Past-paper walk-through

Inductance ▪ 13.4

eXercise

Questions in this set

- 2026 Q3

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 3

2026 ▪ Q3

The following information applies to parts A and B.
In Experiment 1, students are asked to collect data that can be graphed to determine the inductance L_1 of an inductor. The students have access to multiple charged capacitors, each of a different known capacitance, and a voltmeter that measures potential difference as a function of time. In each trial, the inductor is connected to a charged capacitor and an initially open switch, as shown in Figure 1.
[Figure 1: A circuit diagram showing a charged capacitor (parallel-plate symbol) on the left connected via a switch (initially open, shown as a break with two contact dots) to an inductor L_1 (coil symbol) on the right, forming a closed loop.]
The following information applies to parts C and D.

Question 3

In Experiment 2, the students are asked to use a graph to determine the inductance L_2 of a new inductor. The inductor is connected to a 12 V battery, a $10\ \Omega$ resistor, and an initially open switch, as shown in Figure 2.

[Figure 2: A circuit diagram showing a 12 V battery on the left connected via a switch (initially open) at the top to a loop containing an inductor L_2 (coil symbol) on the right side and a $10\ \Omega$ resistor along the bottom, all forming a single closed loop.]

After the switch is closed, the current I in the circuit is measured at different times and the corresponding rate of change of the current, $\frac{dI}{dt}$, is determined. The collected data are shown in Table 1.

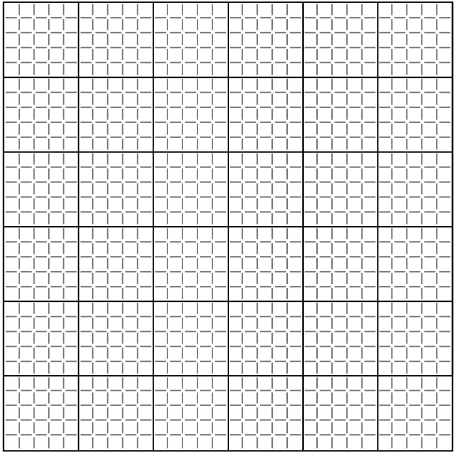
Table 1

I (A)	$\frac{dI}{dt}$ (A/s)
0.40	280
0.50	230
0.75	150
0.90	100
1.00	68

Question 3

(a)(i) Indicate quantities that could be measured by the students that would allow them to determine L_1 using a linear graph.
(a)(ii) Briefly **describe** a method to reduce experimental uncertainty.

Question 3



Question 3

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Question 3

2026 ▪ Q3

The following information applies to parts A and B.

In Experiment 1, students are asked to collect data that can be graphed to determine the inductance L_1 of an inductor. The students have access to multiple charged capacitors, each of a different known capacitance, and a voltmeter that measures potential difference as a function of time. In each trial, the inductor is connected to a charged capacitor and an initially open switch, as shown in Figure 1.

[Figure 1: A circuit diagram showing a charged capacitor (parallel-plate symbol) on the left connected via a switch (initially open, shown as a break with two contact dots) to an inductor L_1 (coil symbol) on the right, forming a closed loop.]

The following information applies to parts C and D.

In Experiment 2, the students are asked to use a graph to determine the inductance L_2 of a new inductor. The inductor is connected to a 12 V battery, a $10\ \Omega$ resistor, and an initially open switch, as shown in Figure 2.

Question 3

[Figure 2: A circuit diagram showing a 12 V battery on the left connected via a switch (initially open) at the top to a loop containing an inductor L_2 (coil symbol) on the right side and a $10\ \Omega$ resistor along the bottom, all forming a single closed loop.]

After the switch is closed, the current I in the circuit is measured at different times and the corresponding rate of change of the current, $\frac{dI}{dt}$, is determined. The collected data are shown in Table 1.

Table 1

I (A)	$\frac{dI}{dt}$ (A/s)
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1.00	68

(b)(i) Indicate what quantities the students could graph on the horizontal and vertical axes to create a linear graph that can be used to determine L_1.

(b)(ii) Briefly **describe** the relationship between L_1 and a feature of the graph from part B(i). Your answer may include an equation that relates L_1 and the chosen feature of the graph.

Question 3

2026 ▪ Q3

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[Figure 1: A circuit diagram showing a charged capacitor (parallel-plate symbol) on the left connected via a switch (initially open, shown as a break with two contact dots) to an inductor L_1 (coil symbol) on the right, forming a closed loop.]

The following information applies to parts C and D.

In Experiment 2, the students are asked to use a graph to determine the inductance L_2 of a new inductor. The inductor is connected to a 12 V battery, a $10\ \Omega$ resistor, and an initially open switch, as shown in Figure 2.

Question 3

[Figure 2: A circuit diagram showing a 12 V battery on the left connected via a switch (initially open) at the top to a loop containing an inductor L_2 (coil symbol) on the right side and a $10\ \Omega$ resistor along the bottom, all forming a single closed loop.]

After the switch is closed, the current I in the circuit is measured at different times and the corresponding rate of change of the current, $\frac{dI}{dt}$, is determined. The collected data are shown in Table 1.

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(c)(i) Label the axes of the grid provided with measured or calculated quantities. Include units, as appropriate. The graphed quantities should yield a linear graph that can be used to determine L_2.

(c)(ii) On the grid provided, create a graph of the quantities indicated in part C(i).

- Clearly **label** each axis with a numerical scale.

Question 3

- **Plot** the corresponding data points on the grid.
- Table 2 is provided in your booklet for scratch work and will not be scored.

[A blank labeled grid is provided for the student to plot the graph, with blank axis-label lines above/below reading "Quantity (units, if appropriate)" for both the horizontal and vertical axes.]

(c)(iii) Draw a best-fit line for the data plotted in part C(ii).

Question 3

2026 ▪ Q3

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The following information applies to parts C and D.

In Experiment 2, the students are asked to use a graph to determine the inductance L_2 of a new inductor. The inductor is connected to a 12 V battery, a $10\ \Omega$ resistor, and an initially open switch, as shown in Figure 2.

Question 3

[Figure 2: A circuit diagram showing a 12 V battery on the left connected via a switch (initially open) at the top to a loop containing an inductor L_2 (coil symbol) on the right side and a $10\ \Omega$ resistor along the bottom, all forming a single closed loop.]

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(d) Using the best-fit line that you drew in part C(iii), **calculate** an experimental value for L_2.