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F

Monday 30 January 2012 – Afternoon

GCSE GATEWAY SCIENCE
PHYSICS B

B651/01 Unit 1 Modules P1 P2 P3 (Foundation Tier)

B620870112

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)

Duration: 1 hour

B651101

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. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- 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).
- 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

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

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

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

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

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

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

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

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

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

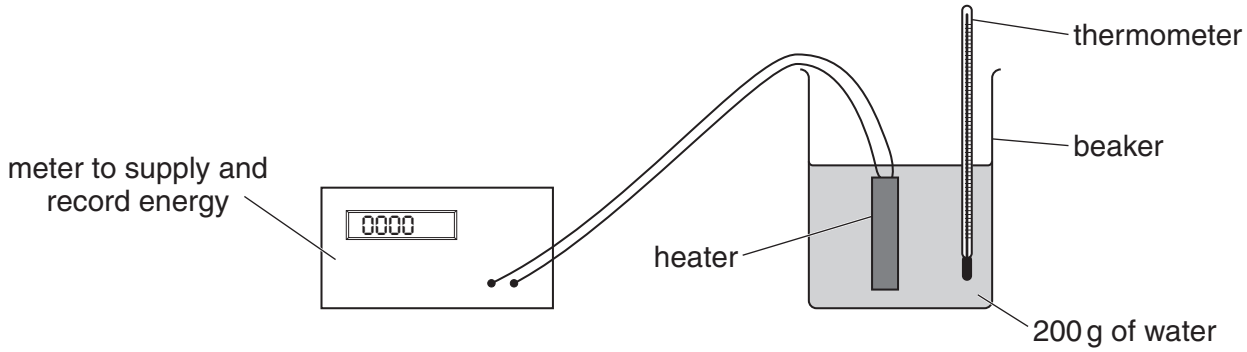
Answer **all** the questions.

Section A – Module P1

1 Wesley investigates heating water.

He supplies energy to the water.

Look at the apparatus he uses.



(a) Wesley records the temperature of the water.

temperature at start	temperature at end	temperature rise
20	45	25

He forgets to put the unit for **temperature** in his results.

What **unit** should he use?

Choose from

A **J** **°C** **N** **W**

answer ..... **[1]**

(b) Wesley wants to extend his investigation.

He uses the **same** heater and the **same** beaker. The starting temperature is the **same**.

A different amount of energy would produce a different temperature rise.

Write about **two other** things that would produce a different temperature rise.

.....

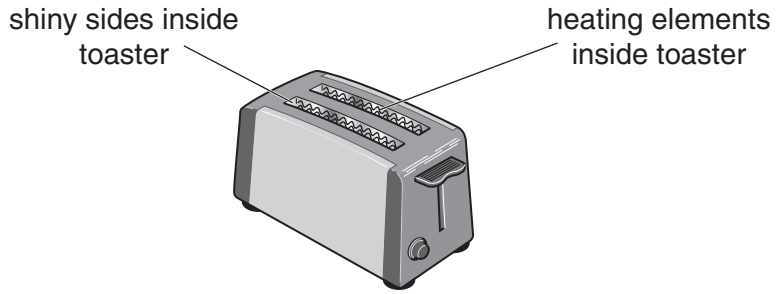
.....

.....

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

[Total: 3]

2 Abir has an electric toaster in her kitchen.



She puts some bread in the toaster.

(a) (i) The bread is toasted (heated) by **infrared** radiation given off by the heating elements.

Describe how the infrared radiation toasts the bread.

In your answer write about

- what part of the bread is toasted
- how the shiny sides help to toast the bread quickly.

.....

.....

.....

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

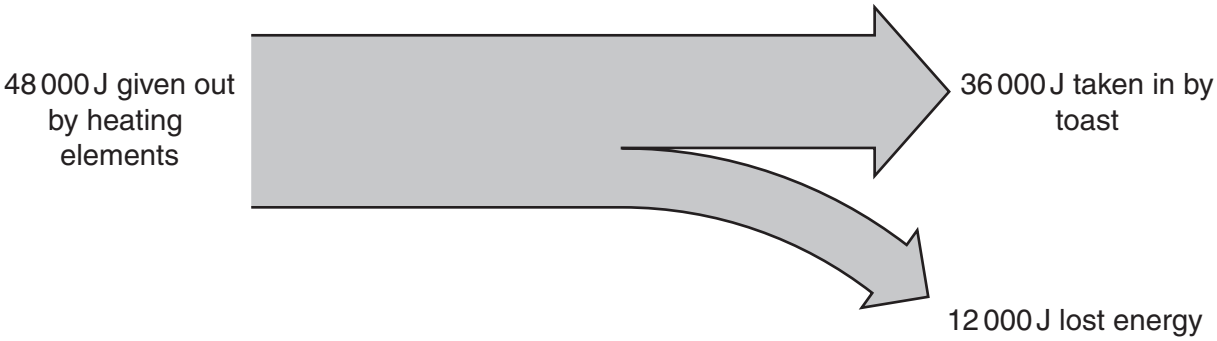
(ii) Infrared radiation is used in cooking.

Write down one **other** use of infrared radiation.

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

(b) When the bread is toasted

- the heating elements give out **48 000 J** of energy
- the toast takes in **36 000 J** of this energy
- the rest of the energy is taken in by the toaster or lost into the atmosphere.



Calculate how efficient the heating elements are at toasting the bread.

The equations on page 2 may help you.

.....

.....

.....

answer ..... **[2]**

(c) Abir wants to keep her house warmer by making it more energy efficient.

She knows that trapped air is a good insulator.

Write down two things that use **trapped air** to keep houses warmer.

1 .....

2 .....

[2]

[Total: 7]

3 This question is about ultraviolet (UV) radiation from the Sun.

(a) Thomas knows that ultraviolet radiation can harm people.

How can ultraviolet radiation **harm** people?

.....

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

(b) Thomas wants to go outside on a sunny day.

He has two sun creams.

'**SPF**' means **S**un **P**rotection **F**actor.

(i) Thomas uses Cool Tan sun cream.

How long can Thomas safely stay in the sun?

Complete the table.

safe time in the sun without sun cream	**safe time in the sun with *COOL TAN* sun cream, SPF 15**
7 minutes	..... minutes

[1]

(ii) Thomas uses **Tan Fastic** sun cream instead of Cool Tan.

The Tan Fastic sun cream has an SPF of 45.

He can now safely stay in the sun for a longer time.

How much longer?

.....

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

[Total: 3]

4 **(a)** Radio waves are used in wireless communication.

No external wiring is used in wireless communication.

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

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

(b) Two **types** of signal are transmitted by radio waves.

(i) One type of signal is **digital**.

Digital signals are replacing the other type of signal.

What is the name of the other type of signal?

Choose from

analogue

infrared

light

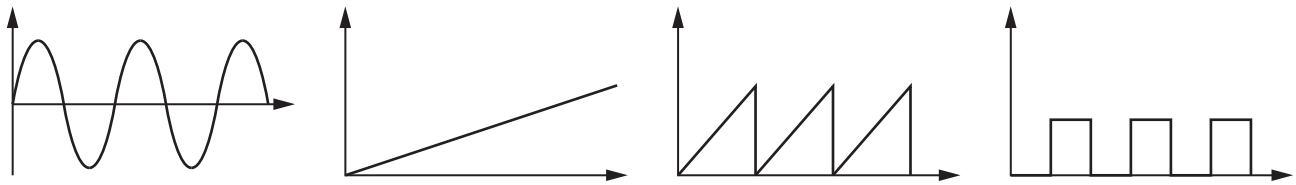
Morse code

television

answer ..... **[1]**

(ii) Look at the signals.

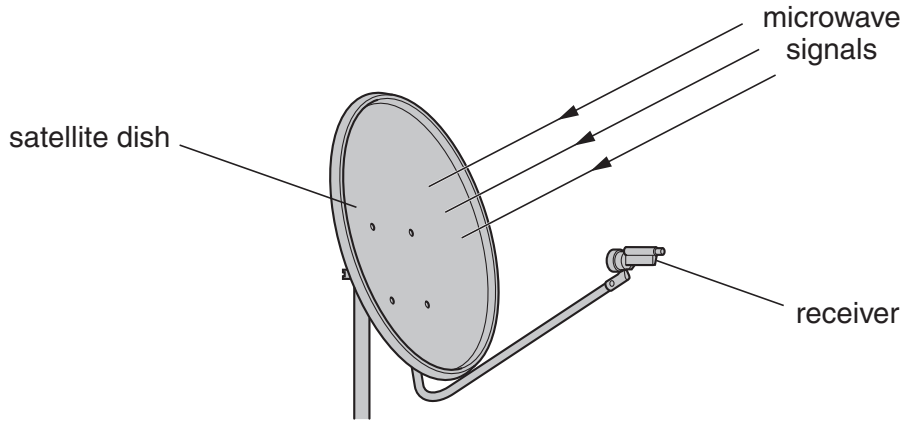
Which one is a **digital** signal?



A **B** **C** **D**

answer ..... **[1]**

(c) Look at the diagram of a satellite dish and its receiver.



The microwave signals reach the satellite dish.

How do the signals get from the dish to the receiver?

Choose from

diffraction

interference

reflection

refraction

answer ..... **[1]**

[Total: 4]

5 This question is about light.

(a) Light waves are **electromagnetic** (EM) waves.

All EM waves can travel in space.

Look at the statements about waves in space.

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

sound waves travel faster than EM waves ☐

EM waves all travel at the same speed ☐

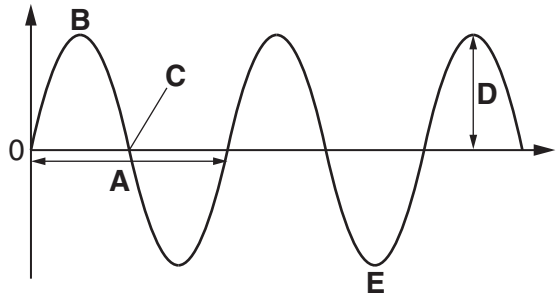
high frequency EM waves travel faster than low frequency EM waves ☐

low frequency EM waves travel faster than high frequency EM waves ☐

[1]

(b) Light travels in **transverse** waves.

Look at the diagram of a transverse wave.



Which letter labels the **amplitude**?

answer ..... **[1]**

(c) Many years ago, signals were sent in the form of a flashing light code.

This method was better than a person carrying a written message.

How did the use of light signals improve communications?

.....

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

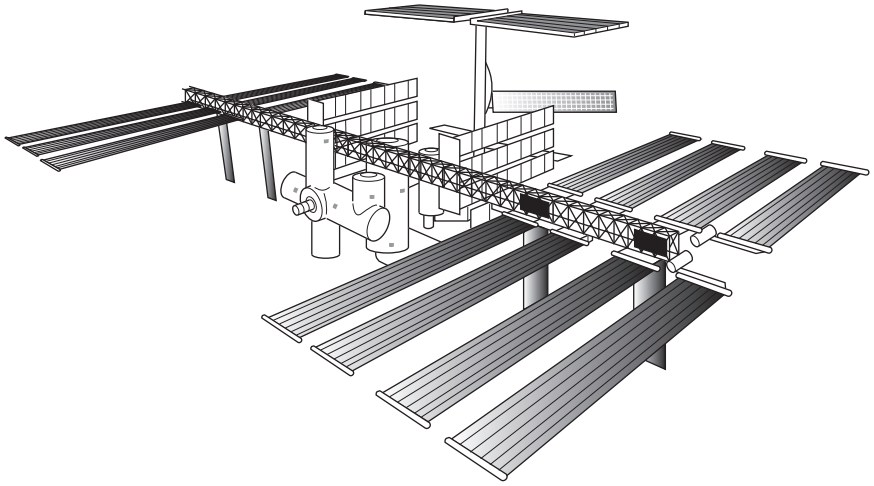
[Total: 3]

Section B – Module P2

6 Many people have visited space in the last 50 years.

Astronauts have built the International Space Station.

It is a large artificial satellite.



(a) Astronauts are often in the Space Station for several months.

They need things to keep them **alive**.

Write about what they **need** to keep them alive.

.....

.....

.....

..... **[3]**

(b) The Space Station is a satellite that is used for scientific research and experiments.

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

1 .....

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

[Total: 5]

7 This question is about nuclear radiation.

(a) Nuclear radiation has many uses.

Draw lines to join each **radiation** to its **correct use**.

radiation	use
beta	sterilising medical equipment
alpha	smoke alarms
gamma	thickness testing for paper

[2]

(b) **Background** radiation is around us all the time.

All living things emit very small amounts of nuclear radiation.

Write down **one other** source of background radiation.

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

(c) Radioactive materials can be **dangerous**.

Scientists have to handle radioactive materials **safely**.

Suggest three safety precautions for handling radioactive materials.

1 .....

2 .....

3 ..... **[3]**

[Total: 6]

8 Bob tests many electrical appliances in the laboratory.

(a) Look at this table of appliances and their powers in kW.

appliance	power in kW
kettle	3.0
lamp	0.1
shower	7.0
toaster	1.0
TV	0.3

Bob tests each of these appliances.

They are switched on for the **same** time.

Complete the sentences.

The one which costs the most to use in the test is the ..... .

This costs the most to use because ..... . **[1]**

(b) Bob tests different kettles with the same 3 kW power rating.

The kettles have different colours.

He switches them on for the times shown.

appliance	time switched on in minutes
black kettle	2.5
blue kettle	3.5
green kettle	2.7
red kettle	4.5
white kettle	3.9

Complete the sentences.

The one which costs the most to use in the test is the ..... coloured kettle.

This costs the most to use because ..... . **[1]**

(c) Bob tests the electric shower.

Its power is 7.0 kW.

The shower is switched on for 0.2 hours.

The cost of electricity is 12p for a kilowatt-hour unit.

Calculate the cost of using the shower for 0.2 hours.

The equations on page 2 may help you.

.....

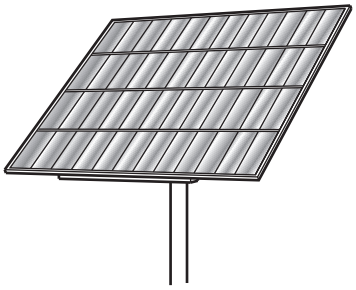
.....

.....

answer ..... pence **[3]**

[Total: 5]

9 We can collect energy from the Sun using **photocells**.



Complete the sentences.

Photocells transfer .....

into ..... .

This can be used to charge batteries.

Photocells produce a different type of current to generators.

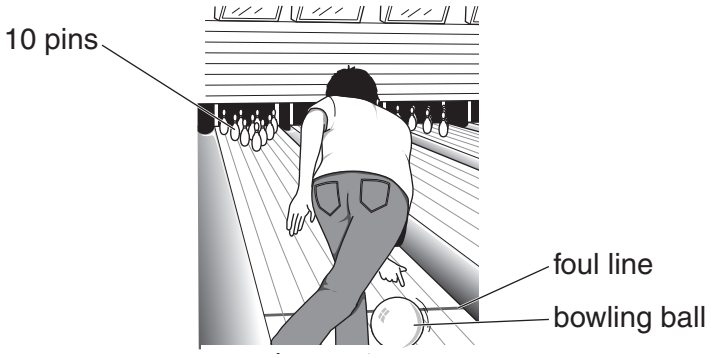
The **type** of current produced by photocells is called ..... current.

A photocell with a larger surface area produces ..... than one with a smaller surface area. **[4]**

[Total: 4]

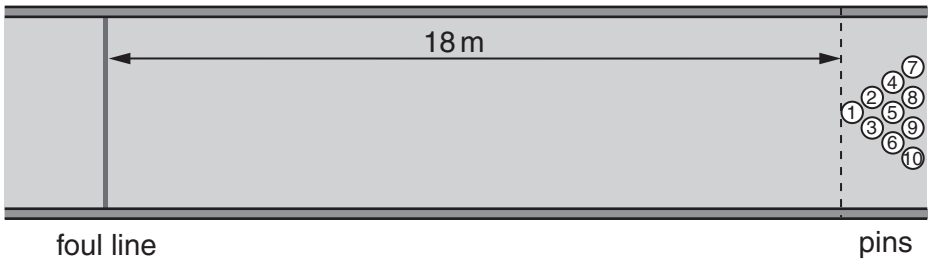
Section C – Module P3

10 Jay goes tenpin bowling.



(a) Jay wants to measure the **speed** of the bowling ball.

(i) He measures **distance** and **time**.



Complete the sentences to show the equipment Jay should use.

Distance is measured with a ..... .

Time is measured with a ..... . **[2]**

(ii) The distance from the foul line to the front pin is **18 m**.

The bowling ball travels from the foul line to the front pin in **4.5 seconds**.

Calculate the average speed of the bowling ball.

The equations on page 2 may help you.

.....

.....

.....

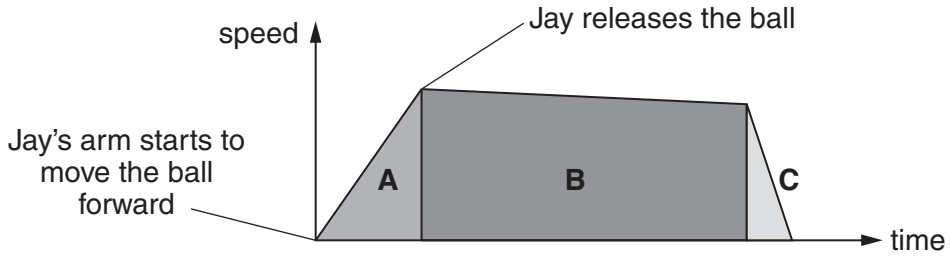
answer ..... m/s **[2]**

(b) Jay draws a sketch graph of the speed of the ball.

He labels when his arm starts to move the ball forward.

He also labels the point when the ball is released from his hand.

Look at these labels on the graph.



(i) What happens to the ball in part **A** of the graph?

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

accelerates ☐

stays stationary ☐

slows down gradually (decelerates gradually) ☐

moves at a constant speed ☐

slows down rapidly (decelerates rapidly) ☐

[1]

(ii) Compare parts **B** and **C** of the graph.

What happens in part **C** of the graph?

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

stays stationary ☐

slows down (decelerates) more than in **B** ☐

slows down (decelerates) at the same rate as in **B** ☐

slows down (decelerates) less than in **B** ☐

moves at a constant speed ☐

[1]

[Total: 6]

11 Alisha drives a truck.

(a) (i) The truck uses a fuel made from a fossil fuel.

Write down the **name** of a fuel that the truck could use.

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

(ii) When the truck moves it has a type of energy because of its **movement**.

What is the **name** of this type of energy?

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

(b) (i) The mass of the truck is **3000 kg**.

Alisha drives the truck with an acceleration of **3 m/s^2**.

What is the **driving force**?

The equations on page 2 may help you.

Put a (ring) around the correct answer.

0.001 N **1000 N** **2997 N** **3003 N** **9000 N** **[1]**

(ii) Alisha drives the truck with **less** acceleration.

The new driving force is **900 N**.

She drives the truck for a distance of **450 m**.

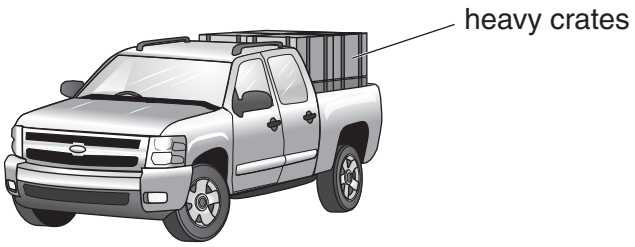
What is the **work done**?

The equations on page 2 may help you.

Put a (ring) around the correct answer.

405 000 J **1350 J** **450 J** **2 J** **0.5 J** **[1]**

(c) Alisha's truck has heavy crates put into it.



This **increases** the **braking** distance of the truck.

Complete the sentence.

The braking distance is the distance taken to stop once the .....

..... .

Alisha's **thinking** distance stays the **same**.

Complete the sentence.

The thinking distance is the distance travelled between the need for braking occurring and

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

(d) **(i)** Seat belts in trucks and cars absorb energy in a crash.

Write down the name of **another** part of a vehicle that is designed to absorb energy in a crash.

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

(ii) Why do seat belts have to be replaced after a crash?

.....

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

[Total: 8]

12 Lexi drops two identical paper cake cases.

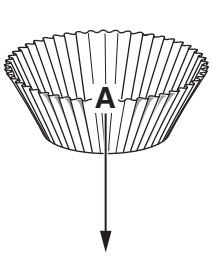
She squashes one cake case into a ball shape.

She drops them from a bridge.

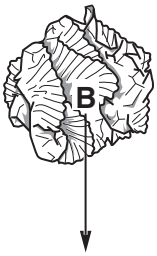
There is **no** wind blowing.

The cake cases fall into the stream below.

The two cake cases look like this.



A is a cake case



B is a cake case crushed into a ball shape

The two paper cake cases have the **same mass**.

Describe why they fall **and** why **B** falls faster than **A**.

In your answer include ideas about

- downward forces
- upward forces.

.....

.....

.....

.....

..... **[3]**

[Total: 3]

13 Dwayne is a high jumper.

He is running towards the high jump bar.

(a) Dwayne is doing **work**.

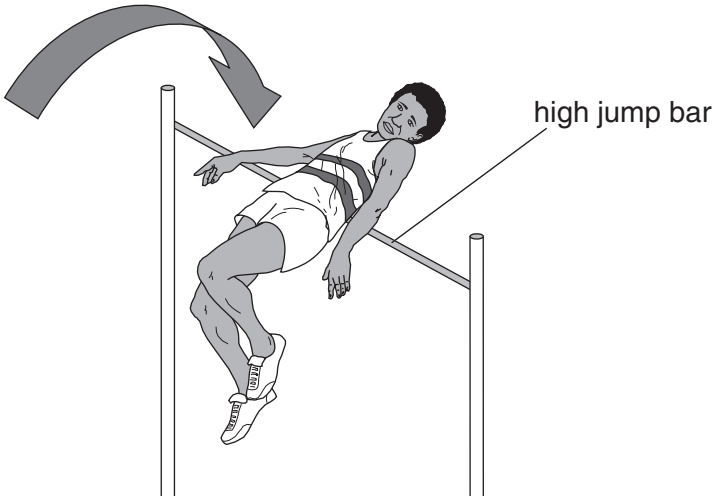
What **two** things are needed for work to be done?

.....

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

(b) Dwayne pushes off from the ground.

He jumps just above the bar.



(i) What type of energy increases when Dwayne jumps from the ground to the bar?

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

Turn over for the remainder of question 13

(ii) Marlon trains with Dwayne.

He does a high jump.

Marlon's energy above the bar is greater than Dwayne's.

Suggest **one** reason why.

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

[Total: 3]

END OF QUESTION PAPER