

**THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**

031/2B

**PHYSICS 2B
ACTUAL PRACTICAL B
(For Both School and Private Candidates)**

Time: 2:30 Hours

Tuesday, 14th November 2017 a.m.

Instructions

1. This paper consists of **two (2)** questions. Answer **all** the questions.
2. Calculations should be clearly shown.
3. Marks for questions are indicated at the end of each question.
4. Calculators, cellular phones and any unauthorized materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).
6. The following information may be useful:

$$\pi = 3.14$$



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1. The aim of the experiment in Figure 1 is to determine the effective mass of the spring and its spring constant K .

- (a) Suspend the spiral spring to the retort stand.
- (b) Load the lower end of the spring with a mass of $M = 200\text{g}$ and then pull the mass slightly vertically downwards through a short distance from an equilibrium position and release it so that the system executes vertical oscillations of small amplitudes.
- (c) Use a stop watch to record the time t (sec) for 20 vertical oscillations and then determine the periodic time T (sec), hence determine $T^2(\text{sec}^2)$.

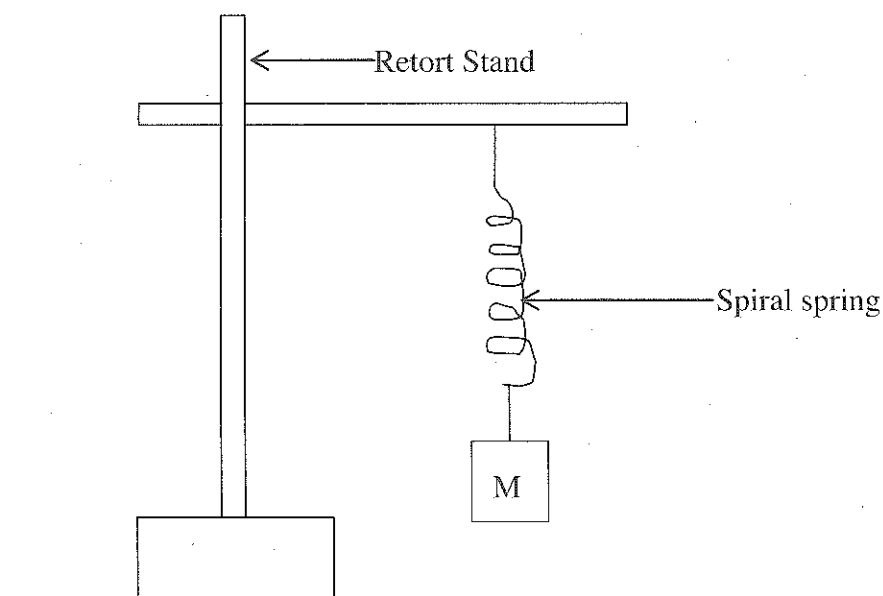


Figure 1

- (d) Repeat this procedure for the other four (4) masses in steps of 50 grams.
- (e) Tabulate your results.
- (f) It is found that the period T of oscillations and the spring constant K are related by the equation, $\frac{T^2}{4\pi^2} = \frac{M + S}{K}$, where S is the effective mass of the spring.
 - (i) Plot a graph of T^2 against M .
 - (ii) Calculate the slope of the graph.
 - (iii) Using the given equation and the graph, determine the value of S and K .

(25 marks)

2. The aim of the experiment in Figure 2 is to determine the critical angle A of the given glass block.

- (a) Fix a sheet of paper on a soft board using drawing pins.
- (b) Place the glass block provided on the sheet of paper with its largest face upper most and trace its outline $EFGH$.
- (c) Remove the block and on its outline, draw a perpendicular BI .
- (d) Draw a ray AB such that angle $\beta = 35^\circ$.

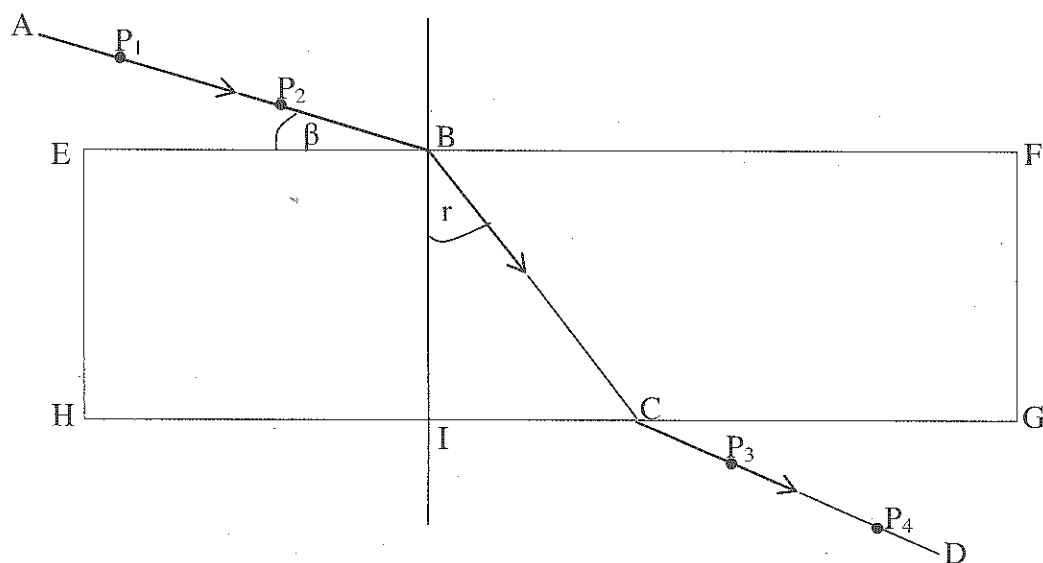


Figure 2

- (e) Replace the glass block.
- (f) Stick two pins P_1 and P_2 along AB and looking through the glass block from the opposite face HG, stick two other pins P_3 and P_4 in line with P_1 and P_2 . Remove the glass block.
- (g) Draw a straight line DC through P_4 and P_3 and join up C to B.
- (h) Measure the angle of refraction r and then calculate the value of $\cos\beta$ and $\sin r$.
- (i) Repeat the procedure (d) to (h) for values of $\beta = 45^\circ, 55^\circ, 65^\circ$ and 75° .
- (j) Tabulate your results.
- (k) Plot a graph of $\sin r$ against $\cos\beta$.
- (l) Determine the gradient G of the graph.
- (m) Calculate the value of the critical angle A from $G = \sin A$.

(25 marks)

Note: The diagrams for question 2 should be attached to answer booklet(s)

