$\qquad$
DATE: $\qquad$
232/3
PHYSICS
(PRACTICAL)
OCTOBER 2017
FORM THREE
$2 ½$ HOURS

## INSTRUCTIONS TO CANDIDATES

i. Write your name, admission number, date and signature in the space provided above.
ii. Answer all the questions in the spaces provided in the question paper
iii. You are supposed to spend 15 minutes of $21 / 2$ hours allocated for this paper reading the whole paper before starting your work.
iv. Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.
v. Record your observations as soon as you make them.
vi. Non-programmable silent electronic calculators and KNE G mathematical tables may be used.
vii. All questions are answered in English.

FOR EXAMINERS USE ONLY
QUESTION ONE


Total $\square$

## QUESTION TWO

|  | a (i) | e | f (i) | f (ii) | f (iii) | g | h | j | k |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Maximum score | P | 4 | 5 | 1 | 2 | 2 | 1 | 2 | 2 |
| Candidate’s <br> score |  |  |  |  |  |  |  |  |  |

Total
Grand Total


## QUESTION ONE

You are provided with the following:

- One metre rule
- Two half metre rules
- One stop watch
- Two pieces of thread
- Some sell tape
- One stand, boss and clamp

Proceed as follows
a) Using the retort stand, clamp one half metre rule at its centre, such that the scale is horizontal in a vertical plane. (See the figure below). Using a cell tape and two strings, suspend the second half metre rule in a horizontal plane such that:
i. Its scale is horizontal
ii. The strings are equidistant from the centre of the half metre rule and diameter $\mathrm{d}_{1}=40 \mathrm{~cm}$ apart.
iii. The height between the two half metre rules is $\mathrm{L}=65 \mathrm{~cm}$.

b) Set the suspended rule into scale oscillations in a horizontal plane above a vertical axis through its centre.
c) (i) Using the stop watch, record the time $t_{1}$ for 10 oscillations.
$\mathrm{t}_{1}=$ $\qquad$
(ii) Determine the period $\mathrm{T}_{1}$ for one oscillation.
$\mathrm{T}_{1}=$ $\qquad$
d) With $L$ still at 65 cm change the distance between the strings from 40 cm to $\mathrm{d}_{2}=20 \mathrm{~cm}$. repeat part (c) to obtain period $\mathrm{T}_{2}$.
(1 mk)
$\mathrm{T}_{2}=$
e) Determine the constant $r$ given that

For the rest of the experiment the distance between the strings should remain 20 cm .

| f) Repeat part (c) for values of L shown in the table below. Complete the table. |  |  |  |  |  | ( 5 mks ) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Length L (cm) | 60 | 55 | 50 | 45 | 40 |  |
| Time for 10 oscillations t (s) |  |  |  |  | $0^{\prime}$ |  |
| Period T (s) |  |  |  |  | 5 |  |
| Log T |  |  |  |  |  |  |
| Log L |  |  |  |  |  |  |

g) Plot a graph of $\log \mathrm{T}$ (y axis) against $\log \mathrm{L}$.
(* ATTACH GRAPH PAPER)
h) Determine the slope $S$ of the graph.
i) Given that the time $t$ for $N$ oscillations is given by $t=K N L{ }^{s} D^{r}$ where $K$ is a constant, deduce an expression for the periód T in terms of L and D with s and r correct to 1 decimal place.
(2 mks)

## QUESTION TWO

PART A
You are provided with the following:

- A piece of soft board
- Four (4) optical pins
- A sheet of plain paper
- A triangular glass prism

Proceed as follows
a) Place the plain sheet of paper on the soft board. Trace the triangular outline of the prism on the sheet of paper. Remove the prism and use a ruler to extend the three sides of the outline. (See figure 2 (a) below)


Figure 2 (a)
b) Use a protractor to measure the refracting angle R of the prism.
(1 mk)
$\mathrm{R}=$ $\qquad$
c) On the side AB of the triangular outline, draw a normal at a appoint half way between A and B . (this normal will be used for the rest of this experiment)
d) Draw a line at an angle $\mathrm{i}=30^{\circ}$ to the normal. Stick two pins $\mathrm{P}_{1}$ and $\mathrm{P}_{2}$ vertically on this line. (See figure above)
e) Place the prism accurately on the outline. By viewing through the prism from side AC, stick two pins $\mathrm{P}_{3}$ and $\mathrm{P}_{4}$. Extend this line to meet AC. (see figure 2(b). measure and record in the table below the value of angle $\Theta$.


Figure 2 (b)
Repeat the procedures in (c) and ©d) above for other values of i in the table below. Complete the table. NB: the sheet of paper with the drawing must be handed in with this question paper. Ensure you write your name and admission number on the sheet of paper.

| Angle of incidence i $\left({ }^{0}\right)$ | 30 | 35 | 40 | 45 | 50 | 55 | 60 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Angle $\Theta\left({ }^{0}\right)$ ) |  |  |  |  |  |  |  |
| Angle of emergence, $\mathrm{E}=(90-\Theta)^{0}$ |  |  |  |  |  |  |  |

f) (i) On the graph paper provided, plot the graph of the angle of emergence E (y -axis) against the angle of incidence.
(* ATTACH GRAPH PAPER)
(ii) Use the graph to find $\mathrm{i}_{0}$ the angle of incidence at which $\mathrm{i}=\mathrm{E}$.
(iii) Evaluate:
I. $\quad \mathrm{y}=2 \mathrm{i}_{0}-\mathrm{R}$

$$
\begin{equation*}
\text { II. } \quad \mathrm{b}=2 \sin \mathrm{i}_{0} \tag{1mk}
\end{equation*}
$$

## PART B

You are provided with the following:

- A resistance wire labeled P
- A resistance wire labeled Q
- A switch
- A center zero galvanometer
- 2 dry cells and a cell holder
- Ten connecting wires (at least five with a crocodile clip on one end)
- A resistance wire mounted on a millimeter scale labeled $A B$
- A metre rule or half metre rule
- A micrometer screw gauge (to be shared)
- A jockey

Proceed as follows
g) Using the micrometer screw gauge provided, measure the diameter:
I. D of wire P.

II. d of wire Q.
h) Determine c , the value of the ratio $\mathrm{D} / \mathrm{d} . \mathrm{s}_{\mathrm{c}} \mathrm{c}=$
i) (i) Set up the circuit as shown in the figere below. (Ensure that each of the wires P and Q is 50 cm long.)


Close the switch. Using the jockey at the free end of the wire from the galvanometer, tap the wire AB near end A and observe the deflection in the galvanometer.
(ii) Then tap the wire near B and again obsefve the deflection in the galvanometer.
(iii) Now tap the wire $A B$ at various points between $A$ and $B$ to obtain a point $T$ where there is no deflection in the galvanometer.
I. Determine the length $\mathrm{L}_{1}$, theraistance from A to T. $\mathrm{L}_{1}=$ $\qquad$
II. Determine the length $\sqrt{2} 2$, the distance from B to T.
$\mathrm{L}_{2}=$
(1 mk)
$\qquad$
k) Given that the resistañce $R_{Q}$ of $Q$ is 9.0 ohms, determine the resistance $R_{P}$ of $P$ using the expression.

$$
\mathrm{R}_{\mathrm{P}} \cdot \mathrm{~L}_{2}=\mathrm{R}_{\mathrm{Q}} \cdot \mathrm{~L}_{1}
$$

