ST MARY'S HIGH SCHOOL

'O' LEVEL PHYSICS

TOPIC: OSCILLATIONS AND WAVES

LEARNER'S C.A.L.A. GUIDE 2

Measurement techniques are an important part of experimental physics. The aspect of selecting an appropriated measuring tool and reading off the measurements to an accurate figure can never be over emphasized.

Objectives

A. Measure physical quantities; read an instrument scale to the nearest fraction of a division.
B. Express quantities in terms of S.I. units.
C. Understand and explain refraction of wave through transparent blocks and liquids.
D. Understand the properties of waves in different medium.

Activities for Learners

1.

A student investigates the period of oscillation of a mass attached between two springs.

The apparatus used is shown in Figure 1

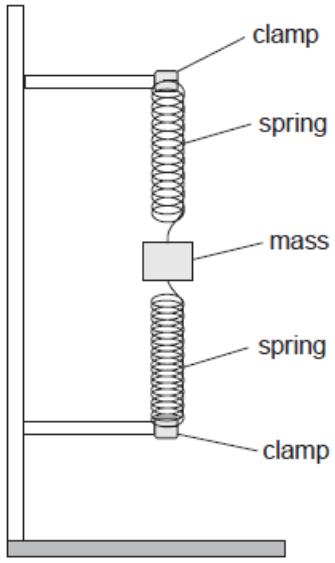

Figure 1: Oscillating Mass

A 400 g mass *m* is attached between two springs, displaced a small distance downwards, and then released so that it oscillates. The time *t* taken for 10 complete oscillations of the mass is recorded. The experiment is repeated using values for *m* of 300 g and 200 g. The readings are shown in the table below.

m/g	tls	T/s	$\frac{T}{m}/\frac{s}{g}$
400	9.0		
300	7.8		
200	6.3		

(a) Calculate the period *T* of the oscillations. *T* is the time for one complete oscillation. Enter the values in the table. [2]

(b) Calculate and enter in the table the values of $\frac{T}{m}$. [2]

(c) The student suggests that *T* should be directly proportional to *m*. State with a reason whether the results in the table support this suggestion.

Statement [2]

Reason [2]

(d) In this experiment, the mass oscillates rapidly so that it is difficult to take the times accurately. A technique has been included in this experiment to obtain an accurate value for the period *T*. State, briefly, what this technique is and any calculation involved to obtain the *T* value. [2]

(e) Another student carried out the same experiment using a wider range of masses.

Suggest why, when the mass was 900 g, it could not oscillate freely. [2]

2.

A student investigates the refraction of light through a transparent block. He places the transparent block on a sheet of plain paper, largest face down, and draws a line round the block. He draws a line to represent an incident ray and places two pins **W** and **X** in the line. Figure 2 shows the outline of the block and the incident ray.

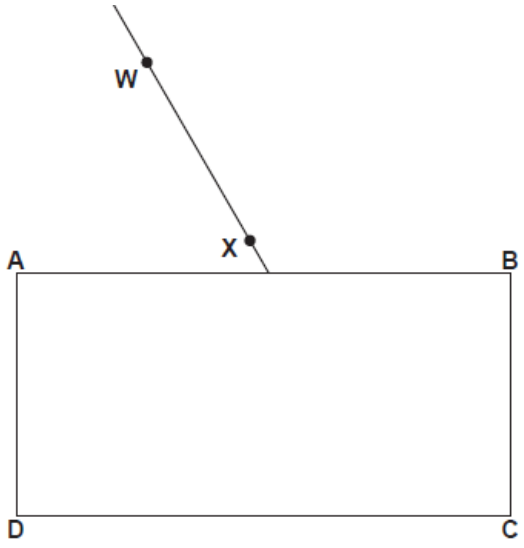

Figure 2

(a) On Figure 2, draw a normal to line **AB** at the point where the incident ray meets the block. The incident ray is drawn on the diagram. The positions of the two pins **W** and **X** that mark the incident ray are shown. [2]

(b) Measure the angle of incidence *i*. [2]

(c) Draw in the refracted ray with an angle of refraction of 20°. Continue this line until it meets the line **CD**. [2]

(d) The ray emerges from the block in a direction that is parallel to the incident ray. Draw in this emergent ray. [2]

(e) Two pins **Y** and **Z** are placed so that the pins **W** and **X**, viewed through the block, and the pins **Y** and **Z** all appear exactly in line with each other. Mark on the diagram, with the letters **Y** and **Z**, where you would place these two pins. [2]

(f) Perform and qualitatively describe an experiment to illustrate refraction of light in a media of your choice. (Take photographs at least 4 (colored) and print) [8]

[**Total Marks 30**]