AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

Level 3 Certificate/Extended Certificate
APPLIED SCIENCE

Unit 1 Key Concepts in Science
Section C – Physics

Tuesday 22 January 2019 Morning

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
- Formulae Sheet.

Instructions
- Use black ink or black ball-point pen.
- 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	
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.

Do not write outside the box

Section C – Physics

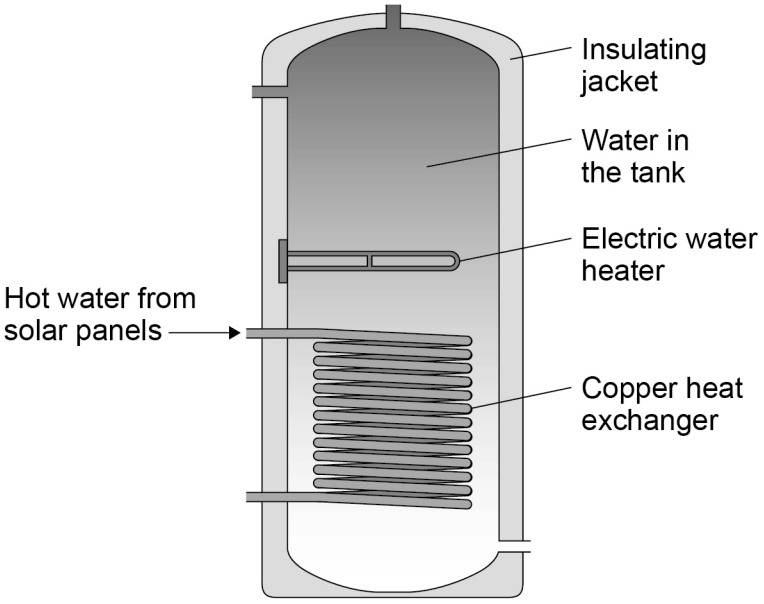
Answer **all** questions in this section.

0 1 Solar water heating systems use sunlight to heat water.

Hot water from the solar panels goes through a heat exchanger and heats the water in a hot water storage tank.

Figure 1 shows a hot water storage tank.

Figure 1



0 1 . 1 Give **two** ways the heat exchanger maximises the energy transfer from the solar panels to the water in the hot water storage tank.

[2 marks]

1 _____

_____

2 _____

_____

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0 1 . 2 Suggest why the hot water storage tank also has an electric water heater.

[2 marks]

0 1 . 3 A heating engineer wants to calculate the U-value of the insulating jacket around the hot water storage tank.

The heating engineer knows:

- the surface area of the insulating jacket
- how much heat is lost through the insulating jacket each second.

Give **two** measurements the heating engineer must make in order to calculate the U-value of the insulating jacket.

[2 marks]

1

2

Question 1 continues on the next page

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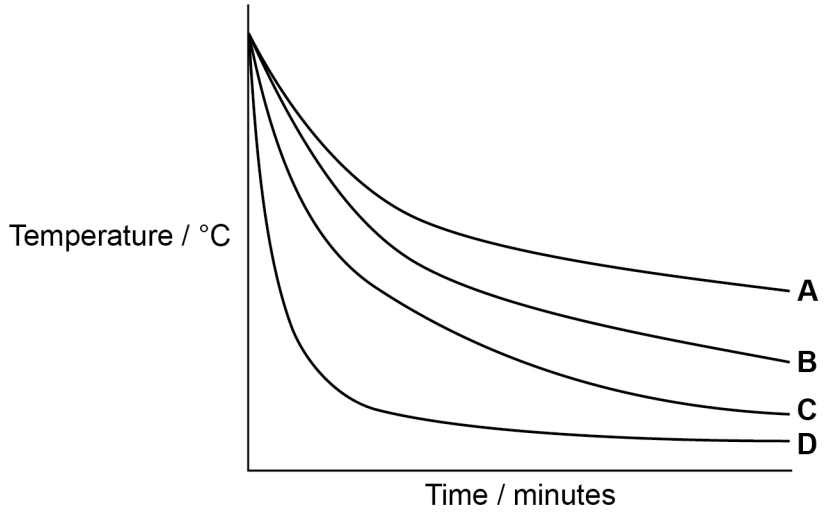
Figure 2 shows the cooling curves for the hot water storage tank when it is fitted with four different insulating jackets **A**, **B**, **C** and **D**.

Figure 2



0 1 . 4 Which insulating jacket has the lowest U-value?

Tick (✓) **one** box.

[1 mark]

A ☐

B ☐

C ☐

D ☐

0 1 . 5 Explain your answer to Question **01.4**.

[1 mark]

_____

_____

8

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 2 In the UK, approximately 3% of cars sold are electric.

0 2 . 1 Give **one** advantage and **one** disadvantage of using an electric car compared to a car powered by a petrol engine.

[2 marks]

Advantage _____

_____

Disadvantage _____

_____

0 2 . 2 Tests are being performed on a new model of electric car.

The car contains a 360 V battery that provides a power of 72 kW during a particular test.

Calculate the current from the battery during the test.

State the correct unit in your answer.

[3 marks]

Current from the battery = _____ Unit = _____

0 2 . 3 The battery can deliver a charge of 9.1×10^5 C before it needs to be recharged.

Show that the time taken before the battery needs to be recharged is approximately 76 minutes.

[2 marks]

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0 2 . 4 The car is driven on a horizontal test track at a constant speed of 24 m s^{-1}.

Calculate the maximum distance, in metres, the car can travel at a speed of 24 m s^{-1} on the horizontal test track.

[2 marks]

Maximum distance = _____ m

0 2 . 5 A further test is now performed on the car.

The car is driven **downhill** at a constant speed of 24 m s^{-1}.

The current from the battery is less than the current calculated in Question **02.2**

Explain why the current is less.

[3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

12

END OF QUESTIONS

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Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

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