

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

**B651/01**

Unit 1 Modules P1 P2 P3 (Foundation Tier)

**Friday 27 May 2011  
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	
-----------------------	--	----------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- Answer **all** the questions.
- Do **not** write in the bar codes.

**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 This question is about the electromagnetic spectrum.

Look at the diagram. It shows the seven types of electromagnetic radiation.

**the electromagnetic spectrum**

radio waves	microwaves	infrared	visible light	radiation <b>A</b>	X-rays	gamma rays
-------------	------------	----------	---------------	--------------------	--------	------------

long wavelength  
low frequency

short wavelength  
high frequency

(a) (i) Radiation **A** causes suntan or sunburn.

Write down the name of radiation **A**.

..... [1]

(ii) Sunburn causes skin damage.

How can sunburn be prevented?

..... [1]

(b) (i) In a toaster which radiation is absorbed by the **surface** of the food **and** causes it to heat up?

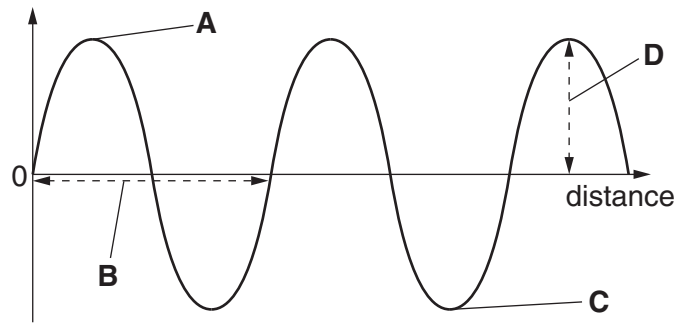
..... [1]

(ii) In a microwave oven, which substance in the food absorbs the microwaves?

..... [1]

(c) (i) Radiations in the electromagnetic spectrum have different wavelengths.

Which letter shows the **wavelength** of a wave?



Choose **A**, **B**, **C** or **D**.

answer ..... [1]

(ii) Complete the sentence about the speed of electromagnetic waves.

All electromagnetic waves travel at the **same** high speed in ..... [1]

(iii) An electromagnetic wave has

- a frequency of 30 000 000 Hz
- a wavelength of 10 metres.

Calculate the speed of the electromagnetic wave.

The equations on page 2 may help you.

.....

.....

.....

.....

answer ..... m/s [2]

[Total: 8]

2 Sanjay wants to save money on his energy bills.

He finds some information about the costs of some energy saving methods.

Look at the table.

	energy saving method	cost to fit in £	money saved each year on energy bills in £	payback time in years
<b>A</b>	cavity wall insulation	300		3
<b>B</b>	double glazing	6000		20
<b>C</b>	loft insulation	240		6

(a) Complete the table.

Sanjay thinks that double glazing will save him the **most** money in a year.

Is Sanjay correct?

answer .....

Explain your answer by using the completed table.

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

(b) Sanjay only has a small amount of money to spend.

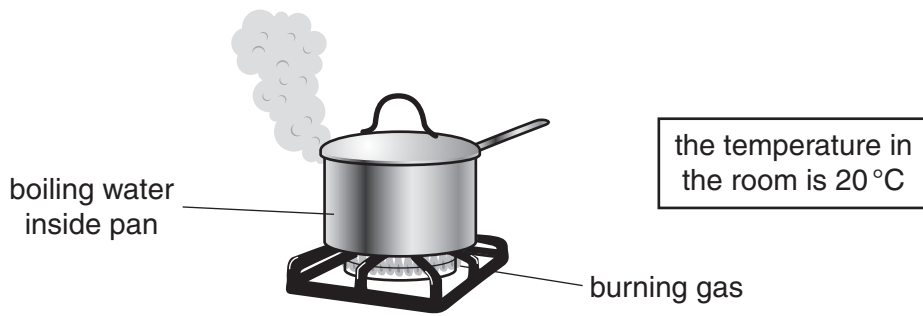
He decides to have cavity wall insulation.

Explain why this is a **good** decision.

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

[Total: 3]

3 Leanne is cooking some potatoes in a pan.



The potatoes start at room temperature (20°C).

When the water is **boiling** she puts the potatoes in the pan.

Explain why the potatoes cook.

In your answer write about

- what is supplied to the water to make it boil
- what happens to the temperature of the water when it is **boiling**
- what happens to the temperature of the potatoes when they are in the pan.

.....

.....

.....

.....

.....

.....

[3]

[Total: 3]

4 Signals are used to transmit data. There are two types of signal.

One type is digital.

(a) (i) Complete this sentence to describe a **digital** signal.

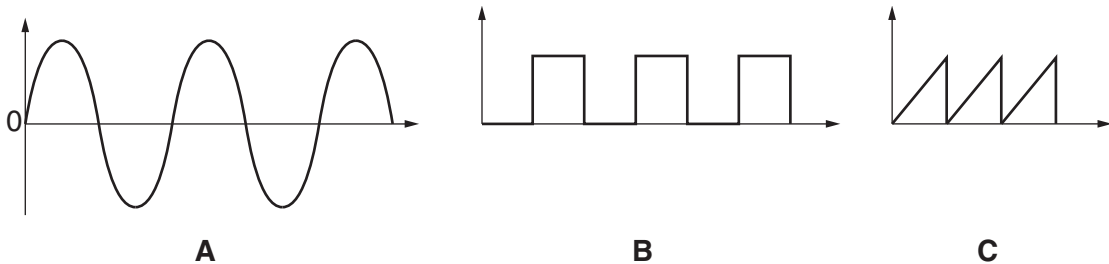
A digital signal is either ..... or ..... [1]

(ii) What is the name of the **other** type of signal?

answer ..... [1]

(b) (i) Wireless technology uses digital signals.

Which diagram shows a digital signal?



Choose **A**, **B** or **C**.

answer ..... [1]

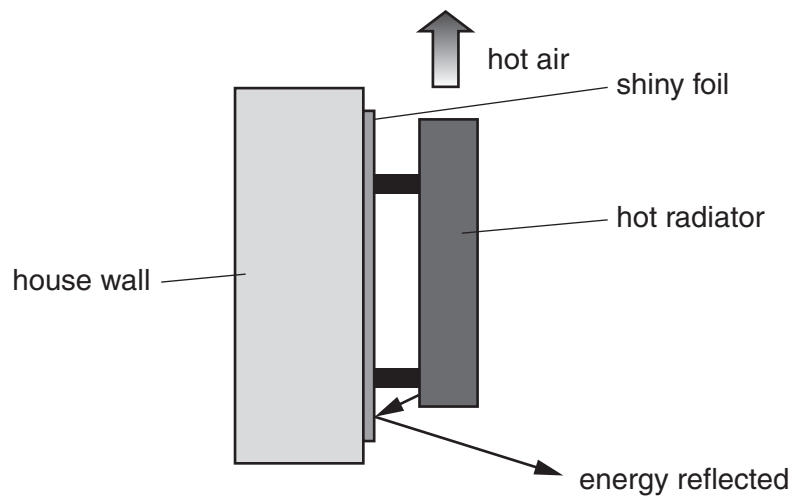
(ii) One advantage of wireless technology is that there are no wires involved.

Write down one **other** advantage of using wireless technology.

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

[Total: 4]

5 Look at the diagram of a radiator in a room.



Complete the sentences about how the radiator heats the room.

The hot air around the radiator rises and is replaced by ..... air.

The shiny foil reflects ..... radiation as heat back into the room.

[2]

[Total: 2]

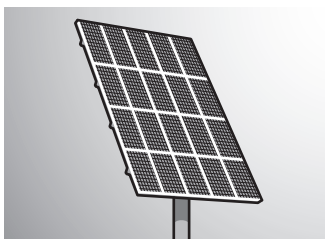


## Section B – Module P2

6 This question is about renewable energy sources.

Photocells provide energy.

The picture shows some photocells.



(a) Look at the statements about photocells.

Put a tick (✓) next to the **three** correct statements.

Photocells transfer light energy to electricity.

Photocells run on batteries.

Photocells need to be connected to the mains.

Photocells will not produce electricity in the dark.

Photocells can operate in remote locations.

[2]

(b) Photocells produce direct current (dc).

What is direct current (dc)?

.....

..... [1]

(c) Convection currents make air move (wind).

This causes wind turbines to turn and produce electricity.



What is the source of the energy that makes these convection currents?

..... [1]

[Total: 4]

7 This question is about generating and using electricity.

One type of power station uses **fossil fuel**.

(a) (i) Write down the name of **one** fossil fuel.

..... [1]

(ii) Biomass can be fermented to produce a fuel.

What gas is made when biomass is fermented?

Choose from

**carbon monoxide**

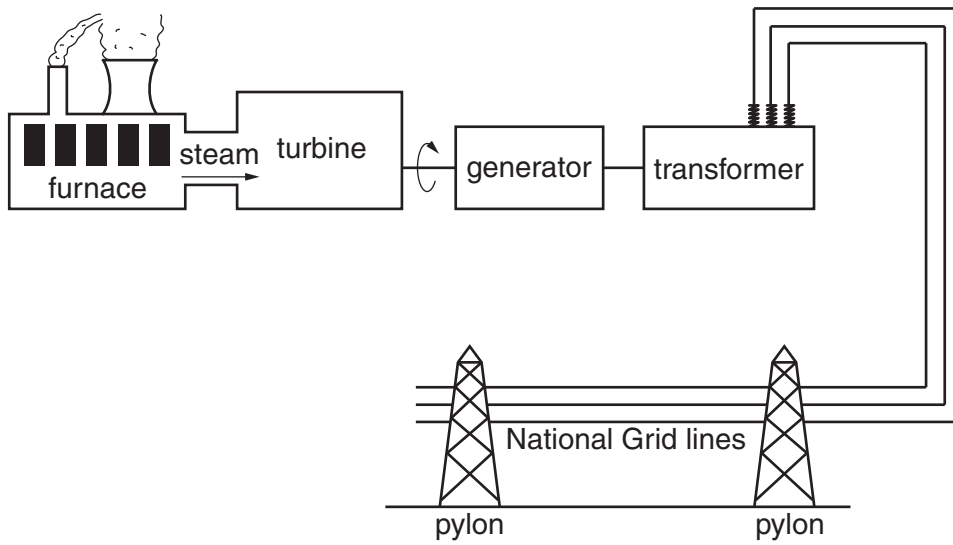
**hydrogen**

**methane**

**propane**

answer ..... [1]

(b) Look at the diagram showing different parts of a power station.



The generators in a power station produce alternating current (ac).

The output is connected to a transformer.

(i) What is the job of a transformer?

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

(ii) The transformer is connected to the National Grid.

What is the job of the National Grid?

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

(c) It costs money to use electrical appliances.

The cost depends on the power rating of the appliance in watts (W).

An 'old type' light bulb uses a current of 0.26A when connected to a 230V supply.



Calculate the power rating of this light bulb.

The equations on page 2 may help you.

.....  
.....

answer ..... W

[2]

[Total: 6]

8 This question is about space and exploring the Solar System.

(a) Stars can be seen even though they are a very long distance away.

Explain why.

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

(b) Spacecraft can be manned or unmanned.

Both types of spacecraft allow us to explore space. Both types need fuel.

Write about the **extra** things that are needed in a **manned** spacecraft which are **not** needed in an unmanned spacecraft.

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

(c) Rockets are used to put satellites above the Earth.

These satellites can be used for telecommunications and TV transmission.

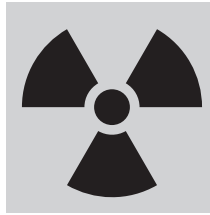
Write down **two other** uses of artificial satellites.

1 .....

2 ..... [2]

[Total: 6]

9 This question is about nuclear radiation.



(a) Nuclear radiation is dangerous.

What damage can nuclear radiation do to the body?

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

(b) People who work with radioactive materials have to wear protective clothing.

Write down one **other** precaution they should take.

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

(c) Nuclear radiation ionises particles.

When a particle is ionised it becomes an ion.

What happens to a particle when it is ionised?

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

(d) Nuclear material must be disposed of carefully.

Write down one way this can be done.

..... [1]

[Total: 4]

Section C – Module P3

10 The hull of this ship is being painted.

The paint reduces friction.



(a) (i) Describe how reducing friction affects the motion of the ship.

..... [1]

(ii) Suggest what effect reducing friction has on the amount of **fuel** used.

..... [1]

(b) The shape of a ship helps to increase its top speed.

Finish the sentence.

The shape of the front of the ship is ..... [1]

(c) When the ship is moving at a **constant speed**, one of the following statements is true.

Put a tick (✓) in the box next to the correct statement.

The thrust from the engines is equal to the drag.

The thrust from the engines is greater than the drag.

The thrust from the engines is less than the drag.

The thrust from the engines is increasing as the drag is decreasing.

The thrust from the engines is decreasing as the drag is increasing.

[1]

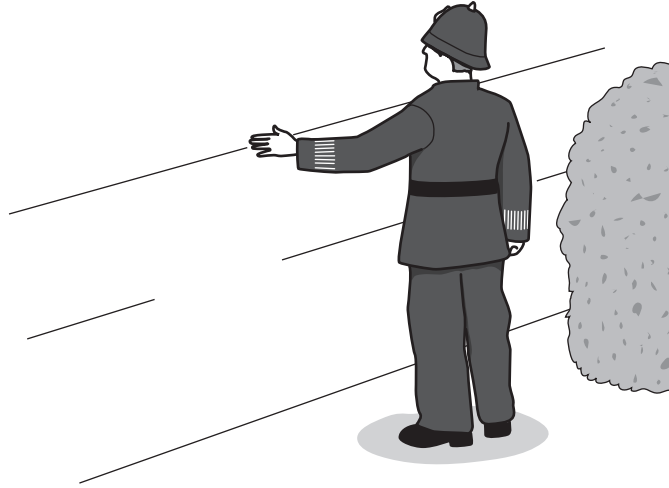
[Total: 4]

Turn over

11 The speed of cars used to be measured by two policemen.

One policeman would drop his hand as the car passed.

This was a signal to the second policeman further along the road.



(a) The policemen then calculated the speed of the car.

What two **quantities** must be measured?

- 1 .....
- 2 ..... [2]

(b) Today, speed is measured automatically at the roadside using speed cameras.

These cameras normally take **two** pictures of the car.

Put a tick (✓) in the box next to the correct reason why.

- in case the first picture does not come out
- to get more details about the type of car
- to check the driver spends enough time looking forwards
- to see how far the car travels in a fixed time

[1]

(c) The speed of a car is not always the same.

What name is given to a change in speed?

..... [1]

[Total: 4]



12 Robert is doing chin-ups.



Every time he does a chin-up he is doing work.

(a) What is meant by doing **work**?

Choose from

**changing direction**

**using a force to move an object**

**gaining energy as heat**

**losing energy as heat**

answer ..... [1]

(b) Robert does 540J of work every time he does a chin-up.

He does 20 chin-ups in 60 seconds.

Calculate his power.

The equations on page 2 may help you.

.....  
.....

answer ..... W [2]

(c) Finish the sentences by choosing the **best** words from this list.

**chemical**

**geothermal**

**kinetic**

**potential**

**static**

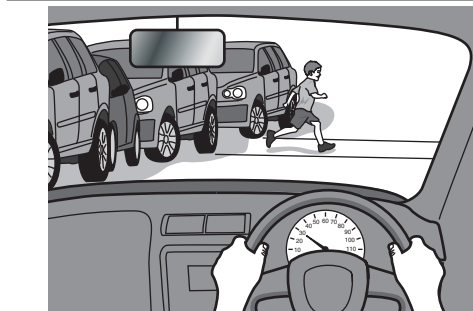
When Robert **raises** his body above the ground he gains gravitational ..... energy.

When his body **moves** it has ..... energy. [2]

[Total: 5]

13 Car drivers must always be very careful when passing parked cars.

If a child runs out, the driver may need to brake suddenly.



(a) Draw a straight line from each **distance** to the correct **explanation**.

**distance**

**explanation**

braking distance

the distance travelled between seeing the child and applying the brakes

the distance travelled between applying the brakes and stopping

thinking distance

the distance travelled between seeing the child and stopping

[2]

(b) Braking causes a car to slow down.

The thrust of the engine causes a car to speed up.

Finish the sentence.

Braking and thrust are both examples of a .....

[1]

[Total: 3]

14 Most cars have airbags.

Airbags are an example of a safety feature.



(a) A car has crashed.

Look at the picture. The airbag has inflated.

Describe what happens after the airbag has inflated.

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

(b) An airbag is one safety feature which is useful in a crash.

Write down the name of one **other** safety feature which is useful when a car crashes.

..... [1]

(c) ABS brakes and traction control are examples of safety features that help to avoid an accident.

Write down the name of another safety feature that helps to **avoid an accident**.

..... [1]

[Total: 4]

**END OF QUESTION PAPER**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.