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

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 | |
| **TOTAL** | |

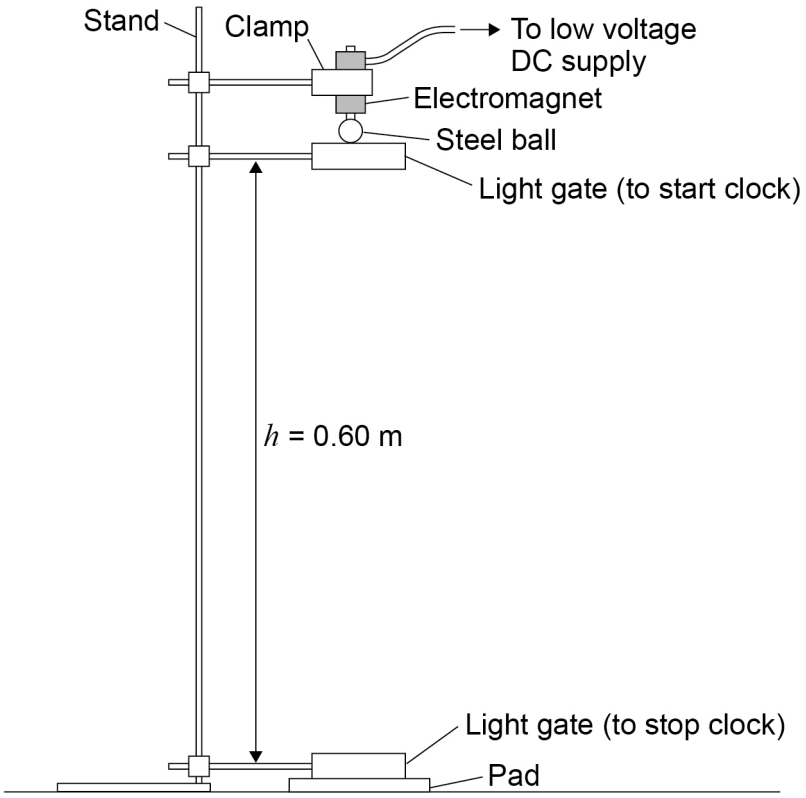
## Section C – Physics

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]**

*Do not write outside the box*

**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 $s^{-1}$

**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 $s^{-1}$

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**

*Do not write outside the box*

**0 1 . 6** The student calculates the speed of the steel ball to be 3.7 m $s^{-1}$ just before it hits the pad.

The mass of the steel ball is 0.060 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]**

_____

_____

_____

_____

_____

_____

_____

_____

**13**

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**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

**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**

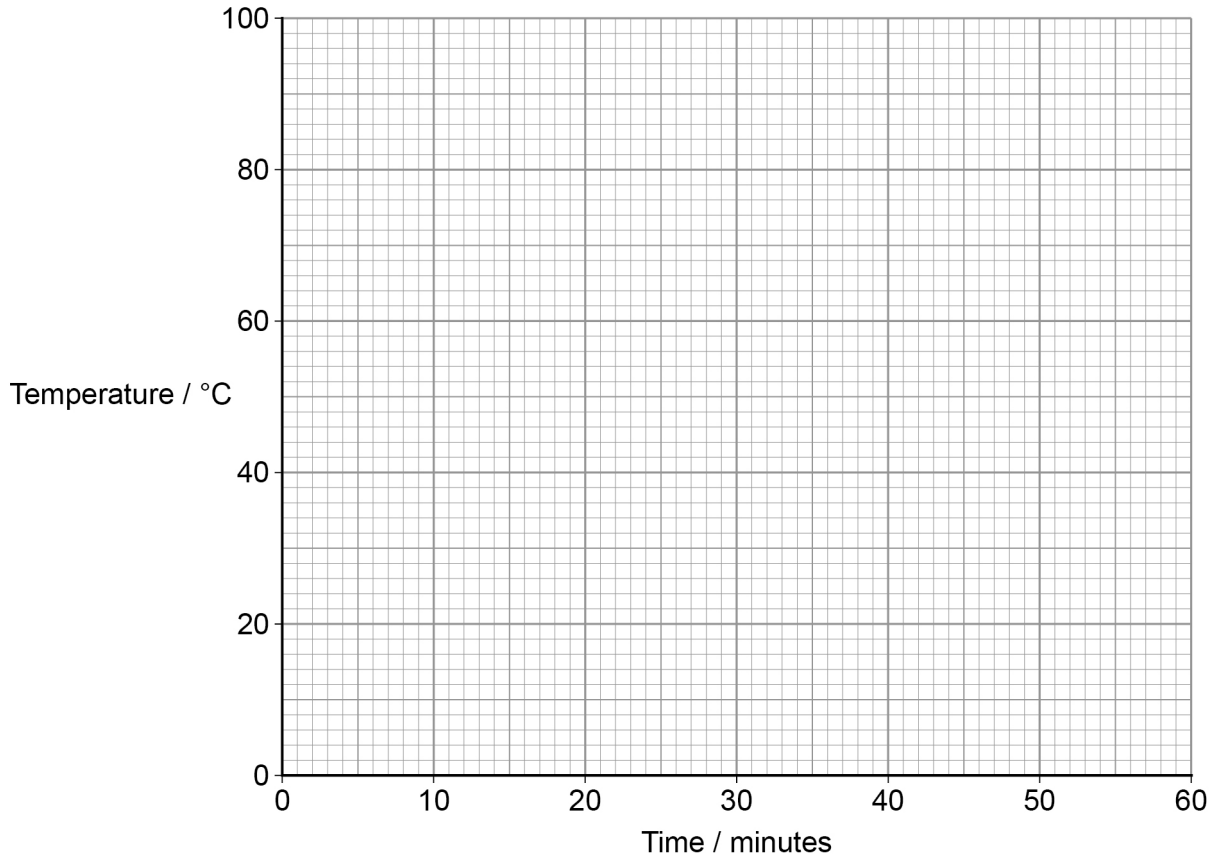
| **Time / minutes** | 0 | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|---|
| **Temperature / °C** | 88 | 54 | 39 | 30 | 24 | 23 | 23 |

**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**



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**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]**

**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 $m^2$

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

**[2 marks]**

U-value = _____ W $m^{-2}$ $°C^{-1}$

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

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

**[2 marks]**

1 _____

2 _____

**7**

**END OF QUESTIONS**

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**ANSWER IN THE SPACES PROVIDED**