AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

Level 3 Certificate/Extended Certificate
APPLIED SCIENCE

Unit 1 Key Concepts in Science
Section C – Physics

Time allowed: 1 hour 30 minutes.
You are advised to spend approximately 30 minutes on this section.

Materials
For this paper you must have:
- a calculator
- the Formulae Sheet (enclosed).

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in each section.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

For Examiner's Use	
Question	Mark
1	
2	
3	
TOTAL	

Information
- You will be provided with a copy of the Formulae Sheet.
- There are three sections in this paper:
  Section A – Biology **Section B** – Chemistry **Section C** – Physics.
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60 and the maximum mark for this section is 20.

Advice
Read each question carefully.

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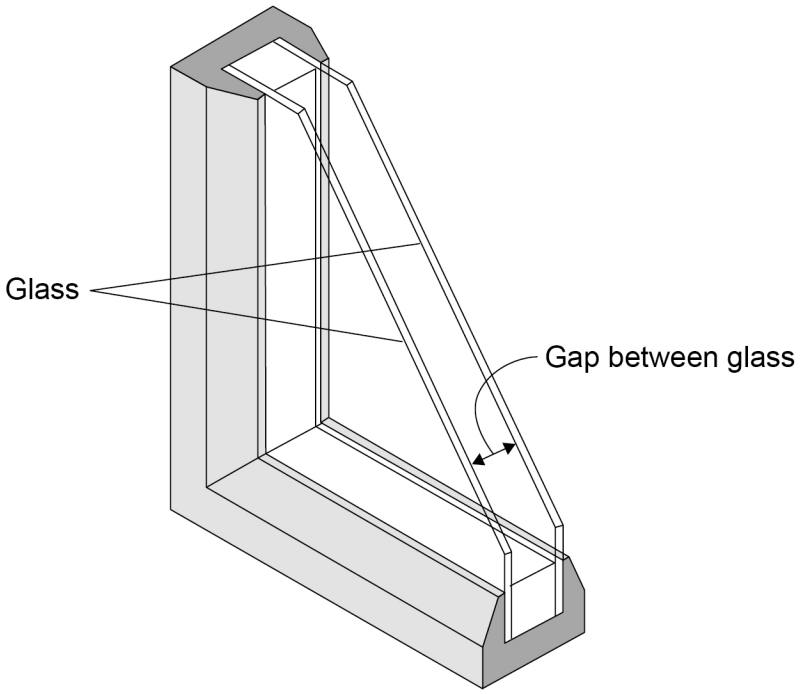
Section C – Physics

Answer **all** the questions in this section.

0 1 **Figure 1** shows the cross-section of a double-glazed window.

Figure 1



The double-glazed window can be made from four different types of glass. The gap between the glass can be **12 mm**, **16 mm** or **20 mm**.

Table 1 shows the U-values for different double-glazed windows made with different types of glass.

Table 1

Type of glass	U-value (W m^{-2} °C^{-1})		
	12 mm gap between glass	16 mm gap between glass	20 mm gap between glass
W	2.9	2.7	2.8
X	2.7	2.6	2.6
Y	1.9	1.8	1.8
Z	1.6	1.5	1.5

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0 1 . 1 Which type of glass is the best insulator?

[1 mark]

Tick (✓) **one** box.

W ☐ **X** ☐ **Y** ☐ **Z** ☐

0 1 . 2 How does the data in **Table 1** show that the type of glass has more effect than the gap size on reducing heat transfer?

[1 mark]

0 1 . 3 Suggest how the U-values would change if thicker glass was used.

[1 mark]

0 1 . 4 A double-glazed window made from glass **Y** with a **16 mm** gap has an area of 1.1 m^2.

The temperature difference between the inside of the window and the outside of the window is 15 °C.

Calculate the heat energy transferred through the window in 1 second.

Use data from **Table 1** and the equation:

$$Q = UAt\Delta T$$

[1 mark]

Heat energy transferred = _____ J per second

Question 1 continues on the next page

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0 1 . 5 Give **two** benefits of fitting double-glazed windows.

[2 marks]

1 _____

_____

2 _____

_____

6

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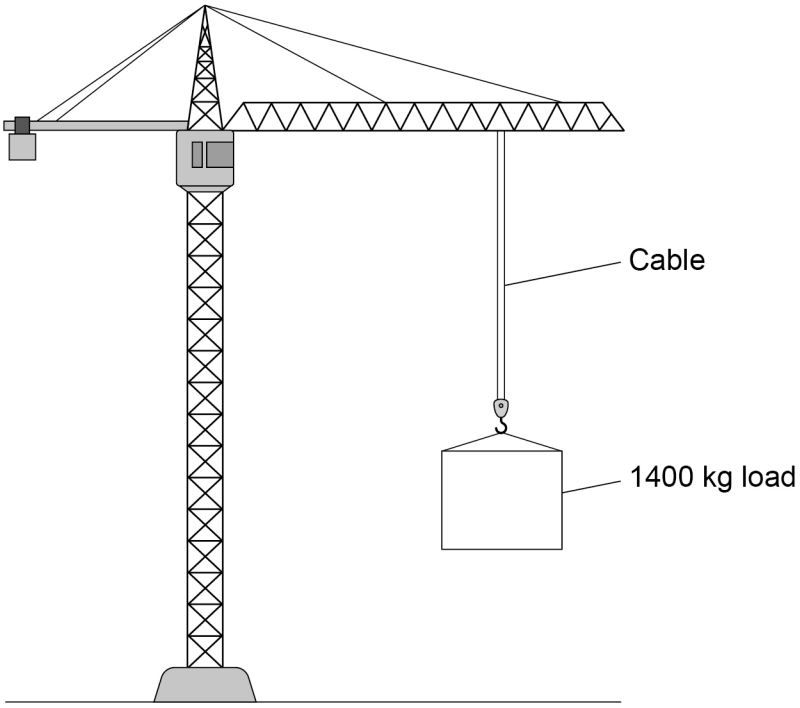
0 2 **Figure 2** shows a crane lifting a 1400 kg load.

Figure 2



0 2 . 1 The crane lifts the load at a **constant** velocity of 0.75 m s^{-1}.

Calculate the momentum of the load.

Give the unit.

Use the Formulae Sheet.

[2 marks]

Momentum of the load = _____ Unit _____

Question 2 continues on the next page

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0 2 . 2 The load gains 176 000 J of gravitational potential energy when it is lifted for 20 seconds.

Calculate the power of the crane.

Use the Formulae Sheet.

[1 mark]

Power of the crane = _____ W

0 2 . 3 The load is lifted at a **constant** velocity.

How does the tension force in the cable compare with the weight of the load?

[1 mark]

0 2 . 4 Explain what will happen to the load if the tension in the cable increases.

[2 marks]

6

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 3 A student measured the resistance of a thermistor at different temperatures.

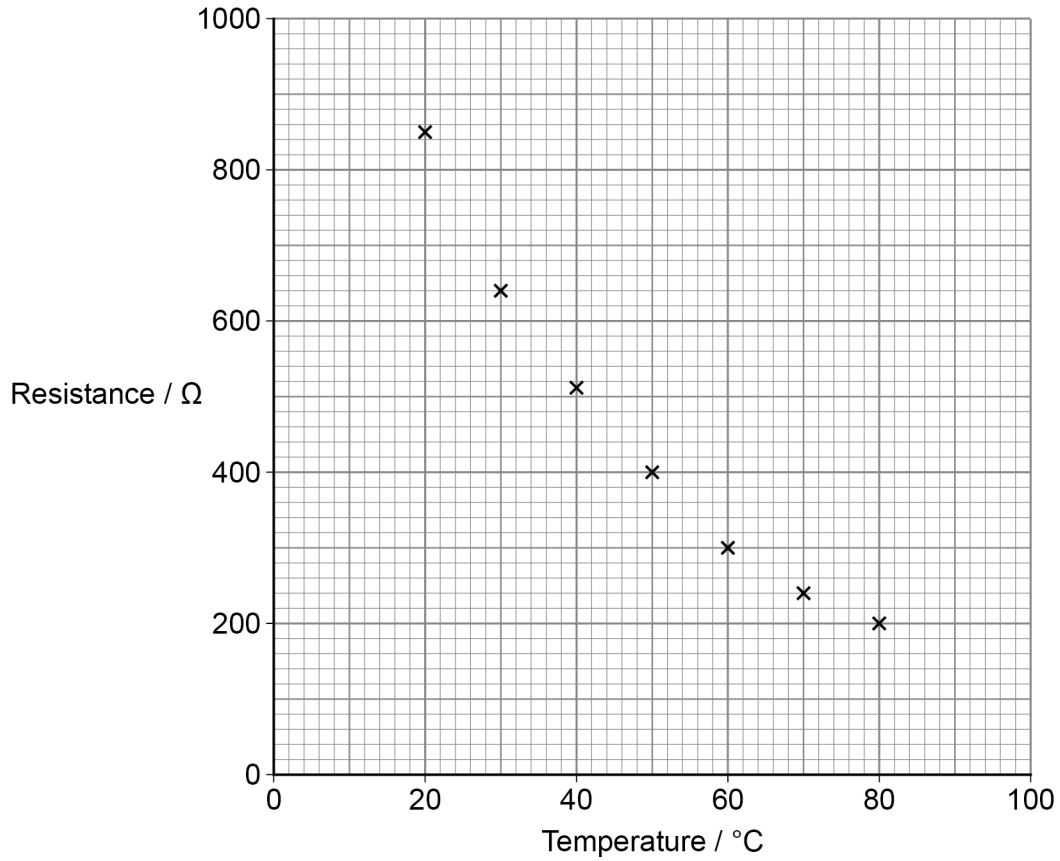
Table 2 shows the results.

Table 2

Temperature / °C	20	30	40	50	60	70	80
Resistance / Ω	850	640	510	400	300	240	200

Figure 3 is a graph of the values from **Table 2**.

Figure 3



0 3 . 1 Draw a line of best fit on **Figure 3**.

[1 mark]

0 3 . 2 Describe the relationship between the resistance and temperature shown in **Figure 3**.

[1 mark]

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0 3 . 3 Explain why the resistance of the thermistor changes as the temperature changes.

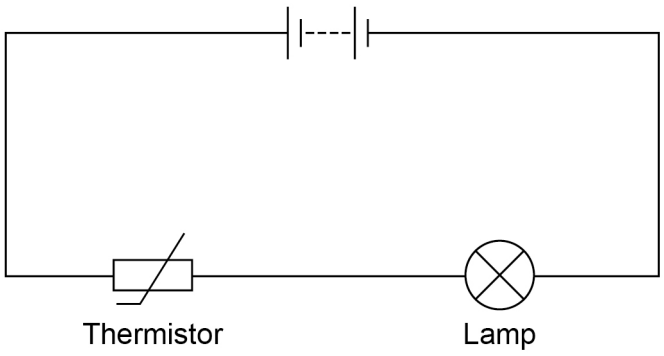
Refer to electrons in your answer.

[2 marks]

0 3 . 4 The student builds a series circuit with the thermistor.

Figure 4 shows the circuit diagram.

Figure 4



The resistance of the lamp is 15 Ω when the temperature of the thermistor is 20 °C.

Calculate the total resistance of the circuit when the temperature of the thermistor is 20 °C.

Use the Formulae Sheet and data from **Table 2**.

[1 mark]

Total resistance of the circuit = _____ Ω

Question 3 continues on the next page

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0 3 . 5 The brightness of the lamp increases as the temperature of the thermistor increases.

Explain why.

[2 marks]

0 3 . 6 Give **one** use for a circuit that includes a thermistor.

[1 mark]

8

END OF QUESTIONS

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