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Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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# Level 3 Certificate / Extended Certificate APPLIED SCIENCE

Unit 1 Key concepts in science

Section C – Physics

Monday 11 June 2018

Afternoon

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.
- Do all rough work in this book. Cross through any work you do not want to be marked.

## 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.

For Examiner's Use	
Question	Mark
1	
2	
<b>TOTAL</b>	



J U N 1 8 A S C 1 P 0 1

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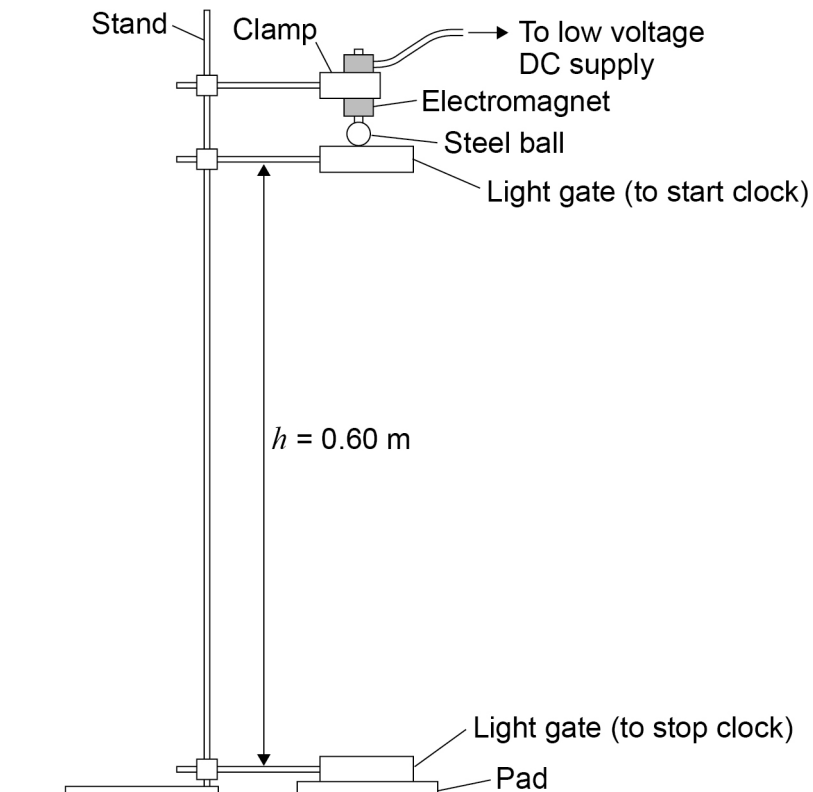
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## Section C – Physics

Answer **all** questions in this section.

0 1

A student wants to measure the acceleration due to gravity of a steel ball.

**Figure 1** shows the equipment the student plans to use.**Figure 1**

0 1 . 1

Name the energy the steel ball has before it is released.

**[1 mark]**

\_\_\_\_\_

0 1 . 2

Explain why the steel ball remains stationary before it is released.  
In your explanation, include the forces involved.**[2 marks]**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



0 1 . 3 The distance between the light gates,  $h$ , is 0.60 m.

The time taken for the steel ball to fall between the light gates was 0.351 s.

Calculate the **average** speed of the steel ball as it travelled between the light gates.

[1 mark]

Average speed = \_\_\_\_\_ m s<sup>-1</sup>

0 1 . 4 Calculate the acceleration due to gravity of the steel ball.

Assume the speed of the steel ball at the first light gate is 0 m s<sup>-1</sup>

State the correct unit in your answer.

[3 marks]

Acceleration due to gravity = \_\_\_\_\_ Unit = \_\_\_\_\_

0 1 . 5 Give **two** ways the student could reduce the effect of errors in the results.

[2 marks]

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

**Question 1 continues on the next page**

**Turn over ►**



0 1 . 6

The student calculates the speed of the steel ball to be  $3.7 \text{ m s}^{-1}$  just before it hits the pad.

The mass of the steel ball is  $0.060 \text{ kg}$ .

Calculate the kinetic energy of the steel ball just before it hits the pad.

**[2 marks]**

Kinetic energy = \_\_\_\_\_ J

0 1 . 7

The steel ball exerts a force on the pad when it hits it.

Explain why.

Use **one** of Newton's Laws of Motion in your explanation.

**[2 marks]**

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**13**

**Turn over for the next question**

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ANSWER IN THE SPACES PROVIDED**

**Turn over ►**



**0 2**

A product design engineer measures the temperature of a hot drink as it cools in a cup.

**Table 1** shows the engineer's results.

**Table 1**

<b>Time / minutes</b>	0	10	20	30	40	50	60
<b>Temperature / °C</b>	88	54	39	30	24	23	23

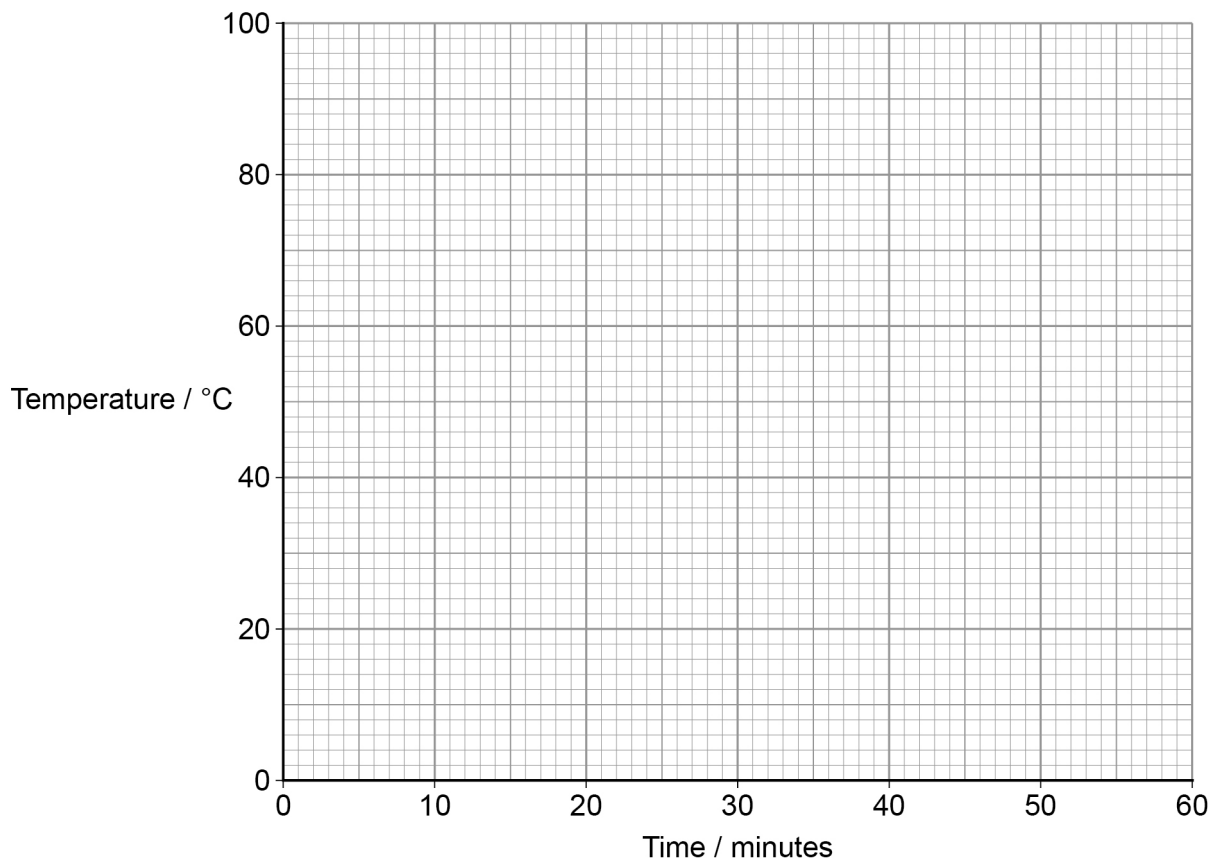
**0 2 . 1**

Plot a graph of the values in **Table 1** on **Figure 2**.

Draw a line of best fit.

**[2 marks]**

**Figure 2**



**0 2 . 2** The engineer wants to calculate the **U-value** of the material the cup is made from.

State what is meant by the term **U-value** of a material.

[1 mark]

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**0 2 . 3** When the hot drink has a temperature of 88 °C, the drink loses 58 J of heat in 1 second.

The temperature of the room is 23 °C.

The total surface area of the cup is 0.050 m<sup>2</sup>

Calculate the U-value of the material the cup is made from.

[2 marks]

U-value = \_\_\_\_\_ W m<sup>-2</sup> °C<sup>-1</sup>

**0 2 . 4** The engineer designed the cup to minimise thermal transfer.

Suggest **two** examples where thermal transfer should be maximised.

[2 marks]

1 \_\_\_\_\_

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2 \_\_\_\_\_

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7

**END OF QUESTIONS**



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