

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
PHYSICS B**

B651/01

Unit 1 Modules P1 P2 P3 (Foundation Tier)

**Friday 28 May 2010
Morning**

Duration: 1 hour

Candidates answer on the Question Paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- A list of physics equations is printed on page two.
- The total number of marks for this paper is **60**.
- This document consists of **20** pages. Any blank pages are indicated.

EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{power} = \text{voltage} \times \text{current}$$

$$\text{energy (kilowatt hours)} = \text{power (kW)} \times \text{time (h)}$$

$$\text{speed} = \frac{\text{distance}}{\text{time taken}}$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{work done} = \text{force} \times \text{distance}$$

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

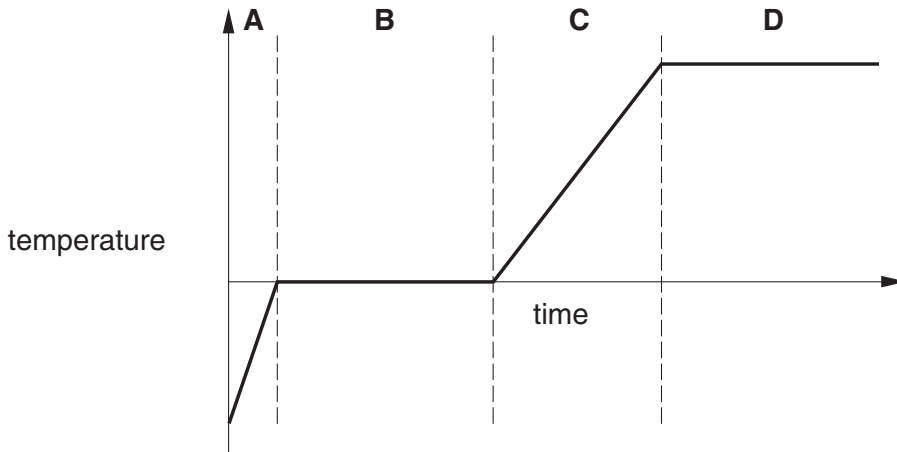
Answer **all** the questions.

Section A – Module P1

1 Dan heats some ice using a Bunsen burner.

He measures the temperature until the ice turns to water and boils.

Look at the graph of his results.



(a) Which part of the graph shows the **fastest** increase in temperature?

Choose from: **A** **B** **C** **D**

answer

[1]

(b) Which part of the graph shows the ice **melting**?

Choose from: **A** **B** **C** **D**

answer

[1]

(c) Time is measured in seconds (s).

(i) What is **temperature** measured in?

Choose from: **J** **N** **°C** **W**

answer

[1]

(ii) What is **energy** measured in?

Choose from: **J** **N** **°C** **W**

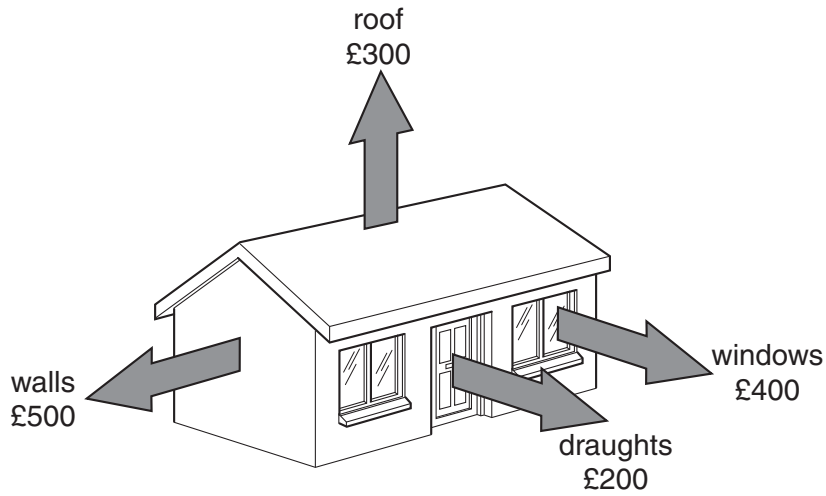
answer

[1]

[Total: 4]

2 Jake's house costs a lot to heat.

The diagram shows the cost of heat escaping from his house per year.



(a) Where does most heat escape through?

Choose from:

- draughts roof walls windows**

answer [1]

(b) Jake can reduce heat loss from his house.

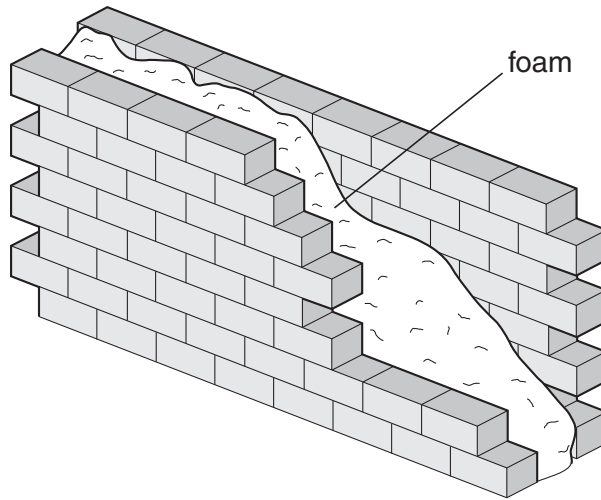
(i) How can Jake reduce heat loss through the **windows**?

.....
..... [1]

(ii) How can Jake reduce heat loss through the **roof**?

.....
..... [1]

(c) Jake has cavity wall insulation fitted.



(i) The foam in the wall contains small air bubbles.

Why is the **air** in the foam important?

.....
..... [1]

(ii) Cavity wall insulation costs £1200 to fit.

This reduces Jake's heating bill by £300 every year.

Calculate the payback time for cavity wall insulation.

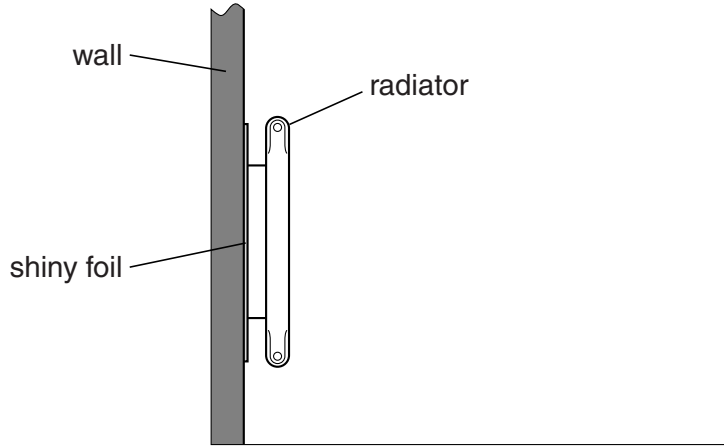
.....
.....

answer years [1]

(d) Jake puts shiny foil behind each radiator.

This reduces heat loss.

Look at the diagram.



Explain how the foil reduces his heating bills.

.....

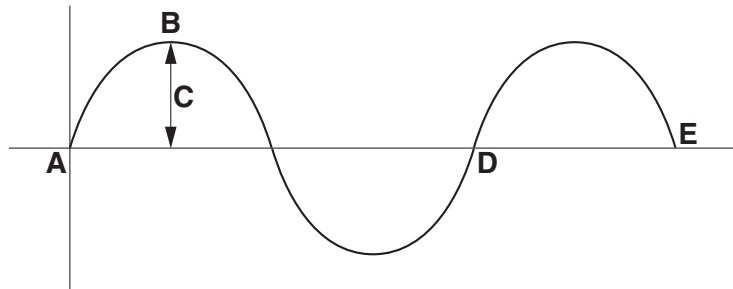
.....

..... [2]

[Total: 7]

3 Waves carry energy.

(a) Look at the diagram of a water wave.



Complete the sentences.

The amplitude is shown by letter.....

The wavelength is the **distance** between letters and [2]

(b) There are different types of wave.

Look at the list.

gamma**infrared****microwave****radio****ultraviolet**(i) Which type of wave causes a **suntan**?

Choose from the list.

answer [1]

(ii) Which type of wave is used to send a text message from a mobile phone?

Choose from the list.

answer [1]

(c) A wave has a frequency of 0.2 Hz.

(i) Explain what **frequency** means.

.....
..... [1]

(ii) The wave has a wavelength of 5 m.

Its frequency is 0.2 Hz.

Calculate the **speed** of the wave.

The equations on page 2 may help you.

.....
.....

answer m/s [2]

[Total: 7]

4 The average temperature of the Earth is increasing.

This is called **global warming**.

Describe **two** possible **causes** of global warming.

.....

.....

.....

..... [2]

[Total: 2]

Section B – Module P2

5 This question is about electrical power.

Look at the table of electrical appliances.

appliance	power rating in W	time used per week in hours
hair dryer	1500	0.5
iron	2000	3
microwave oven	1000	1
toaster	1500	2
vacuum cleaner	1900	1

(a) The iron costs the most to use per week.

There are **two** reasons why the iron costs the most to use.

Write down the two reasons.

- 1
- 2 [1]

(b) (i) The power rating of the toaster is 1500 watts (W).

When converted to **kilowatts** (kW) the power rating is 1.5kW.

Calculate how many kilowatt hours (kWh) of electrical energy are used by the toaster in two hours.

The equations on page 2 may help you.

-
-
- answer kWh [2]

(ii) The cost of a kilowatt hour of electrical energy is 12 pence.

Calculate the cost of the electrical energy used by the toaster in two hours.

-
- answer pence [1]

[Total: 4]

6 The Sun transfers energy to the Earth.

(a) Complete the following sentence.

The two main types of energy transferred from the Sun to the Earth are

..... energy and energy. [2]

(b) Energy from the Sun can produce **convection currents** in the air.

Convection currents have energy in them.

Explain how the energy can be harnessed and converted to useful energy.

.....
.....
.....
..... [2]

(c) (i) The Sun gives out rapid bursts of ionising radiation.

The ionising radiation is ejected at high speed from the Sun.

The radiation interferes with signals from artificial satellites.

What are these rapid bursts of ionising radiation called?

..... [1]

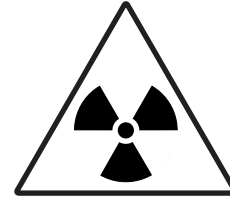
(ii) Write down one **use** of an artificial satellite.

..... [1]

[Total: 6]

7 There are three types of nuclear radiation.

- alpha (α)
- beta (β)
- gamma (γ)



(a) Which type of nuclear radiation has the greatest penetrating power?

..... [1]

(b) Nuclear radiation can pass through substances.

The radiation can collide with atoms in the substance.

What happens to these atoms?

..... [1]

(c) Background radiation is all around us in the atmosphere.

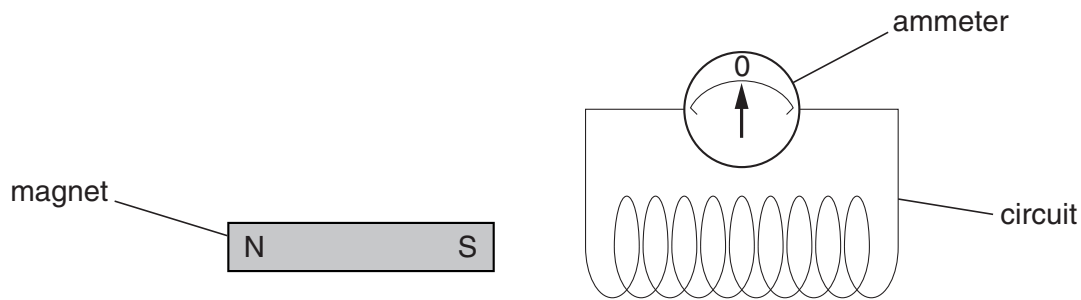
What causes background radiation?

..... [1]

[Total: 3]

8 Emily is investigating the **dynamo effect**.

She sets up the experiment shown in the diagram.



(a) How can Emily make a current flow in the circuit?

..... [1]

(b) A dynamo produces **alternating** current (AC).

What type of current does a **battery** produce in a circuit?

..... [1]

[Total: 2]

9 This question is about the Solar System and the Universe.

(a) There are many objects in the Universe.

Some are shown below.

asteroid black hole comet
Earth Moon star

Draw a straight line from each **object** to its correct **description**. One has been done for you.

object	description
asteroid	orbits the Earth
black hole	started as a gas cloud
comet	a planet
Earth	has a tail made of debris
Moon	a rock in space
star	light cannot escape from it

[4]

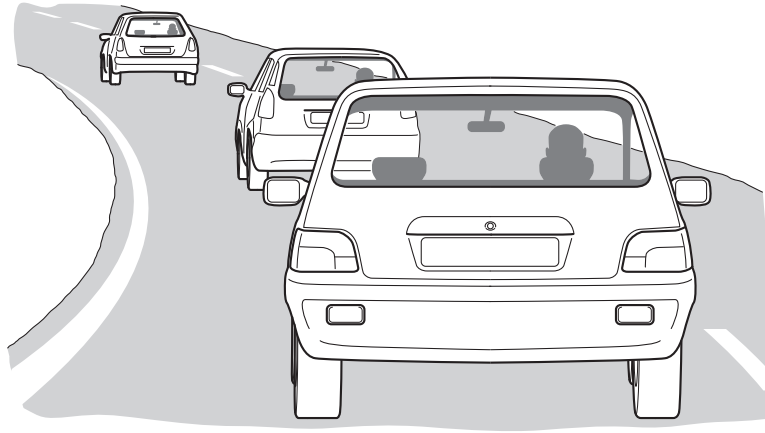
(b) How did the Universe begin?

.....
..... [1]

[Total: 5]

Section C – Module P3

- 10 Gina does an experiment to find out the speeds of cars along a road.



She takes measurements using some apparatus.

Complete the table about her experiment.

measurement	apparatus	units
.....	tape measure	m
time	s
speed	speed gun

[3]

[Total: 3]

11 Look at the information on the **stopping** distance for a car.



(a) Calculate the **stopping** distance for this car.

.....
.....

answer m [1]

(b) (i) What does **thinking** distance mean?

.....
.....
..... [2]

(ii) Higher speed increases thinking distance.

Write down one other thing that **increases thinking** distance.

..... [1]

(c) **Traction control** can make driving safer.

Suggest how.

.....
..... [1]

[Total: 5]

12 Most road vehicles use fuels made from a fossil fuel.

(a) Name **two** main fuels used by cars, buses or lorries.

..... and [2]

(b) Look at the information on the fuel economy of some vehicles.

vehicle	fuel economy in kilometres per litre	number of people carried
saloon car	15	5
sports car	18	2
bus	5	60
motorbike	25	1
van	8	2

All the vehicles travel a distance of 50 km.

(i) Which **vehicle** uses the **least** fuel?

Choose from:

saloon car sports car motorbike van

answer [1]

(ii) The bus uses the most fuel.

Look at the table.

Calculate how much fuel the bus uses travelling 50 km.

.....
.....

answer litres [1]

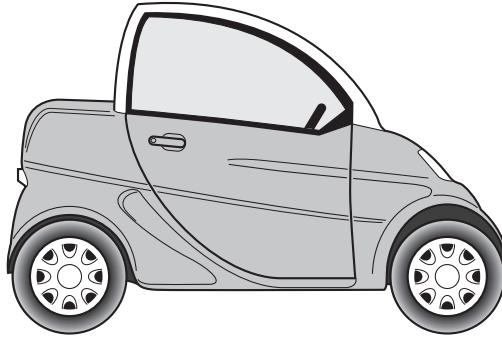
(iii) The sports car uses less fuel than the bus.

Suggest why using the bus is a more sensible use of fuel.

.....
..... [1]

(c) Some cars do not use fuels.

They are powered by electricity.



Explain how electric cars get their energy.

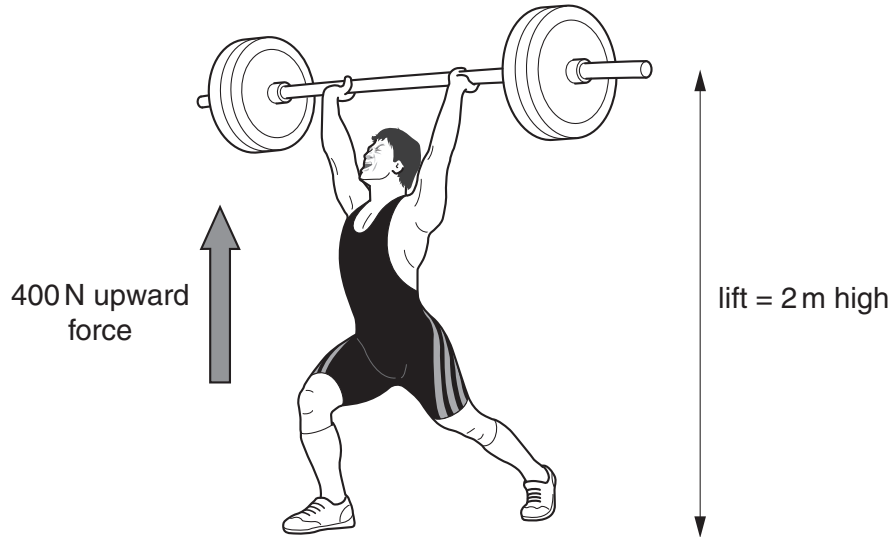
.....
..... [1]

[Total: 6]

13 Neil works out in the gym.

He lifts the bar from the floor to above his head.

Look at the diagram.



(a) Neil does work when he lifts the bar.

He pushes up with a force of 400 N.

He lifts the bar 2 m.

Calculate the **work done** on the bar.

The equations on page 2 may help you.

.....

.....

answer J [2]

(b) Neil holds the bar **above** his head.

He holds it **still**.

What type of energy does the bar have?

..... [1]

(c) Neil drops the bar. It **accelerates** to the floor.

(i) What does accelerate mean?

..... [1]

(ii) A **force** causes the bar to fall to the floor.

Write down the **name** of this force.

..... [1]

(iii) What type of energy **increases** as the bar falls?

..... [1]

[Total: 6]

END OF QUESTION PAPER

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