Name..... Index No...../.....

232/3
PHYSICS
(PRACTICAL)
Paper 3
Oct./Nov. 2015
$2\frac{1}{2}$ hours

Candidate's Signature.....

Date.....

02315190

THE KENYA NATIONAL EXAMINATIONS COUNCIL

Kenya Certificate of Secondary Education

PHYSICS
(PRACTICAL)
Paper 3
$2\frac{1}{2}$ hours

Instructions to candidates

(a) *Write your name and index number in the spaces provided above.*
(b) *Sign and write the date of examination in the spaces provided above.*
(c) *Answer **all** the questions in the spaces provided in the question paper.*
(d) *You are supposed to spend the first 15 minutes of the $2\frac{1}{2}$ hours allowed for this paper reading the whole paper carefully before commencing your work.*
(e) *Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.*
(f) *Candidates are advised to record their observations as soon as they are made.*
(g) ***Non-programmable** silent electronic calculators may be used.*
(h) ***This paper consists of 11 printed pages.***
(i) ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***
(j) ***Candidates should answer the questions in English.***

For Examiner's Use Only

Question 1	a	d	e	f	g	h	i	j	m	n	o	Total	
Maximum Score	1	1	1	1	1	2	2	2	4	1	4		
Candidate's Score													

Question 2	a	b	d	e	f(i)	f(ii)	g	Total	
Maximum Score	1	1	7	3	3	3	2		
Candidate's Score									

Grand Total

Question one

You are provided with the following:

- a micrometer screw gauge (to be shared)
- a vernier calliper (to be shared)
- glass tube
- a wire labelled **M**
- some sellotape
- one 50 g mass
- some masses (totalling 40 g)
- a meter rule
- 100 ml beaker
- a stand boss and clamp
- a stop watch
- a source of light
- a screen
- some water
- a measuring cylinder

PART A

Proceed as follows:

(a) Using a micrometer screw gauge, measure and record the diameter of the wire labelled **M**. (1 mark)

d = ... mm

d = ... m.

(b) Using wire **M**, make a spring as follows:

(i) Use some sellotape to fix one end of the wire M (about 2.5 cm) along the glass tube;

(ii) Hold firmly the part of the wire under the tape with one hand. Use the other hand to wind 30 turns as closely and tightly as possible. *(see **figure 1**)*

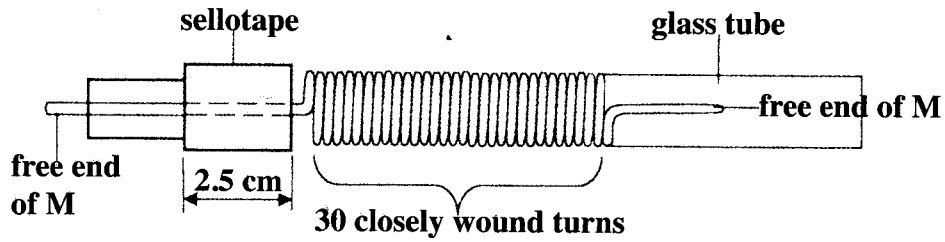

Figure 1

(c) Remove the sellotape and release the spring from the tube.
(The spring will slightly unwind and some turns will disappear)
Bend the free ends as shown in **figure 2**.

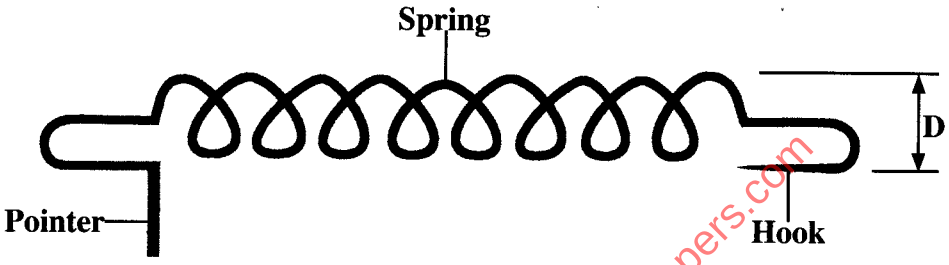

Figure 2

(d) Using a vernier callipers, measure and record the external diameter **D** of the spring.

(1 mark)

D = ... cm

D = ... m.

(e) Suspend the spring and a 50 g mass from a retort stand as shown in **figure 3**.

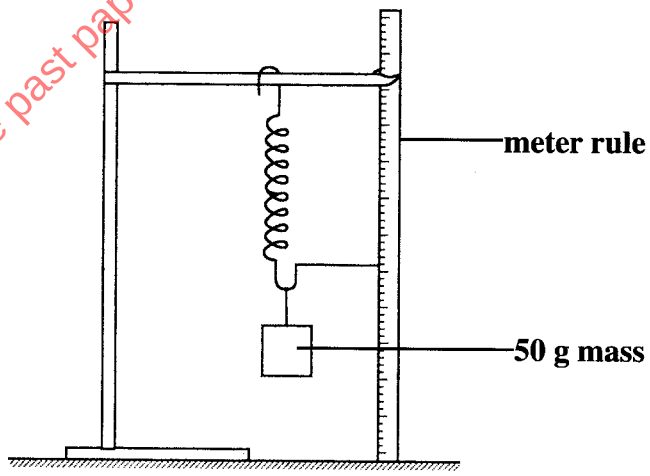

Figure 3

Count and record the number of turns **N** of the suspended spring. (1 mark)

N = ...

(f) Add 40 g to the 50 g mass and record the extension **X** of the spring due to the 40 g. (1 mark)

X = ... cm

X = ... m

(g) Determine **c** given that (1 mark)

$$\mathbf{c} = \frac{0.4}{X}$$

.....

.....

(h) Determine **n** given that (2 marks)

$$\mathbf{c} = \frac{\mathbf{nd}^4}{8\mathbf{ND}^3}$$

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(i) With the spring still loaded with the 90 g, pull the lower mass slightly downwards and let go so that the mass oscillates vertically. Record the time **t** for 20 oscillations. Hence determine the period **T**.

t = ... (s) (1 mark)

T = ... (s) (1 mark)

(j) Determine Z given that

$$T = 2\pi\sqrt{\frac{m}{Z}}$$

where m is the mass in kg on the spring. (2 marks)

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PART B

Proceed as follows:

(k) Place the 100 ml beaker on a meter rule and pour 80 cm^3 of water into it. Arrange a lamp (source of light) and a screen on either side of the beaker. *(see **figure 4**)*

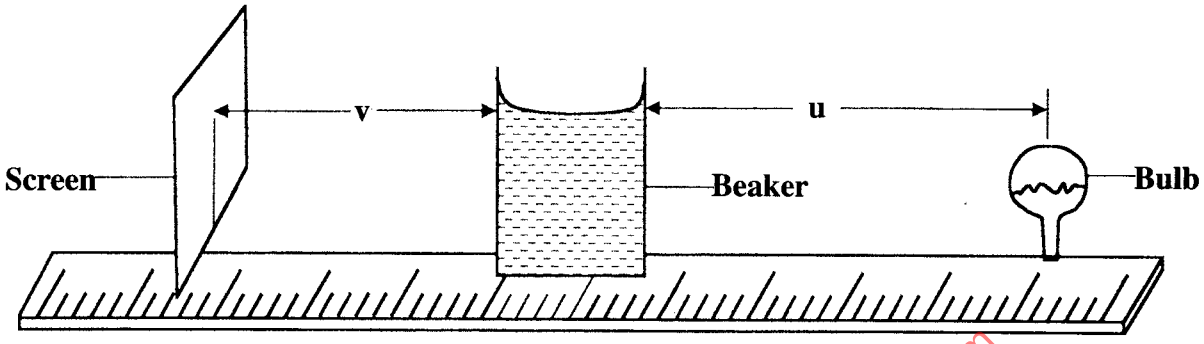

Figure 4

(l) Adjust the position of the lamp on the metre rule so that its centre is a distance **u** = 12 cm from the beaker. Switch on the light. Adjust the position of the screen until a well focused vertical line *(the image of filament)* is formed on the screen. Measure and record in **table 1** the image distance **V** between the screen and the beaker.

(m) Repeat part (l) for other values of **u** shown in **table 1** and complete the table.

Table 1

Distance u (cm)	**12**	**16**	**20**
Distance V (cm)			
$y = \frac{uv}{u+v}$			

(4 marks)

(n) Determine **m**, the mean value of **y** using the values in **table 1**. (1 mark)

m = ...

(o) (i) With the meter rule outside the beaker, measure the height **h** of the water meniscus above the bench. (1 mark)

h = ... cm

(ii) Determine the value of **P** given that (1 mark)

$$P = \frac{5}{\sqrt{h}}$$

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(iii) Hence determine the value of f given that $f = \frac{P}{2m} + 1$ to one decimal place. (2 marks)

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Question two

You are provided with the following:

- an ammeter
- a voltmeter
- two cells (size D)
- a cell holder
- a switch
- a wire labelled **L** mounted on a millimetre scale
- a micrometer screw gauge (to be shared)
- six connecting wires at least four with crocodile clips

Proceed as follows:

(a) Using a micrometer screw gauge, measure and record the diameter **d** of the wire **L**. (1 mark)

d = ... mm

d = ... m.

(b) Place the two cells **in series** in the cell holder and use the voltmeter to measure the total electromotive force (emf) $\mathbf{E_0}$ of the battery. (1 mark)

$\mathbf{E_0}$ = ... V.

(c) Starting with the switch open, connect the circuit as shown in **figure 5**. **P** and **Q** are points on the wire **L** such that **PQ** is 60 cm. *(PQ should remain 60 cm throughout the experiment)* **N** is a point on the wire such that **PN** is 10 cm (0.1 m).

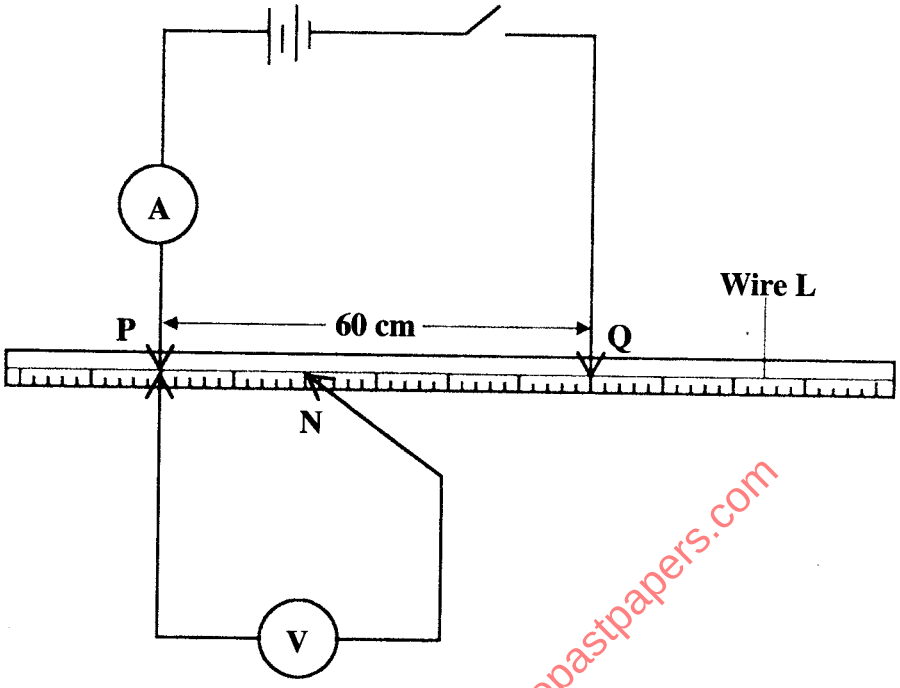


Figure 5

(d) (i) Close the switch and record the current I. (1 mark)

I = ... A.

(ii) Measure and record in **table 2** the potential difference across **PN**.

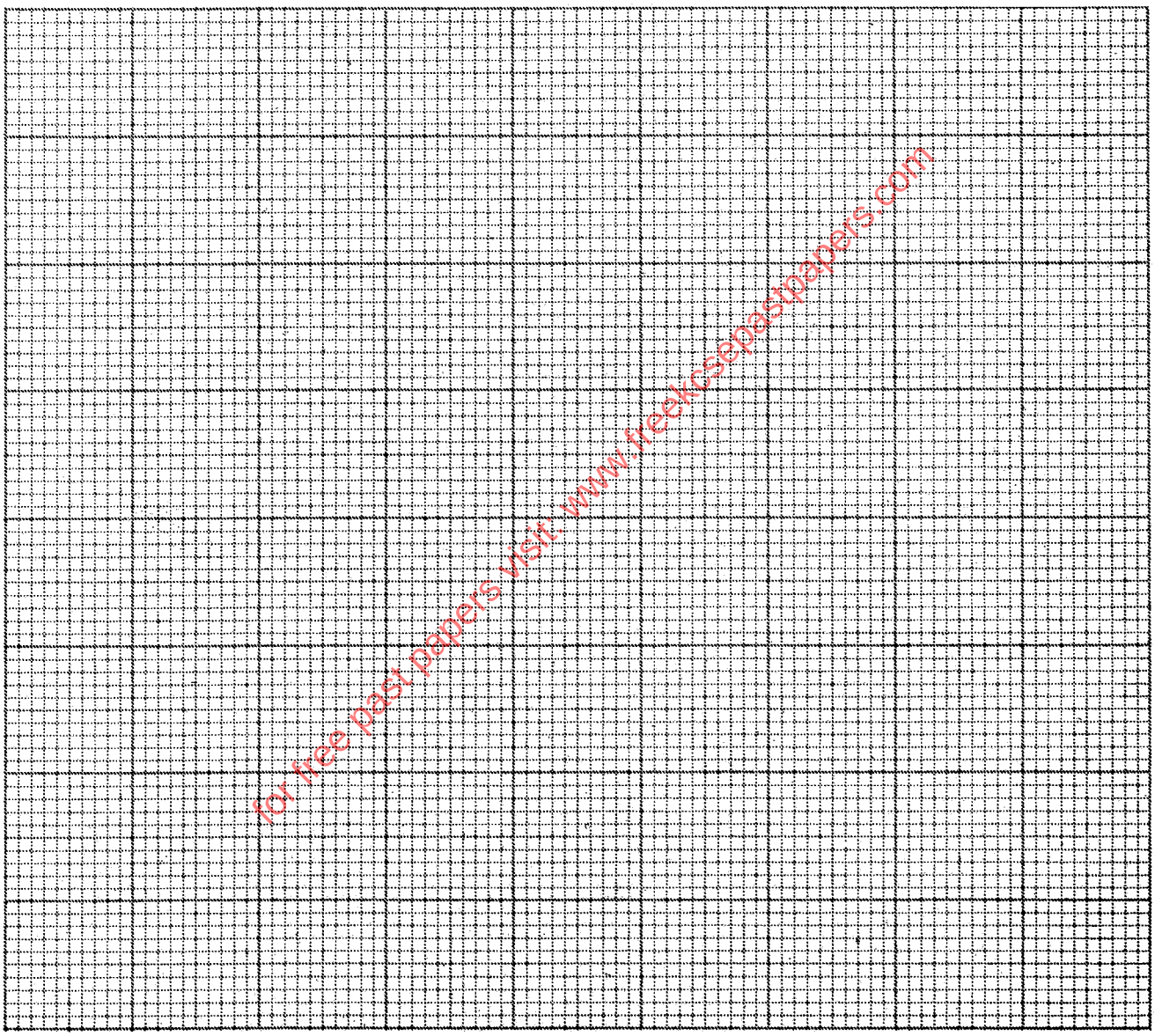
(iii) Measure and record the potential difference across **PN** for the other values of **PN** shown in **table 2** and complete the table. *(The current is expected to remain constant)*
Hint: *The switch should be closed only when reading the voltmeter.*

Table 2

Length PN (m)	**0.1**	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**
p.d (V)						
Resistance $\left(\frac{V}{I}\right)$ Ω						

(6 marks)

(e) On the grid provided, plot a graph of resistance (y-axis) against length. (3 marks)



(f) From the graph, determine:

(i) the slope **S** and its units. (3 marks)

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(ii) the constant **k** and its units given that

$$S = \frac{4k}{\pi d^2}$$ (3 marks)

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(g) Determine constant t given that

$$t = \frac{E_0 - V_n}{I}$$

where V_n is the p.d at PN = 0.6 m. (2 marks)

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