

General Certificate of Education  
June 2007  
Advanced Level Examination



**PHYSICS (SPECIFICATION A)**

**PHAP/TN**

<b>Instructions to Supervisors for the Units 5–9 Practical Examination</b>
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**CONFIDENTIAL**

**OPEN ON RECEIPT**

The examination will be held on Monday 21 May 2007 1.30 pm to 3.15 pm

- These *Instructions* are provided to enable centres to make appropriate arrangements for the examination. Copies of the *Instructions* are to be kept at the centre under lock and key when not in use; they are not to be removed from the centre. The question paper packets must not be opened prior to the examination.
- These instructions explain how to set up the equipment for Question 2.
- Question 2 is printed on pages 4 and 5 of this instruction booklet.
- Centres are at liberty to make any reasonable minor modifications to the apparatus which may be required for the successful working of the experiment but a note of all such modifications must be forwarded to the Examiner with the scripts. However, any such modifications must permit the experiment to be carried out in the specified manner.

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## INSTRUCTIONS TO THE SUPERVISOR OF THE PRACTICAL EXERCISES

### Preparing for the Practical Examination

- 1 The instructions and details of materials contained in this document are for the use of the Supervisor and are strictly confidential. After use, these Instructions must be kept in safe custody by the Examinations Officer until after the issue of results (in March or August as appropriate).
- 2 The Supervisor has been granted access to some of the questions to aid the practical set up as part of these instructions. The relevant questions are printed to enable the Supervisor to carry out the experimental parts of the Exercises in order to ensure that the apparatus and materials obtained are satisfactory and to seek advice from AQA if there are any problems. The Instructions must be returned to safe custody at the earliest possible moment after the Supervisor has ensured that all is in order.

### The Practical Examination

- 1 If a candidate is unable to perform the experiment, or is not performing it safely, the Supervisor is expected to give the minimum help required to enable the candidate to proceed. In this instance, a note bearing the candidate's name and number must be attached to the candidate's script reporting to the Examiner the extent of the help given. Any failure in the apparatus should also be reported to the Examiner. No help should be given with the analysis of the experimental data.

It is not the wish of the Examiner that a candidate should waste time because of, for example, an incorrect electrical connection. The Examiner wishes to test the candidate's ability to perform an experiment and carry out the subsequent analysis.

- 2 Details should be given to the Examiner if the apparatus or materials provided differ from that detailed in this document. Where specific information or data about apparatus or materials is requested in these Instructions, it is important that it is given accurately. In some cases it may represent the only means available to the Examiner of assessing the accuracy of a candidate's work.

In case of difficulty the Supervisor should telephone the Senior Subject Officer for A Level Physics, David Baker, at AQA (Manchester Office), telephone number 0161 953 1180, or email [dbaker@aqa.org.uk](mailto:dbaker@aqa.org.uk)

Candidates will investigate the vertical oscillation of a spring-mass system as the mass of the system is varied.

**Apparatus required by each candidate:**

- stopwatch or electronic stopwatch, capable of reading to 0.1 s or better
- two retort stands, flat bases, rods to be of length at least 600 mm
- three bosses
- two clamps
- one G clamp
- three expendable steel springs (Philip Harris C7A41397)
- nail or small screwdriver to act as fiducial mark
- two mass hangers to accommodate 100 g slotted masses: the mass of these hangers may be 50 g or 100 g
- seven 100 g slotted masses
- metre ruler

A general view of the arrangement of the apparatus is shown in **Figure 3** on **page 4** of this booklet.

The retort stands should be arranged with their bases in contact so that the rods are aligned. Position the retort stands so that the rods lie in the same vertical plane over the edge of the bench and then G-clamp the bases of the stands in place.

Using a boss, fix a clamp close to the top of the upper rod and close to the bottom of the lower rod (the vertical separation of the clamps should be between 1.10 m and 1.20 m).

Take the mass hangers and arrange these with their bases in contact. Tape the bases together e.g. using electrical insulation tape.

Link two springs together end to end and suspend this arrangement from the upper clamp. Connect one hooked end of the joined mass hangers to the lower end of the coupled springs. Use the remaining spring to connect the lower clamp to the lower hooked end of the joined mass hangers. Make suitable adjustments to the positions of the clamps until all three springs lie in the same vertical plane. Position the remaining boss level with the equilibrium position of the centre of the joined mass hangers. Connect the nail or small screwdriver to this boss to produce a suitable fiducial mark, ensuring that no sharp ends are exposed. The apparatus should now appear as in **Figure 3** on **page 4** of this booklet.

Add all seven 100 g slotted masses to the upper part of the joined mass hangers so that the tension in the two upper (joined) springs increases and the tension in the other (lower) spring decreases. Confirm that when the system is set in small amplitude vertical oscillations, the lower spring does not fully relax (i.e. it continues to exert a downward force on the mass hangers). If in doubt, increase the vertical separation between the upper and lower clamps.

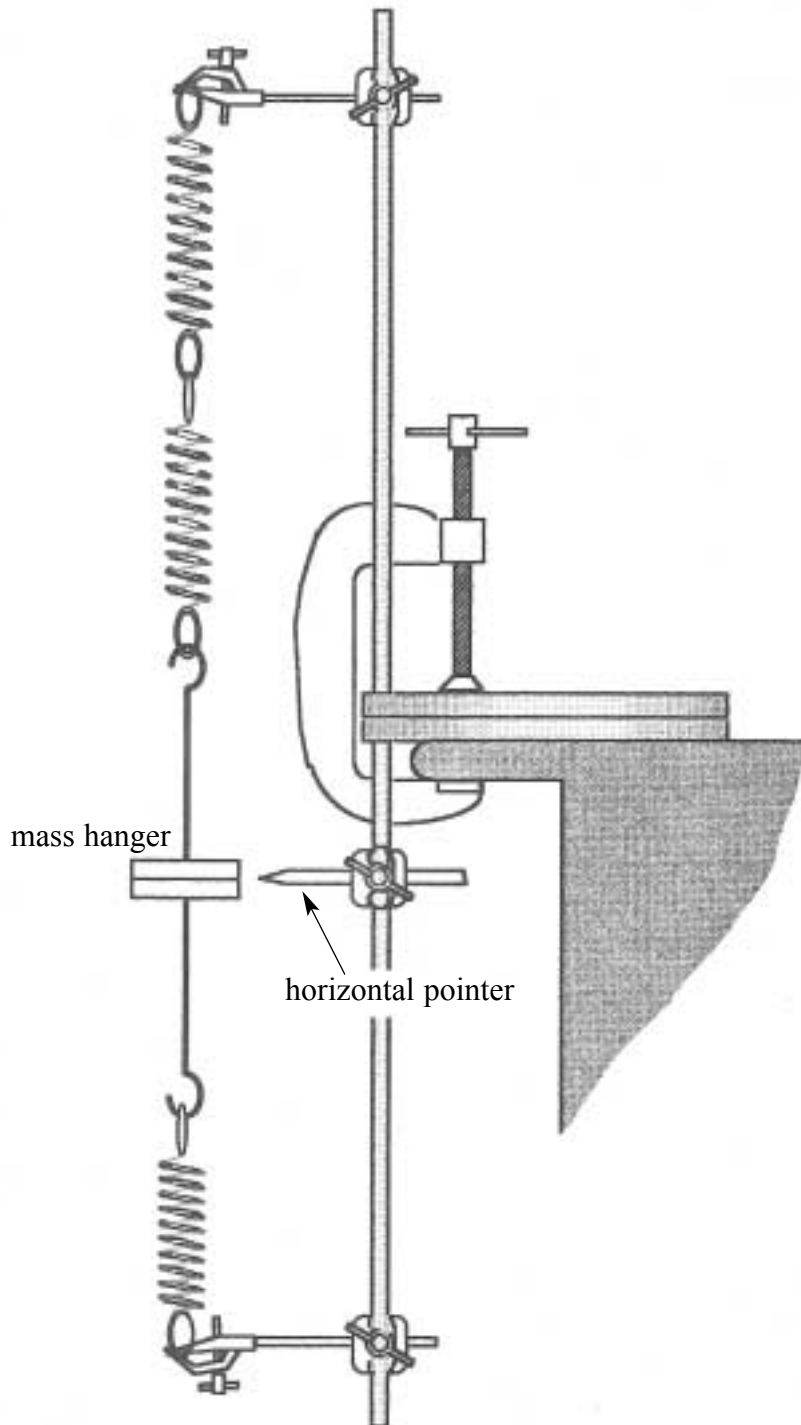
**Examiners require no further information for this question.**

- 2 You are to investigate the properties of a system consisting of a variable mass suspended between three vertical springs.

**No description of the experiment is required.**

- (a) Check and if necessary adjust the position of the horizontal pointer until it is level with the middle of the mass hanger, as shown in **Figure 3**.

**Figure 3**



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- (b) You are provided with a number of 100 g slotted masses. Use sufficient slotted masses to determine accurately  $\mu$ , which is the vertical deflection produced per kg of mass **added** to the hanger.  
Give a suitable unit with your result for  $\mu$ . *(1 mark)*

- (b) Place a mass,  $m$ , of 100 g on the mass hanger. Adjust the position of the horizontal pointer until it is level with the middle of the mass hanger.

Vertically displace and then release the mass hanger so that the system performs small amplitude oscillations in a vertical plane.

Make suitable measurements to determine  $T$ , the period of the oscillations.

You should use the horizontal pointer as a fiducial mark.

Repeat the procedure to find  $T$  for larger values of  $m$ . Each time adjust the position of the fiducial mark until it is level with the middle of the mass hanger. *(4 marks)*

- (c) Plot a graph with  $T^2$  on the vertical axis and  $m$  on the horizontal axis. *(8 marks)*

**The remaining questions for this examination are not provided. It is not necessary for the Supervisor to be aware of these questions as they do not have a bearing on the setting up of the experiment.**

**However, centres are advised that the graph will be a straight line of positive gradient and positive intercept.**

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