

Name: Index No.....

School: Stram.....Adm No.....

232/1

PHYSICS

Paper 1

(Theory)

AUGUST 2021

Time: 2 Hours

BUNYORE-MARANDA PRE-MORK EXAMS 2021

Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- ✓ The paper consists of TWO sections A and B.
- ✓ Answer all the questions in section A and B in the spaces provided
- ✓ All working MUST be clearly shown
- ✓ Non-programmable silent calculators and KNEC mathematical tables may be used.

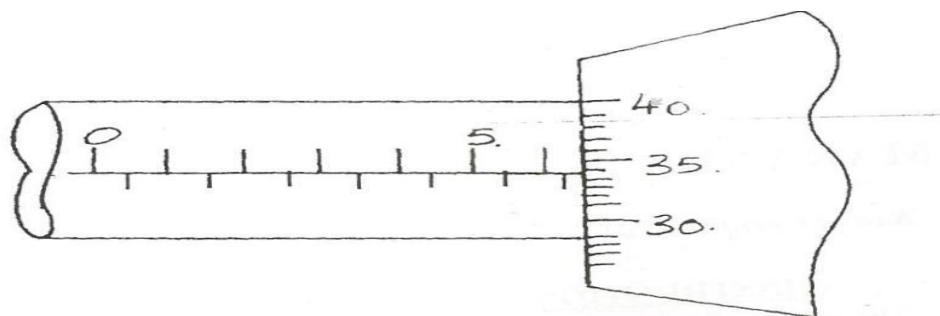
FOR EXAMINER'S USE ONLY

Section	Question	Maximum Score	Candidate's Score
A	11-11	25	
B	12	11	
	13	10	
	14	10	
	15	13	
	16	11	
TOTAL SCORE		80	

This paper consists of 13 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A (25 Marks)

1. The figure below shows a micrometer screw gauge being used to measure the diameter of a rod. The thimble scale has 50 divisions.



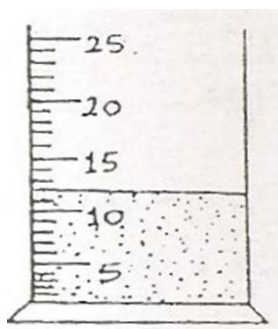
State the reading shown above.

(2 marks)

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2. The figure below shows water placed in a measuring cylinder calibrated in cm^3



An object of mass 50.1g and density 16.7 g/cm^3 is lowered gently in the water. Indicate on the diagram the new level.

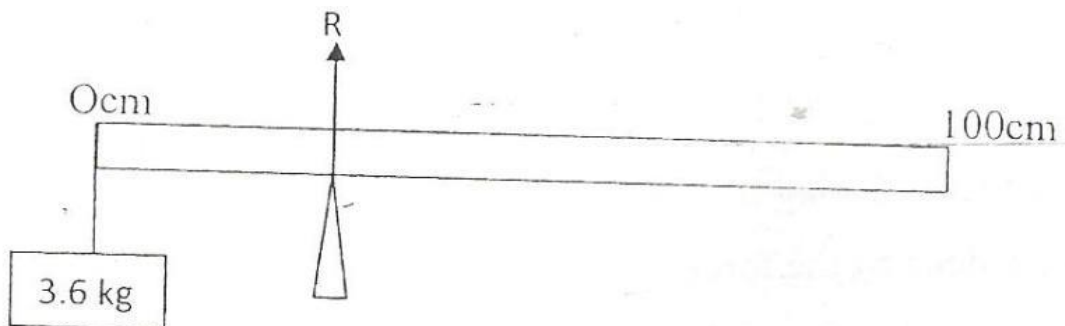
(1 mark)

3. An object is attached to a spring balance and its weight determined in air. It is then gently lowered into a liquid in a beaker. State what will happen to the reading. (1 mark)

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4. The figure below shows a uniform meter rule pivoted at the 23cm mark with a mass of 3.6kg hanging at 0cm mark the system is in equilibrium.



Determine,

- i) The weight of the rule (2 marks)

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- ii) The normal reaction force R at the rule (1 mark)

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5. When a mercury in a glass thermometer is used to measure the temperature of hot water, it is observed that the mercury level first drops before beginning to rise. Explain (2 marks)

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6. A trolley of mass 0.5kg moving with a velocity of 1.2m/s collides with a second trolley of mass 1.5kg moving in the direction with a velocity of 0.2m/s . If the collision is inelastic, determine the velocity of the trolleys after collision. (3 marks)

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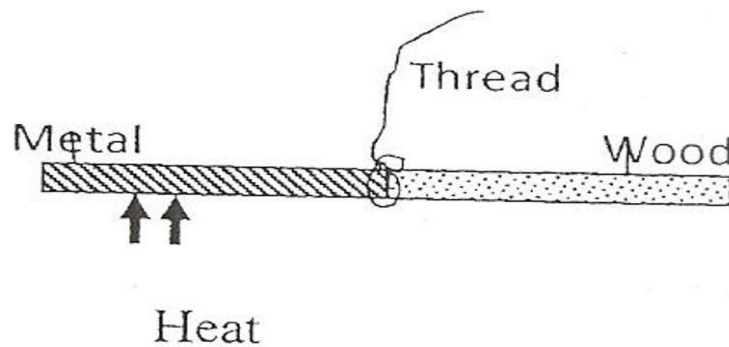
7. A block of copper of mass 2kg and specific heat capacity 400 J/kg K initially at 81°C is immersed in water at 20°C . If the final temperature is 21°C , determine the mass of water. (3 marks)

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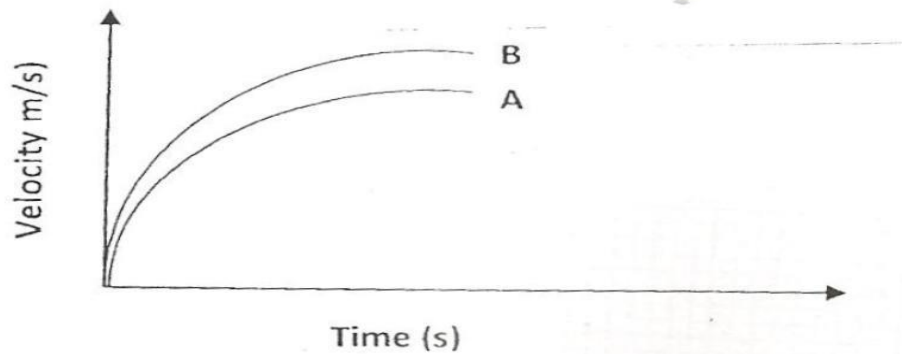
8. When a body of mass 0.25kg is acted on by a force, its velocity changes from 5m/s to 7.5m/s , determine the work done by the force. (3 marks)

9. The following figure shows a rod made of wood on one end and metal on the other end suspended freely with a piece of thread so that it is in equilibrium.



The side made of metal is now heated with a Bunsen flame. State with a reason, the side to which the rod is likely to tilt. (2 marks)

10. The figure shows the velocity time graph of two identical spheres released from the surfaces of two liquids A and B.



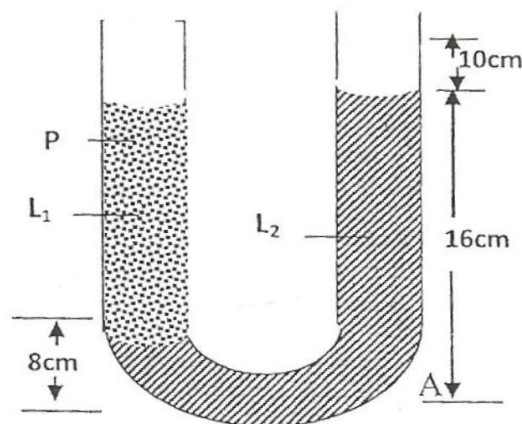
Give a reason why the terminal velocity of the sphere in B is higher than in A. (1 mark)

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11. A u-tube vertically holds two liquids L_1 and L_2 as shown in the figure below.



- (a) Mark accurately the point in liquid L_2 that is at the same pressure as point P

(1 mark)

- (b) If the atmospheric pressure is 103000 N/m^2 and the density of liquid L_2 is 103 kg/m^3 determine the pressure acting at point A. (3 marks)

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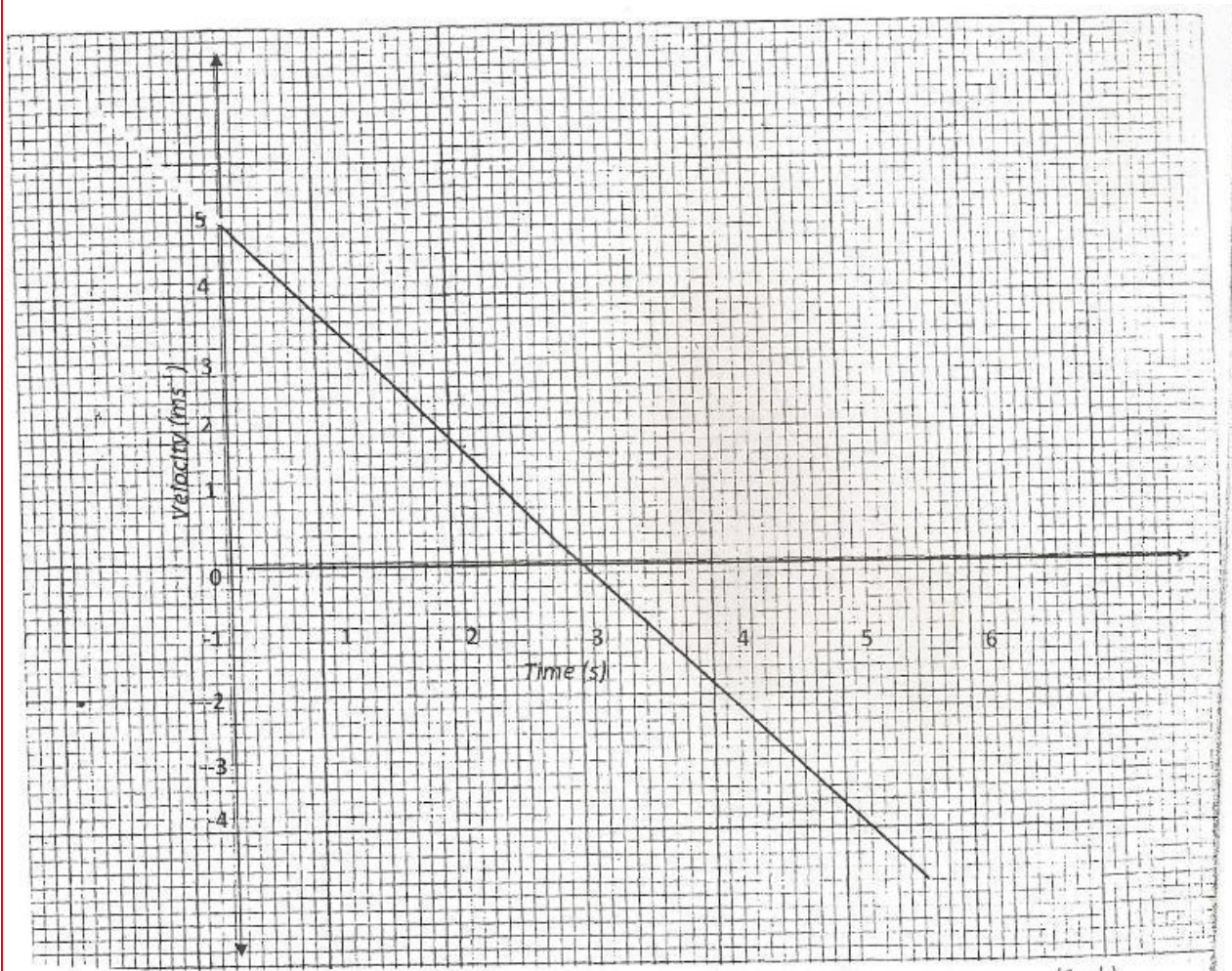
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SECTION B (55 MARKS)

Answer all questions in this section

12 (a) The velocity-time graph in the figure below illustrates the motion of a ball which has been projected vertically upwards from the surface of the moon. The weight of the object on earth's surface is 20N, when the acceleration due to gravity is 10ms^{-2} .



- (i) State why the velocity becomes negative after 3 seconds. (1 mark)

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- (ii) Determine the acceleration of free fall on the moon showing clearly your work (1 mark)

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- (iii) Determine the total distance traveled by the ball in 1.0 sec (2 marks)

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- (iv) Find the weight of the ball on the moon (2 marks)

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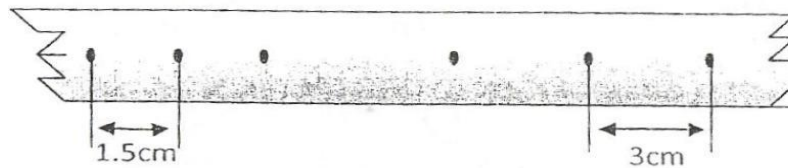
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- (v) If the ball was projected vertically upwards on the earth with the same velocity. What difference would you expect to observe in the velocity-time graph above? Illustrate with a sketch on the same axis. (1 mark)

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- (b) The figure below represents part of a tape pulled through the ticker-timer of frequency 50Hz moving down an inclined plane.



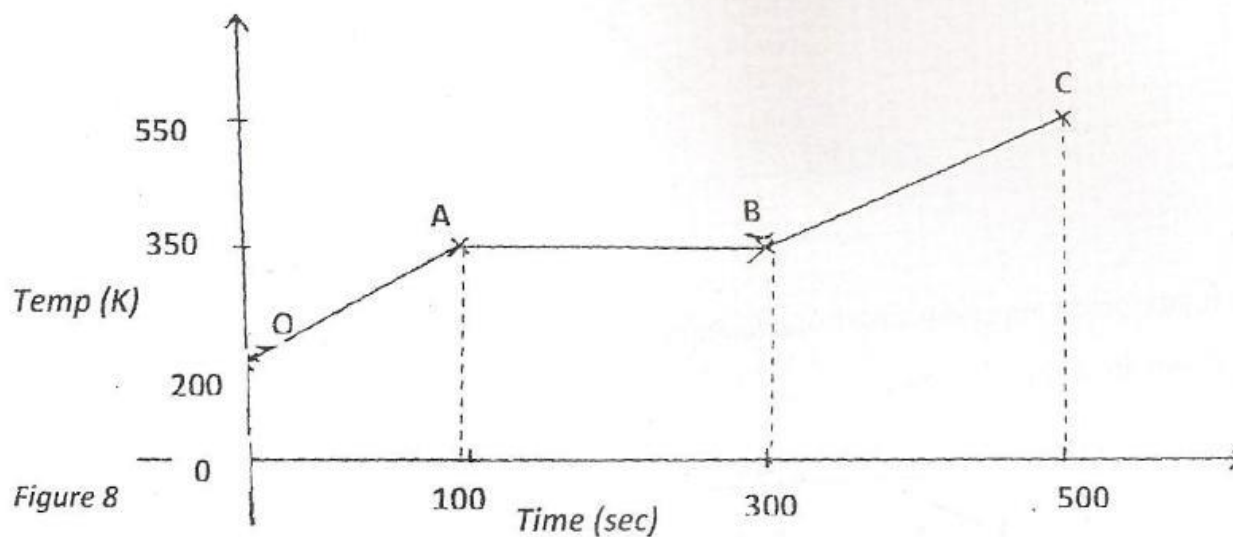
If the trolley was allowed to move down the inclined plane for 4 seconds. Calculate the distance it covers.
(3 marks)

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13 a) State two differences between boiling and evaporation. (2 marks)

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(b) 200g of a solid was uniformly heated by a 0.2kw heater for sometime. The graph in the figure below shows how the temperature of the solid changed with time.



- (i) Explain what is happening between OA and AB. (2 marks)

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- (ii) Calculate the specific heat capacity of the solid. (3 marks)

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- (iii) Calculate the specific latent heat of fusion **k** of the solid. (3 marks)

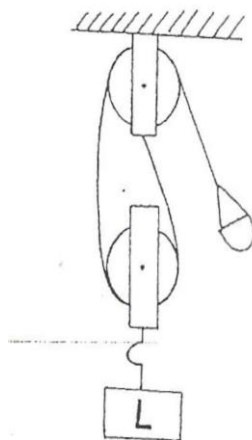
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- 14 (a) (i) Define the term velocity ratio (V.R) (1 mark)

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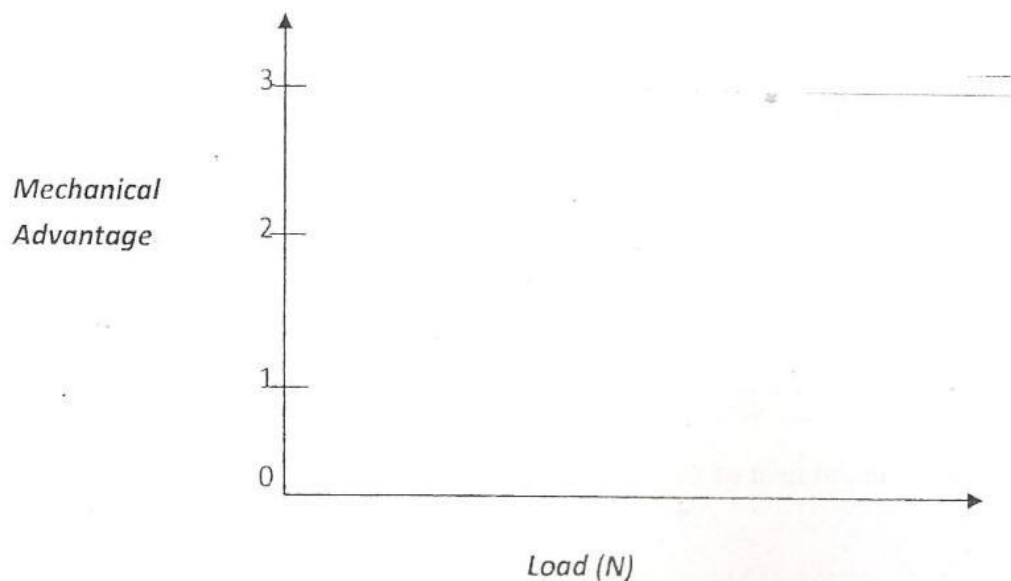
- (ii) Name one machine that has a velocity ratio of less than one ($V.R < 1$) (1 mark)

- (b) The figure below shows a set-up used to find the mechanical advantage of a pulley system\



On the axes provided sketch a graph of mechanical advantage (M.A) against load (L)

(2 marks)



- (c) A hydraulic machine is used to raise a load of 100kg at a constant velocity through a height of 2.5m. The radius of the effort piston is 1.4cm while that of the load piston is 7.0cm. given that the machine is 80% efficient, calculate: -

(i) The effort needed

(3 marks)

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(ii) The energy wasted in using the machine

(3 marks)

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15. a) Define pressure and state its S.I Units.

(2 marks)

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- b) State Pascal's principal. (1 mark)

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- c) In construction of a mercury barometer care is taken to make sure it has no gas in the space above mercury.

- i) How would you test whether there is gas above? (1 mark)

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- iii) State the problem caused by the presence of gas in the barometer. (1 mark)

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- d) Find the total pressure experienced by a diver 8 meters below the sea surface.

Take; Atmospheric pressure = $103\,360\text{N/m}^2$. Density of sea water 1030kg/m^3
(3 marks)

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- e) i) The air pressure at the base of a mountain is 75.0cm of mercury while at the top it is 60.0cm of mercury. Given that the average density of air is 1.25kgm^{-3} and the density of mercury is 13600kgm^{-3} , calculate the height of the mountain.

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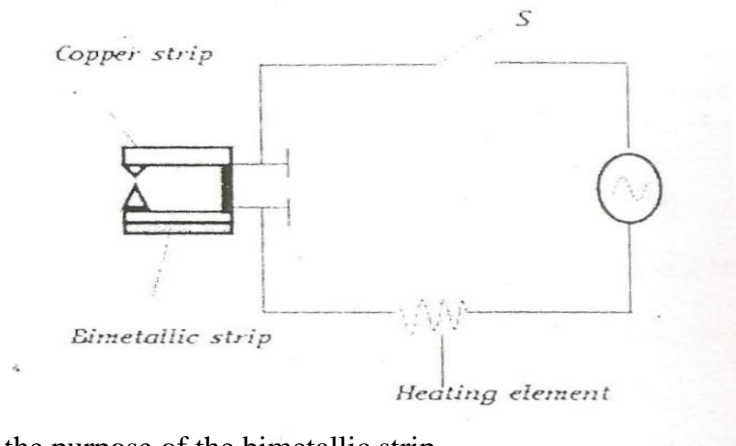
- ii) State factors that affects pressure due to liquid column. (2 marks)

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- 16 a) The figure below shows a circuit diagram for a device for controlling the temperature in a room.



- i) Explain the purpose of the bimetallic strip. (2 marks)

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- ii) Describe how the circuit controls the temperature when the switch is closed. (2 marks)

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- b) (i) Explain why bodies in circuit motion undergo acceleration even when their speed is constant. (1 mark)

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- (iii) A particle moving along a circular path of radius 5cm describes an arc of length 2cm every second. Determine:

I) Its angular velocity (2 marks)

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II) Its periodic time. (2 marks)

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- (iv) A stone of mass 40g is tied to the end of a string 50cm long and whirled in a vertical circle at 2rev/s. Calculate the maximum tension in the string.

(3 marks)

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PHYSICS

PAPER 2

(THEORY)

AUGUST, 2021

TIME: 2 HOURS

CANDIDATE'S SIGN.....

DATE.....

BUNYORE-MARANDA JOINT EXAM - 2021

Kenya Certificate of Secondary Education

PHYSICS

PAPER 2

(THEORY)

TIME: 2 HOURS

INSTRUCTIONS TO THE CANDIDATE:

- Write your **name** and **index number** in the spaces provided above.
- Sign** and write the **date** of examination in the spaces provided above.
- This paper consists of **two** Sections **A** and **B**.
- Answer **all** the questions in sections **A** and **B** in the spaces provided.
- All working **must** be clearly shown in the spaces provided.
- Mathematical tables and electronic calculators **may be** used.

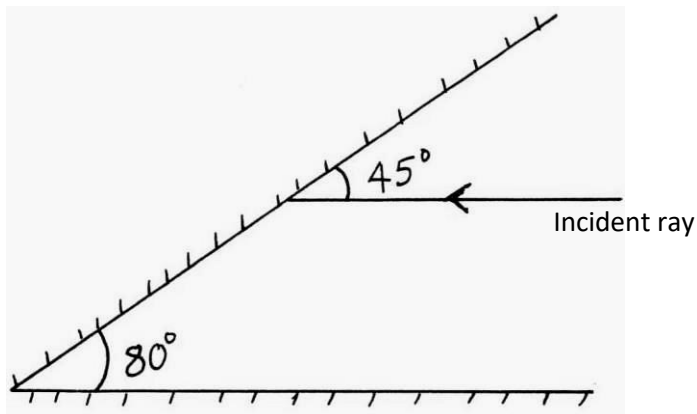
FOR EXAMINER'S USE ONLY:

Section	Question	Maximum Score	Candidate's Score
A	1 – 13	25	
B	14	11	
	15	9	
	16	7	
	17	9	
	18	9	
Total Score		80	

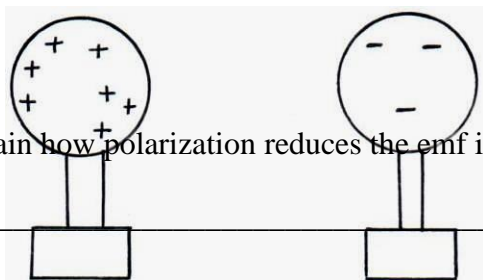
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SECTION A: (25 MARKS)

1. The figure below shows two mirrors M_1 and M_2 placed at an angle of 80° . A ray of light incident to the mirror makes an angle of 45° with the mirror M_1 . Find the angle the ray turns after reflection in the two mirrors. (3mks)

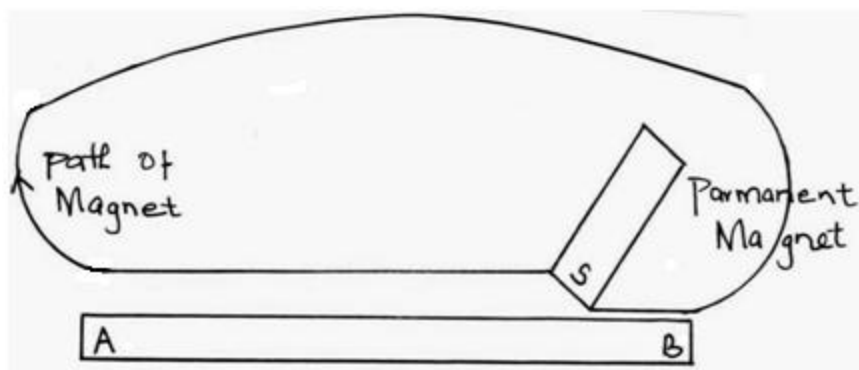


2. The figure below shows two charged spheres A and B. If the two spheres are brought into contact and then separated complete the diagram showing charge distribution on the two spheres after separation. (2mks)

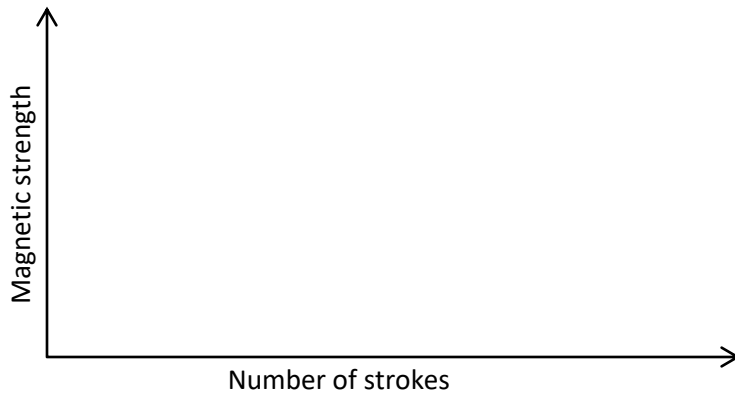


3. Explain how polarization reduces the emf in a simple cell. (1mk)

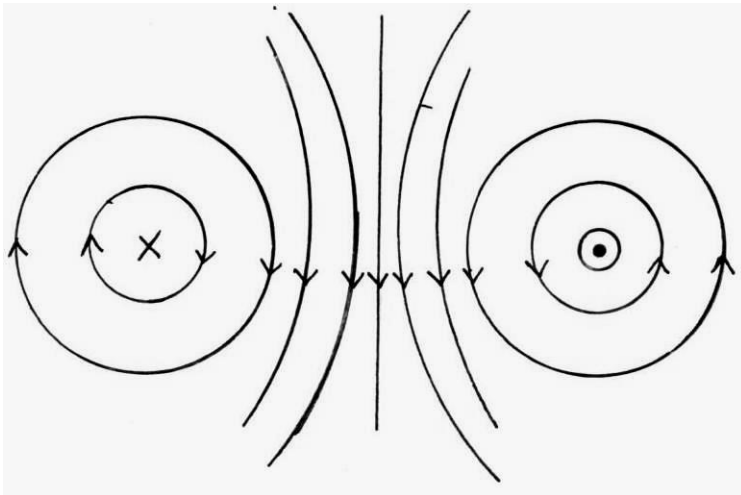
4. The diagram below shows a method of magnetization.



Ferromagnetic material is being magnetized sketch a graph to show how the strength of a magnet being created varies with the number of strokes. (2mks)

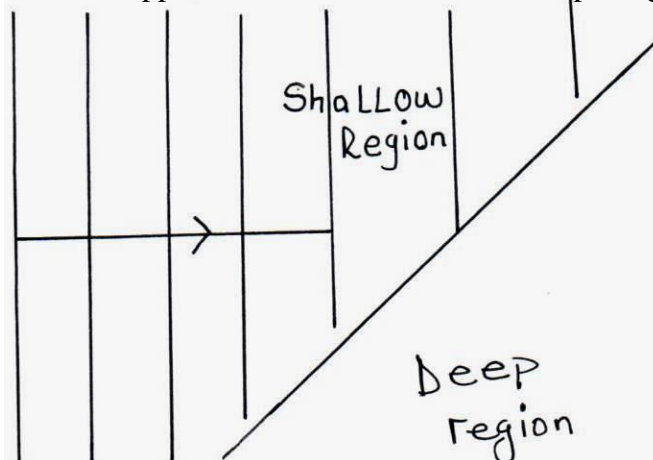


5. The figure below shows the magnetic field between two parallel current carrying conductors **A** and **B** placed close to one another current flows in the opposite directions.



Indicate the direction of force F , due to the current on each conductor.

6. The figure below show water waves moving from a shallow region to a deep region. Complete the diagram to show the appearance of the waves in the deeper region. (2mks)

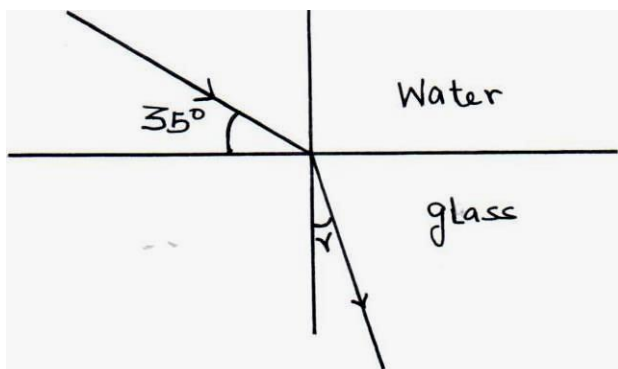


7. An echo sounder produces a pulse and an echo is received from the sea bed after 0.4 seconds. If the speed of sound in water is 1500m/s. Calculate the depth of the sea bed. (2mks)

Physics Paper 2

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8. The diagram below shows a ray of light travelling from water to glass given that the refractive index of water and glass are 1.33 and 1.5 respectively find the angle of refraction in glass. (3mks)



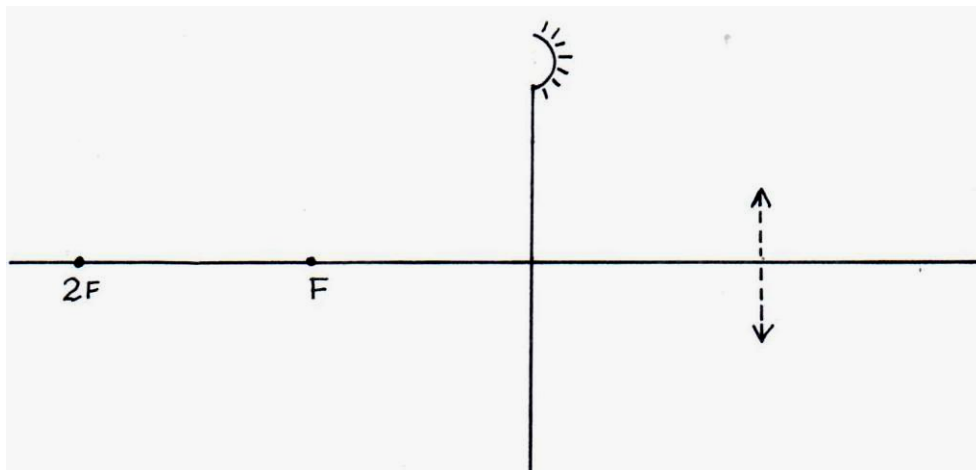
9. Below is part of the electromagnetic spectrum in order of increasing wavelength.

A	B	C	Visible light	Infra-red	D	E
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How are waves A produced?

(2mks)

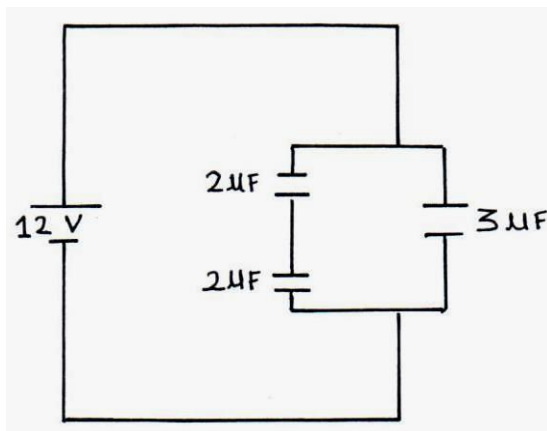
10. The figure below shows an image formed by concave mirror. Complete the drawing rays and locate the position of the object. (2mks)



Physics Paper 2

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11. The figure below shows capacitors connected to a d.c. supply.



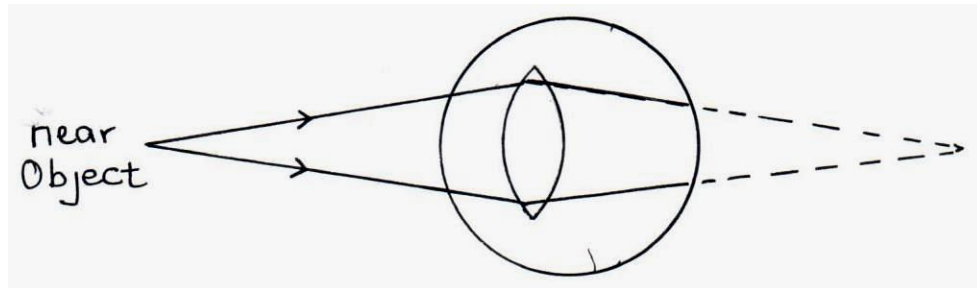
Determine the charge stored in the $3\mu\text{F}$ capacitor.

(3mks)

12. A pendulum bob takes 0.5 seconds to move from its mean position to a maximum displacement position. Calculate its frequency. (2mks)

SECTION B: (55 MARKS)

13. (a) A defective eye focuses a near object as shown in the figure below.



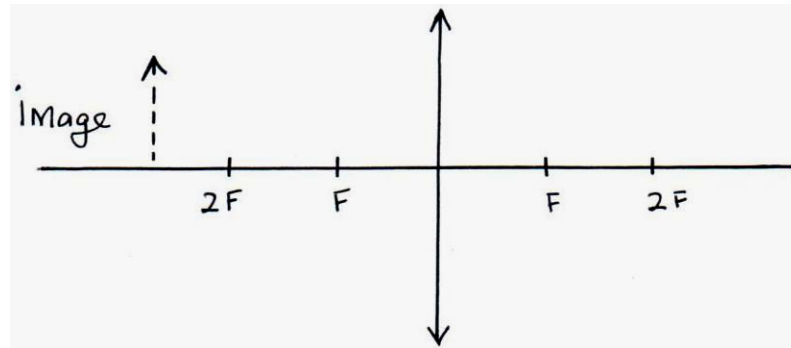
- (i) State the defect. (1mk)

- (ii) Suggest a suitable lens that can be used to correct the defect. (1mk)

- (iii) Draw a diagram to illustrate the correction of the defect. (2mks)

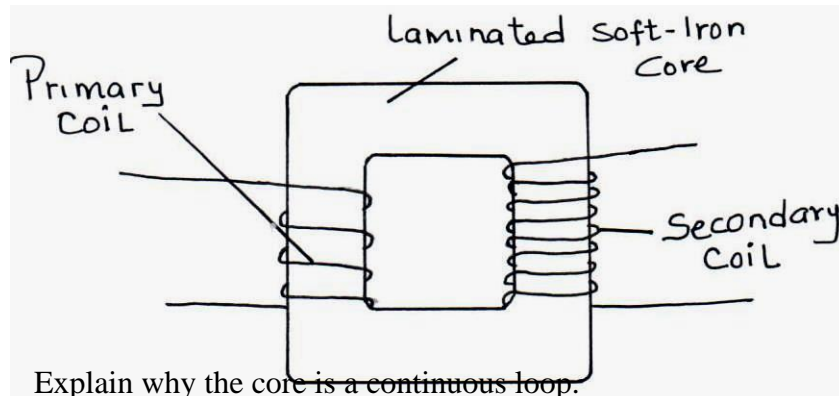
- (b) (i) A real image, half the size of the object is formed by a lens. If the distance between the object and the image is 450mm. Determine the focal length of the lens. (3mks)

- (ii) The figure below shows a virtual image formed by a convex lens. Complete the ray diagram to show the position of the object. (3mks)



14. (a) State Faraday's law of electromagnetic induction. (1mk)

- (b) The figure below shows a simple transformer. Study it and answer the questions that follow.



- (i) Explain why the core is a continuous loop. (1mk)

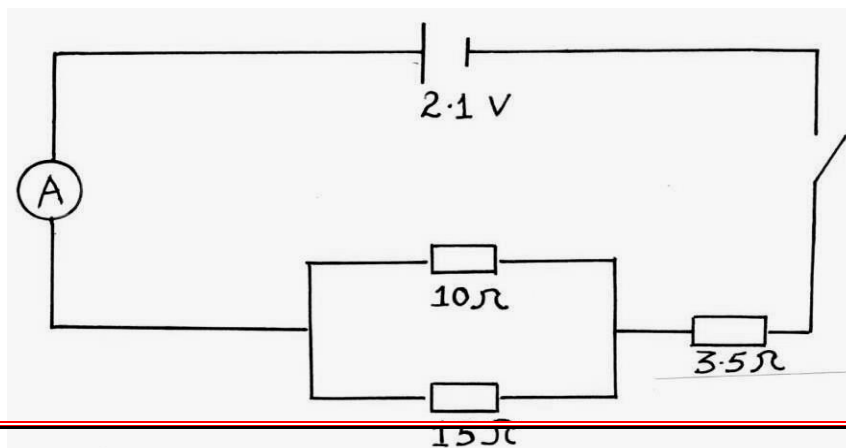
- (ii) Give a reason as to why the core is laminated. (1mk)

- (iii) State and explain which coils are thicker. (2mks)

- (c) State **one** difference and **one** similarity between a step up transformer and an induction coil. (2mks)

- (d) State **two** advantages of the use of alternating voltage for the transmission of electrical energy. (2mks)

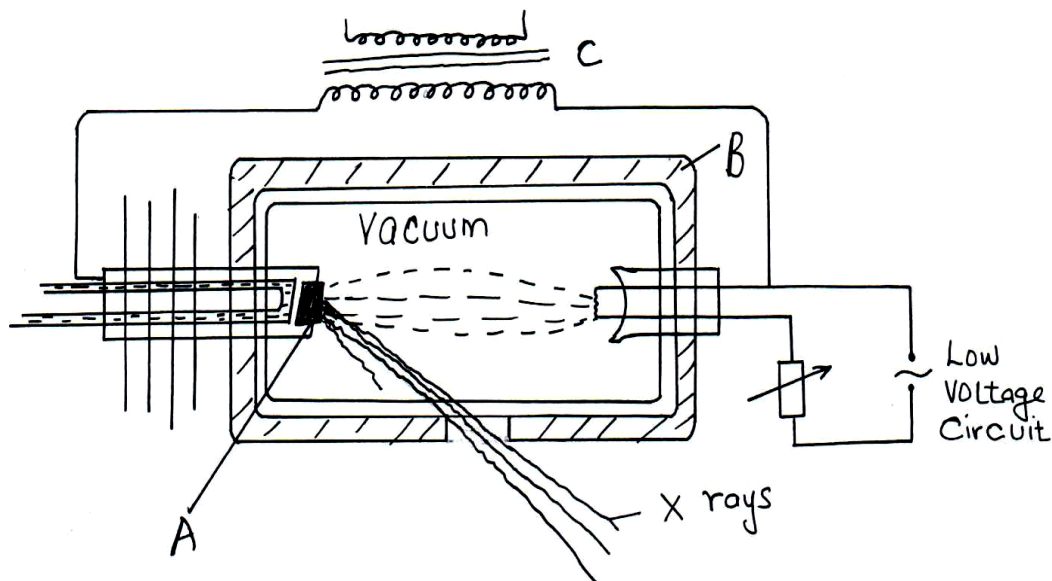
- (e) In the circuit below, the e.m.f of the battery is 2.1V and has an internal resistance of 0.5Ω .



- (i) Determine the effective resistance in the circuit. (2mks)

- (ii) Determine the ammeter reading when the switch is closed. (2mks)

15. (a) Figure 6 below shows an X-ray tube.



- (i) Name the elements used in making the parts labelled A and B. (2mks)

- (ii) Explain the use of the part labelled C. (1mk)

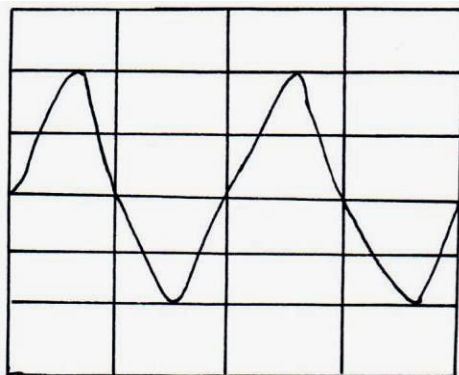
- (iii) Explain how the X-rays are produced. (2mks)

- (iv) Why is the X-ray tube evacuated? (1mk)

- (b) The penetrating power of X-rays is normally varied depending on the intended use. Explain briefly how this is done. (1mk)

- (c) The energy of X-rays is 1.989×10^{-14} joules. Given that the speed of light is 3.0×10^8 m/s and plank's constant is 6.63×10^{-34} Js. Find the wavelength of the X-rays. (2mks)

- (d) The figure below shows a wave form displayed on the screen of C.R.O when the time base is set at 20ms per division.

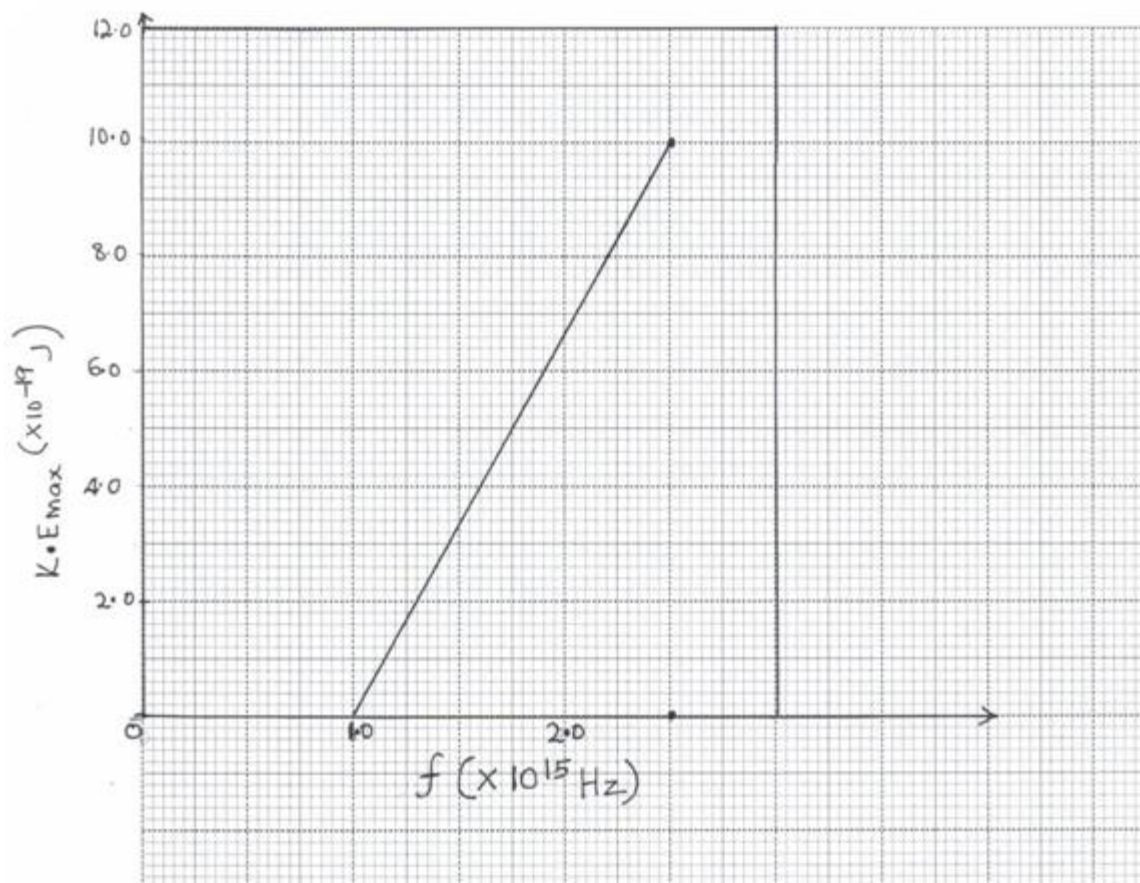


Determine the frequency of the signal.

(3mks)

16. (a) Give a condition necessary for electrons to be emitted from the cathode of a photocell. (1mk)

- (b) In an experiment using a photocell, ultraviolet light of varying frequency strikes a metal surface. The maximum Kinetic Energy ($K.E_{\max}$) of photoelectrons for each frequency f is measured. The graph below shows how the maximum kinetic energy varies with the frequency f .



Use the graph to determine:

(i) The Threshold frequency, f .

(1mk)

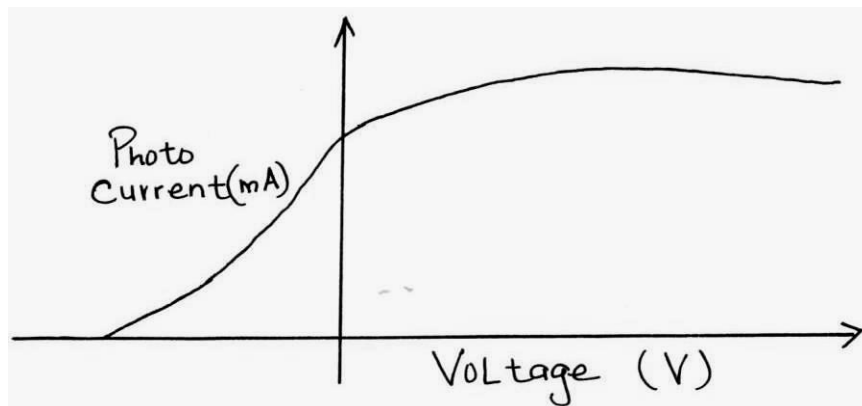
(ii) Planck's constant, h .

(3mks)

(iii) Work function of the metal.

(3mks)

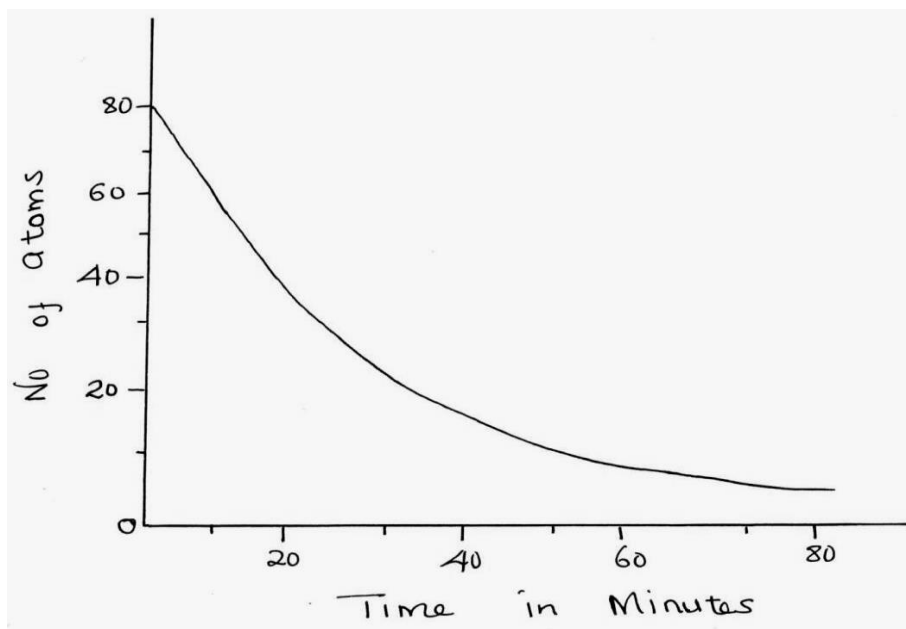
- (c) The figure below shows the variation of photoelectric current with applied voltage when a surface was illuminated with light of a certain frequency. On the same axes, sketch the graph when a light of higher intensity but same frequency is used to illuminate the same surface. (1mk)



17. (a) (i) Define the term half life of a radioactive material.

(1mk)

- (b) The figure below shows a decay of a certain element. The diagram is drawn to scale.

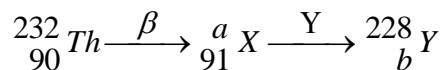


From the graph find:

- (i) Half life of the element. (1mk)

- (ii) Number of half lives undergone when the count rate is 10 atoms. (2mks)

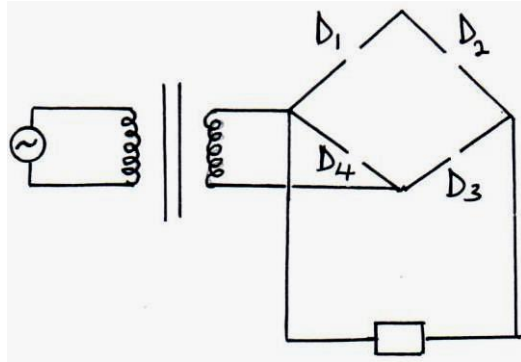
- (iii) The following is part of a radioactive decay series.



Determine the value of 'a' and 'b'. (2mks)

18. (a) Define the term doping. (1mk)

- (b) The diagram below shows a bridge rectifier for alternating current. Complete the diagram by placing the diodes in the correct order. (2mks)



- (c) Explain why a bridge rectifier circuit is better than a single diode rectifier circuit. (1mk)

- (d) What happens to depletion layer when diode is reverse biased. (1mk)

NAME..... INDEX NO.....

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PHYSICS

PAPER 3

(PRACTICAL)

AUGUST, 2021

TIME: 2½ HOURS

CANDIDATE'S SIGN.....

DATE.....

BUNYORE-MARANDA JOINT EXAM - 2021

Kenya Certificate of Secondary Education

PHYSICS

PAPER 3

(PRACTICAL)

TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES:

1. Write your **name** and **index number** in spaces provided **above**.
2. **Sign** and write the date of examination in spaces provided **above**.
3. Answer **all** the questions in spaces provided in the question paper.
4. You are supposed to spend the first 15 minutes of 2½ hours allowed for this paper reading the whole paper carefully before commencing the work.
5. Marks are given for clear record of the observations actually made, their suitability, accuracy and the use made of them.
6. Candidates are advised to record their observations as soon as they are made.
7. Non-programmable silent electronic calculators and KNEC Mathematical table may be used.

FOR EXAMINER'S USE ONLY

Question 1	a	c & d	e	Part B	j	k	i & m	Total	20
Maximum Score	2	2	1		5	5	3		
Candidate's Score									

Question 2	a	b(i) – (vi)	Part B	(i)	(ii)	Total	20
Maximum Score	3	15		1	3		
Candidate's Score							

**GRAND
TOTAL**

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Physics Paper 3

Turnover

1. You are provided with the following apparatus:

- Two optical pins mounted on corks.
- Candle.
- Metre rule.
- Screen.
- White sheet of paper.
- Lens and lens holder.
- Plane mirror.
- Clamp stand.
- Boss and a clamp.
- Piece of cellotape.
- Vernier calipers.

- (a) Set up your apparatus as in figure 2 such that the tip of the cork is vertically above the center of lens.

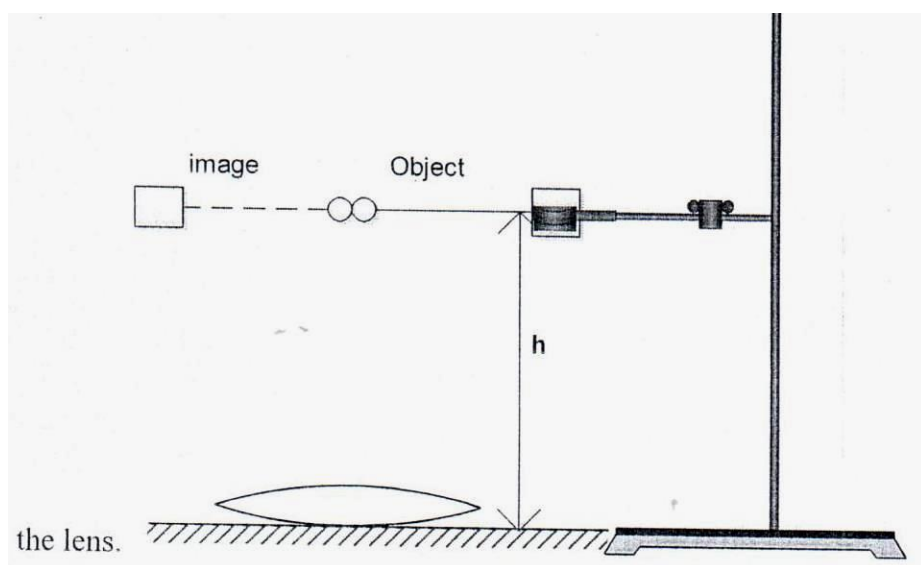


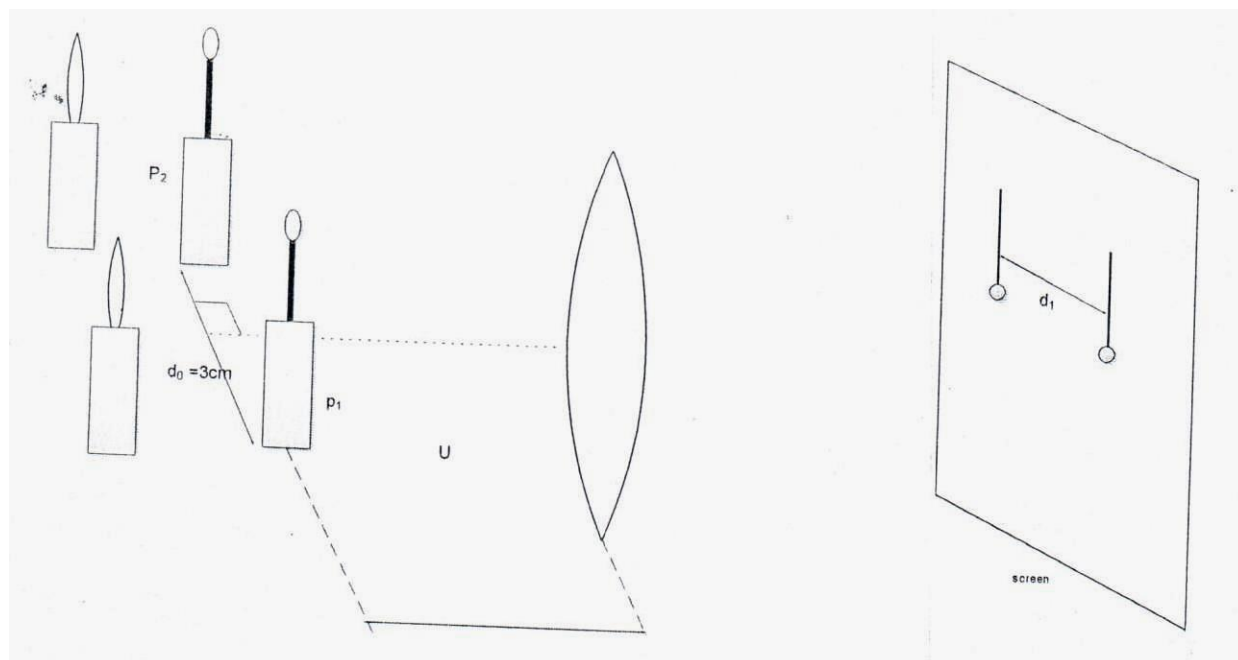
Figure 2

- (b) Raise the cork until it coincides with its image without any parallax.

- (c) Measure the height h . $h = \underline{\hspace{2cm}}$ cm (2mks)

- (d) Measure the thickness of the lens t . $t = \underline{\hspace{2cm}}$ cm (1mk)

- (e) Calculate the focal length from $f = \frac{2h-t}{2}$ $f = \underline{\hspace{2cm}}$ cm (1mk)

PART B

- Place pin P_1 and Pin P_2 3cm apart and at right angle to the principal axis of the convex lens.
- Place the candle behind P_1 to illuminate it.
- Fix the white sheet of paper on the screen using a cello tape.
- Place the screen in front of the lens and move it until a shape image of pin appear on the screen.
- Draw a line against image of P_1 .
- Without moving the screen, move the candle behind P_2 so that a shape image of P_2 appears on the screen.
- Draw a line against the image of P_2 and measure the distance d_1 , between the two images.
- Calculate the magnification from $M = \frac{d_1}{d_0}$.
- Complete the table using other values of the objects distances (U) in the table.

	Object distance $U(\text{cm})$	$d_1(\text{cm})$	Magnification (M)	$\frac{1}{M}$
1.	23.5			
2.	26.5			

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3.	30.0			
4.	35.0			
5.	40.0			
6.	45.0			
7.	50.0			

(5mks)

- (j) Plot a graph of U (cm) against $\frac{1}{M}$.

(5mks)

(k) Determine the gradient of the graph.

(3mks)

Physics Paper 3

4

(l) Given that $\frac{U}{f} = \frac{1}{M} + 1$ determine the focal length of the lens.

(2mks)

(m) Calculate the average value of focal length.

(1mk)

2. You are provided with the following apparatus.

- 2 new dry cells size D
- A cell holder.
- One 100cm resistance wire mounted on millimeter scale.
- 1 switch.
- 1 Voltmetre 0 – 3V.
- 1 Ammeter 0 – 1A.
- 8 connecting wires (4 with at least 1 crocodile clip).
- Resistor wire mounted on cardboard.

(a) Connect the circuit as shown below in figure 3.0.

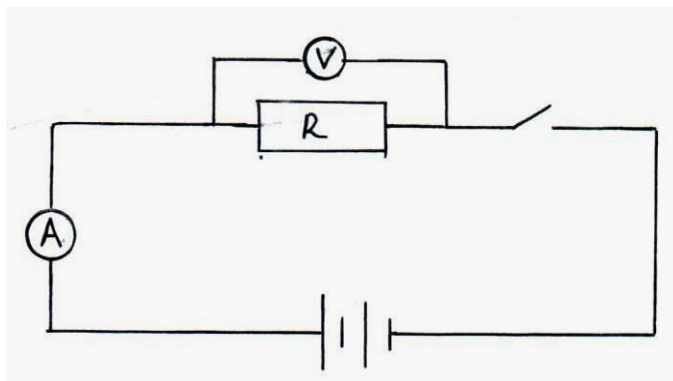
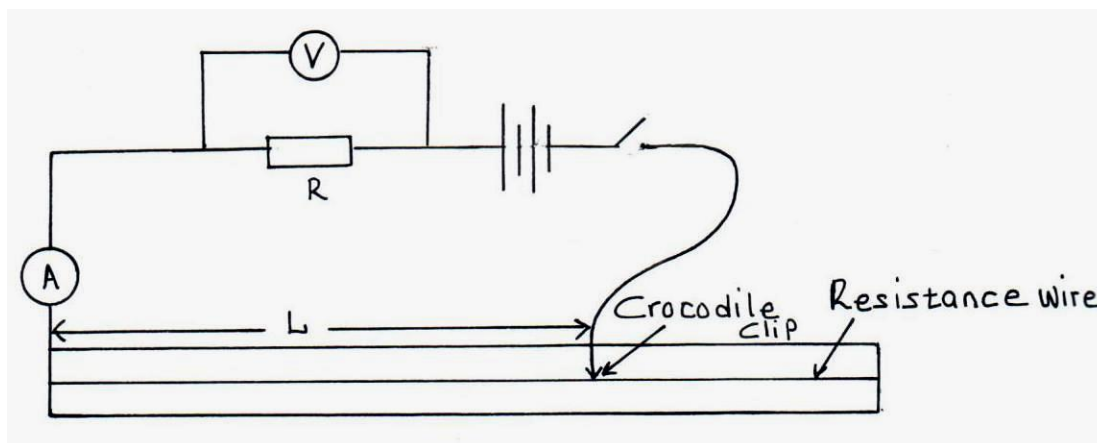


Figure 3.0

Record the reading of

(i) Ammeter, $I = \underline{\hspace{2cm}}$ A (1mk)(ii) Voltmeter, $V = \underline{\hspace{2cm}}$ V (1mk)(iii) Given that $K = \frac{V}{I}$, find $K = \underline{\hspace{2cm}}$ (1mk)

(b) Disconnect figure 3.0 above and arrange the apparatus as shown below.



- (i) Adjust the position of crocodile clip on the resistance wire to a point such that $L = 10\text{cm}$.
- (ii) Record in the table 2, the value of p.d across R and corresponding current through R .
- (iii) Repeat procedure in (2) above for $L = 20, 30, 40, 50, 60, 70\text{cm}$.

L(cm)	10	20	30	40	50
V(V)					
I(A)					

(5mks)

- (iv) On the grid provided plot the graph of V (Y-axis) against I (X-axis). (5mks)

(v) Find the slope of the graph.

(2mks)

(vi) What quantity is represented by the slope of the graph?

(1mk)

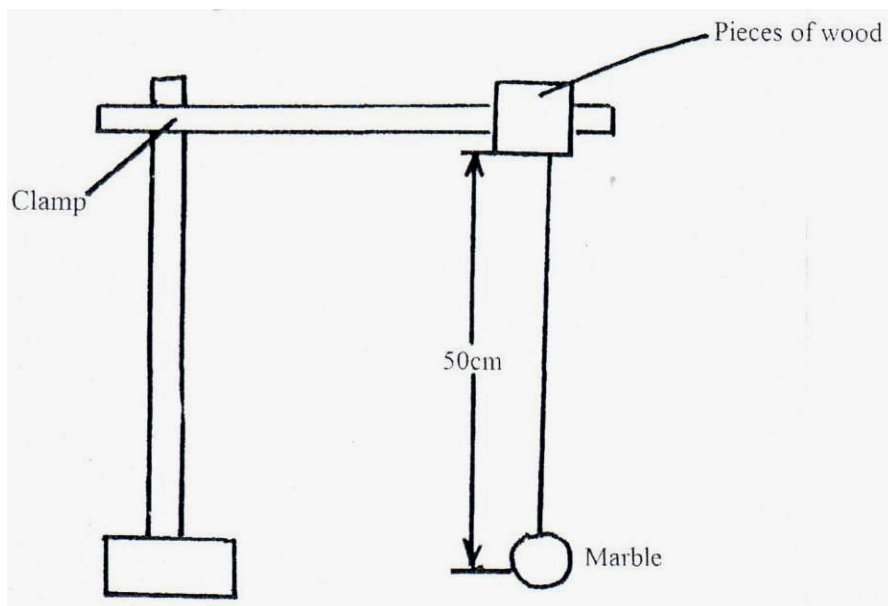
PART B

You are provided with the following:

- A 70cm long thread.
- Stopwatch.
- Metre rule.
- Clamp, boss and retort stand.
- Small pieces of wood.

Proceed as follows:

- (i) Using the provided thread, tie the marble to be used as a pendulum clamp the thread so that the length of the pendulum to the centre of the marble is 50cm as in figure 3.



Displace the marble slightly so as to oscillate along the vertical plane.
Time and record the time, t , for 20 oscillations.

$t = \underline{\hspace{2cm}}$ S

(1mk)

- (ii) If the oscillation of the marble is given by the formula $T^2 = \frac{4\pi^2 \ell}{g}$.

Use the values in part (i) above to determine the value of g. (3mks)