



General Certificate of Education
Advanced Level Examination
June 2015

Physics

PHY6T/Q15/TN

Unit 6 Investigative and Practical Skills in A-level Physics

Investigative Skills Assignment (ISA) Q

Teachers' Notes

Confidential

The Exams Officer should make two copies of these Teachers' Notes; one copy for the Head of A-level Physics and one for the technician.

These copies can be released to the Head of A-level Physics and the technician at any point following publication but must be kept under secure conditions at all times.

Teachers can have sight of the Teachers' Notes but no further copies should be made.

All teacher-assessed marks to be submitted by 15 May.

ISA (Q) Oscillations of a spring-supported beam

Centre instructions for the investigation

In this ISA candidates will be investigating a system consisting of a mass hanging from a metre ruler supported by two springs. They will investigate how the period of oscillations varies with mass.

Information for Centres

Candidates should be told approximately one week before undertaking Stage 1 of the ISA that the investigation will involve an oscillating mass–spring system, stiffness k , resonance and damping.

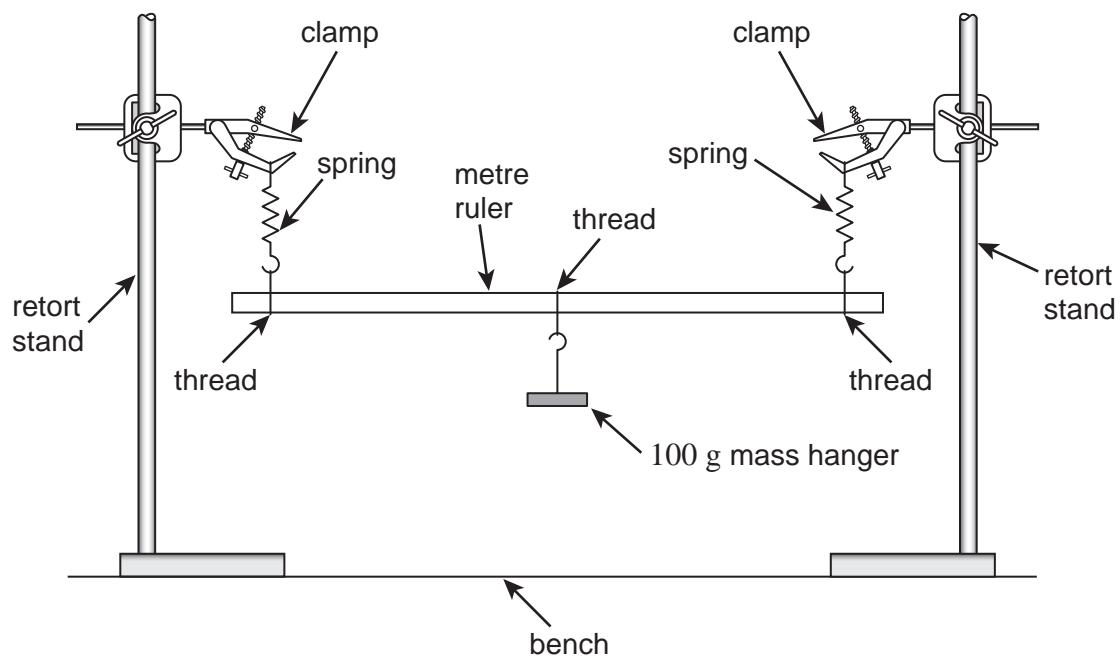
Apparatus

Centres should ensure that the apparatus provided can be used safely. Each candidate will need:

- (a) metre ruler
- (b) half-metre ruler
- (c) strong thread or thin string
- (d) scissors
- (e) five 100 g masses on a 100 g hanger
- (f) two expendable springs with stiffness k about 25 N m^{-1} . See note below
- (g) two retort stands with bosses and clamps
- (h) set-square
- (i) digital stopclock or stopwatch, reading to 0.01 s
- (j) plumb line
- (k) suitable fiducial marker.

Note that if the springs have been pre-stretched this will not affect the stiffness k . Small string loops can be attached to each spring so that the overall unstretched length of the spring and the string loops in each pair is about the same.

Set up the arrangement as shown in the diagram, with the graduated face of the ruler vertical. The apparatus should be left in such a way that candidates will need to make fine adjustments to the position of the springs to make the ruler horizontal and to position the mass hanger at the 50 cm mark on the ruler.



Task Sheet

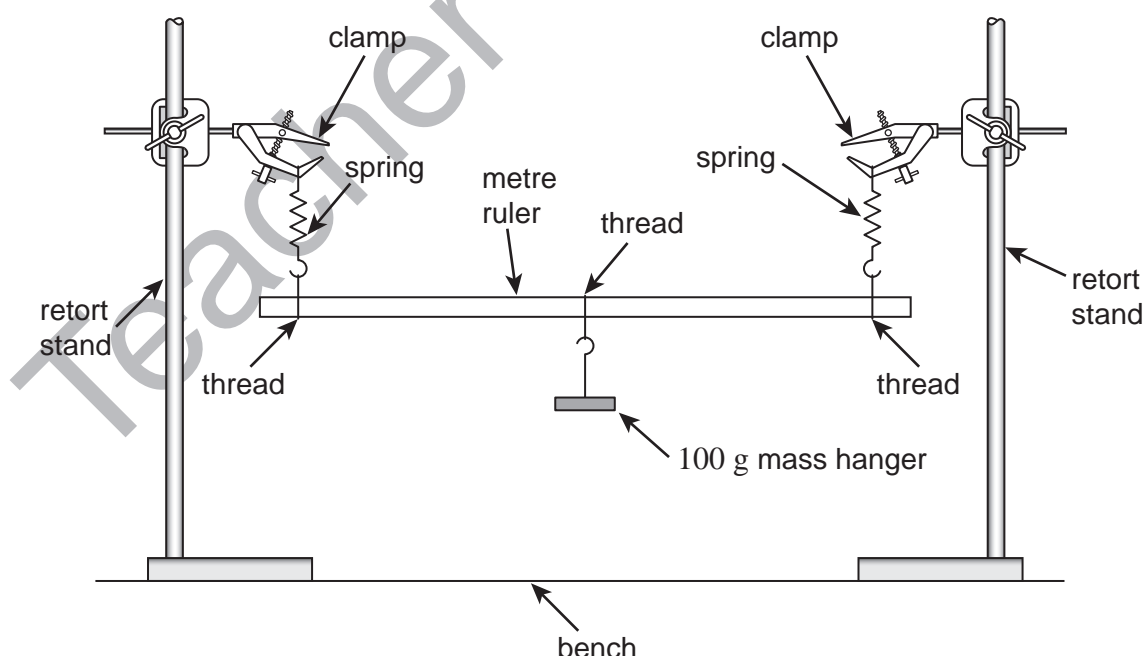
This task is worth 7 marks

You are advised to read through these instructions before beginning your work.

You are going to carry out an experiment to measure the period of the oscillations of a metre ruler which is supported by two springs with the same spring constant. You will do this for a range of masses m .

- The apparatus is set up as shown in **Figure 1**. Make adjustments so that the springs support the ruler 10 cm from each end and the 100 g mass hanger is suspended at the 50 cm mark on the ruler.
- Adjust each clamp so the ruler is horizontal and the springs are vertical (check this carefully).
- Press the ruler downwards slightly so that it remains horizontal and then release it so that it oscillates in a **vertical** plane.
- Take measurements to determine the period T of these oscillations.
- Add a 100 g mass to the hanger and repeat the procedure up to a total mass of 600 g.
- Tabulate all your data and include a column for T^2 .
- Plot a graph of T^2 on the vertical axis against m and draw a straight line of best fit.

Figure 1



After the Investigation

At the end of the investigation, hand in all your written work, including the graph and recorded results, to the supervisor.

This documentation will be required for Stage 2 of the ISA. Ensure that you have entered your centre details, candidate number and name on all the sheets you have completed.