535/2
Physics
Paper 2
July 2024
2 Hours

ACEITEKA JOINT MOCK EXAMINATIONS 2024

Uganda Certificate of Education

Physics

Paper 2

Practical

Time: 2 hours

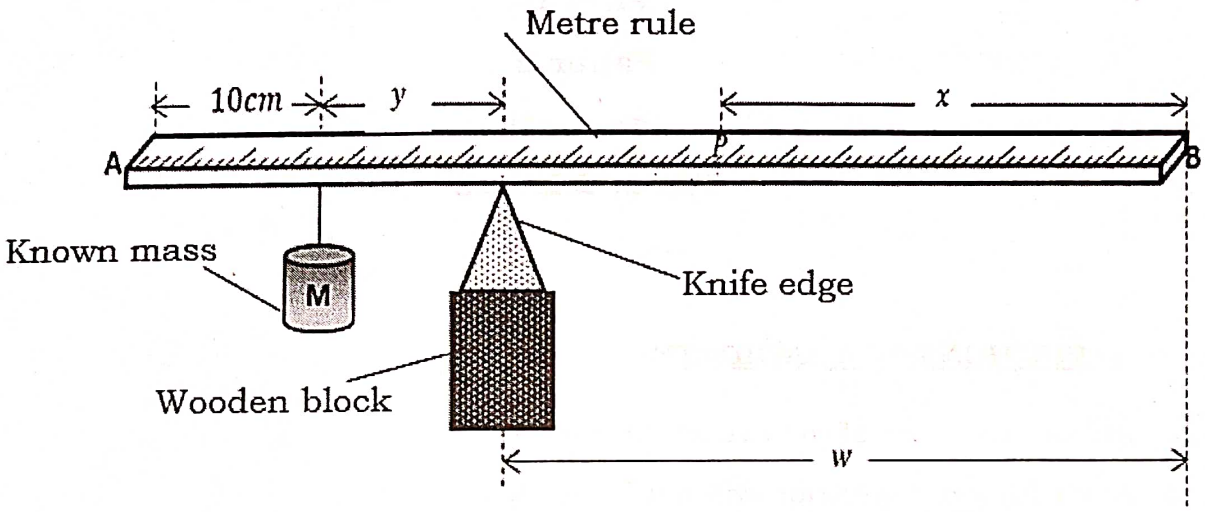
INSTRUCTIONS TO CANDIDATES

- Answer ***any one*** of the two set Scenario.
- Any additional question will not be marked
- You will be required to select suitable apparatus from the equipment provided.
- Marks are given for a clear record of the observations actually made, for their suitability and accuracy and for the use made of them.
- Candidates are reminded to record their observations as soon as they are made.
- Where possible, candidates should put their observations and calculations in a suitable table drawn in advance.
- Squared papers are provided and must be fastened with your answers.
- Mathematical tables and silent non programmable calculators may be used.

SCENARIO ONE

Physics is one of the practical subjects which involves verification and investigation of facts. In preparation for association Mock exams in Kisilu High School, the association requested the teachers to prepare metre rulers whose masses ranged between **70g** to **120g.** Unfortunately, the laboratory attendant did not have any mass measuring instrument in the laboratory but only had **five** known masses of **20g** each with in the laboratory. However, he did not know how to use the above masses to find the required range of the mass of the metre rule.

SET UP



TASK

As a learner of physics in s.4, help the laboratory attendant using the above figure on how to determine the mass of the metre rule provided.

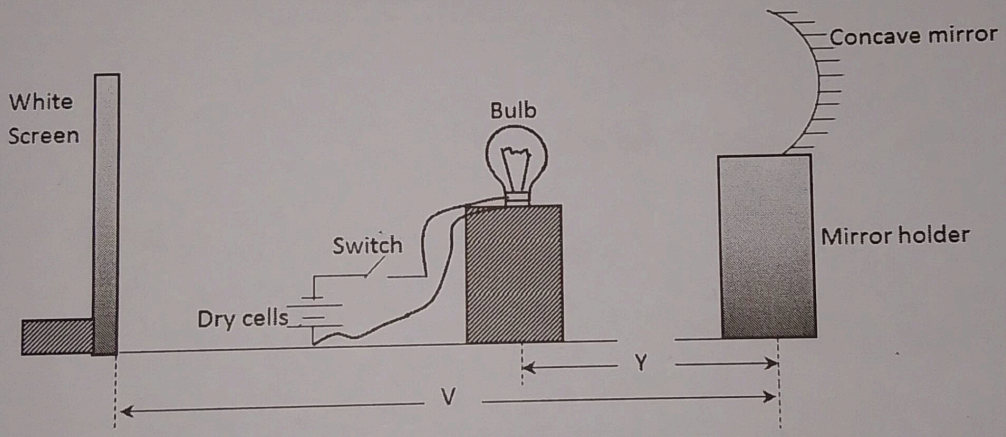
HINT

The mass of the metre rule, M_R is given from $M = M_R \frac{(w-x)}{y}$ where M_R is the mass of the metre rule and M is the known mass.

SCENARIO TWO

Physics is one of the compulsory subjects at Ordinary Level in the Uganda's Education System. It involves many constants that were investigated on years back by several Scientists such as Isaac Newton, Robert Hooke among the many. However, not every learner at Ordinary Level who offers the subject is interested in it but many of them do it because they have no option. This was evidenced when Musa was given a concave mirror of unknown focal length and was told to investigate on how to determine the focal length, f of the mirror. He kept quiet and would not make any statement in regard to the question no matter the several lessons the teacher had with his class in regard to light. Kabaya a classmate of Musa briefed the former that the focal length of the mirror is most likely to be between **10cm** and **15cm.**

SET UP



TASK

Assuming you were the one who was asked to determine the focal length of such a mirror, give a detailed report on how you could do it.

HINT

The focal length, f is obtained from the expression VY = f (V+Y) where f is the focal length of the mirror.

THE END

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PROPOSED [illegible]
UCE 5.4 2024 MOCKS
PHYSICS 535/2 4CE

Aim; An experiment to determine the mass, M_R of the metre rule. (01)

Hypothesis; The mass of the metre rule ranges between 70g and 120g (01)

This is what you keep changing or adjusting throughout the expt.

Independent Variable; mass M = 20, 40, 60, 80, and 100g (01)

This is what varies (changes) after varying the independent variables.

Dependent Variables; - Distance y
- Distance w
- Distance (w-x) Any two
- Ratio $\frac{w-x}{y}$

Control Variable/constants; - Balance point, p (01)
- Distance of M from end A
- Distance x.

List of apparatus; - Known mass, M
- Wooden block
- Horizontal table
- Knife edge
- Metre rule
- Thread

(02) Any four

Procedures;

- A wooden block is placed on a horizontal table
- A knife-edge is placed on top of the wooden block
- A metre rule is balanced on the knife edge and the balance point, p is noted.
- The distance, x of p from end B of the metre rule is determined.

Relevance - 2
Accuracy - 2
coherence - 2

PG (1)

- A known mass, M = 20g is suspended on the metre rule using a piece of thread at 10cm from end A of the metre rule.
- The metre rule is balanced again on the knife-edge
- The distance, y of mass M from the knife edge and that of the knife edge from end B of the metre rule is determined.
- The above procedures are repeated for M = 40, 60, 80 and 100g
- The results are tabulated in a suitable table including values of (w-x) and $\left(\frac{w-x}{y}\right)$
- A graph of M against $\left(\frac{w-x}{y}\right)$ is plotted.
- The slope, S of the graph is determined
- The mass, M_R of the metre rule is then obtained from $M_R = S$.

Accept any other relevant procedure (06)

Table of results

$x = 50.0\,cm$ ½ $x = (50.0 \pm 0.5)\,cm$

M(g) (½)	y(cm) (½) $y_0 < 40.0$ cm $y_1 = y_0 - (20-M)$	w(cm) (½)	(w-x)(cm) (½)	$\frac{(w-x)}{y}$ (½)	
20	34.5	55.5	5.5	0.159	$R_1 = ½$
40	~~30.4~~ 30.1	59.9	~~9.9~~ 9.9	0.329	$T_1 = 1½$
60	26.5	63.5	13.5	0.509	$T_2 = 0$2
80	24.2	65.8	15.8	0.653	$T_3 - 2½$
100	21.5	68.5	15.5	0.860	$- 2½$
					$- 1½$
					$- 1½$
1½	03	03	02	02	TOTAL 12

Marks allocation

½ → At least 5 columns.
½ → First column entered correctly.
½ → Enclosing the table well.

from $M = m_R\left(\frac{w-x}{y}\right)$.

by comparison $y = mx + c$.

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(To be fastened together with other answers to paper)

UCE

Candidate's Name .....

Signature .....

Subject Name ..... Paper code ..... 1 .....

Random No.

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graph of M against $\frac{w-x}{y}$ (11)

$g_1 = 01$ (Title)

$g_2 = 02$ (Drawing & labelling axes)

$g_3 = 02$ (scales on axes)

$g_4 = 02\frac{1}{2}$ (plotting)

$g_5 = 01$ (line of best fit)

$g_6 = 01$ (slope)

Total = 09½

(08)

(0·01)

Pg (3)

Slope, $S = \frac{\text{change in } M}{\text{change in } \frac{w-x}{y}} = \frac{103-16}{0.89-0.12} = \frac{87}{0.77} = 113g$ ✓ ✓ ✓ (02)

C_1 – Cal. of slope = 02.
* Substitution – ½
* Arithmetic – ½
* correct unit – ½
* Accuracy – ½. (70 to 120).

mass of metre rule, $M_R = 113g$ ✓ (01)

Sources of errors
- parallax errors ✗
- Non uniformity of the metre rule ✓ (01)
- Air resistance / wind
- Roughness of the wooden block (Any two)
- The knife edge was not sharp

*Mitigation / precaution.
- The experiment should be done carefully and readings taken while eyes are perpendicular to the metre rule.
- The wooden block should be made as smooth as possible (01) (Any two)
- Windows and doors should be closed when this experiment is being carried out.
- Only uniform metre rules should be selected for this investigation
- The knife edge should be as sharp as possible.

Conclusion:

It is really true that the mass of the metre rule lies with in the range of 70g to 120g. (01)

Recommendation:

It was really a successfull investigation and i therefore recommend that everyone should always use the above stated procedures while determining the mass of a metre rule. (01)

X/40

SCENARIO TWO

AIM; An experiment to determine the focal length of a concave mirror (01)

Hypothesis;- The focal length of the mirror lies in the range 10cm to 15cm. (01)

Independent Variable; Object distance, U (01)

Dependent Variables;- - Image distance, V (01)
- x- Values of V
- x- Values of U+V (Any two)

Controlled Variables/Constant;- - Intensity of light (01)

List of apparatus;
- White screen
- Dry cells
- Connecting wires (02)
- Torch bulb
- Concave mirror (Any four)
- metre rule
- mirror holder.

procedures;
- A concave mirror in a mirror holder, a well connected torch bulb and a white screen are arranged in a straight line on a horizontal table with a torch bulb between the mirror and the screen.
- The mirror is placed at a known distance, say U = 30cm from the torch bulb.
- The white screen is adjusted to and fro until a sharp image of light from the torch bulb is formed on the screen..
- The distance, V of the white screen from the

mirror is measured and recorded.
- The above procedures are repeated for different values of $Y = 35, 40, 45, 50$ and 55 cm.
- The results are tabulated in a suitable table including values of V_Y and $V+Y$
- A graph of V_Y against $V+Y$ is plotted
- The slope, S of the graph is determined
- The focal length, f of the concave mirror is then obtained from the expression $f = S$. (05)

Table of results; Accept any other relevant procedure.

Y(cm) ✓	V(cm) ✓	$(V+Y)$(cm) ✓	VY(cm^2) ✓
30.0	15.0 ✓	45.0 ✓	450 ✓
35.0	14.0 ✓	49.0 ✓	490 ✓
40.0	13.5 ✓	53.5 ✓	540 ✓
45.0 ✓	12.6 ✓	57.6 ✓	567 ✓
50.0	12.0 ✓	62.0 ✓	600 ✓
55.0	11.8 ✓	66.8 ✓	649 ✓

07 | 03½ | 03½ | 03½

Marks Allocation.

T_1 – 1½ ← Table with at least (1) 4 columns.
- All Y-values entered (½) in any order.
- Y column with units (½)

T_2 – 1½ ← Table the rest of the 3 columns.

T_3 – 03 values of V to 1 dp and using order.
- 03 values of (V+Y) to 1 dp
- 05 values of VY based on SFs.

Total 12.

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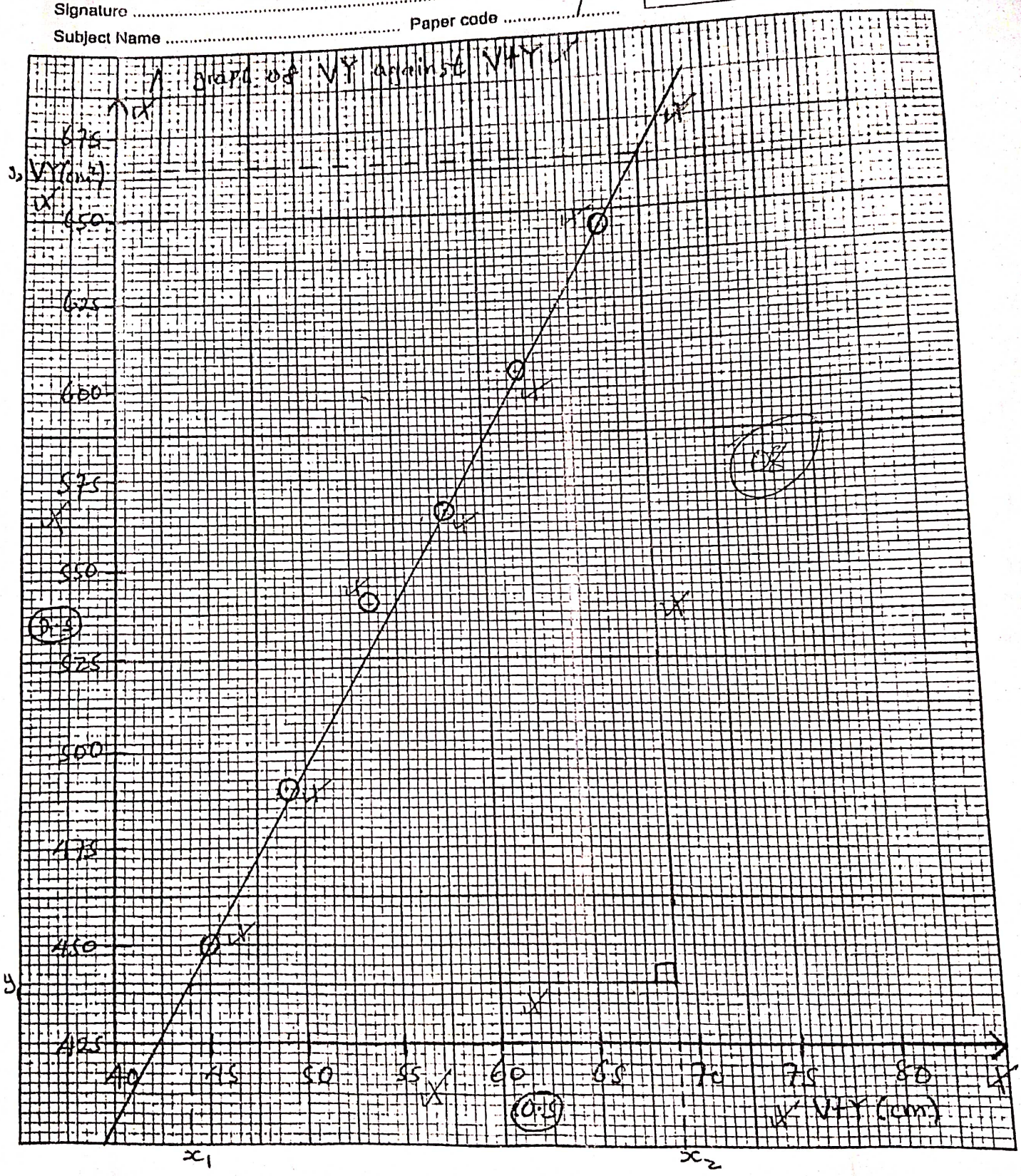

Slope $S = \frac{\text{change in } VT}{\text{change in } VtT}$ ✓

$= \frac{665.0 - 440.0}{69.0 - 44.0} = \frac{225.0}{25.0}$ ✓

$= 9.00\,cm$ ✓ (02)

focal length; $f = 9.00\,cm$ ✓ (01)

Sources of errors;

- parallax errors ✓
- Varying intensity of light from the bulb ✓ (01)
- Varying sharpness of the image on the white screen.

Any two

Mitigation / precaustion.

- Carefully taking readings of V ✓ (01)
- Light from the bulb should be of the same intensity for all values of Y

Any two.

- The sharpness of the image should be well defined.

Conclusion

The focal length, f of a ~~concave~~ mirror doesnot necessarily range from 10cm (01) to 15cm as stated in the hypothesis. It can as well be less than 10cm.

Recomendation;

The above procedures can be recommended to be used by any person (01) interested in determining the focal length of a concave mirror; though under alot of precaustions.

X/40