



Cambridge International AS & A Level

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PHYSICS

9702/05

Paper 5 Planning, Analysis and Evaluation

For examination from 2022

SPECIMEN PAPER

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 30.
- The number of marks for each question or part question is shown in brackets [].

This document has **8** pages. Blank pages are indicated.

- 1 A circular coil P carrying an alternating current produces a changing magnetic field. When a second similar coil Q is placed with its centre a distance x from the centre of coil P, as shown in Fig. 1.1, an electromotive force (e.m.f.) E is induced in coil Q.

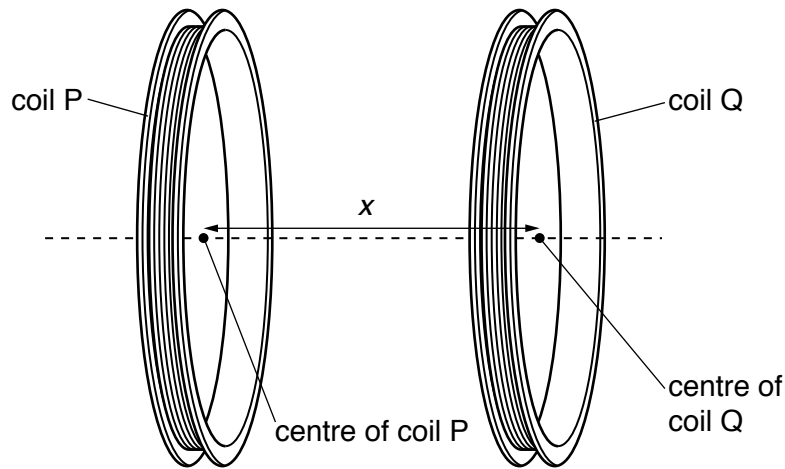


Fig. 1.1

It is suggested that E is related to x by the relationship

$$E = IZe^{-kx}$$

where I is the current in coil P, and k and Z are constants.

Plan a laboratory experiment to test the relationship between E and x .

Draw a diagram showing the arrangement of your equipment.

Explain how the results could be used to determine values for k and Z .

In your plan you should include:

- the procedure to be followed
- the measurements to be taken
- the control of variables
- the analysis of the data
- any safety precautions to be taken.

- 2 A student investigates the potential difference in a circuit. The circuit is set up as shown in Fig. 2.1.

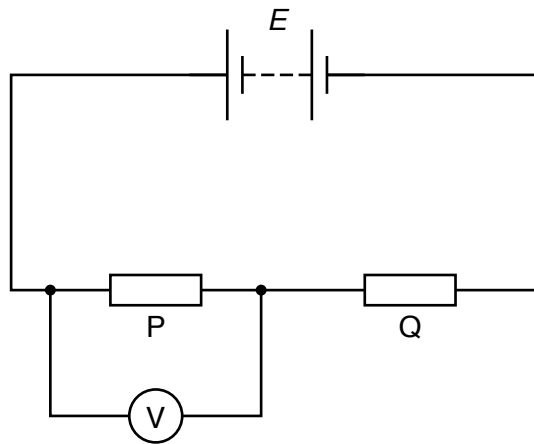


Fig. 2.1

Two resistors P and Q are connected in series to a power supply of electromotive force (e.m.f.) E and negligible internal resistance. Resistor P has resistance P .

The potential difference V across resistor P is measured. The experiment is repeated for different values of P .

It is suggested that V and P are related by the equation

$$V = \left(\frac{P}{P+Q} \right) E$$

where Q is the resistance of resistor Q . The value of Q is kept constant.

- (a) A graph is plotted of $\frac{1}{V}$ on the y -axis against $\frac{1}{P}$ on the x -axis.

Determine expressions for the gradient and the y -intercept.

gradient =

y -intercept =

[1]

(b) Values of P , V and $\frac{1}{V}$ are given in Table 2.1.

Table 2.1

P/Ω	V/V	$\frac{1}{P}/10^{-3}\Omega^{-1}$	$\frac{1}{V}/V^{-1}$
250	0.66		1.52
330	0.86		1.16
470	1.15		0.870
560	1.30		0.769
680	1.49		0.671
840	1.64		0.610

Each value of P has an uncertainty of $\pm 10\%$.

Calculate and record values of $\frac{1}{P}/10^{-3}\Omega^{-1}$ in Table 2.1.

Include the absolute uncertainties in $\frac{1}{P}$. [2]

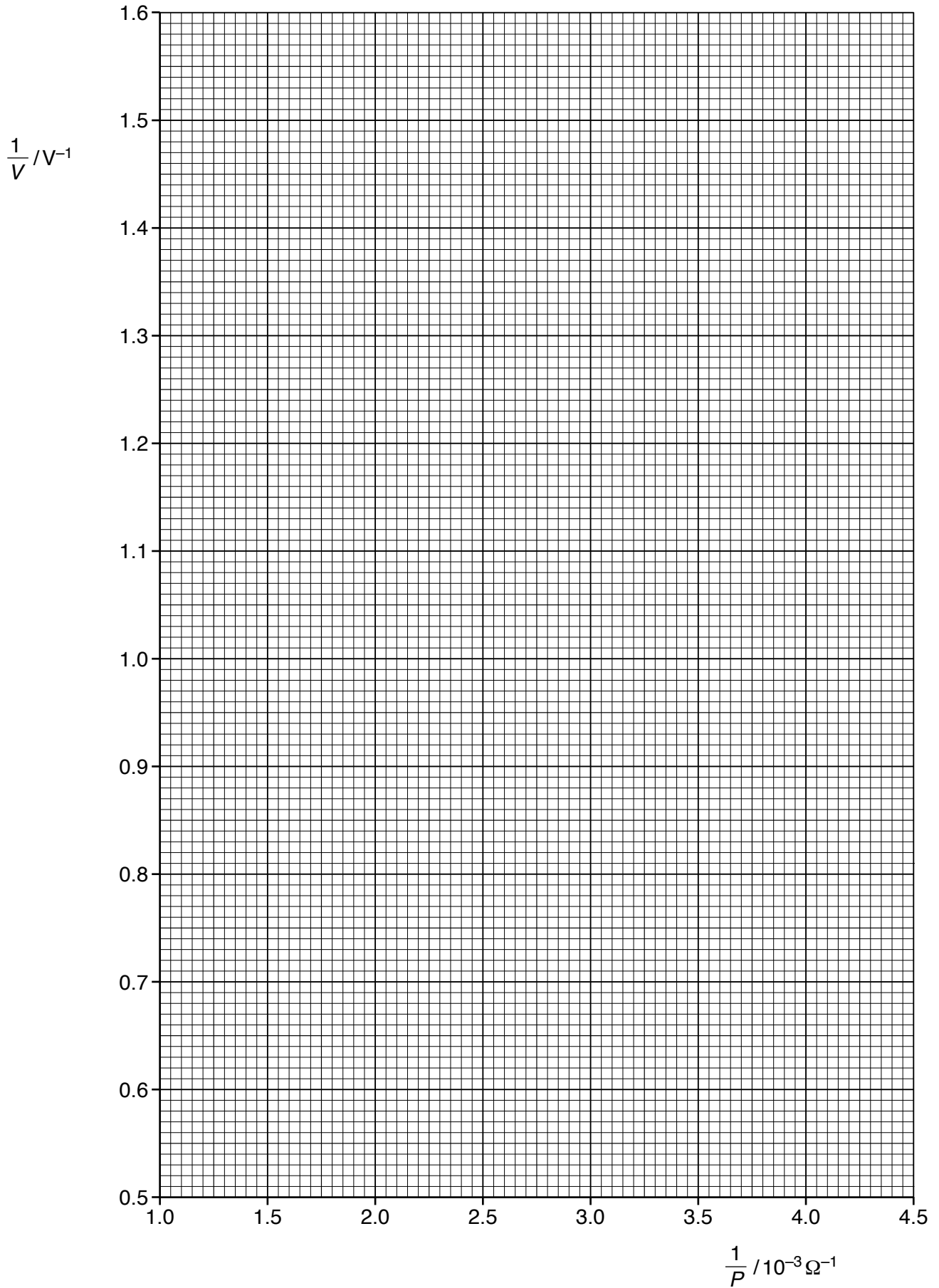
(c) (i) Plot a graph of $\frac{1}{V}/V^{-1}$ against $\frac{1}{P}/10^{-3}\Omega^{-1}$.

Include error bars for $\frac{1}{P}$. [2]

(ii) Draw the straight line of best fit and a worst acceptable straight line on your graph. Label both lines. [2]

(iii) Determine the gradient of the line of best fit. Include the absolute uncertainty in your answer.

gradient = [2]



- (iv) Determine the y -intercept of the line of best fit. Include the absolute uncertainty in your answer.

y -intercept = [2]

- (d) (i) Using your answers to (a), (c)(iii) and (c)(iv), determine the values of E and Q . Include appropriate units.

E =

Q = [2]

- (ii) Determine the percentage uncertainty in E .

percentage uncertainty in E =% [1]

- (iii) Determine the absolute uncertainty in Q .

absolute uncertainty in Q = [1]
[Total: 15]

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