General Certificate of Education
June 2002
Advanced Subsidiary Examination

PHYSICS (SPECIFICATION A) **PHA3/PTN**

Instructions to Supervisors for the Unit 3 Practical Examination

CONFIDENTIAL

OPEN ON RECEIPT

The examination will be held on Thursday 16 May 2002 Morning Session

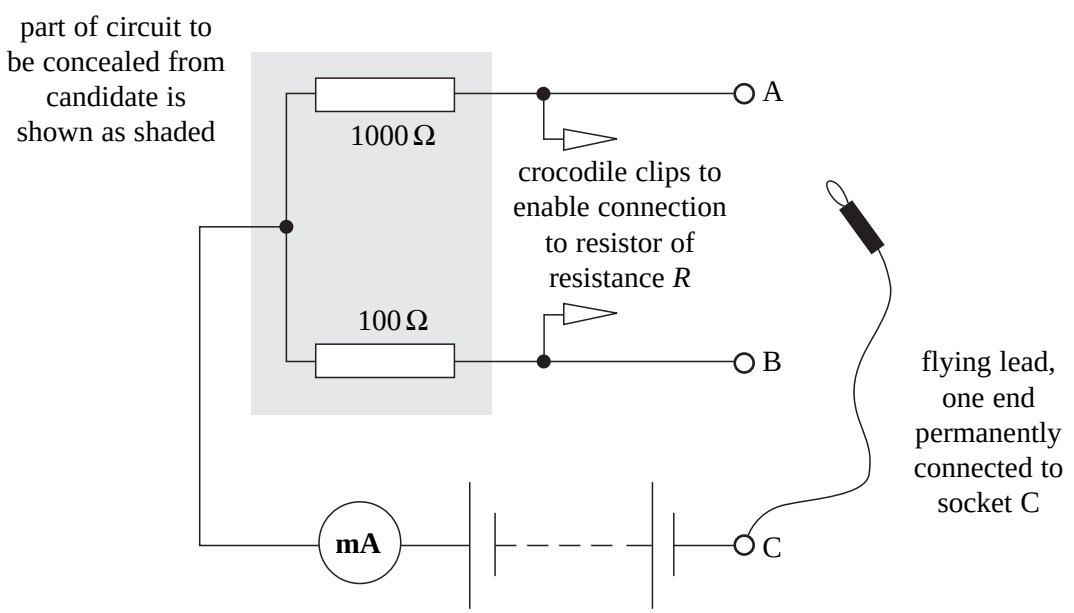
- **These *Instructions* are provided to enable centres to make appropriate arrangements for the examination. Copies of the *Instructions* are to be kept at the centre under lock and key when not in use; they are not to be removed from the centre. The question paper packets must not be opened prior to the examination.**
- **These instructions explain how to set up the equipment for Question 2.**
- **Question 2 is printed on pages 3 to 4 of this instruction booklet.**
- **Centres are at liberty to make any reasonable 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.**

Candidates are to investigate currents in a circuit containing a resistor of known resistance *R* and two resistors of unknown resistance.

Apparatus required for each candidate:

- ❒ dc supply with terminal pd not greater than 6 V, e.g. four 1.5 V 'D-type' cells in good condition, in a suitable holder
- ❒ milliammeter (or distance multimeter) with full scale reading not less than 100 mA, capable of reading to ± 1mA or better
- ❒ 100 Ω and 1000 Ω resistors, 0.5 W or 0.6 W metal or carbon film, three 4mm round sockets labelled 'A', 'B' and 'C', two crocodile clips and connecting leads fitted with 4 mm plug to construct circuit shown below
- ❒ 10 Ω, 47 Ω, 100 Ω, 220 Ω, 470 Ω and 1000 Ω resistors, 0.5 W or 0.6 W metal or carbon film, to be inserted separately by candidate into circuit, values to be displayed for candidates' use

The supervisor should assemble the circuit shown in the diagram. Part of the circuit (shown shaded in the diagram) is to be concealed from the candidates. It is suggested that the 100 Ω and the 1000 Ω resistors are soldered to a small piece of stripboard. When the external connecting leads have been soldered to the stripboard, masking tape can be wrapped around the stripboard.



The crocodile clip connections should be arranged to provide easy insertion of the resistors, the resistances of which should be clearly marked for the candidates.

One end of the flying lead should be permanently connected to terminal C. No additional leads should be provided. If a multimeter is to be used, the range settings should be checked before the examination and the attention of candidates can be drawn to these settings before the commencement of the experiment. Any unused sockets on the meter should be masked with tape.

The examiners require no information for this question.

Question 2 is printed on pages 3 and 4.

In the examination, space is provided for the answer to each part-question. The spaces for candidates' answers have been omitted in this version. The graph paper grid for part (c) has been similarly omitted.

Apparatus

General equipment for the examination may be obtained from:

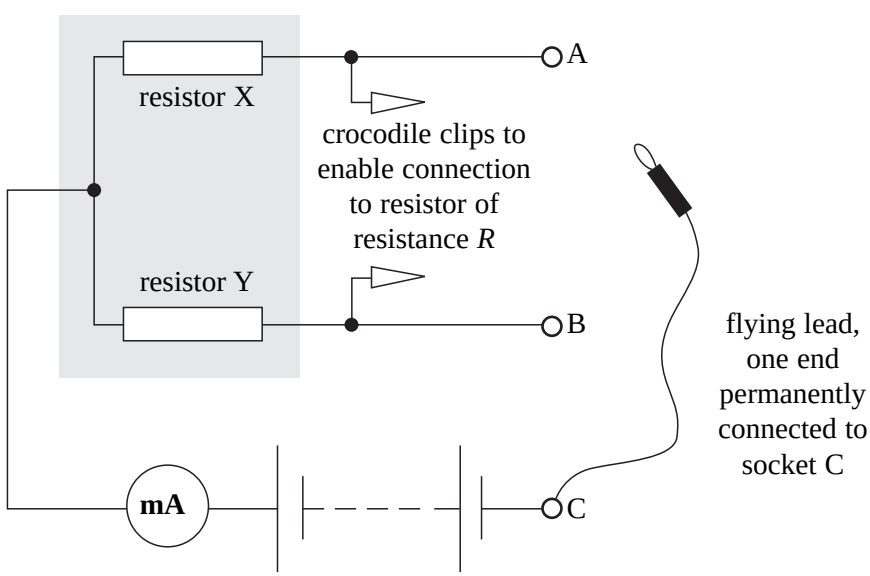
Philip Harris Education
Novara House
Excelsior Road
Ashby Park
Ashby-de-la-Zouch
Leicestershire
LE65 1NG

Griffin Education
Griffin & George
Bishop Meadow Road
Loughborough
Leicestershire
LE11 5RG

2 In this experiment you are required to investigate currents in a circuit containing a resistor of known resistance R and two resistors, X and Y, of unknown resistance. Note that the circuit in the shaded part of the diagram has been concealed from you.

No description of the experiment is required.

You are provided with the circuit shown below and six resistors of resistances 10 Ω, 47 Ω, 100 Ω, 220 Ω, 470 Ω and 1000 Ω.



(a) Connect the 10 Ω resistor between the crocodile clips (i.e. so that R = 10 Ω).

(i) Connect terminal C to terminal A using the flying lead. Read and record the current I_1

(ii) Connect terminal C to terminal B using the flying lead.
Read and record the current, I_2.

(iii) Calculate k, where $k = \frac{I_1}{I_2}$.

(b) Using each of the other resistors in turn, repeat the procedure to determine k for the five further values of R.
Record all your measurements in the space below. *(7 marks)*

(c) Using the grid **on page 11** of this booklet, plot a graph with k on the vertical axis and $\frac{(1-k)}{R}$ on the horizontal axis.

Use the space below to tabulate the data you will plot on the graph. *(6 marks)*

(d) Measure and record the gradient G, of your graph. *(3 marks)*

(e) (i) Explain whether the graph you have drawn shows that k is directly proportional to $\frac{(1-k)}{R}$.

(ii) A student performs the experiment using combinations of three 100 Ω resistors. By considering the number and range of different resistances that the student could produce, explain if any advantage is gained by this approach compared with the experiment that you have performed.

(6 marks)

22

END OF QUESTIONS