

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
Maximum Score	1	1	1	1	1	2	2	2	4	1	4
Candidate's Score											

Total

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

Total

**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*)

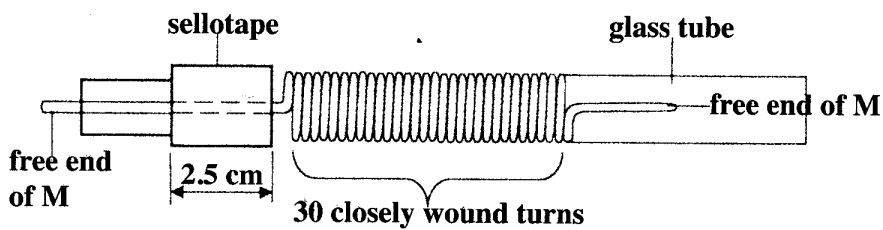


Figure 1

- (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.

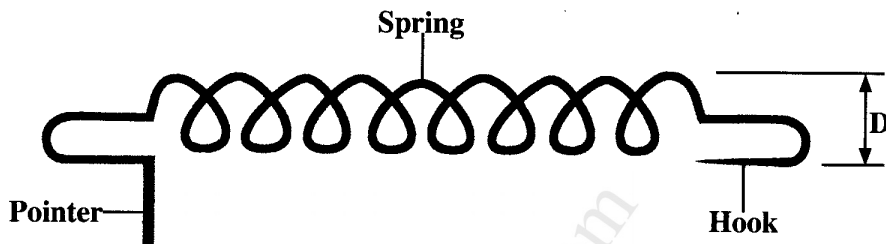


Figure 2

- (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.

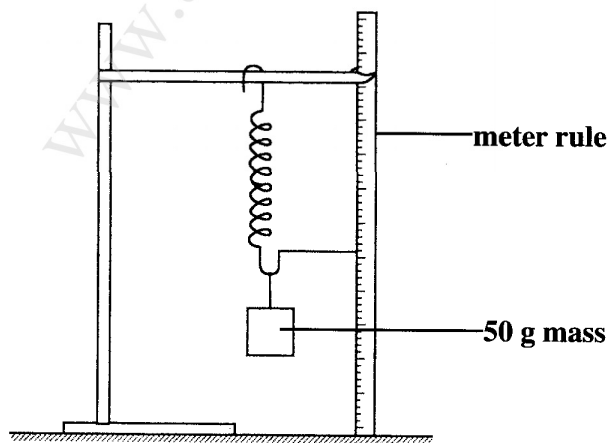


Figure 3

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)

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

.....  
 .....

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

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

.....  
 .....

(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<sup>3</sup> of water into it. Arrange a lamp (source of light) and a screen on either side of the beaker. (see figure 4)

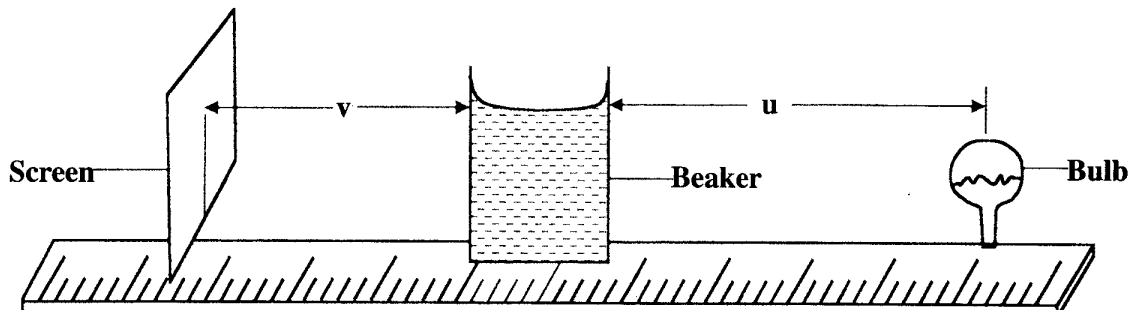


Figure 4

- (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)

$m = \dots\dots\dots$

- (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)

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

.....  
 .....

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

.....  
 .....

**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

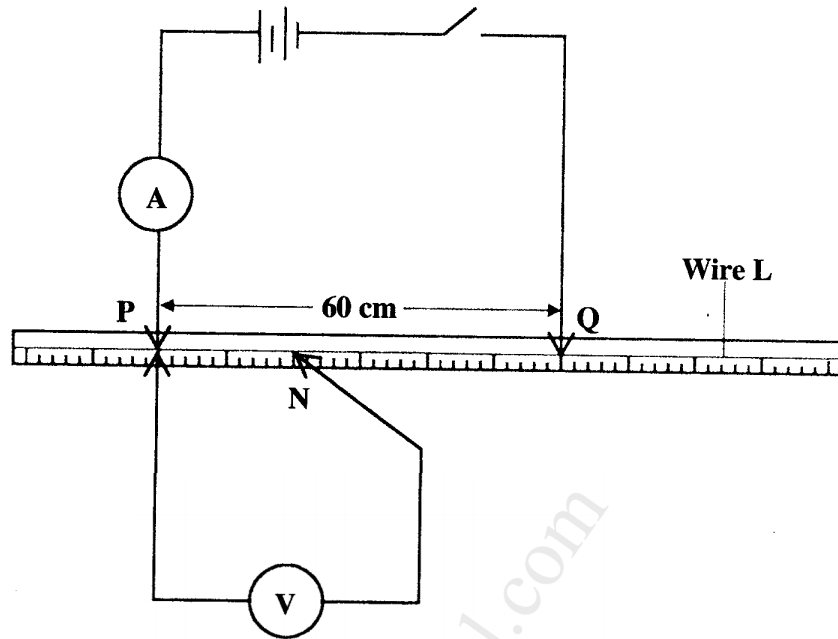
**d** = ..... m.

- (b) Place the two cells **in series** in the cell holder and use the voltmeter to measure the total electromotive force (emf) **E<sub>0</sub>** of the battery. (1 mark)

**E<sub>0</sub>** = ..... 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)
- $I = \dots\dots\dots$  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.*

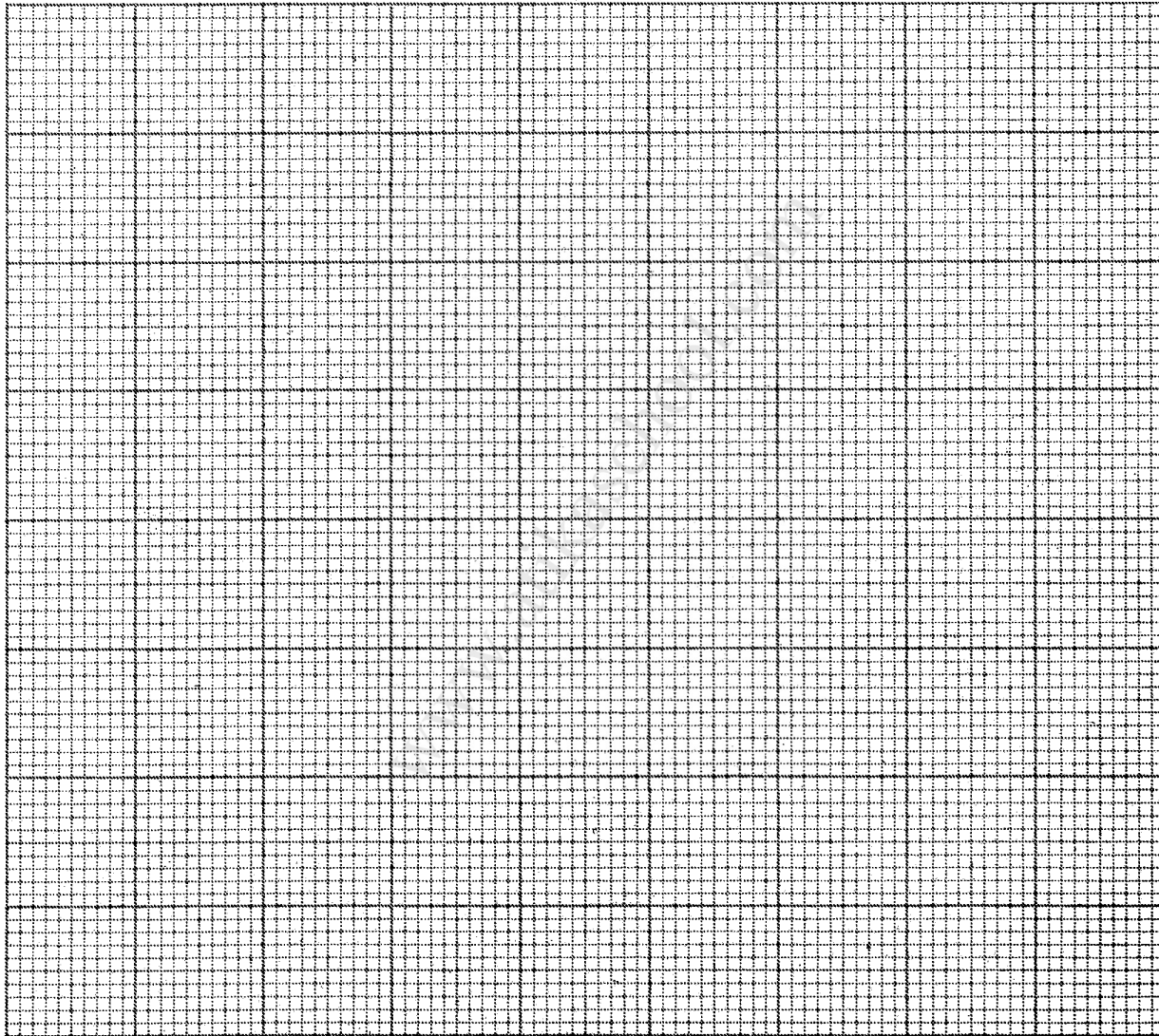
Table 2

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

(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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.....

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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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