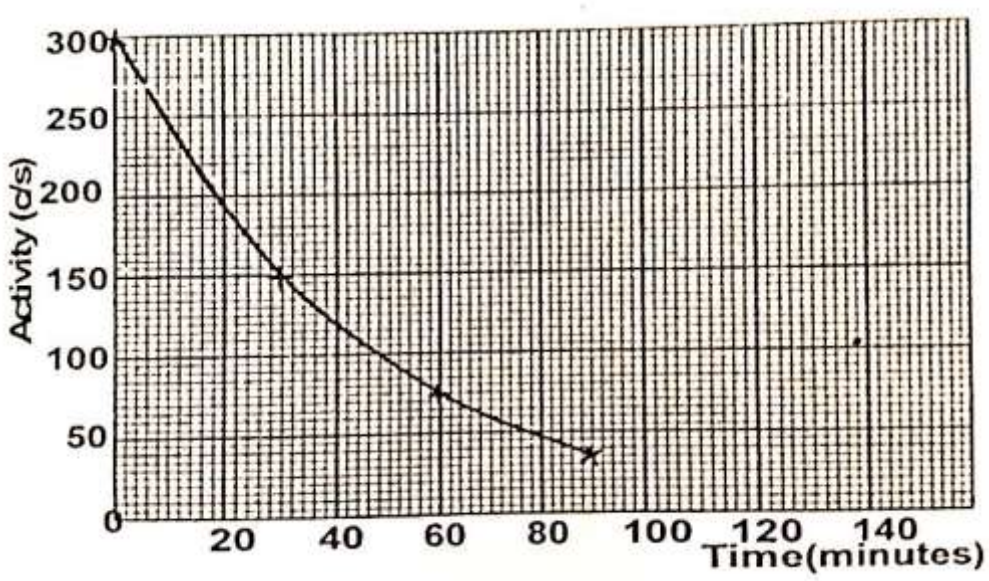
(i) Low voltage alternating current is connected to the time base and the y-gain switched off. 1mk

A dark spot is seen moving to and from on the horizontal of the screen.

(ii) A high voltage ac is connected to the y-gain and the time base is switched off 1mk

A dark line is formed vertically along the screen

(c) The graph shows the activity versus tie for a sample of radioactive material.



Use the graph to determine:

(i) The half life of the sample 3mks

Half life= time corresponding to activity of $\frac{310}{150}$ = which is 30minutes

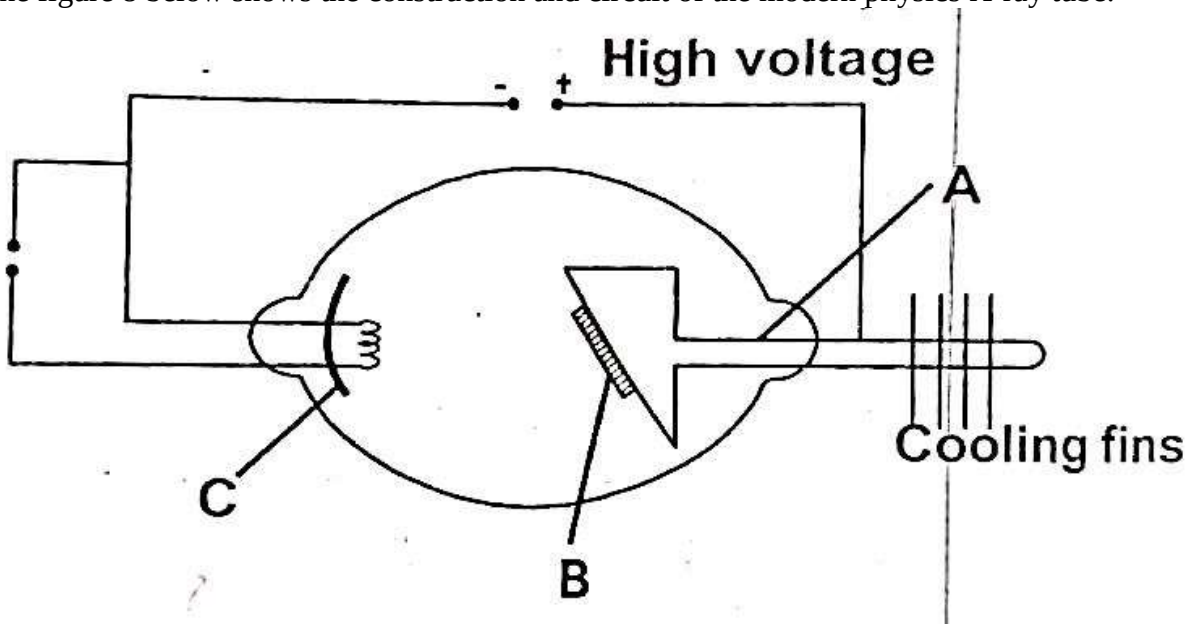
(ii) The number of half-life's needed for the activity to reduce from 300C/S to 37.5CS^{-1} 3mks

$t^1/_2$ $t^1/_2$ $t^1/_2$

300 ——— 150 ——— 75 ——— 37.5

These are half lives

18. The figure 8 below shows the construction and circuit of the modern physics X-ray tube.



(a) Indicate on the diagram the path of the X-ray beam 1mk

(X-rays must be reflected from B)

(b) Name the part marked C and state its function 2mks

Cathode- To emit electrons and focus them to the anode

(c) Name the metal used in parts A and B and state why they are suitable for use in the tube 4mks

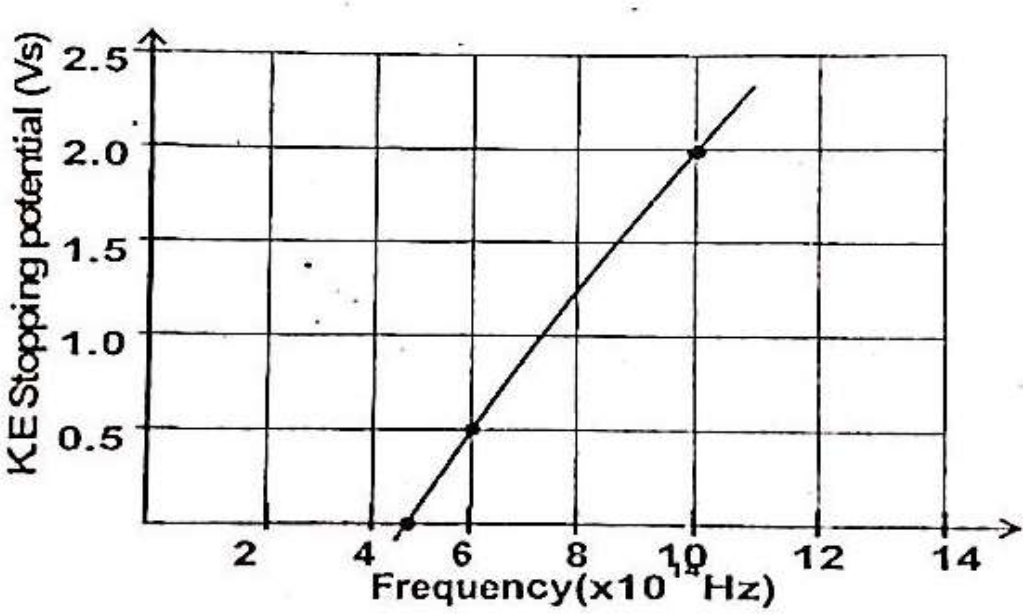
A- Copper; good conductor of heat

B- Tungsten/Molybdenum ; has high melting point

(d) Why are cooling fins necessary? 1mk

To enhance cooling of the copper anode

(e) Form four students performed an experiment in photoelectric effect and drew the graph below from the data collected



From the graph determine:

(i) Threshold frequency 1mk

$f_0 = 4.5 \times 10^{14}$ Hz

(ii) Planks constant (take charge on an electron, e= 1.6×10^{-19}C) 3mks

$$\frac{h}{e} = m$$

$$h = me$$

$$= \frac{20. - 0.5}{(10-6)\times 1.6 \times 10^{-19}}$$

$$= 3.75 \times 10^{-15} \times 1.6 \times 10^{-19}$$

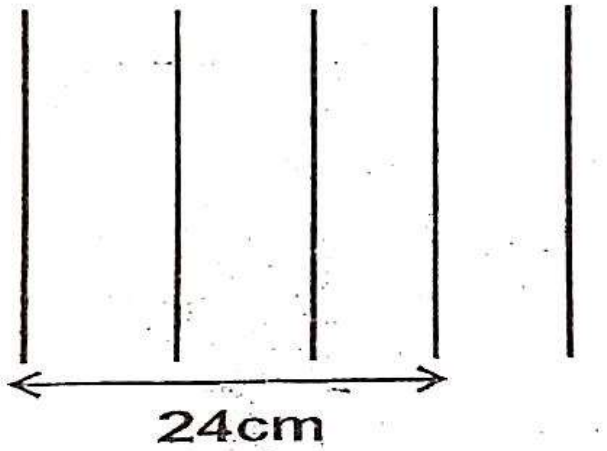
$$= 6 \times 10^{-34} Js$$

19.

(a) A person standing behind a wall hers a bell ringing although he cannot see the bell. What property of sound enables him hear the sound 1mk

Diffraction

(b) The figure 9.0 below is a sketch of ripples caused by a vibrator in a ripple tank whose frequency is 50Hz.



Using the above information, determine the speed of the wave motion 3mks

$\mathbf{1=\frac{24}{3} = 8cm}$ $\mathbf{V=f = 50 \times {}^{8}/_{100} = 4m/s}$

(c) The speed of sound in air determined o a warm day is 330m/s. Explain any difference you would expect in the results if the measurement is done on a cold day 2mks

The speed will be wlower because of low temperature

(d) In an experiment to determine the speed of sound, an observer stood in front of a high wall at a distance of 80m. he clapped two boards together at such a rate that each clap coincided with the echo from the wall. A second observer noted a time of 9.5seconds starting with the first clap and ending with the 21st clap.

(i) Calculate the speed of sound under these conditions 3mks

$$\mathbf{V=n \times 2d}$$
$$\mathbf{= \frac{20 \; X \; 2 \; X \; 80}{95}}$$
$$\mathbf{= 336.8m/s}$$

(ii) Describe one probable source of error in this experiment 1mk

The time for the 20 claps might not be accurate

(iii) State two ways in which sound wave differ from light waves 2mks

Requires a material medium to travel through