Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

B651/01

GATEWAY SCIENCE

PHYSICS B

Unit 1 Modules P1 P2 P3 (Foundation Tier)

FRIDAY 27 May 2011: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

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INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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 three.**
- **The total number of marks for this paper is 60.**

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 opposite. It shows the seven types of electromagnetic radiation.

(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]**

THE ELECTROMAGNETIC SPECTRUM

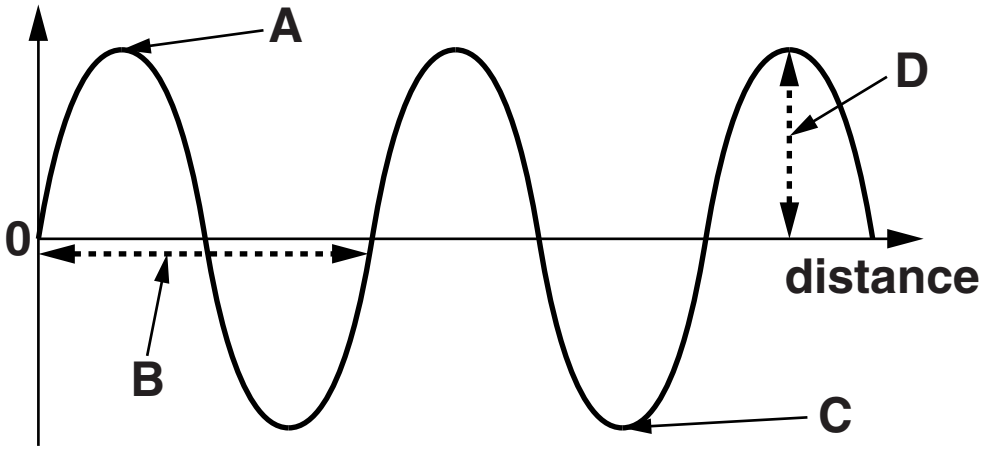
radio waves	microwaves	infrared	visible light	radiation A?	X-rays	gamma rays

long wavelength
low frequency

short wavelength
high frequency

(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 3 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
A	cavity wall insulation	300		3
B	double glazing	6000		20
C	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 on a gas stove.

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 _____

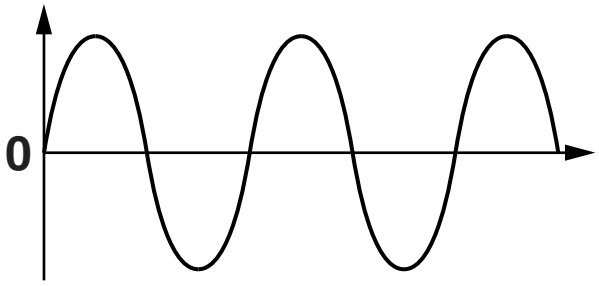
or _____ . **[1]**

(ii) What is the name of the OTHER type of signal?

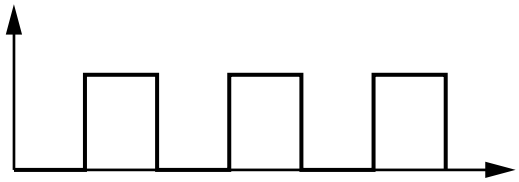
answer _____ **[1]**

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

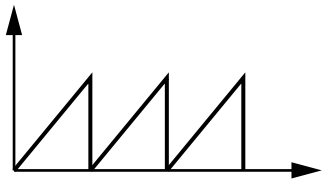
Which diagram shows a digital signal?



A



B



C

Choose A, B or C.

answer _____ **[1]**

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

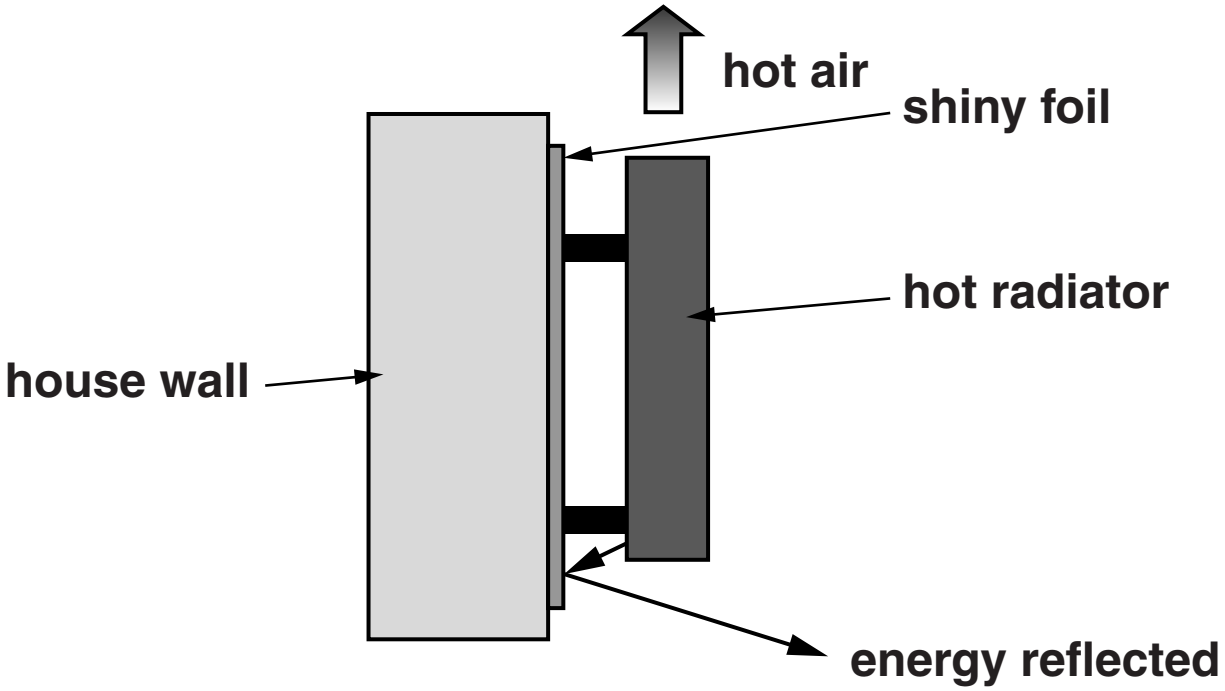
Write down one OTHER advantage of using wireless technology.

_____

_____ **[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.

(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 opposite 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]**

furnace
steam
turbine
generator
transformer
pylon
National Grid lines
pylon

(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 0.26 A when connected to a 230V supply.

Calculate the power rating of this light bulb.

The equations on page 3 may help you.

_____

_____

answer _____ W **[2]**

[Total: 6]

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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.

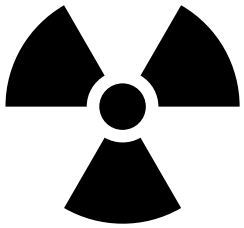
Write down TWO OTHER uses of artificial satellites.

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]

10 The hull of a 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]

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 540 J of work every time he does a chin-up.

He does 20 chin-ups in 60 seconds.

Calculate his power.

The equations on page 3 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
	the distance travelled between seeing the child and applying the brakes
braking distance	
	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.

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

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