Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

AQA

General Certificate of Secondary Education
Higher Tier
June 2014

Science A
Unit Physics P1

PH1HP

H

Physics
Unit Physics P1

Thursday 12 June 2014 9.00 am to 10.00 am

For this paper you must have:
- a ruler
- a calculator
- the Physics Equations Sheet (enclosed).

A

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- 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
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 2 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Do not write outside the box

Answer **all** questions in the spaces provided.

1 Electricity can be generated using various energy sources.

1 (a) Give **one** advantage and **one** disadvantage of using nuclear power stations rather than gas-fired power stations to generate electricity.

[2 marks]

Advantage .....

.....

Disadvantage .....

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1 (b) (i) A single wind turbine has a maximum power output of 2 000 000 W.

The wind turbine operated continuously at maximum power for 6 hours.

Calculate the energy output in kilowatt-hours of the wind turbine.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

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Energy output = ... kWh

1 (b) (ii) Why, on average, do wind turbines operate at maximum power output for only 30% of the time?

[1 mark]

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1 (c) An on-shore wind farm is made up of many individual wind turbines.

They are connected to the National Grid using underground power cables.

Give **one** advantage of using underground power cables rather than overhead power cables.

[1 mark]

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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2 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

The information in the box is about the properties of solids and gases.

Solids:
- have a fixed shape
- are difficult to compress (to squash).

Gases:
- will spread and fill the entire container
- are easy to compress (to squash).

Use your knowledge of kinetic theory to explain the information given in the box.

You should consider:
- the spacing between the particles
- the movement of individual particles
- the forces between the particles.

[6 marks]

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Extra space .....

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Turn over for the next question

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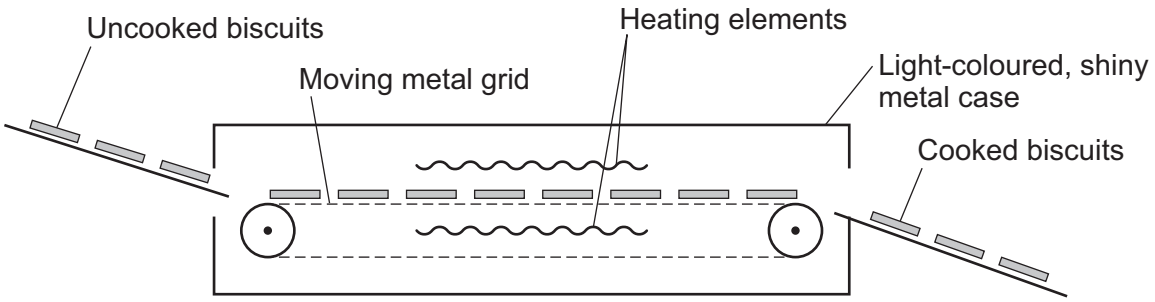
3 **Figure 1** shows one way that biscuit manufacturers cook large quantities of biscuits.

The uncooked biscuits are placed on a moving metal grid.

The biscuits pass between two hot electrical heating elements inside an oven.

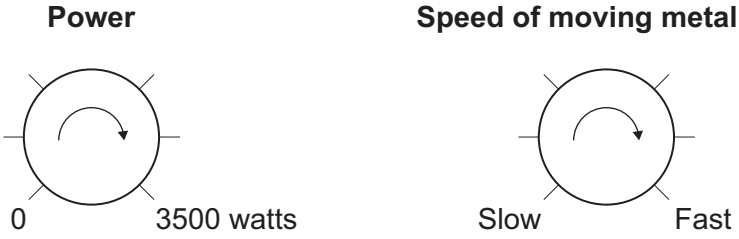
The biscuits turn brown as they cook.

Figure 1



The oven has two control knobs, as shown in **Figure 2**.

Figure 2



3 (a) Which type of electromagnetic radiation makes the biscuits turn brown?

[1 mark]

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3 (b) Suggest **two** ways of cooking the biscuits in this oven, to make them turn browner.

[2 marks]

1 .....

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2 .....

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Do not write outside the box

3 (c) The inside and outside surfaces of the oven are light-coloured and shiny.

Explain why.

[3 marks]

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Turn over for the next question

Do not write outside the box

4 A note was played on an electric keyboard.

The frequency of the note was 440 Hz.

4 (a) (i) What does a frequency of 440 Hz mean?

[1 mark]

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4 (a) (ii) The sound waves produced by the keyboard travel at a speed of 340 m/s.

Calculate the wavelength of the note.

Use the correct equation from the Physics Equations Sheet.

Give your answer to **three** significant figures.

[3 marks]

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Wavelength = ... metres

4 (b) **Figure 3** shows a microphone connected to a cathode ray oscilloscope (CRO) being used to detect the note produced by the keyboard.

Figure 3

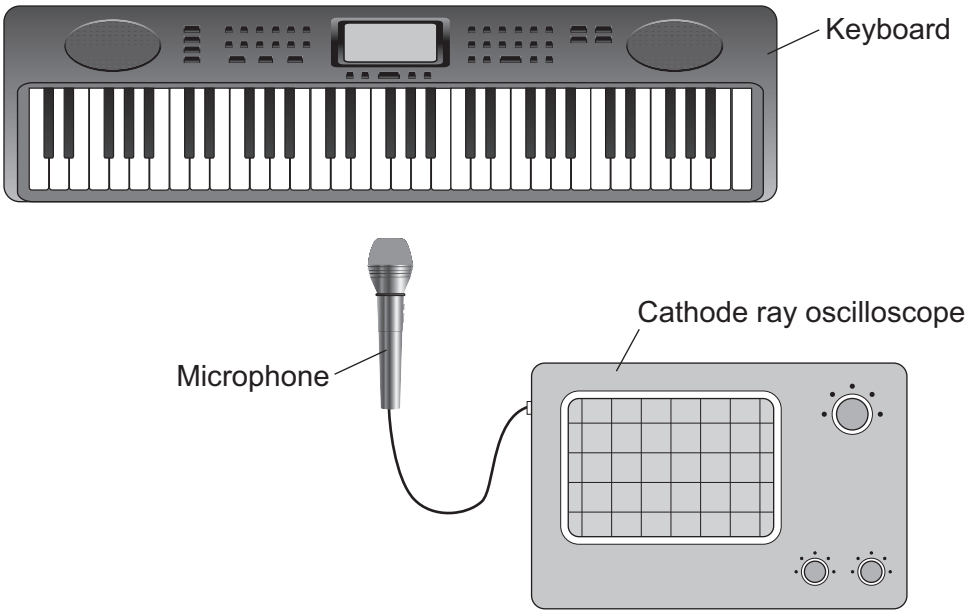

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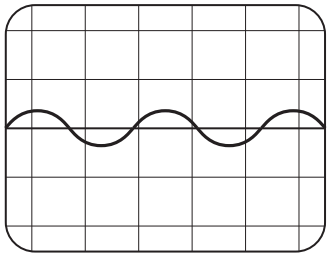
Figure 4 shows the trace produced by the sound wave on the CRO.

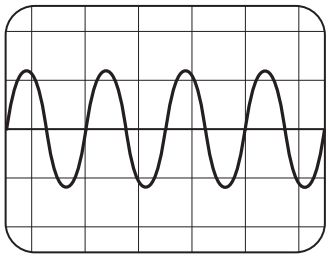
Figure 4



A second note, of different wavelength, was played on the keyboard.

Figure 5 shows the trace produced by the sound wave of the second note on the CRO.

Figure 5



The settings on the CRO were unchanged.

What **two** conclusions should be made about the **second** sound wave produced by the keyboard compared with the **first** sound wave?

Give a reason for each conclusion.

[4 marks]

Conclusion 1 .....

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Reason .....

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Conclusion 2 .....

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Reason .....

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8

Do not write outside the box

5 (a) Iceland is a country that generates nearly all of its electricity from renewable sources.

In 2013, about 80% of Iceland's electricity was generated using hydroelectric power stations (HEP).

Describe how electricity is generated in a hydroelectric power station. Include the useful energy transfers taking place.

[4 marks]

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5 (b) The UK produces most of its electricity from fossil fuels.

Many people in the UK leave their televisions in 'stand by' mode when not in use, instead of switching them off.

It is better for the environment if people switch off their televisions, instead of leaving them in 'stand by' mode.

Explain why.

[3 marks]

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5 (c) A scientist wrote in a newspaper:

'Appliances that do not automatically switch off when they are not being used should be banned.'

Suggest why scientists alone cannot make the decision to ban these appliances.

[1 mark]

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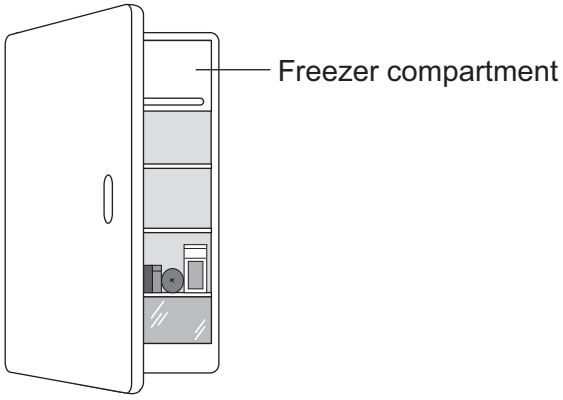
Turn over for the next question

Do not write outside the box

6 (a) **Figure 6** shows a fridge with a freezer compartment.

The temperature of the air inside the freezer compartment is –5 °C.

Figure 6



The air inside the fridge forms a convection current when the fridge door is closed. Explain why.

[4 marks]

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6 (b) **Table 1** shows information about four fridges.

Table 1

Fridge	Volume in litres	Energy used in one year in kWh
A	250	300
B	375	480
C	500	630
D	750	750

A householder concludes that the energy used in one year is directly proportional to the volume of the fridge.

Explain why her conclusion is **not** correct.

Use data from the table in your answer.

[2 marks]

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6 (c) New fridges are more efficient than fridges made twenty years ago.

Give **one** advantage and **one** disadvantage of replacing an old fridge with a new fridge.

Ignore the cost of buying a new fridge.

[2 marks]

Advantage .....

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Disadvantage .....

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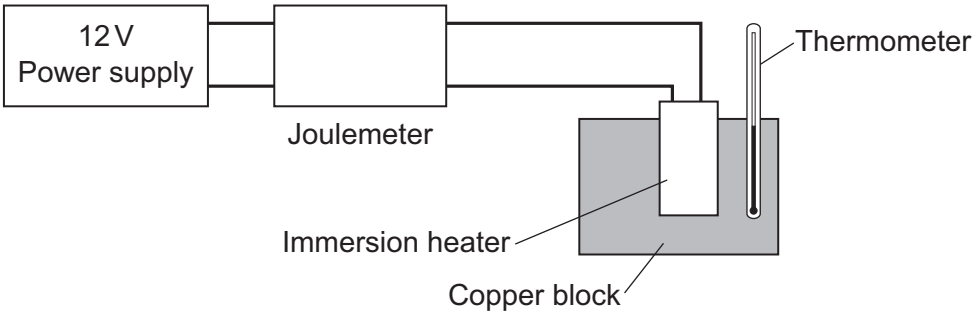
8

Do not write outside the box

7 A student used the apparatus in **Figure 7** to obtain the data needed to calculate the specific heat capacity of copper.

Figure 7



The initial temperature of the copper block was measured.

The power supply was switched on.

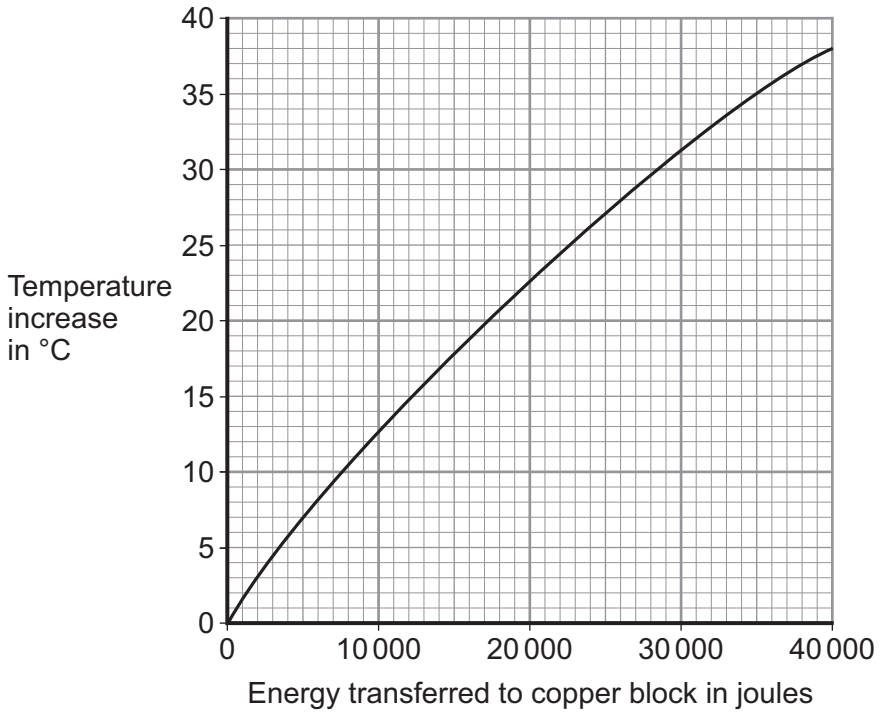
The energy transferred by the heater to the block was measured using the joulemeter.

The temperature of the block was recorded every minute.

The temperature increase was calculated.

Figure 8 shows the student's results.

Figure 8



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7 (a) Energy is transferred through the copper block.

What is the name of the process by which the energy is transferred?

Tick (✓) **one** box.

[1 mark]

Conduction ☐

Convection ☐

Radiation ☐

7 (b) Use **Figure 8** to determine how much energy was needed to increase the temperature of the copper block by 35 °C.

[1 mark]

..... joules

7 (c) The copper block has a mass of 2 kg.

Use your answer to part **(b)** to calculate the value given by this experiment for the specific heat capacity of copper. Give the unit.

Use the correct equation from the Physics Equations Sheet.

[3 marks]

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Specific heat capacity = ...

7 (d) This experiment does **not** give the correct value for the specific heat of copper.

Suggest **one** reason why.

[1 mark]

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ANSWER IN THE SPACES PROVIDED

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8 **Table 2** shows information about different light bulbs.

The bulbs all have the same brightness.

Table 2

Type of bulb	Input power in watts	Efficiency
Halogen	40	0.15
Compact fluorescent (CFL)	14	0.42
LED	7	0.85

8 (a) (i) Calculate the useful power output of the CFL bulb.

Use the correct equation from the Physics Equations Sheet.

[2 marks]

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Useful power output = ... watts

8 (a) (ii) Use your answer to part **(a)(i)** to calculate the waste energy produced each second by a CFL bulb.

[1 mark]

.....

Waste energy per second = ... joules

Question 8 continues on the next page

Do not write outside the box

8 (b) (i) A growth cabinet is used to investigate the effect of light on the rate of growth of plants.

Figure 9 shows a growth cabinet.

Figure 9

In the cabinet the factors that affect growth can be controlled.

A cooler unit is used to keep the temperature in the cabinet constant. The cooler unit is programmed to operate when the temperature rises above 20 °C.

The growth cabinet is lit using 50 halogen bulbs.

Changing from using halogen bulbs to LED bulbs would reduce the cost of running the growth cabinet.

Explain why.

[4 marks]

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8 (b) (ii) A scientist measured the rate of growth of plants for different intensities of light.

What type of graph should be drawn to present the results?

[1 mark]

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Give a reason for your answer.

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8 (c) **Table 3** gives further information about both a halogen bulb and an LED bulb.

Table 3

Type of bulb	Cost to buy	Lifetime in hours	Operating cost over the lifetime of one bulb
Halogen	£1.50	2 000	£16.00
LED	£30.00	48 000	£67.20

A householder needs to replace a broken halogen light bulb.

Compare the cost efficiency of buying and using halogen bulbs rather than an LED bulb over a time span of 48 000 hours of use.

Your comparison must include calculations.

[4 marks]

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12

END OF QUESTIONS

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