Surname	Centre Number	Candidate Number
First name(s)		2

GCE A LEVEL

1420U50-1A

S23-1420U50-1A

WEDNESDAY, 3 MAY 2023

PHYSICS – A2 unit 5
Practical Examination

Experimental Task
TEST 1

1 hour 30 minutes

For Teacher's use only Award a mark of 0 or 1 for each of the following	
Circuit set up correctly – (a)	
Risk assessment correct – (c)(ii)	

For Examiner's use only	
Mark awarded	
Total	

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01

ADDITIONAL MATERIALS

In addition to this examination paper you will require a calculator and a **Data Booklet**.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.
Pencil may be used to draw tables and graphs.
Write your name, centre number and candidate number in the spaces at the top of this page.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

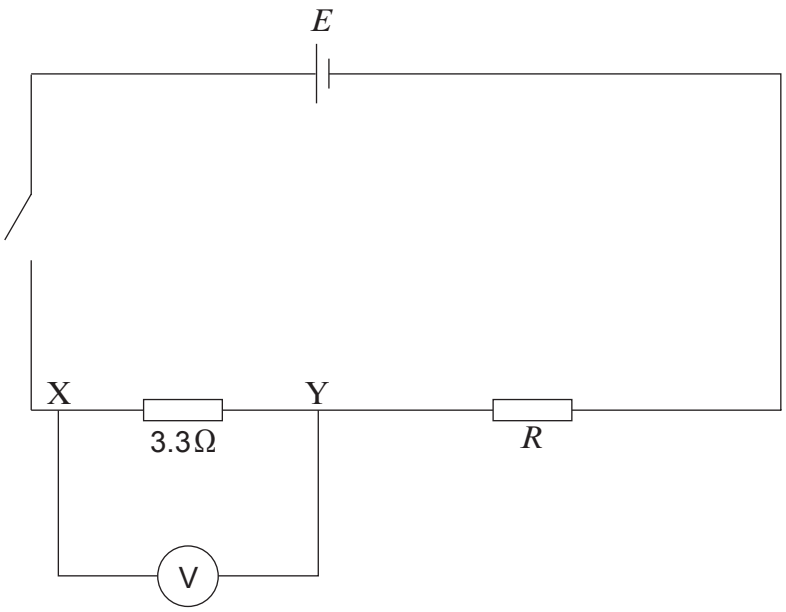
The total number of marks available for this task is 25.
Your teacher will directly assess your practical skills in parts (a) **and** (c)(ii).
The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the necessity for orderly presentation in your answers.

Examiner only

Answer **all** questions.

You are going to use a simple circuit to determine the emf, E, of a cell and the value of an unknown resistor, R. The internal resistance of the cell is negligible.

(a) Set up the following circuit using the components that have been provided. Your teacher will check whether you have connected the circuit correctly. [1]



(b) For the circuit it can be shown that:

$$\frac{1}{V} = \frac{R}{ER_{XY}} + \frac{1}{E}$$

where: V = pd across XY
E = emf of the cell
R_{XY} = resistance between XY (initially 3.3Ω)
R = resistance of the unknown resistor, R.

The graph of $\frac{1}{V}$ against $\frac{1}{R_{XY}}$ is expected to be a straight line.

Use the equation to identify the expressions for the gradient and intercept. [1]

Gradient = ...

Intercept = ...

Examiner only

(c) (i) By using the 3.3 Ω, 4.7 Ω and 6.8 Ω resistors individually and in all possible **series** combinations for R_{XY}; write a plan of how you will use the circuit to determine the resistance of the unknown resistor, R, and the emf of the cell, E. Trial readings and repeat readings are **not** required for this experiment. [2]

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(ii) Provide a risk assessment for your investigation. [1]

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(d) Record your results in a table below and also include columns for $\frac{1}{V}$ and $\frac{1}{R_{XY}}$.

Assume that the percentage uncertainty in all the values of R_{XY} is ±5 %.

Determine the **absolute** uncertainty for each value of $\frac{1}{R_{XY}}$ and include these in your table. The uncertainty values for $\frac{1}{V}$ are not required. [4]

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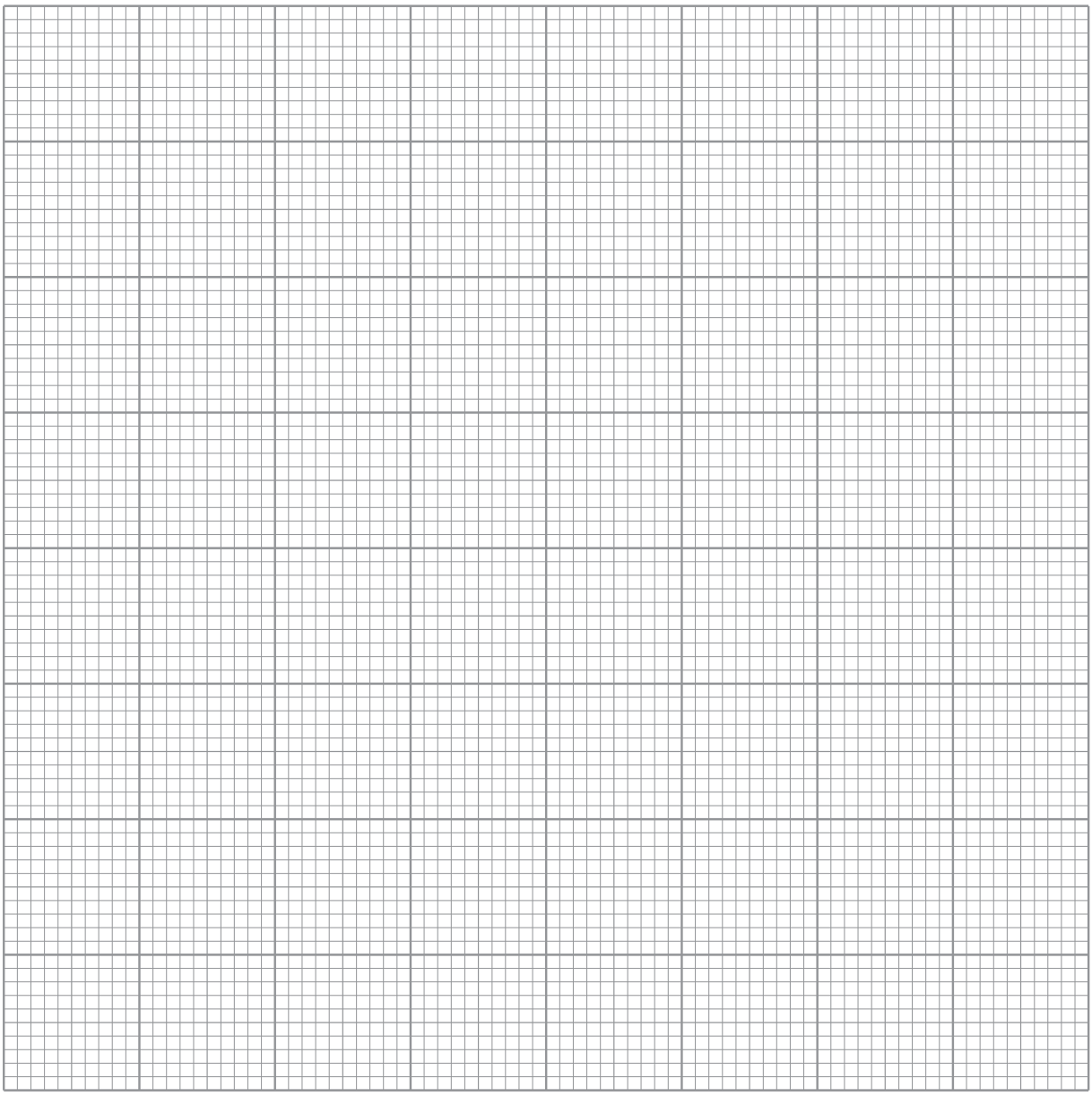
Examiner only

(e) Plot a graph of $\frac{1}{V}$ (y-axis) against $\frac{1}{R_{XY}}$ (x-axis). **Include error bars** on the x-axis and draw a line of maximum gradient and a line of minimum gradient. Ensure that your axes start at the origin (0,0). [5]



Examiner only

(f) (i) Calculate the maximum and minimum gradients for your graph. [3]

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(ii) Hence, determine the mean gradient and its **percentage** uncertainty. [2]

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(g) Determine the emf, E, of the cell along with its **percentage** uncertainty. [3]

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Examiner only

(h) Determine the value of resistor, R, along with its **absolute** uncertainty. [3]

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END OF PAPER

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