535/2
PHYSICS
PAPER 2
July/August
$2^1/_4$ hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

PHYSICS

Paper 2

2hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

- Answer any **five** questions.
- Any additional question(s) answered will **not** be marked.
- Mathematical tables and silent non- programmable calculators may be used.

These values of Physical quantities may be useful to you,

Acceleration due to gravity, g	=	$10ms^{-2}$
Specific heat capacity of water	=	$4200Jkg^{-1}K^{-1}$
Specific heat capacity of copper	=	$400Jkg^{-1}K^{-1}$
Specific latent heat of fusion of ice	=	$3.36 \times 10^5 Jkg^{-1}$
Density of water	=	$1000kgm^{-3}$
Density of Mercury	=	$13,600kgm^{-3}$
Speed of sound in air	=	$340ms^{-1}$
Velocity of electromagnetic waves	=	$3 \times 10^8 ms^{-1}$

1. (a) Define the following as applied to motion;
   (i) **Uniform velocity.** (01 mark)
   (ii) **Length of the pendulum.** (01 mark)

(b) Figure 1 below shows the variation of velocity with time of the car.

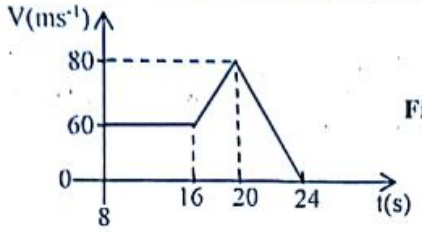


Fig. 1

   (i) Describe the motion of the car. (03 marks)
   (ii) Calculate the distance covered between 16th and 24th second. (03 marks)

(c) A body of known mass is acted upon by forces of; 3N, 8N and 4N as shown in figure 2(i).

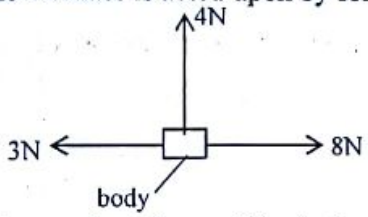


Fig. 2(i)

   (i) Find the resultant force of the body. (03 marks)
   (ii) Explain what happens when a balloon filled with air is released in space as shown in figure 2(ii). (02 marks)

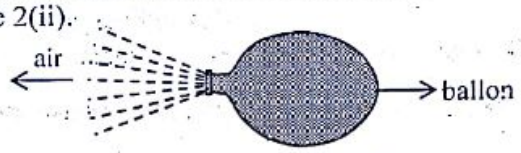


Fig. 2(ii)

(d) Explain how a person is able to draw a liquid from a glass using a straw. (03 marks)

2. (a) What is meant by the following?
   (i) Mechanical advantage. (01 mark)
   (ii) **Moment of force.** (01 mark)

(b) (i) State the **principle of moments.** (01 mark)

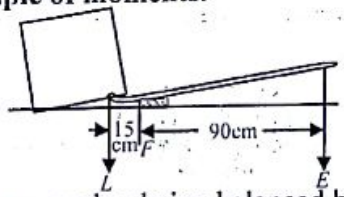


Fig. 3

   (ii) Figure 3 shows a crow bar being balanced by the forces E,g the effort and L, the load and F being the fulcrum.
   Determine the Mechanical advantage of the crow bar. (03 marks)

(c) (i) What is meant by **density of substance**? (01 mark)
   (ii) Calculate the mass of air in a room of floor dimensions 10m x 12m and height 4m. (Density of air 1.26kgm^{-3}). (03 marks)

(d) (i) State **Archimede's principle.** (01 mark)
   (ii) Describe an experiment to verify Archimede's principle. (04 marks)
   (iii) Explain why water in the bottom of a floating boat cannot be siphoned over the side. (01 mark)

3. (a) What is meant by;
   (i) **Convection.** (01 mark)
   (ii) **Fixed temperature points.** (01 mark)

(b) The diagram below shows a refrigerator.

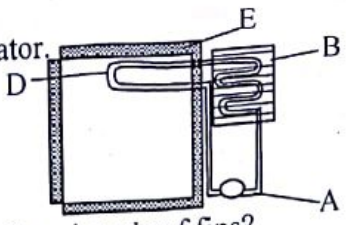


Fig. 4

(i) Name the part A. (01 mark)
(ii) Explain why B is painted black and made of fins? (02 marks)
(iii) Explain why D is on the upper side in the refrigerator and not in the lower side. (02 marks)

(c) (i) Describe how the scale of a new thermometer can be calibrated. (03 marks)
(ii) State **two** advantages and **two** disadvantages of using mercury as a thermometric liquid. (03 marks)

(d) Explain how the green house effects leads to global warming. (01 mark)

4. (a) (i) State any **two** different types of sources of electrical energy. (02 marks)
(ii) Explain why birds standing on electricity transmission wires do not get electrocuted. (01 mark)

(b) (i) Define **potential difference (p.d).**
(ii) Use the definition in (b) (i) above, to show that the power produced across a conductor is P = IV where V is the p.d across conductor and I is the current in the conductor. (02 marks)
(iii) Explain the necessity of earthing some electrical appliance. (02 marks)

(c) Draw circuit diagrams to show;
(i) Voltmeter reading emf of a cell. (01 mark)
(ii) Voltmeter reading terminal p.d of a cell. (01 mark)

(d) On the same axis, sketch a graph of current against potential difference (p.d) for;
(i) a torch bulb. (01 mark)
(ii) a carbon resistor. (01 mark)

(e) (i) Describe the faults of a simple primary cell. (02 marks)
(ii) What special precaution are taken in caring for a lead acid battery? (02 marks)

5. (a) (i) What is meant by the term light? (01 mark)
(ii) Describe an experiment to show that light travels in a straight line. (04 marks)

(b) Distinguish between primary and secondary colours giving an example in each case. (03 marks)

(c) (i) An object 2cm high is placed 5cm from optical center of the converging lens of fold length 10cm. By scale drawing, determine the position and size of the image formed. (04 marks)
(ii) State **two** uses of a converging lens. (01 mark)

(d) (i) What is **total internal reflection**? (01 mark)
(ii) Explain how sky radio waves travel from a transmitting station to a receiver. (02 marks)

6. (a) Draw a diagram to show how plane progressive wave are refracted as they travel from deep water to shallow water. (02 marks)

(b) (i) Distinguish between a **transverse** and a **longitudinal wave.** (02 marks)
(ii) The distance between 11 successive crests of a wave is 33m. Find the speed of the wave, if time taken to make one complete cycle is 0.01 second. (03 marks)

(c) (i) Describe an experiment to show that sound cannot travel through a vacuum. (04 marks)
(ii) State **two** applications of Ultrasonic sounds. (01 mark)

(d) A student standing between two high walls and 500m from the nearest wall shouted. He heard the first echo after 3s and second echo 2s later. Determine,
(i) the speed of sound in air. (02 marks)
(ii) The distance between walls. (02 marks)

7. (a) Define the terms as applied to magnetism;
   (i) **Paramagnetic material.** (01 mark)
   (ii) **Neutral point** (01 mark)

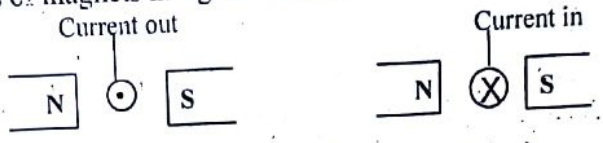
(b) (i) Using domain theory, explain why the strength of a magnet cannot be increased beyond a certain point. (02 marks)

(ii) Explain how magnetic keepers function to prevent stored bar magnets from self-demagnetization. (02 marks)

(c) Describe the function of the following parts of a moving coil galvanometer.
   (i) The soft iron cylinder. (01 mark)
   (ii) The return spring. (01 mark)

(d) (i) Predict the direction of force when current flows out of the plane between the poles of magnets in figure 5 below. (02 marks)

Fig. 5



(ii) Describe how the efficiency of a D.C motor may be increased. (02 marks)

(iii) State **four** examples in which a D.C motor is made use of. (02 marks)

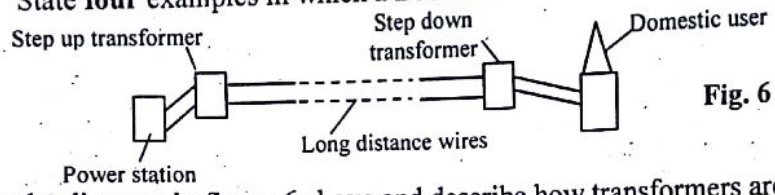


Fig. 6

(e) Study the diagram in figure 6 above and describe how transformers are used to transmit electric power from the hydroelectric power dam to a domestic house. (02 marks)

8. Define the following terms as applied to radio activity;
   (a) (i) **Activity.** (01 mark)
   (ii) **Half-life.** (01 mark)

(b) Below is the graph of activity against time for a radioactive sample.

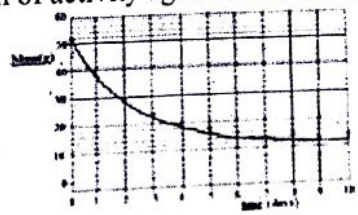


Fig. 7

Use the graph to;
   (i) Find the half-life of the sample of the material. (01 mark)
   (ii) Determine how much of the original sample of the material will have decayed in 9.6 days. (02 marks)

(c) Fig. 8 shows a technician locating the position of the leak of an underground water pipe which has cracked.

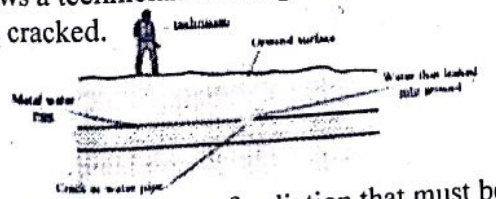


Fig. 8

State and explain, the type of radiation that must be emitted by the isotope introduced into water supply for the leak to be detected. (02 marks)

(d) (i) What are **x-rays**? (01 mark)
   (ii) Describe how X-rays are produced in an X-ray tube. (04 marks)
   (iii) Give **two** uses of X-rays. (02 marks)

(e) Give **two** precautions taken while handling radioactive substances. (02 marks)

END

C/E - Lutaaya

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PHYSICS 535/2

Qn	SCORING POINT	NOTES	MARKS
1(a)	(i) The rate of change of displacement is constant.	Same displacement in equal time intervals.	01
	(ii) The distance from the point of suspension to the center of gravity of the pendulum bob.		01
(b)	(i) At the 8th second, the car started moving with a constant velocity of $60ms^{-1}$ for 8s, it then uniformly accelerated to $80ms^{-1}$ for 4s. Then finally decelerated uniformly to rest in 4s.		03
	(ii) Distance covered ½ bh + LxW +1/2 bh =1/2 x4x80+4x60+1/2 x4 x20 =160 + 240 +40 =440m	Acc: $\frac{1}{2}h(a+b) + ½$ bh use of Acc: equations of motion	03
(c)	(i) $\rightarrow 8 - 3 = 5N$ Resultant force = $\sqrt{4^2+5^2} = \sqrt{41}$ $= 6.403N$ (atleast 1 dp)	Acc:	03
	(ii) Air begins to escape, ballon moves in opposite direction to escaping air with equal and opposite force (Newton's 3rd law). When all air has escaped, the balloon falls to the ground due to gravity.	As air escapes from balloon at a high speed back ward, by law of conservation of momentum, a backward momentum due to air escaping sets up equal but opposite forward momentum on the balloon causing it to move forward	02
(d)	The person placed the mouth at one end of the straw with frother and dipping in the liquid. The person reduces pressure insert the straw by sucking. Atmospheric pressure is now greater than pressure inside the straw, pushes liquid from glass to mouth.		03
			T = 16
2(a)	(i) Mechanical advantage is the ratio of load to effort.	load over effort.	01
	(ii) Moment of force is the product of force and perpendicular distance from the line of action of the force to pivot.		01
(b)	(i) When a body is in equilibrium, the sum of clockwise moments about a point is equal to the sum of anticlockwise moment about the same point.		01

(ii) By principle of moments; $Lx15 = E \times 90$

$\frac{L}{E} = \frac{90}{15}$

M.A = 6 — 01

(c) (i) Density is the mass per unit volume

(ii) Volume = 10m x 12m x 4m

$= 480m^3$

$Density = \frac{mass}{volume}$

Mass = 1.26 x 480 = 604.8kg — 03

(d) (i) When a body is wholly or partially immersed in a fluid, it experience up thrust equals to the weight of fluid displaced. — 01

(ii) A solid object (stone/metal) is suspended in air from a spring balance and its weight Wa noted.

A displacement can is filled with water up to the spout.

The body, still attached to the balance is carefully lowered into the can and its weight in water Ww noted.

The displaced water caught in the weighed beaker is measured and record W. If the weight of empty beaker is Wb.

Loss in weight = Wa – Ww

Weight of displaced water = W – Wb

Hence result shows that Wa – Ww = W-Wb thus verified. — 04

(iii) No atmospheric pressure on water inside the bottom of the boat. — water level inside is less than that out the boat. — 01

T = 16.

3.(a) (i) Convection is the flow of heat from a region of high temperature to a region of low temperature by motion of the fluid in bulk. — itself — 01

(ii) Is a temperature that can be reproduced. and Can easily be obtainable — Acc: A temp at which pure water changes from one state to another — 01

(b) (i) A – Compressor pump — 01

(ii) B – Painted black radiator of heat — because black is a better emitter of heat

B – made of fins because fins have a larger surface area and more heat is radiated — 02

	(iii) D- on the upper sides such that cooled air moves down as warm air rises and is cooled in turn. ✓ ✓ A convection current is thus formed which uniformly cools the contents.		02
(c)	(i) Lower fixed point of thermometer is marked by placing bulb in pure melting ice and marking the level where the mercury thread stops. ✓ The upper fixed points is marked by placing the bulb in steam from boiling water at standard pressure and marking the level where mercury thread stops. ✓ The length between the two fixed points is marked off at equal intervals. ✓		03
	(ii) Advantages - Mercury does not wet glass ✓ - Does not vaporize easily. ✓ - Opaque and easily seen. - Better conductor of heat. - Has a regular expansion.	Any first 2 @ 1 mark	02
	Disadvantages - Has a high freezing point, cannot measure very low temps ✓ - Has a low expansivity ✓	Any first two.	01
(d)	Radiation from ~~from outer space~~ sun of ~~long~~ short wave length is absorbed by the earth which produces radiation of ~~shorter~~ longer wave length. ✓ This radiation is absorbed by greenhouse gases (CO_2 and CO) and remains close to the earth's surface keeping the earth warm ✓		03
			T = 16
4.(a)	(i) Thermocouples ✓ - Photo – electric cells / Solar Cells. - Chemical cells (dry cells, batteries) e.g phone / Car batteries - Thermal and hydro electric generators / Dyamo - Nuclear electrical generators.	~~Car battery / phone battery~~ Any first 2 @ ½ mark	01
	(ii) Birds stand at one same p.d on the wire and do not make any complete circuit, ✓ therefore, current does not flow through them.		02

(b) (i) P.d is the work done per coulomb of electricity passing from one point to another. 01

(ii) From $V = \frac{W}{Q}$ and $W = Qv$ but $Q = It$ 02

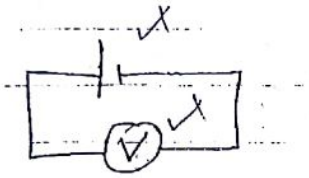
$W = IVt$

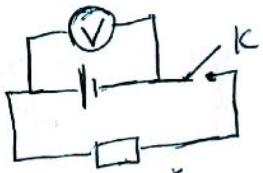
$\frac{W}{t} = IV$

$P = \frac{W}{t} = IV$

(iii) Earthing is installed such that incase of fault current flow through earth wire to earth hence preventing electric shocks to the user. 02

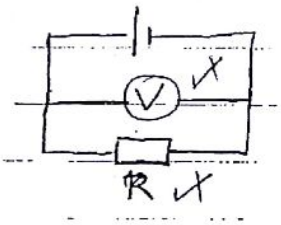
(c) (i)

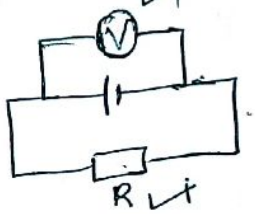




01

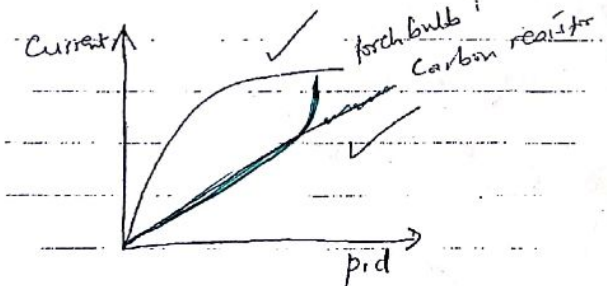
(ii)





01

(d)



02

(e) (i) Polarization – accumulation of hydrogen bubbles on copper plate reduces flow of current.

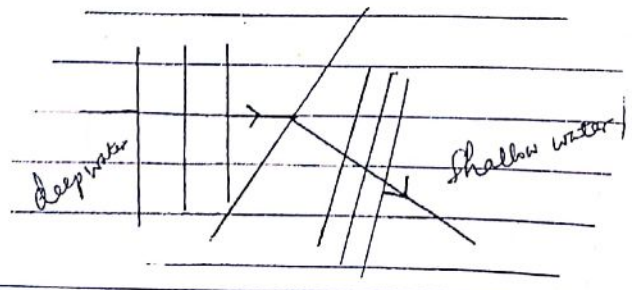
Local action – production of hydrogen at zinc plate as a result of impurities. 02

(ii) It should be charged using small current

- Should not be kept in undis charged state for long time
- No short – circuiting
- When acid level is low, add distilled water.
- Battery should not be dropped.

any 2 02

T = 16

5.(a)	(i) Is a form of energy which enables us to see (ii) Make holes in three cardboards such that they are at the same level. - Pass a string through the holes and pull it taut to, makes sure that the holes are in a straight line. - Carefully remove the thread without disturbing the arrangement - Place a light candle at one end and look through two their end. - You should be able to see the candle flame through the hole. - If one cardboard is slightly displaced, the flame will no longer be visible. - This shows that light travels in a straight line.	arrangement on a diagram scored 1mk.	01 04
(b)	(i) Primary colours are ones which cannot be formed by combining any two other colour e.g. Red, blue, green While Secondary colours are colours which are formed by combining two primary colours e.g. yellow, cyan, ~~magneta~~ magenta. (ii) Image position = ~~10~~ 4 x 2.5cm = 10cm Image size = 4x1 = 4 cm (iii) Used in projectors In lens camera. In eye In lens microscope / magnifying glass. Inspectacles.	Acc 10 ± ~~1cm~~ 0.2cm See the graph Any first 2 @ ½ mk.	03 02 02 01
(c)	(i) Is a type of reflection where a ray of light travels from a denser medium to less dense when the angle of ~~reflection is 90°~~ incidence is greater than Critical angle. (ii) The ~~receiver~~ transmitter produces radio waves and send them in space. (ionised layer) These waves meet ionosphere and under goes total internal reflection and they are reflected back to other parts of the earth where the receiver (radio) receives them.		01 02
			T = 16
6 (a)		-Direction -Small spacing of refracted wave fronts	02

(b)	(i) A transverse wave is one in which the particles of the medium vibrate perpendicular to the direction of wave motion While A longitudinal wave is one in which the particles of the medium vibrate parallel to the direction of wave motion.		01
	(ii) $10\lambda = 33$ $\lambda = 3.3$m Period T = 0.01s From $V = f\lambda = \frac{\lambda}{T}$ $= \frac{3.3}{0.01}$ V = ~~300ms^{-1}~~ 330ms^{-1}	Acc $f = \frac{1}{T} = \frac{1}{0.01} = 100$Hz $V = f\lambda$ $= 100 \times 3.3$ $= 330 ms^{-1}$	03
(c)	(i) An electric bell is placed in a bell jar. - When switched on, the bell is heard ringing. - The air in the ball jar is gradually pumped out using a vacuum pump, the ~~stand~~ sound of the bell continues to decrease. - When air is completely removed no sound is heard, even though the hammer is still seen striking the gong.	Can be scored on a diagram Acc ticking ~~clique~~ Clear for electric bell.	04
	(ii) To design whistles for dogs. - Designing spectacles for blind. - To kill bacterial in water. - Breaking kidney stones - Ultra scanning - Ultra sound drilling. - Cleaning delicate materials. - ~~Used by bats to overcome obstacles~~.	First 2 @ ½mk - Echo sounder in determining depth of sea bed - Medical surgical and diagnosis - To reveal flows in welded joints and holes. - Shoal of a fish - detecting rocks in a sea.	01
(d)	(i) $V = \frac{2d}{t} = \frac{2x500}{3}$ $= 333.33 ms^{-1}$	Acc: $V = \frac{2d}{t}$ $333.33 = \frac{2xd}{8}$ $d = 1333.33m$	02
	(ii) $d = \frac{Vt}{2} = \frac{333.333x5}{2} = 833.33$m Total distance = 833.333+500 = 1333.33m		02
			T= 16

7(a)	(i) Paramagnetic material is one that gets slightly magnetized in the direction of a strong magnetic field.	Is one which is weakly attracted by a strong magnetic field	01
	(ii) Neutral point is a point in a magnetic field where the resultant magnetic force is zero.		01
(b)	(i) During magnetisatism; more and more of the domain are made to face one direction. When all dipoles in all the domains face the same direction then magnetic cannot be made any stronger.		02
	(ii) Keepers retain alignment of magnetic domain in the magnets themselves without the opposition or upset in. They form closed loop of its domain hence retain alignment.		02
(c)	(i) It's fixed between poles of a magnet to concentrate the magnetic field and make it uniform.		01
	(ii) Current flows in and out of the coil through the terminals connected.		01
(d)	(i) Force is upward, when current flows out force is down ward when current flows in.		
	(ii) Using a stronger magnet to increase the strength of magnetic field. - Increasing the number of turns in a coil. - Increasing the area of the coil. - Using their copper wires of low resistance. - Winding the coil on a soft in armature to concentrate the magnetic flux.	Any 4 @ ½ mark	02
	(iii) In Fans CD player. Electric drills Electric vehicles Water pump printers	Any first 4 @ ½ mark	02
(e)	Power is transmitted over long distances, the voltage is first stepped up to reduce the current and this reduces power loss/energy loss along the way. When power reaches near the user, the voltage is then stepped down to a value that is safe for the user.		02
			T= 16

8.(a)	(i) Activity is the number of disintegration made per second ✓ (ii) Half-life is the time taken for half the original sample of radioactive material to decay ✓	rate of decay	01 01
(b)	(i) Half-life = 2.6 days. ± 0.2 ✓ (ii) Decayed mass = 52 – 14 = 38g ± 2g ✓		02 02
(c)	Gamma rays ✓ A radioactive solute is dissolved in the liquid at some point. The isotope makes an activity with the soil at the leaking point, which can be detected. ✓		T=16
(d)	(i) X-rays are electromagnetic radioactions produced when fast moving electrons are suddenly stopped by matter ✓ (ii) Cathode is heated using low voltage supply ✓ Cathrode emits electrons by thermionic emission. Electrons are accelerated towards a anode by the high voltage. (eht) When cathode rays strike the target much of their K.e is converted into heat and the rest into x-rays ✓ (iii) Detection of broken bones ✓ - Detection of T.B ✓ - Detection of foreign object in the body. - Killing malignant growth. - Cancerous cells/detection of cancer /kidney stone. - Head injuries - Study crystals - Checking language at air port - Detection of hidden flaws in metal castings. - Detection of craks in welded joints	any first 2. Radiography Radiotherapy Industrial uses Any first 2	01 04 02
(e)	- Avoid direct body contact ✓ - Sources to be transported in thick lead containers - Wear protective gears. - Handle sources with long tongs - Wearing of monitoring gadgets	Any first 2	02
			T=16

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(To be fastened together with other answers to paper)

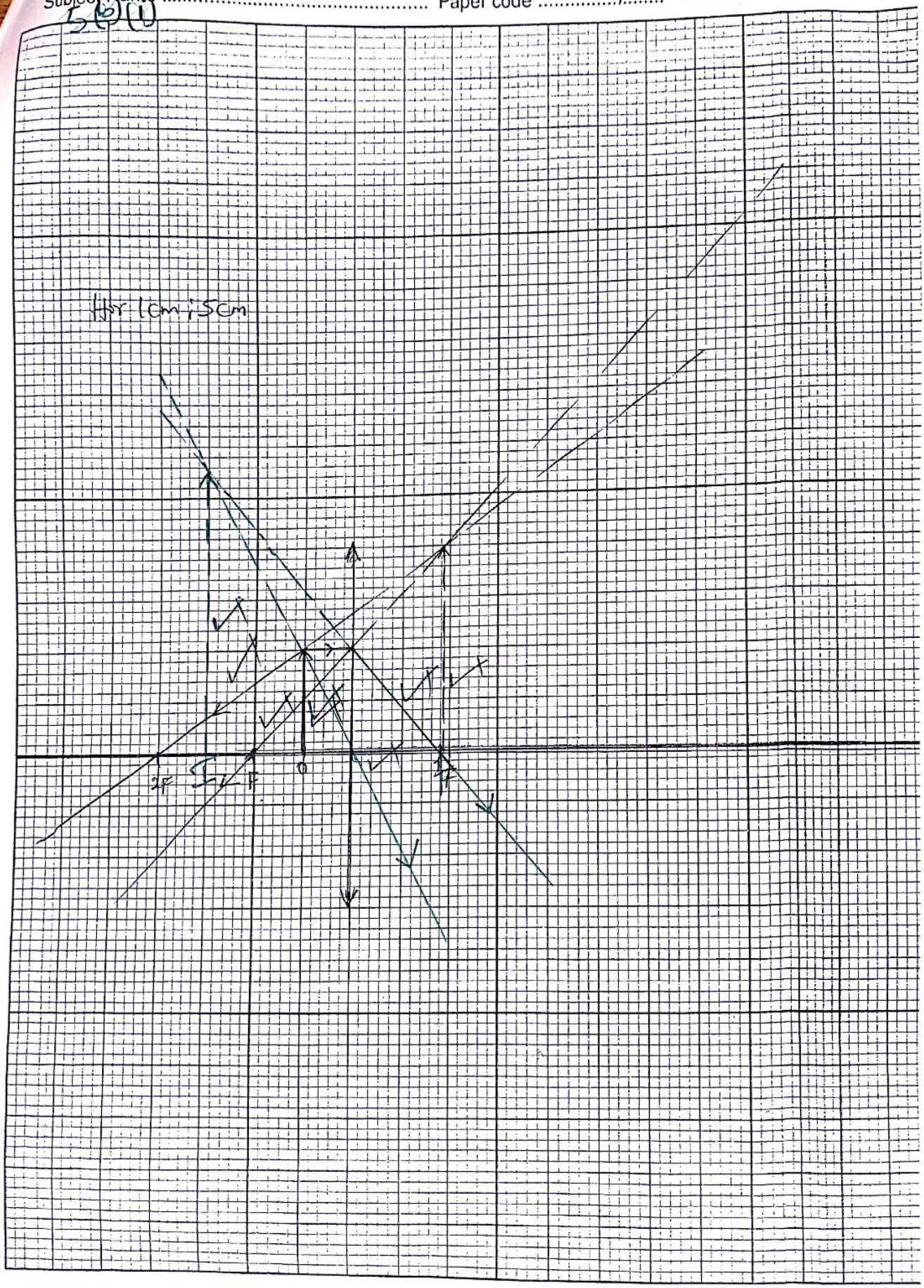
UACE

Candidate's Name .....

Signature .....

Subject Name ..... Paper code ...../.....

Random No.			
Personal Number			



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MARKING GUIDE
Uganda Advanced Certificate of Education
UACE August
PHYSICS P510/3

OG 7

Question One

		Marks
A1:	Value of x_0 = (0.485 – 0.515) 2dp; units: m (*Correct symbols*)	= 1+ ½.
A2	Value of a_1 = (22.0 – 28.0) 2dp; units: cm (*Correct symbols*)	= 1+ ½.
A3:	Value of a_2 = (14.0 – 20.0) 2dp; units: cm (*Correct symbols*)	= 1+ ½.
A4	Correctly calculated, M_1 = (0.0800 – 0.130); 4dp for $M_1 < 0.100$ or 3dp for $M_1 \geq 0.100$, units: kg; provided correct substation; S.I, in $M_1 = \frac{1}{2}\left(\frac{m_1 a_1}{(x_0 - a_1)} + \frac{m_2 a_2}{(x_0 - a_2)}\right)$; (*Correct symbols*)	= 2+ ½.
		07

NB: *-pencil work zero marks*

		Marks
B1:	Initial position of the pointer recorded to 1dp(~~cm~~) or 3dp(~~m~~), unit: cm (*If symbol is used; must be defined otherwise loses the mark for the value*)	= 1+ ½.
B2:	Columnar table labeled: x, p_n, d, $\frac{x}{y}$ @ ½ (*If symbol is used; must be defined otherwise loses the mark for the label ~~and the unit of the column~~*)	= 2
B3:	Indication of units; in brackets: (m), (cm), (m), - @½	= 2
B4:	Values of new position of pointer recorded to 1dp(~~cm~~) or 3dp (~~m~~), following correct unit as in the label, ~~decreasing~~ or increasing. @½ (*Difference between consecutive values:* **0.5 – 1.5) or 0.005 – 0.015**) (If all the five differences are constant mark only 1st 3values)	= ~~3~~ 6
B5:	Correctly calculated values of, d = (0.005 – 0.078), 3dp @½ (~~*Difference between consecutive* values (0.005 – 0.015)~~ ~~(If all the five differences are constant mark only 1st 3values)~~	= ~~6~~ 03
B6:	Correctly calculated values of, $\frac{x}{y}$ = (0.105, 0.211, 0.316, 0.421, 0.526, 0.632) @ ½	$= \frac{3}{17\frac{1}{2}}$

NB: *-pencil work zero marks*

		Marks
C1:	Title: A graph of **d** against $\frac{x}{y}$. (*Accept variation ~~with~~, versus, not v/s, no units, correct symbols*)	= ½
C2:	Perpendicular axes drawn, with arrows, correctly labeled; vertical axis: d (m); horizontal	

axis: $\frac{x}{y}$, @ ½ (*Correct symbols*) = 1

C3: ~~VA~~: Uniform scale covers ½ or more, starting value indicated, axis marked at least 3 times.

HA: ~~uniform scale~~; starting value zero, , ~~axis marked at least 3 times~~.@ ½ = 1

C4: Correctly plotted points using ×, + or ⊙ (not •) ,with error limit of half a small square, accept shaded dots within this error limit/margin. For multiple scales consider 1st uniform scale only, if axes are not labeled do not check, for reverse axes no mark) @1 = 6

C5: Line of best fit drawn, provided at least 4 points are correctly plotted = ½

C6: Indication for slope, S covers ½ a page on at least one of the sides = ½

C7: Correctly calculated slope, S = **(0.0500 – 0.0650), 4dp**, provided coordinates are correctly read; not table values; units: **m, (correct symbols)** = 1+½

C8: Correctly read intercept, C = **(0.010 – 0.021)** 3dp; provided HA starts from zero; unit: m (correct symbols). = 1+ ½.

C9: Correctly calculated value of M_2 = **(0.0800 – 0.130)**, 4dp if **M_2 < 0.100** or 3dp if **$M_2 \geq$ 0.100**; provided correct substitution in, **$M_2 = \frac{myC}{Sx_0}$** unit: **kg** [*Correct symbols*] =1+½

C10: Correctly calculated value of, M = (**0.0800 – 0.130**), 3dp if **M<0.100** or 4dp if **M≥ 0.100**; provided correct substitution in, $M = 0.500(M_1 + M_2)$ unit: kg **(correct symbols)** = $\frac{1+½}{15\frac{1}{2}}$

Total Marks = 40

NB: - *C_7 to C_{10}; pencil work is zero marks*

Question Two

Marks

A1: Breadth b measured at least 3times = ½

A2: Value of b = **(6.00 – 7.00)** 2dp; units: **cm, [*Correct symbols*]** = 1+½.

A3: Columnar table labeled: $e, x, y, e^2, x^2, \frac{1}{e^2}, \frac{y^2}{x^2}$ = 2

8 – 7: **2**, 6 – 5: **1½**, 4-3: **1**, 2-1: **½**

A4: Indication of units; in **brackets**: (cm), (cm), (cm^2), (cm^2), (cm^{-2}), - = 2

8 – 7: **2**, 6 – 5: **1½**, 4-3: **1**, 2-1: **½**

A_5 Values of $x = (3.0 - 10.5)$,1dp; increasing difference between consecutive values (0.8 – 2.0). (If all the five differences are constant mark only 1st 3values) @ 1 = 6

A_6 Values of $y = (7.5 - 12.5)$,1dp; increasing difference between consecutive values (0.8 – 2.0). (If all the five differences are constant mark only 1st 3values) @ 1 = 6

A_7 Correctly calculated values of $e^2 = (4, 6, 9, 12, 16, 20)$,0dp

7-2, 6 – 5: 1, 4-3: 1, 2-1: 1 = 2

A_8 Correctly calculated values of x^2 , 0dp @½

7-2, 6 – 5: 1½, 4-3: 1, 2-1: ½ = 2

A_9 Correctly calculated values of y^2 , 0dp @½

7-2, 6 – 5: 1½, 4-3: 1, 2-1: ½ = 2

A_{10} Correctly calculated values of $\frac{1}{e^2} = (0.250, 0.167, 0.111, 0.083, 0.063, 0.050)$,3dp @½ 02

6-5: 02, 4-3: 1½, 2-1: 01 = 3

A_{11} Correctly calculated values of $\frac{y^2}{x^2}$, 1dp @½ = $\frac{3}{30}$ .02 28

6-5: 02, 4-3: 1½, 2-1: 01

NB: ***-pencil work zero marks***

A_5 and A_6 ***-For values of x and y, used tracing paper must be available***

B_1: Title: A graph of $\frac{y^2}{x^2}$ against $\frac{1}{e^2}$. = ½

(***Accept variation with, versus, not vs, no units, correct symbols***)

B_2: Perpendicular axes drawn, with arrows, correctly labeled; vertical axis: $\frac{1}{e^2}$ (cm^{-2}); $\frac{y^2}{x^2}$

horizontal axis: $\frac{y^2}{x^2}$ @ ½ $\frac{1}{e^2}$ (cm^{-2}) (*Correct symbols*) =1

each axis

B_3: **VA:** Uniform scale covers ½ or more, starting value indicated, axis marked at least 3 times.

HA: uniform scale; starting value zero, , axis marked at least 3 times.@ ½ = 1

B_4: Correctly plotted points using ×, + or ⊙ (not ∗) ,with error limit of half a small square, accept shaded dots within this error limit/margin. For multiple scales consider 1st uniform scale only, if axes are not labeled do not check, for reversed axes no mark) @½ =3

B_5: Line of best fit drawn, provided at least 4 points are correctly plotted = ½

B_6: Indication for slope, **S** covers ½ a page on at least one of the sides = ½

		Marks
B_7:	Correctly calculated slope, S = (~~14.1~~ 11·8 – 25.0), 1dp, provided coordinates are correctly read; not table values; units: **cm²**; **(correct symbols)**	=1+½
B_8:	Correctly read intercept, C = (~~0.1 – 0.5~~ 0·39 – 0·51) 1or 2dp; provided HA starts from zero; ~~unit: m~~ No units (correct symbols).	= 1+ ½. 2
B_9:	Correctly calculated value of, n_1 = (**1.40 – 1.60**), 1or 2dp ; no units; provided correct substitution into; $b^2 = n^2 S$; **(correct symbols)**	= 1+ ½. 2
B_{10}:	Correctly calculated value of, n_2 = (**1.40 – 1.60**), 1or 2dp ; no units; provided correct substitution into; $n_2 = \sqrt{\frac{1}{C}}$; **(correct symbols)**	= 1+ ½. 2
B_{11}:	Correctly calculated value of, n = (**1.40 – 1.60**), 1or 2dp ; no units; provided correct substitution into; $n = \frac{1}{2}(n_1 + n_2)$; **(correct symbols)**	= 1+ ½ 2 ~~11~~ 12
	Total Marks	= **40**

NB: - ***B_7 and B_{11}; pencil work is zero marks***

Question Three.

		Marks
A_1:	Value of V_0 = (**1.40 – 1.60**), 1 or 2dp; units: V, (correct symbols)	=½+½.
A_2:	Value of l_0 = (**60.0 - 95.0**), 1dp or (**0.600 – 0.950**),3dp; unit: cm; (correct symbols)	=1+½.
A_3:	Value of **I** = (**0.16 – 0.20**), 2dp; unit: A, (correct symbols)	=½+½.
A_4:	Value of l = (**0.550 – 0.800**), 3dp; unit: m (correct symbols)	=1+½.
A_5:	Correctly calculated value of R_1 = (**7.0 - 12**), 0dp if $R_1 \geq 10$ and 1dp if $R1 < 10$, unit: **Ω**, provided correct SI substitution in $\boldsymbol{R_1} = \frac{l}{l l_0} V_0$, (Correct symbols)	$= \frac{1+\frac{1}{2}}{06\frac{1}{2}}$

NB: ***-pencil work zero marks***

		Marks
B_1:	Columnar table labeled: R, l, $\frac{1}{l}$ (correct symbols@ 1	= 3
B_2:	Indication of units using brackets: (Ω), (m), (m^{-1}) correct symbols@ 1	=3
B_3:	Values of l = (0.550 - 0.200) 3dp, decreasing; difference between consecutive values in the range (0.010 – 0.100) ; (If all the five differences are constant mark only 1st 3values) @ 2	= 12
B_4:	Correctly calculated values of $\frac{1}{l}$, 2dp @ ½	$= \frac{3}{21}$

NB: ***-pencil work zero marks***

		Marks
C1:	Title: A graph of R against $\frac{1}{l}$ (*Accept variation with, versus, not vs, no units, correct symbols*)	= ½
C 2:	Perpendicular axes drawn, with arrows, correctly labeled; vertical axis: R(Ω); horizontal axis: $\frac{1}{l}$ (m^{-1}) (*Correct symbols*) @ ½	=1
C 3:	~~VA~~: Uniform scale covers ½ or more, starting value indicated, ~~axis~~ marked at least 3 times. HA: ~~uniform scale~~; starting value zero, , ~~axis marked at least 3 times~~.@ ½	= 1
C 4:	Correctly plotted points using × or ⊙ (not •) ,with error limit of half a small square, accept shaded dots within this error limit/margin. For multiple scales consider 1st uniform scale only, if axes are not labeled do not check, for reverse axes no mark) @1	= 6
C 5:	Line of best fit drawn, provided at least 4 points are correctly plotted	= ½
C 6:	Correctly read intercept, C = (- **7.0** – **-12.0**) 1dp; provided HA starts from zero; unit: Ω (correct symbols).	=1+½
C 7:	Value of R_2 = (**7.0** – **12.0**), 1dp; unit: Ω (correct symbols)	=1
C8:	Correctly calculated value of, R_0 = (**7.0** – **12**), 0dp if $R_1 \geq 10$ and 1dp if $R1 < 10$, provided correct substitution in $R_0 = 0.50 (R_1 + R_2)$, (Correct symbols)	$= \frac{1}{12\frac{1}{2}}$
	Total Marks	**= 40**

NB: - *C_6 and C_8; pencil work is zero marks*

END