

General Certificate of Education
January 2008
Advanced Subsidiary Examination



PHYSICS (SPECIFICATION A)

PHA3/P/TN

Instructions to Supervisors for the Unit 3 Practical Examination

CONFIDENTIAL

OPEN ON RECEIPT

The examination will be held on Wednesday 16 January 2008 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.
- Relevant sections of Question 2 are printed on page 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.

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 remaining questions for this examination are not provided in these Instructions as it is not necessary for the Supervisor to be aware of the questions as they have no bearing on the setting up of the equipment. 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 those detailed in these *Instructions*. 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 Assistant Subject Officer for A Level Physics, Philip Bridgehouse, at AQA (Manchester Office), telephone number 0161 953 1180, or email physics-gce@aqa.org.uk

Candidates are to investigate the output characteristics of a potential divider circuit as the resistive load of the circuit is varied.

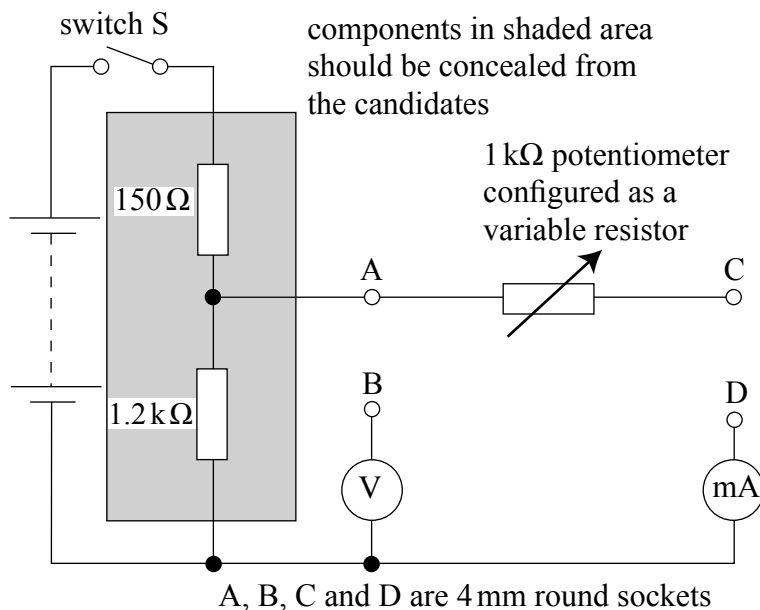
Apparatus required for each candidate:

- dc power supply, emf between 3.0 V and 6.5 V e.g. series arrangement of 3 or 4 D-type 1.5 V cells in a suitable holder or 5 V stabilized supply.
- digital milliammeter capable of reading to 0.1 mA or better, full scale reading at least 50 mA; most inexpensive 3½ digit multimeters will be satisfactory
- digital voltmeter capable of reading to 0.01 V, full scale reading at least equal to emf of chosen supply; most inexpensive 3½ digit multimeters will be satisfactory
- SPST switch, marked with 'S' with 'open' (off) 'closed' (on) positions marked
- connecting leads terminating at stackable 4 mm plugs
- four 4 mm round sockets, to be labelled A, B, C and D
- card, on which the emf of the dc supply should be printed for candidates' use

passive components:

- one 1.2 kΩ resistor, carbon film, at least 0.25 W, e.g. Rapid 62-0372, in suitable component holder (e.g. two mounted crocodile clips);
- one 150 Ω resistor, carbon film, at least 0.25 W, e.g. Rapid 62-0350, in suitable component holder (e.g. two mounted crocodile clips);
- one 1 kΩ linear potentiometer, at least 0.2 W, e.g. Rapid 65-0505, could be mounted in suitable box;

The circuit required should be assembled by the Supervisor as shown below. Centres may wish to mount the potentiometer and sockets A and C in a suitable box. Sockets B and D may be labelled on the appropriate terminals of the voltmeter and milliammeter.



The resistances of the resistive components should be concealed from the candidates. This can be done using masking tape or by mounting the potential divider inside an enclosure. Centres may wish to construct a soldered version of the potential divider on stripboard.

Turn over ►

If dry cells are to be used these should be in good condition. The emf of the dc supply should be measured before the examination and the result printed on a card; this should be placed in clear view for the candidates to see.

Switch S should be open at the start of the experiment.

Testing

Once assembled the circuit may be tested as follows.

Carry out part (a) of the experiment as described in the question on **page 5** of the Instructions.

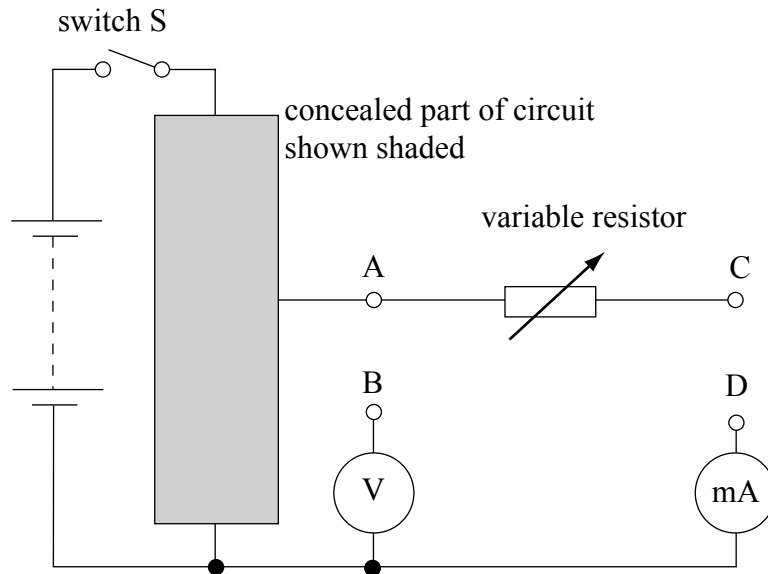
In (a)(i) the milliammeter should read a current of $\frac{E}{150} \times 10^3$ (mA) (where E is the emf of the dc supply).

In (a)(ii) the voltmeter should read $0.89 \times E$ (V)
(sample data $E = 6.0\text{V}$, $I_0 = 40\text{mA}$, $V_0 = 5.33\text{V}$)

Examiners require no information for this question.

- 2 You are provided with the circuit shown in **Figure 3**, part of which is concealed from view. You are provided with two leads that may be used to provide connections between the sockets A, B, C and D.

Figure 3



- (a) (i) Use one of the leads to connect socket A to socket D. Close switch S. Read and record the milliammeter reading, I_0 .
- (ii) Open switch S. Reposition the lead so that socket A is connected to socket B. Close switch S. Read and record the voltmeter reading, V_0 .
- (b) Open Switch S. Leaving the lead connecting socket A to socket B in place, use the additional lead to connect socket C to socket D and then close switch S. Adjust the setting of the variable resistor until the milliammeter reading is at a maximum. Read and record the milliammeter reading, I , and the voltmeter reading, V . Read and record further readings of I and V that correspond to **seven** different settings of the variable resistor. Open switch S when you have completed these readings.
- (c) Using the data produced in part (b), plot a graph with $(V_0 - V)$ on the vertical axis and I on the horizontal axis.

The remaining questions for this examination are not provided in the Instructions to Supervisors. It is not necessary for the supervisor to be aware of the questions as they have no bearing on the setting up of the experiment.

However centres are advised that in this experiment, the graph produced should be a line of positive gradient passing through the origin.

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