



### Instructions for preparing apparatus

The Supervisor is **not** allowed to consult the Question Paper before the examination. This teacher should, as part of the preparation of the examination requirements, test the apparatus in order to ensure that it is satisfactory.

The Supervisor is asked to give (and attach to the Supervisor's Report printed on pages 7 and 8) a *brief* description of the apparatus supplied, mentioning any points that are likely to be of importance to the Examiner in marking the answers. The Supervisor should also report any assistance given to candidates. All reports should be signed by the Supervisor.

In addition to the usual equipment of a physics laboratory, each candidate will require the apparatus specified in these Confidential Instructions. If a candidate breaks any of the apparatus, or loses any of the material supplied, the matter should be rectified and a note made in the Supervisor's Report.

### Number of sets of apparatus

As a *minimum*, the number of sets of apparatus provided should be  $N/3$ , where  $N$  is the number of candidates (per session). A few spare sets should, preferably, be available to avoid any candidate being delayed when moving to another question.

The order in which a given candidate attempts the four questions is immaterial. It is suggested that candidates spend **about 20 minutes on each of questions 1 to 3, and about 15 minutes on question 4.**

### Assistance to candidates

The purpose of the Physics Practical Test is to find out whether the candidates can carry out simple practical work themselves. The Examiners are aware that candidates may sometimes be unable to show their practical ability through failure to understand some point in the theory of the experiment. If an Examiner were present in the laboratory, he/she would be willing to give a hint to enable such a candidate to get on with an experiment. In order to overcome this difficulty, the Supervisor is asked to cooperate with the Examiners to the extent of being ready to give (or allow the Physics teacher to give) a hint to a candidate who is unable to proceed.

The following regulations must be strictly adhered to.

- (i) No hint may be announced to the candidates as a whole.
- (ii) A candidate who is unable to proceed and requires assistance must come up to the Supervisor and state the difficulty. Candidates should be told that the Examiners will be informed of any assistance given in this way.
- (iii) A report must be made of any assistance given to the candidate, with the name and candidate number of the candidate.

It is suggested that the following announcement be made to the candidates.

'The Examiners do not want you to waste time through inability to get on with an experiment. Any candidate, therefore, who is unable to get on with the experiment after spending five minutes at it may come to me and ask for help. I shall report to the Examiners any help given in this way, and some marks may be lost for the help given. You may ask me for additional apparatus which you think would improve the accuracy of your experiments, and you should say, on your script, how you use any such apparatus supplied.'

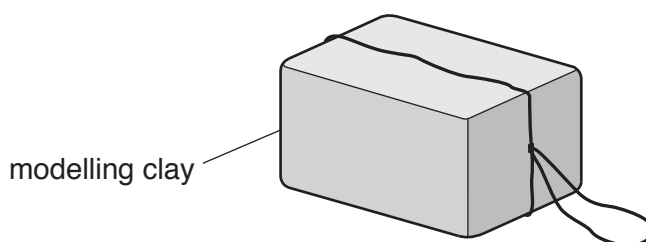
## Question 1

### Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

- (i) Piece of modelling clay of mass approximately 120g. A loop of thin string or strong cotton must be incorporated so that the modelling clay can hang from the forcemeter. See notes 1 and 2.
- (ii) Forcemeter capable of measuring forces up to 2.0N with a resolution of at least 0.1 N.
- (iii) 250 cm<sup>3</sup> measuring cylinder.
- (iv) 30 cm or 50 cm ruler, graduated in mm. Candidates may use their own.
- (v) Supply of water at room temperature. See note 3.
- (vi) Paper towels to soak up any water spillages.
- (vii) Some spare blocks of modelling clay should be available at changeover.

### Notes

1. The modelling clay must be non-porous and able to keep its shape when immersed in water. Plasticine<sup>TM</sup> is suitable. It must be moulded by hand into a rectangular solid as shown in Fig. 1.1. The three dimensions (length, width and height) must be different.



**Fig. 1.1**

2. The modelling clay, suspended from the loop of string, must be able to be totally immersed in water in the measuring cylinder without touching the sides or bottom.
3. Each candidate will require approximately 200 cm<sup>3</sup> of water at room temperature.

### Action at changeover

Ensure that the measuring cylinder is empty.

Ensure that the modelling clay is as dry as possible.

Ensure that the modelling clay is correctly shaped as specified in notes 1 and 2.

## Question 2

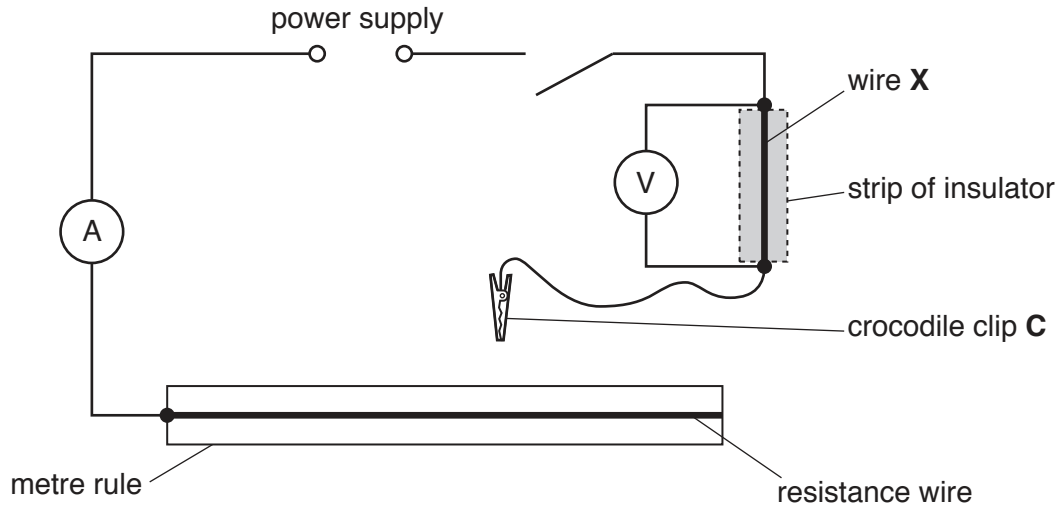
### Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

- (i) A resistance wire approximately 1 m in length, labelled **resistance wire**. 32 swg (0.274 mm diameter) constantan (Eureka) or any other wire with a resistance of approximately  $8\ \Omega/\text{m}$  is suitable. See note 1.
- (ii) Metre rule, graduated in mm. See note 1.
- (iii) A resistance wire approximately 14 cm in length, labelled **X**. The wire must be of the type described in (i) above and must be supplied as straight as possible, fixed to a strip of insulator. Wood is suitable.
- (iv) Power supply of approximately 2 V to 3 V. See note 3.  
Where candidates are provided with a variable power supply, the voltage should be set by the Supervisor and fixed, e.g. taped.
- (v) Switch. The switch may be an integral part of the power supply.
- (vi) Sufficient connecting leads to set up the circuit shown in Fig. 2.1.
- (vii) Crocodile clip. The question will refer to crocodile clip **C**.
- (viii) Ammeter capable of measuring currents up to 1.00 A with a minimum resolution of 0.05 A. See note 4.
- (ix) Voltmeter capable of measuring up to 3.0 V with a minimum resolution of 0.1 V. See note 4.
- (x) Spare leads and crocodile clips.

### Notes

1. The wire is to be fixed to a metre rule in such a way as to allow candidates to connect a crocodile clip to points between the 10 cm and 95 cm marks. Alternatively, a potentiometer fitted with an appropriate wire is suitable. The wire must be taped over with transparent tape between the 0 cm and 5 cm marks to prevent connection to this section.  
Candidates must be able to obtain current readings within the range 0.40 A to 0.80 A.

2. The circuit is to be set up for candidates as shown in Fig. 2.1, with the crocodile clip **C** not connected to the wire.



**Fig. 2.1**

3. If cells are used, they must remain adequately charged throughout the examination. Spare cells must be available.
4. Either analogue or digital meters are suitable. Any variable settings should be set by the Supervisor and fixed, e.g. taped. Spare meters must be available.

### Action at changeover

Ensure that the circuit is connected as shown in Fig. 2.1. Check that the circuit is working. Disconnect the crocodile clip **C** from the resistance wire and ensure that the circuit is switched off.

### Question 3

#### Items to be supplied by the Centre (per set of apparatus unless otherwise specified)

- (i) Sheet of plain A4 paper (*per candidate*) with a hole in one corner so that it can be tied into the Question Paper.
- (ii) Plane mirror, capable of standing upright.
- (iii) 4 optics pins.
- (iv) Pin board (e.g. cork mat), A4 size or larger.
- (v) 50 cm or 30 cm ruler, graduated in mm. Candidates may use their own.
- (vi) Protractor. Candidates may use their own.
- (vii) String or treasury tag (*per candidate*) to tie the ray-trace sheet, (as in (i)), into the Question Paper.

#### Notes

1. Spare sheets of plain paper, (as in (i)), and pins should be available.

#### Action at changeover

Supply a sheet of plain A4 paper, (as in (i)), and string or treasury tag, (as in (vii)).

### Question 4

No apparatus is required for this question.

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**This form must be completed and returned with the scripts.**

### **SUPERVISOR'S REPORT**

#### *General*

The Supervisor is required to give details of any difficulties experienced by particular candidates, giving their names and candidate numbers. These should include reference to:

- (a) difficulties due to faulty apparatus;
- (b) accidents to apparatus or materials;
- (c) any other information that is likely to assist the Examiner, especially if this cannot be discovered in the scripts;
- (d) any help given to a candidate.

#### *Information required*

A plan of workbenches, giving details by candidate number of the places occupied by the candidates for each experiment for each session, must be enclosed with the scripts.

The space below can be used for this, or it may be on separate paper.

*Information required (cont.)*

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

CENTRE NO. ....

NAME OF CENTRE .....

*Declaration (to be signed by the Supervisor)*

The preparation of the practical examination has been carried out so as to maintain fully the security of the examination.

SIGNED .....  
Supervisor