

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Advanced GCE**

**PHYSICS A**

**2826/03/INST**

Practical Examination 2

Instructions for the Planning Exercise and Practical Test

**To be opened immediately**

Planning Exercise – for issue on or after:

Tuesday **15 MARCH 2005**

Practical Test:

Wednesday **25 MAY 2005** Morning 1 hour 30 minutes

This document is for the **Head of Centre** and for the use of the **Physics teacher and/or technician** who prepares the apparatus and materials for the examination.

A packet containing **two** copies of the Physics Practical Test, 2826/03/TEST, accompanies the packet containing these Instructions.

These documents should be issued to the Physics teacher immediately they arrive at the Centre, but they **must be kept in a secure place at all times**.

These documents are provided so that the Physics teacher and/or technician can ensure that the Centre's apparatus is suitable for carrying out the Physics Practical Test.

**Great care should be taken that any confidential information given here does not reach the candidates, either directly or indirectly.**

---

**These instructions consists of 11 printed pages and 1 blank page.**

## PLANNING EXERCISE

The Planning Exercise should be issued to candidates on or after the date shown on the front of this document. The candidates' plans must be collected in, on or before the date of the Practical Test. These arrangements may be made at the discretion and convenience of the Centre.

It should be recognised that each Planning Exercise makes only a small contribution to the overall assessment and candidates should therefore be guided to spend an appropriate amount of time on the work. Candidates should be given between **7 and 10 days** to complete it.

The mark scheme for the Planning Exercise is based closely on the coursework mark descriptors for Skill P given in the Specification and a copy of these descriptors should be made available to candidates to assist them in their work.

Candidates may be given access, if they request it and at the discretion of the Centre, to laboratory space and facilities in order to be able to carry out preliminary work which will help in constructing their Plan. However, it should be noted that the responsibility for Health and Safety during this period rests with the Centre, and the attention of teachers is drawn to the Health and Safety section in the Specification. Access to suitable library and other resources may also be required and, while time at home or in private study will be necessary to complete the task to a high standard, sufficient work must be completed under direct supervision to allow the teacher to authenticate the work with confidence as that of the candidates concerned. Many Centres find that this can best be managed by allowing candidates a set period of time to research the topic but requiring the Plan to be written under supervision. The supervising teacher should complete the statement of authentication for each candidate on the front cover page of the Plan. Details should be provided on the Supervisor's Report for the Practical Test of any assistance given to candidates.

After candidates' work has been collected, it must be kept securely until the date of the Practical Test (or must be collected on the day of the Practical Test) and must be included with the scripts for the Practical Test when these are despatched to the Examiner. Please tie together **loosely** (or use a treasury tag) the Planning Exercise and Practical Test for each candidate **with the Practical Test on the top**.

### Guidance for Teachers/Tutors on authenticating work

*The work submitted by candidates for assessment must be entirely their own.*

Candidates may however:

- quote from books or any other source; this should be referenced in the work and all sources acknowledged;
- receive guidance from someone other than their teacher/tutor; the course teacher must be informed of the name of the person giving external guidance and the nature of the assistance given;
- produce work at a location away from the examination Centre provided that the work remains under the supervision of the teacher/tutor.

*In cases of privately entered candidates or distant tutored candidates, the Centre must ensure that:*

- the teacher/tutor has acquainted themselves thoroughly with the general standard of candidates' work before accepting work for assessment;
- sufficient on-going regular monitoring of candidates' work has taken place.

**Before authenticating work, the teacher/tutor should ask themselves the following basic questions.**

- Has the **Declaration by candidate** been signed by the candidate?
- Was at least part of the work done under your direct supervision?
- Did you check the work during its production?
- Is the standard of finished work consistent with your professional judgement of the candidate's ability?

**If you have answered 'YES' to the above questions you may authenticate the work.**

**The following notes for guidance are issued to candidates**

- 1 Your Plan should have a clear and helpful structure and should be illustrated by diagrams, tables, charts, graphs etc. as appropriate. Remember that these can often be used to replace words in the text. Diagrams should be relevant to the content of your plan and positioned appropriately. Labels on diagrams, flow charts or tables should be clear and concise. Large blocks of text should be included in the word count.
- 2 You should take care to use technical and scientific terms correctly and to write in clear and correct English.
- 3 Your Plan should be hand-written or word-processed on A4 paper, which should have a hole punched at the top left hand corner. Pages should be numbered and should have a clear margin on the right hand side. You should write (or print) on one side of the paper only and each sheet should be marked with your Centre number and Candidate number.
- 4 You should show that you have consulted an appropriate range and variety of sources. At the end of your Plan you should list clearly the sources you have used. You should refer to these references in your Plan where appropriate. Where you have incorporated material which has been *copied directly* from a source such as a book or the Internet, this must be acknowledged in your Plan and details included in the references at the end. However, it should be noted that the inclusion of copied material will not in itself gain credit. The list of references should not be included in the word count.
- 5 Your Plan should be based on the use of standard equipment, apparatus, chemicals and other materials available in a school or college science laboratory.
- 6 Your Plan should be of about **500** words. A plan which is in excess of 500 words is likely to have poor structure and unselective choice of material, so that full credit may not be available. You should indicate the number of words in the margin of the Plan at approximately 100 word intervals.
- 7 When you have finished, tie the pages **loosely** together, with this sheet on the top, so that the pages turn over freely, or use a treasury tag. Your Centre will give you the date by which your Plan must be handed in.

## PRACTICAL TEST

### General Instructions

The examination paper contains two compulsory practical questions. Centres must make suitable arrangements so that candidates are able to begin a second experiment when they choose to do so and not be kept waiting after they have finished the first experiment. Instructions as to how this is to be achieved must be given to candidates at the start of the examination. Spare sets of apparatus for both experiments should be available in case of equipment failure.

It is advisable to set out the apparatus and materials for the examination at least one day before the examination is to commence. Unauthorised persons are not permitted to enter the laboratory during this time. The laboratory must be kept locked until the start of the examination.

The Physics teacher should be granted access to the question paper in advance in order to be satisfied that the apparatus provided is in accordance with these instructions and are fully suitable for the performance of the experiments. To this end, the Physics teacher and/or technician is required to perform the experiments well in advance of the examination and then to submit with the Supervisor's Report a sample set of results in the same form as that expected of the candidates.

Candidates must be instructed to write all their answers in the question booklet. Working must be shown. The use of scrap paper is not permitted.

It is assumed that candidates will provide themselves with such standard items as a calculator, pencil and 30 cm rule.

Whenever a stopwatch or stopclock is specified, candidates should be advised, in advance, that they may, if they wish, use wristwatches with stopwatch facilities.

Candidates should be informed that, if they find themselves in real difficulty, they may ask the Supervisor for assistance but the extent of this assistance will be reported to the Examiner, who may make a deduction of marks. If the Supervisor becomes aware that a candidate is having difficulty, then the Supervisor is expected to give the minimum amount of help required to enable the candidate to obtain a set of results from the apparatus. A note of the type of help given should be made in the Supervisor's Report on the last page of these instructions. The names and index numbers of these candidates must be included. **Under no circumstances should help be given to candidates with the presentation or analysis of experimental data.**

In cases of faulty apparatus (not arising from a candidate's mishandling) which prevents the required readings from being taken, extra time must be allowed so that the candidate has a fair opportunity of performing the experiment as though the fault had not been present. Details of such cases of time compensation should be given in the comments section in the Supervisor's Report.

If the apparatus or materials which have been provided differ significantly from the specifications in these instructions then full details of the changes must be given in the Supervisor's Report. Candidates will not be disadvantaged provided that the nature of the experiments has not been changed. Supervisors are advised to contact the Board well before the date of the examination if, for example, there are difficulties with obtaining particular pieces of apparatus.

Cases of individual hardship, e.g. illness, disability, etc. should be reported direct to OCR on the 'Special Considerations' form and **not** included with the Supervisor's Report.

At the end of the examination each candidate's answer to the Planning Exercise must be tied **loosely** to the appropriate candidate's booklet.

Supervisors must give any required information on the Supervisor's Report form at the back of these instructions. This report must be signed and dated. The Centre Name and Centre Number must also be included. **It is essential that this form is sent with candidates' scripts.** It may be necessary to make copies of the Supervisor's Report for attachment to individual scripts. If the scripts are to be despatched in more than one envelope, it is **essential** that a copy of the Supervisor's Report is enclosed in **each** envelope.

## **HEALTH AND SAFETY**

**Attention is drawn to the section on Health and Safety in Appendix B of the Physics A Specification, which covers practical tests as well as coursework. Centres are reminded that, in UK law, the responsibility for Health and Safety lies with the employer.**

Materials used in the examination should display appropriate hazard symbols.

The Supervisor should intervene if he or she feels that a candidate is working in an unsafe manner. A **brief report** of the circumstances of any such intervention **must** be sent to the Examiner, in the Supervisor's Report.

## INSTRUCTIONS TO SUPERVISORS

### Question 1

Candidates will be required to investigate how the force required to pull a bar magnet away from a metal plate, with some sheets of paper on top of it, varies with the number of sheets of paper separating the magnet and the metal plate.

#### **Apparatus requirements (per set of apparatus unless otherwise specified):**

Stand, boss and clamp.

Metal plate. The plate must be iron or steel. This could be the base of a second stand.

Cork or short piece of wooden dowel with a small nail driven part way into it.

Metre rule. The rule should have a small hole drilled at the 50cm mark which is large enough to accommodate the head of the nail. This hole should be closer to one calibrated edge of the rule for ease of balancing.

Micrometer screw gauge. If there are insufficient micrometers for candidates to have one each then it is permitted for candidates to share. The Supervisor should supply the micrometers on request. Candidates should be informed at the start of the experiment that micrometers are available.

Padding (e.g. small towel or cloth). This will be placed below the right hand side of the rule so that when the mass strikes the bench unnecessary noise and vibration is avoided.

40 sheets of paper, approximate size 10cm x 15cm. The dimensions of the paper sheets must be smaller than the dimensions of the metal plate.

Slotted mass hanger with masses giving a total mass of 200g, but see Note 1.

Card on which is written 'The mass  $m$  of **M** is ..... kg' (The mass supplied is to be inserted. The value should be correct to three significant figures.).

Paper clip (see Fig. 1.2)

Small piece of blutack.

Two small loops of twine. The loops should be large enough to pass onto the rule.

Bar magnet, length 5.0cm or 7.5cm. A length of twine should be attached to the longer sides of the magnet using tape so that a small loop is made at one end of the magnet. See Fig. 1.1. This loop should be attached to one of the small loops of twine using the paper clip as shown in Fig. 1.2.

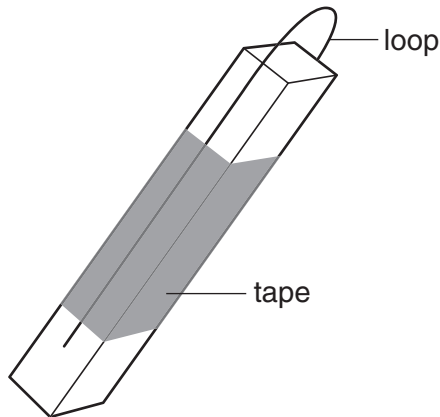


Fig. 1.1

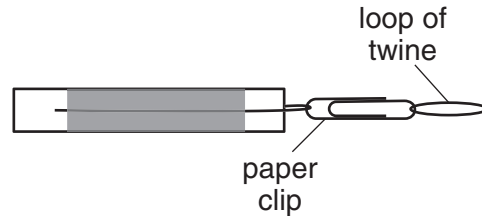


Fig. 1.2

The apparatus should not be assembled.

If the apparatus is to be used by a second candidate, it should be dismantled at the end of the first candidate's experiment and the equipment laid out on the bench ready for the next candidate to use. It may be necessary to supply fresh paper sheets.

**Procedure to be followed by candidates:**

Candidates will mount the rule horizontally using the stand, boss, clamp, nail and cork. The magnet will be suspended 25cm from the pivot and the mass hanger and masses will be suspended on the other side of the rule. The metal plate (with a few sheets of paper on top) will then be placed under the magnet. The arrangement of the apparatus should be as shown in Fig. 1.3.

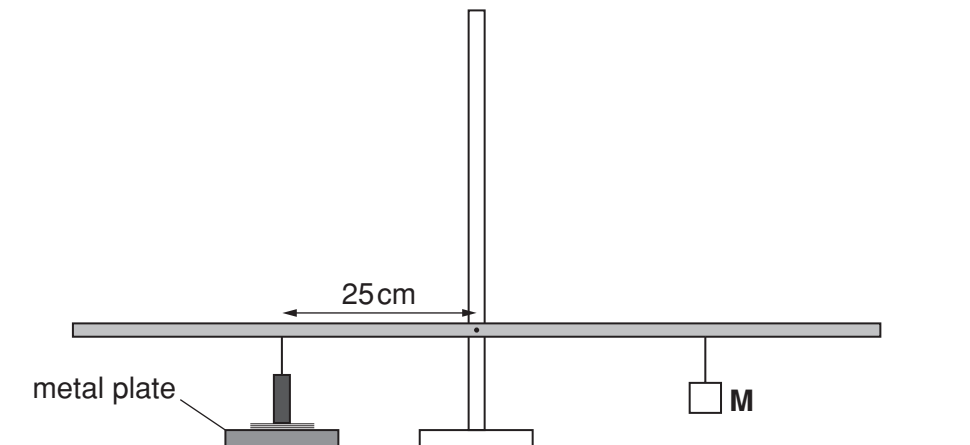


Fig. 1.3

Candidates will adjust the position of **M** until the upward force on the magnet is just sufficient to remove the magnet from the metal plate. Candidates will use moments to calculate the force  $F$  required to remove the magnet from the plate as  $n$ , the number of sheets of paper, is changed. A graph of  $F$  against  $n$  should produce a curve that does not pass through the origin.

**Note 1**

Supervisors must trial the experiment with each magnet in advance to ensure that the equipment performs as intended. It may be that the mass **M** needs to be changed if the magnets are new, or old and weak. The value of  $m$  should be such that the magnet can be pulled away from the plate using about 10 sheets of paper when **M** is between 40cm to 50cm from the pivot.

**Note 2**

It is important that the magnet pulls away from the metal plate **before** the mass **M** meets the padding.

**Question 2**

Candidates will be required to perform an experiment involving the torsional oscillations of a metre rule.

**Apparatus requirements (per set unless otherwise specified):**

Two retort stands, bosses and clamps

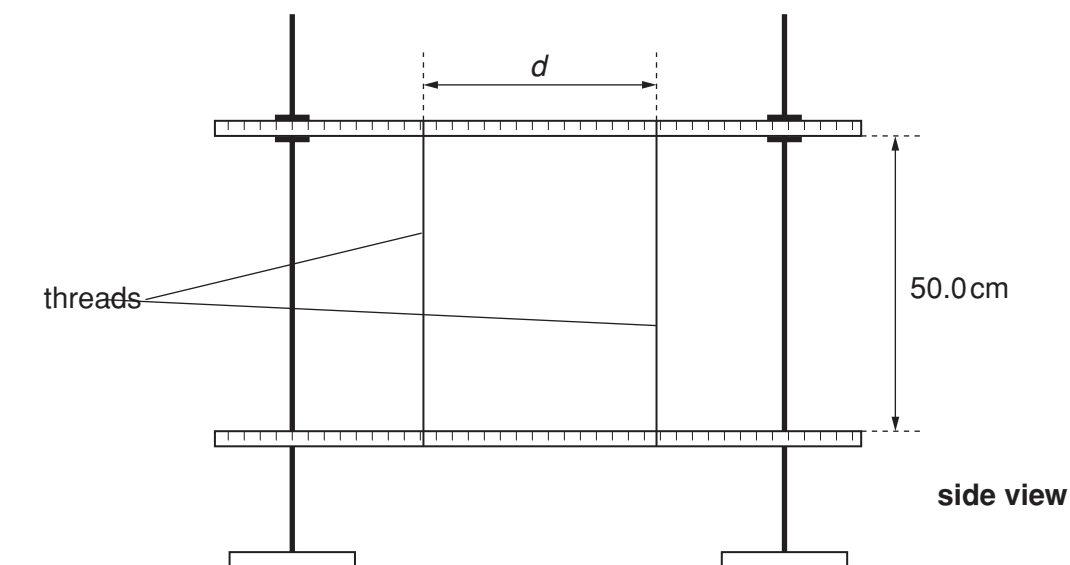
Two metre rules

Two lengths of twine, each about 75cm long

Stopwatch reading to 0.1 s or better

One of the metre rules should be clamped horizontally so that its lower edge is about 60cm above the bench using the retort stands, bosses and clamps. The clamps should be about 80cm apart. The graduated face of the rule should lie in a vertical plane. It may be necessary to place masses on the bases of the stands to prevent them from toppling over.

The second metre rule should be suspended 50.0cm below the clamped rule using the two lengths of twine. At the start of the experiment the separation of the strings should be 40.0cm. The arrangement is shown in Fig. 2.1.



**Fig. 2.1**



**Procedure to be followed by candidates**

Candidates will measure the period  $T$  of torsional oscillations of the lower rule as the separation  $d$  of the threads is changed. Supervisors must be particularly vigilant at the beginning of the experiment to ensure that candidates are using the correct oscillatory mode. Candidates who have to be told which oscillatory mode to use will **not** be penalised. Candidates will then write an evaluation of their procedure.





A list of candidates, by name and candidate number, requiring help, with details of help provided.

A sample set of results for each experiment is included with this report.

Supervisor's Signature .....

Date .....

Centre Number .....

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.