NAME: ……..…CLASS:…..…ADM NO:……

SIGNATURE:……INDEX NO:……

232/1
PHYSICS
PAPER 1
SEPTEMBER 2021

KASSU JET EXAMINATION - 2021

Kenya Certificate of Secondary Education
Physics Paper 1

Instructions to candidates

- 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.
- Mathematical tables and silent electronic calculators may be used.
- Take: Acceleration due to gravity g = 10 ms^{-2}.
- Atmospheric pressure = 76 cmHg
- Density of mercury ≡13600 kg/m^3

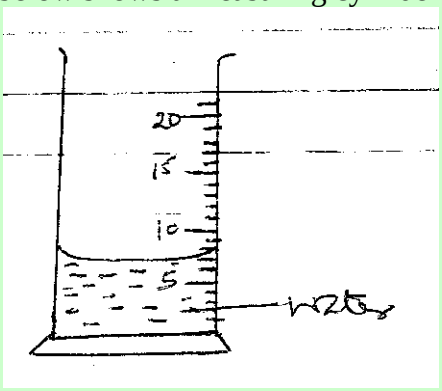
For examiners use only

SECTION	QUESTION	MAX MARKS	CANDIDATE'S SCORE
A	1 – 11	25	
B	12 – 17	55	
TOTAL			

SECTION A (25 MARKS)

Attempt all the questions in this section.

1. The figure below shows a measuring cylinder with some water in it.



A metal cube of mass 18g is submerged in it. Given that the density of the metal is 4.167 g/cm^3, indicate the new level of the liquid. (2 mks)

2. Explain how temperature affects surface tension. (2 mks)

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3. A drop of blue ink is introduced at the bottom of a beaker containing water. It is observed that after sometime, all the water in the beaker turns blue. Name the process that takes place. (1 mk)

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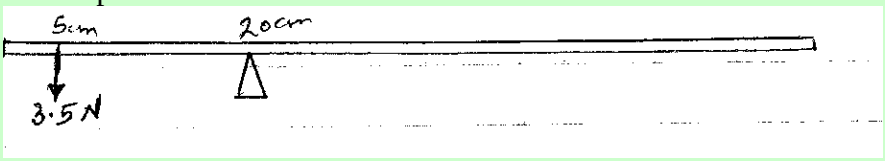
4. The figure below shows a uniform metre rule pivoted at the 20cm mark. It is balanced by a weight of 3.5N suspended at the 5cm mark.



Determine the weight of the metre rule. (3 mks)

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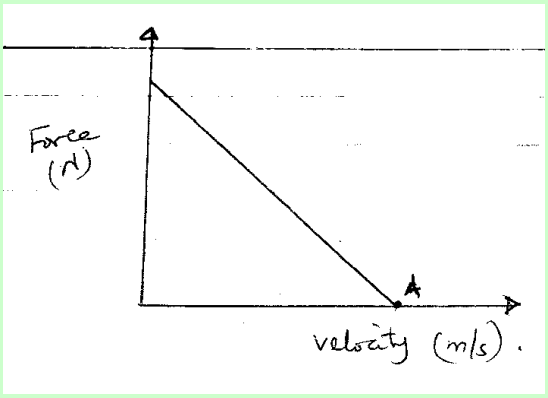
5. The diagram below shows a sketch graph of resultant force against velocity for a body falling through air.



(a) Give the name given to the velocity of the body at point a. (1 mk)

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(b) Explain why the resultant force is equal to zero for the velocity given in (a) above. (2 mks)

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6. A student dipped a mercury thermometer into a very hot liquid.

(a) State what is observed. (1 mk)

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(b) Explain observation in (a) above. (1 mk)

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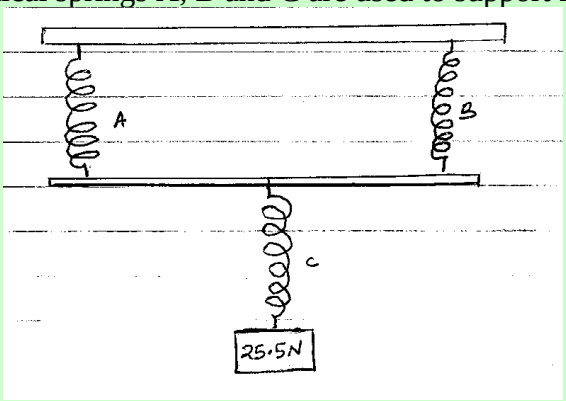
7. Three identical springs A, B and C are used to support 25.5N weights as shown below.



If the weight of the horizontal bar is 2.5N, determine the extension of each spring given that 6N causes an extension of 2 cm. (3 mks)

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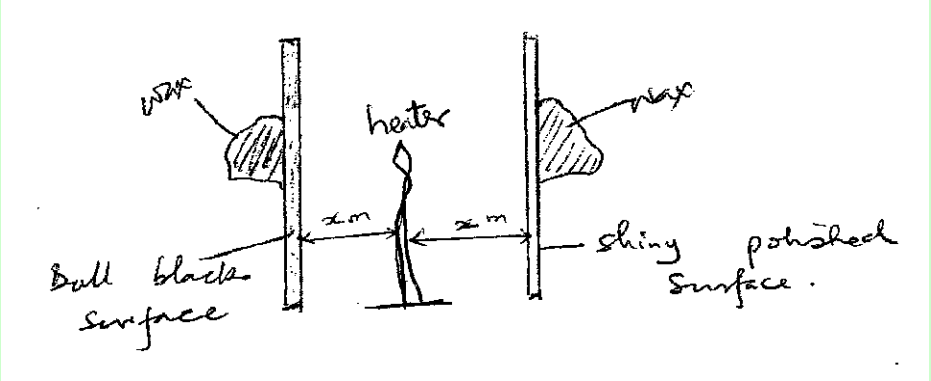
8. The diagram below shows the effect of heat from the heater on two surfaces …… surface.



(i) How does the heat from the heat reach the surface? (1 mk)

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(ii) State what is observed from the set up after a few minutes. (1 mk)

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9. Trees planted along or near the road seem to bend towards the road. State and explain the observation. (2 mks)

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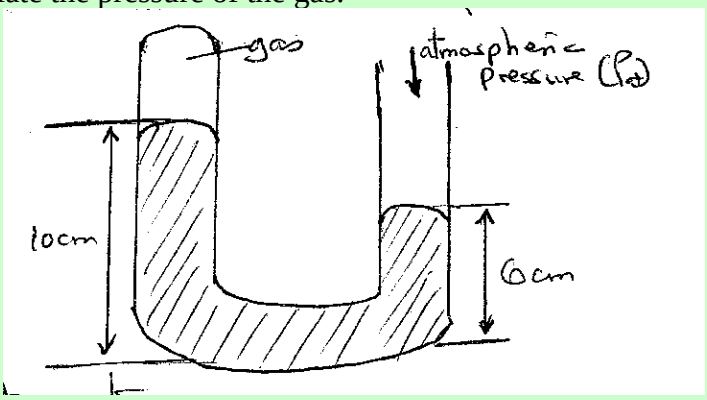
10. Figure below shows a u-tube upon which a gas has been enclosed on one end with mercury in it. Calculate the pressure of the gas.



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11. State two sources of errors in an oil drop experiment. (2 mks)

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SECTION B (55 MARKS)

Attempt all the questions in this section.

12. (a) (i) Define the term angular velocity (ω). (1 mk)

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(ii) A body in a circular path is said to be accelerating and yet it moves in a constant speed. Explain. (1 mk)

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(c) A stone of mass 500g is attached to a string of length 50cm which can break when the tension exceeds 20N. The stone is whirled by a student until the string breaks at a point 100 cm above the ground. (Take g, as 10 m/s^2).

(i) In what position does the string break. (1 mk)

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(ii) Calculate the angular velocity at which the string breaks. (3 mks)

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(iii) Time taken by the stone to reach the ground. (3 mks)

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(iv) Distance from the feet of the student to the point the stone strokes the ground. (2 mks)

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13. (a) A hydraulic lift is used to raise a load of 100 kg through a height of 2.0 m. the radius of the effort piston is 1.6cm while the load piston has a radius of 8.0cm. If the machine is 75% efficient; calculate:

(i) the velocity ratio. (2 mks)

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(ii) mechanical advantage (1 mk)

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(iii) effort required (1 mk)

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(iv) energy wasted in using the machine (2 mks)

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(b) A block and tackle pulley system is used to lift a mass of 200 kg. If the machine has a velocity ratio of 5, and efficiency of 80%;

(i) Sketch in the space provided below the possible arrangement of the system. (2 mks)

(ii) Determine the effort required to lift the load. (2 mks)

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14. (a) State Newton's first law of motion. (1 mk)

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(b) A wooden block resting on a horizontal bench is given an initial velocity, U, so that it slides on the coach surface for a distance, d, before coming to a stop. The values of, d, were measured and recorded for values of initial velocity. The figure below shows a graph of U^2 against d.

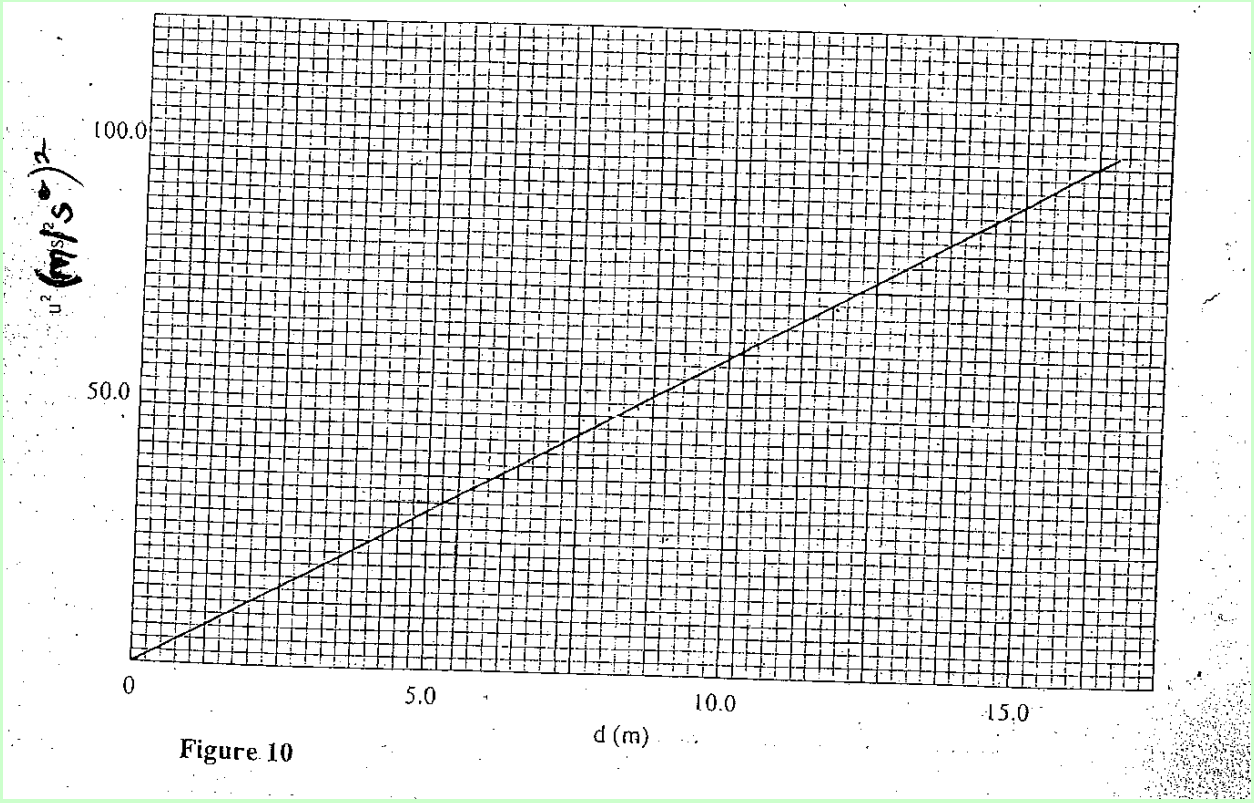

Figure 10

(i) Determine the slope of the graph. (3 mks)

(ii) Given that $U^2 = 20$ kd, where K is a constant for the bench surface, determine the value of K from the graph. (3 mks)

(iii) State how the value of K would be affected by a change in the roughness of the bench surface. (2 mks)

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(c) A car of mass 800 kg starts from rest and accelerates at 1.2 ms^{-2}. Determine its momentum after it has moved 400m from the starting point. (4 mks)

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15. 300g of ice at 0^0c is dropped into a copper calorimeter containing warm water of mass 60g at 60^0c. it's observed that only 80% of ice melted.
(Take: Specific heat capacity of water = 4200 $Jkg^{-1}k^{-1}$
Heat capacity of copper = 400 JK^{-1})

(a) Determine the final temperature of the mixture. (1 mk)

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(b) Determine the heat lost by calorimeter. (2 mks)

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(c) Determine the heat lost by warm water. (2 mks)

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(d) Determine the specific latent heat of fusion of ice. (3 mks)

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(e) It's observed that if the temperature if warm water used was 80^0c, then all the ice could have melted. What would be the final temperature of the mixture? Use the value of specific latent heat of fusion obtained in (d) above. (3 mks)

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16. (a) A concrete block of value, V, is totally immersed in sea water of density, S. Write an expression for the upthrust on the block. (1 mk)

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(b) A certain solid of volume 50 cm^3 displaces 10 cm^3 of kerosene (density 800 kg/m^3). When floating. Determine the density of the solid. (4 mks)

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(c) State the condition necessary for a body to float in a fluid. (1 mk)

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17. (a) A mercury thread 200 mm long traps a gas in a long glass tube. The length of the gas column is 100 cm when the tube if held horizontally. The atmospheric pressure is 750 mmHg. Calculate the length of the gas column when the tube is held vertically with the open end facing downwards. (3 mks)

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(b) State Boyle's law. (1 mk)

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(c) 250 cm^3 of a gas is collected at a pressure of 900 mmHg and 27^0c temperature. Determine the volume of this gas if the pressure is reduced to 500 mmHg and temperature 19^0c. (2 mks)

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NAME_____ADM.NO._____CLASS_____

INDEX NO._____SIGNATURE:_____

DATE:_____

232/2
PHYSICS
Paper 2
2 Hours

K A S S U J. E .T.E XA M I N A T I ON 2021

Instructions to Candidates

1. Write your name, index number, class and admission number in the spaces provided above.
*2. This paper consists of **TWO** sections: Sections **A** and **B**.*
*3. Answer **ALL** the questions in sections **A** and **B** in the spaces provided.*
*4. ALL working **MUST** be clearly shown.*
5. Mathematical tables and electronic calculators may be used.

For Examiner's Use Only

SECTION	QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
A	1-10	25	
B	11	10	
	12	13	
	13	08	
	14	12	
	15	12	
TOTAL SCORE		80	

This paper consists of 12printed pages.
Students should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

SECTION A: (25 MARKS)

1. In **figure 1** two mirrors M1 and M2 are inclined at right angles to each other.

Diagram drawn to scale

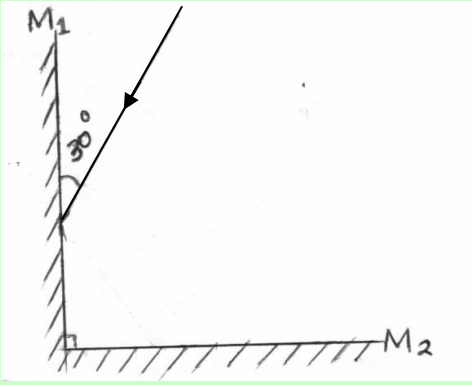


Figure 1

Trace the reflection of the ray through the two mirrors and find the angle between the incident ray and reflected ray of mirror M2. (2 marks)

2. When rod X was rubbed with material Y it was observed that the material acquired a negative charge.

a) State the charge on rod X after rubbing (1 mark)

b) Explain how rod X acquired the charge stated in (a) above. (1 mark)

3. An iron ring is placed between two magnets as shown in **figure 2.**

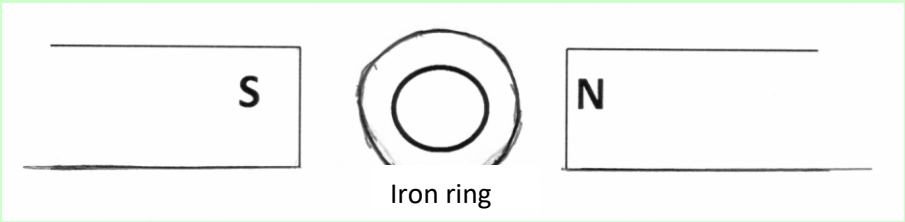


Figure 2.

(a)Sketch the magnetic field pattern between the poles and mark the neutral point, Xon the diagram . (2 marks)

(b) State one application of the concept tested above. (1mark).

4. A charge of 180 Coulombs flows through a lamp every minute. Calculate the number of electrons involved. (Take charge of an electron e, $=1.6\times10^{-19}$C). (2 marks)

5**. Table 1** shows radiations and their respective frequencies.

Type of radiation	Yellow light	Gamma rays	Radio waves	Micro waves
Frequency (Hz)	1×10^{15}	1×10^{22}	1×10^{6}	1×10^{11}

Table1

a) Arrange the radiation in order of increasing energy. (1 mark)

b) State the reason why radio waves signals are easier to receive than TV signals in a place surrounded by hills. (1 mark)

6. **Figure 3**shows a metal rod PQ connected to a d.c supply and placed between two magnets.

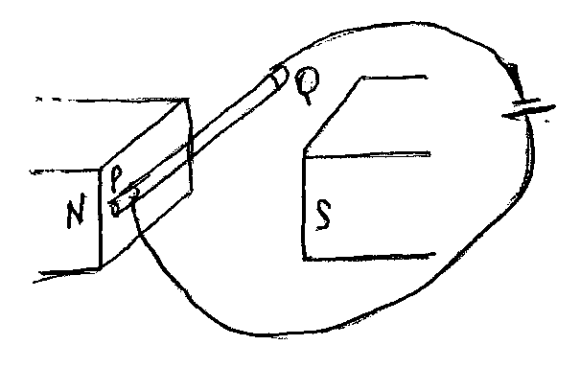


Figure 3

a) Indicate on the diagram the direction of force on rod **PQ** and magnetic field pattern between the two magnetic poles only. (2 marks)

b) State **one** way in which the direction of force can be made to change. (1mark)

7. An explosion in a quarry takes place at a distance of 70m from an observer. An echo from a cliff 50m beyond the source of the explosion is heard by the observer 0.5 seconds after he sees the flash from explosion. Calculate the velocity of sound in air.
(3 marks)

8. (a) **Figure 4**below shows the path of a ray of light through a triangular prism **ABC** of refractive index 1.50. is parallel to **AC**.

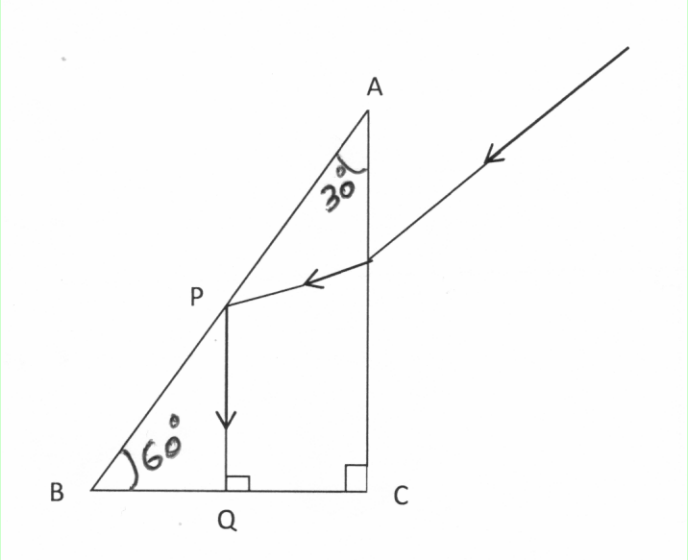


figure 4

Determine the angle of incidence on the side **AC.** (3marks)

b) **Figure 5** shows the image formed by convex mirror

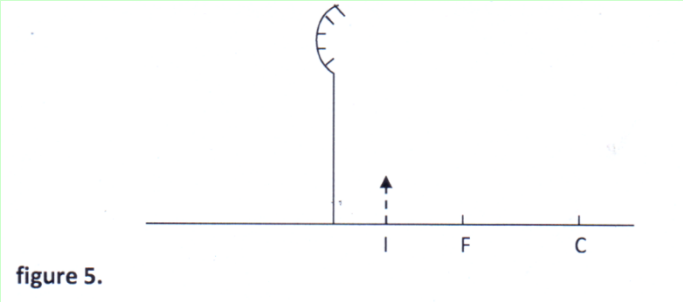


figure 5.

Sketch rays on the diagram to show the position of object (2 marks)

9.In an experiment to study interference in sound waves two identical loudspeakers are connected to an audio frequency generator so that they act as coherent sources L_1 and L_2 as shown in **figure 6.**

Figure 6

An observer walking several metres ahead and a long a line to **L_I L_2** identifies points**A**and**A_1**as the first positions of loud sound on either side after the loud sound at the middle position **O** between the two sources. (2 marks)

(a) Explain the meaning of the term coherent source. (1 mark)

(b) Name the type of interference occurring at the points **O,A,** and **A_1**. (1 mark)

10. Distinguish the n-type and p-type semiconductors. (1 mark)

SECTION B: 55 MARKS

11. a) **Figure 7** shows a source of α,β and r-radiation placed infront of a set of barriers A,B and C

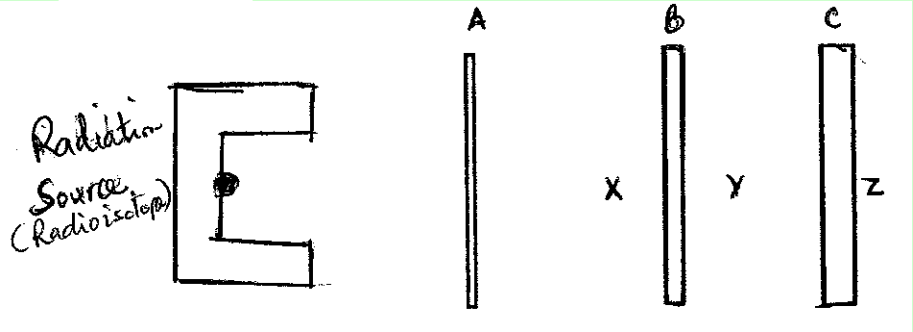


Figure 7

A is a thick sheet of paper, B is a thin sheet of aluminium foil and C is a thin sheet of lead. Name the radiation detected in the regions marked X, Y and Z. (3 marks)

X……

Y……

Z……

b) The **figure 8** below shows the features of a diffusion cloud chamber used for detecting radiation.

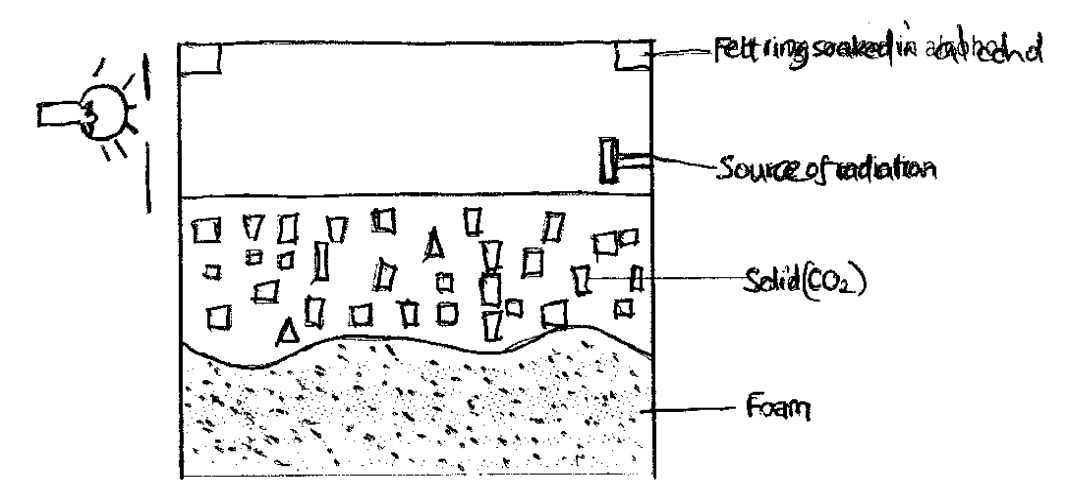


Figure 8

i) Explain how radiation from the source is detected in the chamber. (4marks)

ii) What type of radiation can the device detect? (1mark)

c) The count rate recorded for a certain source is 256 counts per second. What count rate is recorded 20 days later, if the half-life of the source is 5 days. (2marks)

12. (a) A house has five rooms each with 240V,60W bulbs.If the bulbs are switched on from 7:00pm to 10:30 pm;

(i) Calculate the power consumed in the month of April in Kilowatt-hours.(2marks)

(ii) Find the cost per month for lighting these rooms at Ksh6.70 per unit. (2marks)

(b) A student designed a transformer to provide power to an electric bell marked 24W,6V from a mains supply 240V. He wound coils, 50 turns and N turns on an iron ring core. When he connected the coil of 50 turns to the bell and N turns coil to the a.c source, he found out that the transformer was only 80% efficient.Find;

(i) The value of N. (2marks)

(ii) The current in the primary coil. (2marks)

(c) The **figure 9**. shows a connection to the three- pin plug.

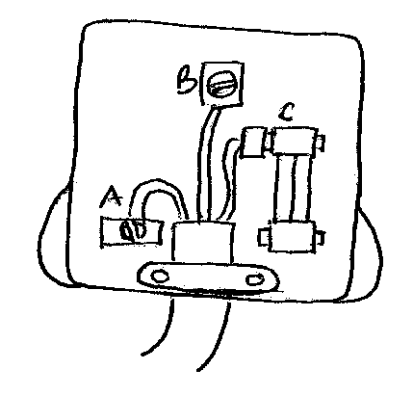


Figure 9

(i) Name the cables A, B and C and state their colours. (3marks)

A……

B……

C……

(ii) Why is the fuse connected to cable C.? (1mark)

(iii) State **one** reason why in domestic wiring system appliances are connected in parallel. (1 mark)

13. **Figure 10** Shows an electric circuit with four capacitors A,B,C and D8 µF ,3µF,6 µF and 15 µF respectively connected to 12V battery.

12 V

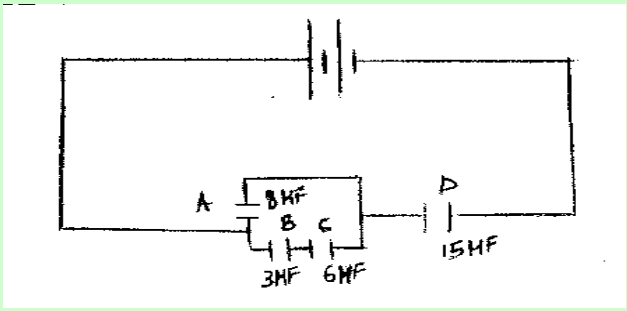


Figure 10

(a) Determine ;

(i) the effective capacitance. (3 marks)

(ii) the charge of capacitor D. (2 marks)

(iii) the total energy stored. (2 marks)

(b) Explain **one** factor that determine the capacitance of a parallel plate capacitor.

(1 mark)

14. (a)**Figure 11**shows the features of a cathode ray tube.

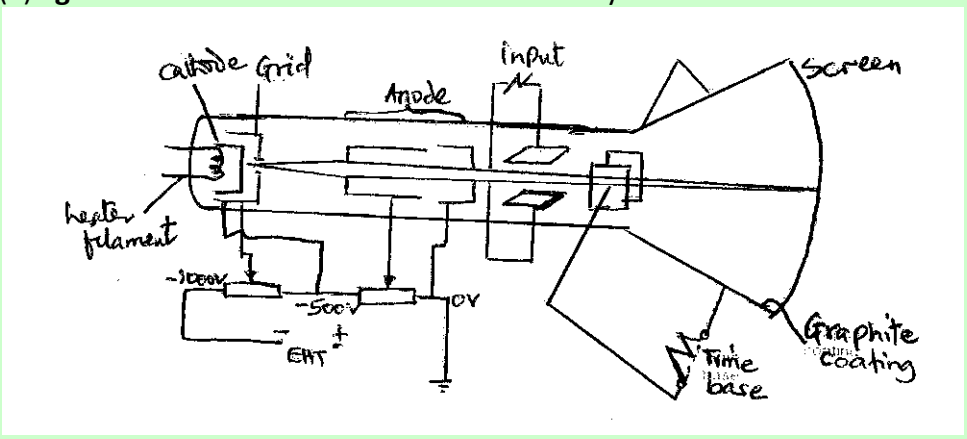


Figure 11

(i) Explain how the electrons are produced in the tube. (1 mark)

(ii) What is the purpose of the anodes? (2 marks)

(iii) Why is the tube evacuated? (1 mark)

(b) **Figure 12**shows the voltage of an a.c. generator on the screen of a C.R.O.

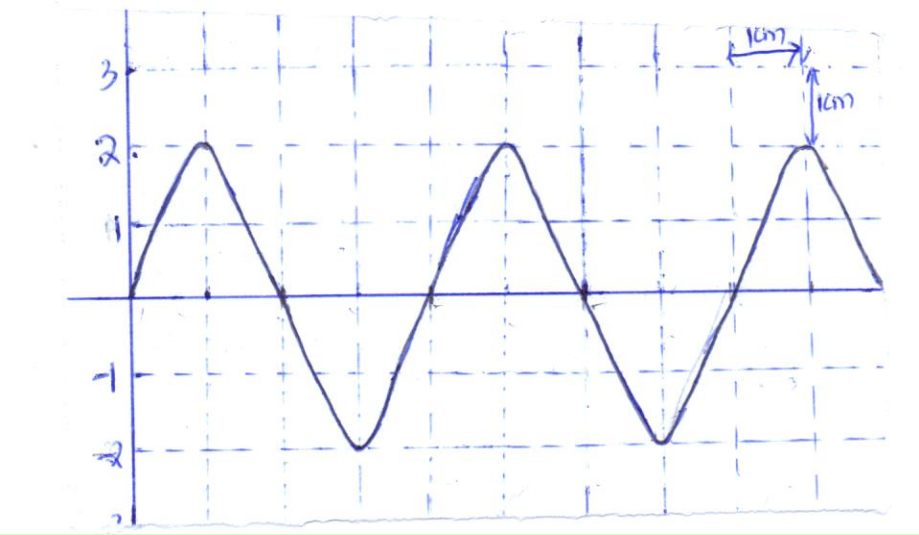


Figure 12

If the time base calibration is 20 milliseconds/cm and the y- gain is 5V/cm , calculate;

(i) the frequency of the generator. (2 marks)

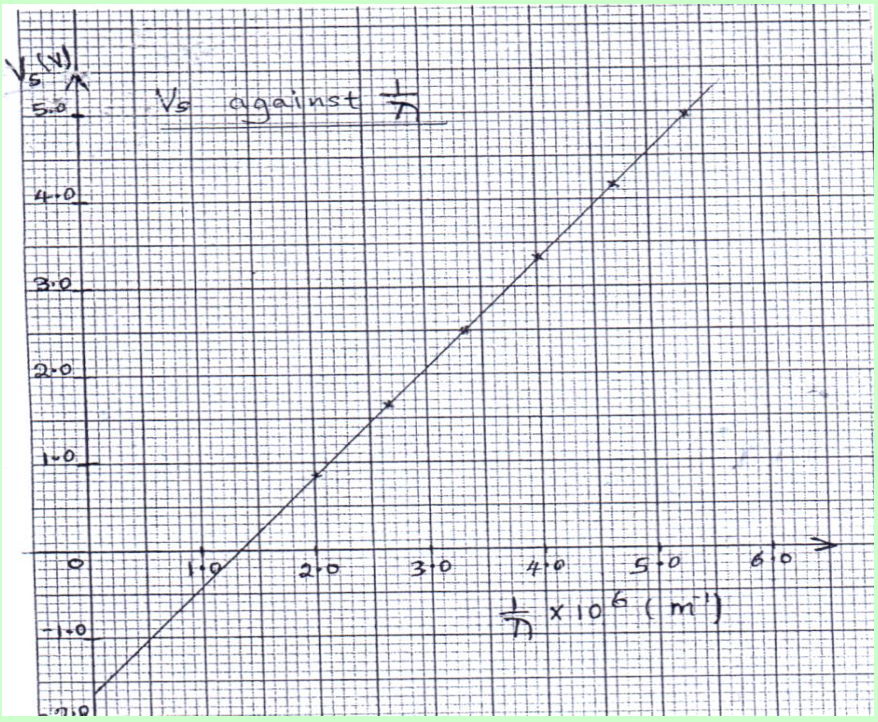
(ii) the peak voltage of the generator. (2 marks)

(c) A potential difference of 40kV is applied across an x-ray tube. Given that the charge of an electron is $1.6 \times 10^{-19}C$ and the mass of an electron is $9.1 \times 10^{-31}kg$ and Planck's constant = 6.63×10^{-34}Js;

(i) What is the effect of increasing the potential difference across the x-ray tube? (1 mark)

(ii) Calculate the velocity with which the electrons strike the target. (3 marks)

15. A Form 4 student carried out on experiment to investigate photoelectric effect. From the results a graph of stopping potential V_s (y-axis) against the inverse of the wavelength $\frac{1}{\lambda}$was plotted and was as shown below.



The equation of the graph is $V_s = \frac{hc}{e\lambda} - \frac{hc}{e\lambda_0}$

Where: c = $3.0 \times 10^8 ms^{-1}$,speed of light in air

e= $1.6 \times 10^{-19} C$, charge of an electron

h = is the Planck's constant.

(a) From the graph, determine;

(i) The slope s of the graph. (2 marks)

(ii) The Planck's constant h. (2 marks)

(iii) The threshold wavelength λ_o (2 marks)

(iv) The threshold frequency f_o (2 marks)

(v) The work function W_o in electron volts (e.v) (2 marks)

(b) On the same graph, sketch a graph which would be obtained if the student used a metal with greater threshold frequency, explain your answer. (2 marks)

<u>This is the last printed page</u>

Name: _____**Index No**. _____ /_____

Candidate's Signature _____ Date: _____

232/3

PHYSICS

Paper 3

(PRACTICAL)

TIME: 2 ½ hours

KASSU JET EXAMINATION

SEPTEMBER 2021

Kenya Certificate of Secondary Education

PHYSICS

Paper 3

TIME: 2 ½ HOURS

Instructions

- *Write your name and index number in the spaces provided above.*
- *Sign and write the date of examination in the spaces provided above.*
- *Answer ALL questions in the spaces provided in the question paper.*
- *You are supposed to spend the first 15 minutes of the 2 ½ hrs allowed for this paper reading the whole paper carefully before commencing your work.*
- *Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.*
- *Candidates are advised to record their observations as soon as they are made.*
- *Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.*
- *This paper consists of 9 printed pages.*
- *Candidates 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

Question 1	b	d	e	f	g	h (i)	(ii) I	I	**TOTAL**	
Maximum Score	1	4	1	5	3	2	2	2	**20**	
Candidate's Score										
Question 2	**Part A**	a	b	c	d	**Part B**	c	g (i)	g (ii)	**TOTAL**
Maximum Score		1	2	5	2		3	5	2	**20**
Candidate's Score										

GRAND TOTAL

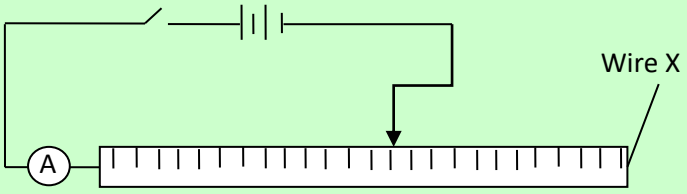
Question one

You are provided with the following:

- 2 new dry cells size D
- A cell holder
- A switch
- An ammeter
- A voltmeter
- 6 connecting wires at least three with crocodile clips
- Nichrome wire mounted on the metre rule labeld X
- A micrometer screw gauge (to be shared)

Proceed as follows

a. Connect the circuit as shown in the figure below



b. Measure the voltage, E of the dry cell before closing the switch
E=…… V (1mark)

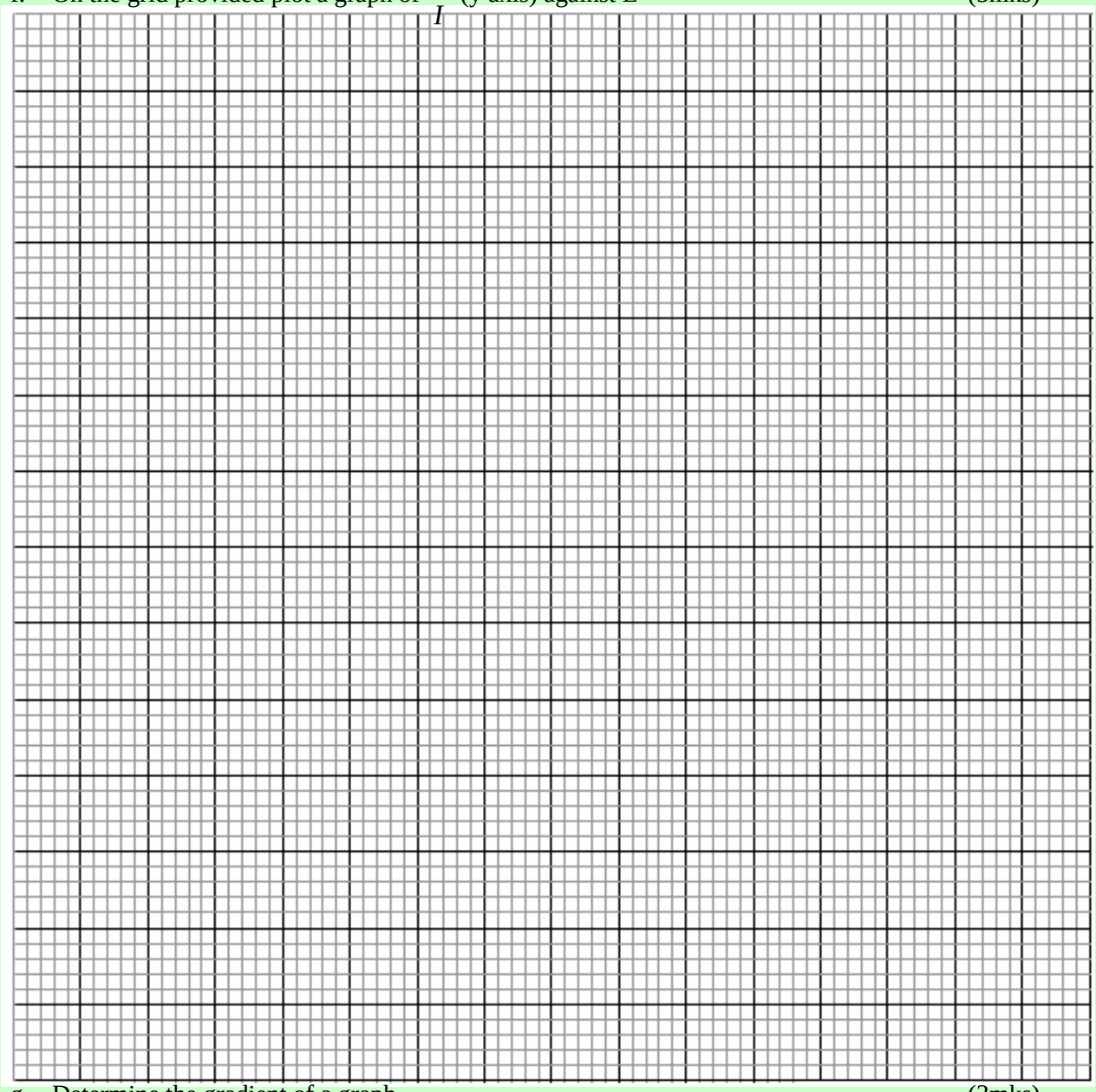
c. Adjust the length L of the wire 0.2m, close the switch S and read the value of current and record in the table below.

Length L(m)	0.2	0.3	0.4	0.5	0.6	0.7
Current , I(A)						
$\frac{1}{I}$ **(A^{-1})**						

d. Repeat the procedure in (c) above for the value of lengths given in the table (3mks)

e. Calculate the values of $\frac{1}{I}$ and record in the table above. (1mk)

f. On the grid provided plot a graph of $\frac{1}{I}$ (y axis) against L (5mks)



g. Determine the gradient of a graph (3mks)

h. (i) Measure the diameter dof the wire in three points used and find the average diameter.
d_1=……d_2 =……d_3…… mm (1mk)

Average d=……m (1mk)

(ii) Determine the cross section area, A of the wire (2mks)

Form the equation

$\frac{1}{I} = \frac{kl}{AE} + \frac{Q}{E}$: determine

i) The value of k (2mks)

ii) The value Q (2mks)

Question 2
Part A
You are provided with the following

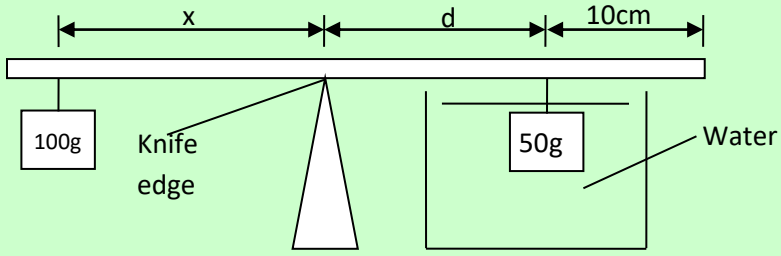
- A metre rule
- Knife edge raising 20cm above bench
- One 50g mass and one 100g mass
- Some thread
- Some water in a beaker
- Liquid L in a beaker
- Tissue paper

Proceed as follows:

a) Balance the meter rule on the knife edge and record the reading at this point.
Balance point = ……m (1mk)

For the rest of this experiment the knife edge must be placed at this position.

b) Set up the apparatus as shown in figure below. Use the thread provided to hang the masses such that the positions of support can be adjusted.



The balance is attained by adjusting the position of the 100g mass. Note that the distance x and d are measured from the knife edge and the 50 mass is fully submerged in the water. Record the values of x and d.

i) x_1 = ……cm (1mk)

d = ……..cm (1mk)

ii) Determine W_1 (weight of the object in water) (2mks)

iii) Determine the upthrust U_w in water of the 50g in water (1mk)

c) Now balance the metre rule when the 50g mass is fully submerged in the liquid L.

x_2 =……cm (1mk)

Apply the principle of moments to determine the weight W_2 of 50g mass in the liquid L and hence determine the upthrust U_L in the liquid.

W_2 (2mks)

U_L (1mk)

d) Determine the relative density R.D of the liquid L, given that

R.D = $\frac{U_L}{U_w}$ (1mk)

Part B

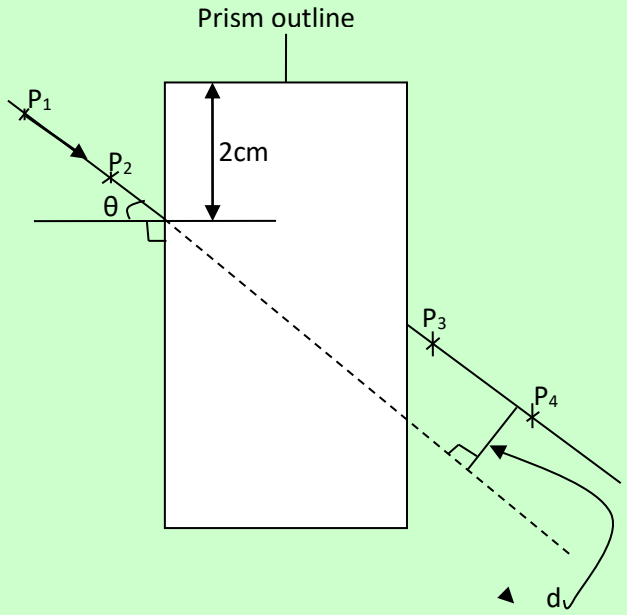
You are provided with the following

- A rectangular glass block
- Four optical pins
- A piece of soft board
- A plain sheet of paper
- Cellotape

You are also required to have your complete mathematical set.

Proceed as follows:

a) Place the plain sheet of paper on the soft board and fix it using the cellotape provided. Place the glass block at the centre of the sheet, and draw its outline. Remove the glass block. See the figure below



Draw a normal at a point 2cm from the end of the longer side of the block outline. This normal line will be used for the rest of the experiment.

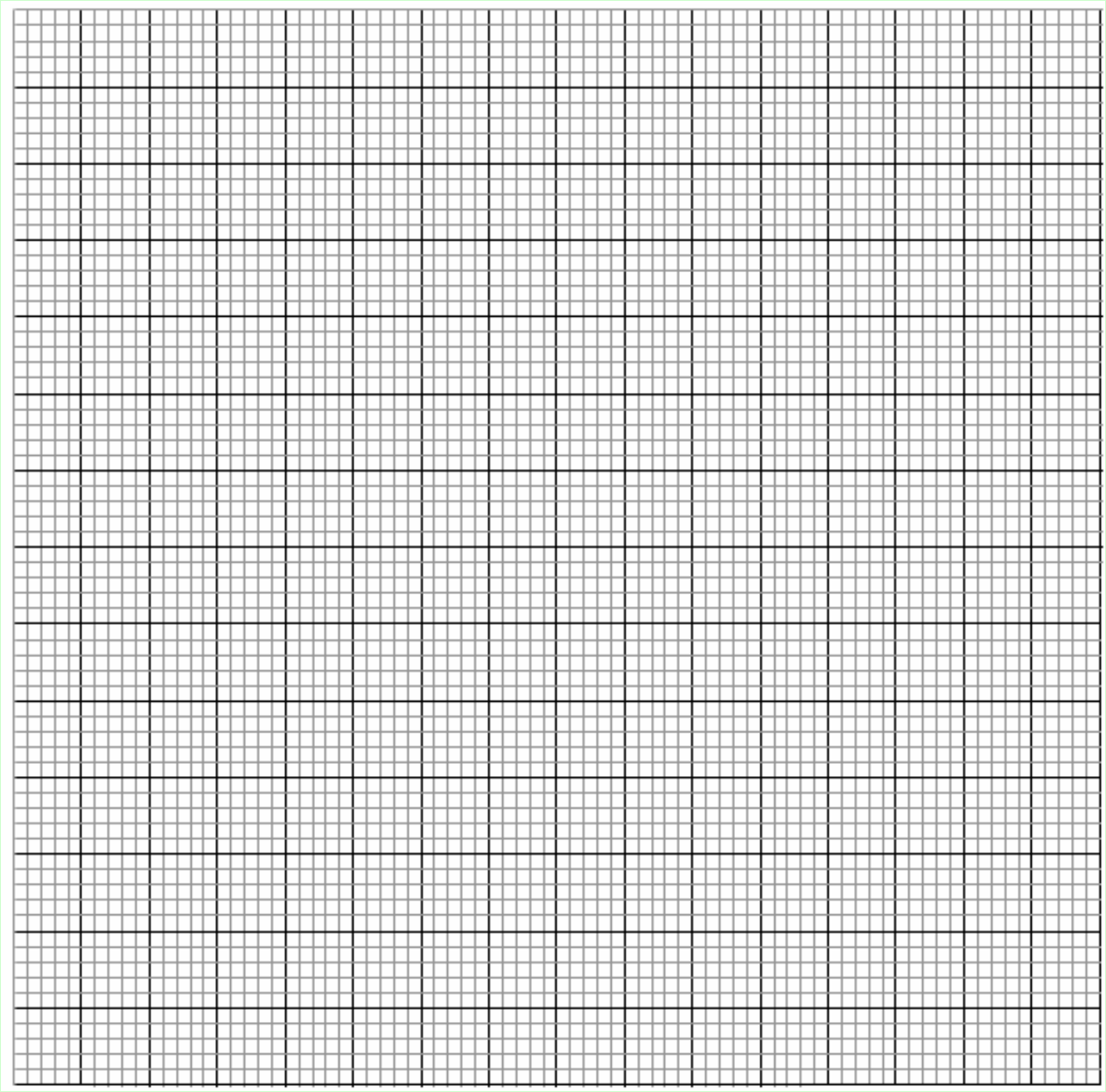
b) By viewing through the glass from the opposite side stick two other pins P_3 and P_4 vertically such that they are in line with the images of the first two pins. Draw a line through the marks made by P_3 and P_4 to touch the outline.
Measure and record in the table below the perpendicular distance **d** between the extended line and the line, P_3P_4. See figure above.

c) Record this value in the table below and repeat the process for other angles shown in the table.
NB: The sheet of paper with the drawing must be handed in together with this question paper. Ensure you write your name and index on the sheet paper.

(3mks)

Θ(deg)	25	35	40	45	55	60	65
d(cm)							

f(i) On the grid provided, plot a graph of d (y –axis) against Θ (5mks)



(ii) Using the graph, estimate the value of d when $\Theta = 0^{o}$ (2mks)