New Specification

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ADVANCED SUBSIDIARY
General Certificate of Education
2017

Centre Number

Candidate Number

Physics

Assessment Unit AS 3A
assessing
Practical Techniques
and Data Analysis

MV18

[SPH31]
THURSDAY 4 MAY, MORNING

Time

1 hour, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Answer **all** the questions in this booklet. Rough work and calculations must also be done in this booklet. Except where instructed, do **not** describe the apparatus or experimental procedures. The Teacher/Supervisor will tell you the order in which you are to answer the questions. One hour is to be spent on four short experimental tests. **You will have access to the apparatus for 13 minutes for each of the tests.** At the end of this 13-minute experimental period there is a 2-minute changeover to the area set aside for the next test. Any spare time before the start of the next test may be used to write up anything you have not yet completed.

Information for Candidates

The total mark for this paper is 40.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
You may use an electronic calculator.

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(Questions start overleaf)

1 Determine the resistivity of the metal provided.

(a) By considering the apparatus provided, outline the procedure you will use to obtain the data from which the resistivity of the metal, marked S, can be determined. Include the name of any measuring instruments you plan to use. [3 marks]

(b) Use the space below to record sufficient results from which you can obtain a reliable value for the resistivity of the metal. [4 marks]

(c) Use your results to determine a value for the resistivity, in Ω m, of metal S. [3 marks]

Resistivity = _____ Ω m

2 Verify Snell's law of refraction.

(a) Consider the apparatus provided and draw a labelled diagram of the experimental arrangement you will use to obtain data from which Snell's law can be verified. Your diagram should show the angles to be measured.
[2 marks]

(b) Carry out the experiment and in the space below tabulate the results you obtained to verify Snell's law. [5 marks]

(c) Use your results to confirm if Snell's law is verified. You **must** show the calculations used to justify your answer. [3 marks]

Snell's law is verified because: _____

_____

3 Determine the mass of the metre rule using the principle of moments.

(a) Consider the experimental arrangement set up for you. Outline how you will use it to obtain data from which the mass of the metre rule can be determined. [3 marks]

(b) Take sufficient readings from which you can determine a reliable value for the mass of the metre rule.
[4 marks]

(c) Use your results to determine the mass of the metre rule. [3 marks]

Mass of metre rule = _____ g

4 A spring is suspended from a fixed point and a mass attached to the other end, as shown in **Fig. 4.1**. Displace the mass a small vertical distance downward and release it. The time taken for one oscillation is called the periodic time. One oscillation is when the mass moves from position A to B and back to A again.

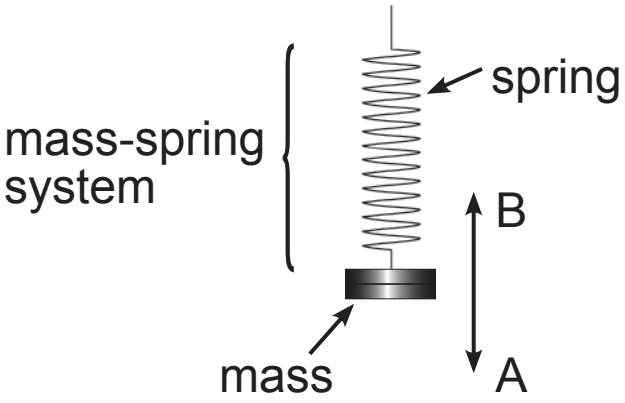

Fig. 4.1

You are to deduce which of the equations below best describes the relationship between the periodic time, T, of an oscillating mass-spring system and the suspended mass, m,

$T = km$ **Equation 4.1**

$T = k\sqrt{m}$ **Equation 4.2**

$T = \frac{k}{m}$ **Equation 4.3**

where k is a constant.

(a) Tabulate sufficient data for the two masses provided from which a deduction can be made. [5 marks]

(b) For each equation, give a justification for whether or not it is the best equation to describe the relationship. [3 marks]

Equation 4.1: _____

_____

Equation 4.2: _____

_____

Equation 4.3: _____

_____

(c) Calculate the value of k for the equation that best describes the relationship. [2 marks]

k = _____ unit

THIS IS THE END OF THE QUESTION PAPER

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
Total Marks	