

**Wednesday 14 June 2017 – Morning**

**GCSE GATEWAY SCIENCE  
PHYSICS B**

**B751/01** Physics modules P1, P2, P3 (Foundation Tier)

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 15 minutes



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

**INFORMATION FOR CANDIDATES**

- The quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **20** pages. Any blank pages are indicated.

## EQUATIONS

$$\text{energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

$$\text{efficiency} = \frac{\text{useful energy output} (\times 100\%)}{\text{total energy input}}$$

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

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

$$\text{energy supplied} = \text{power} \times \text{time}$$

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

$$\text{distance} = \text{average speed} \times \text{time}$$

$$s = \frac{(u + v)}{2} \times t$$

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

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

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

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

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

$$\text{power} = \text{force} \times \text{speed}$$

$$\text{KE} = \frac{1}{2}mv^2$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

$$\text{GPE} = mgh$$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$m_1u_1 + m_2u_2 = (m_1 + m_2)v$$

$$\text{refractive index} = \frac{\text{speed of light in vacuum}}{\text{speed of light in medium}}$$

$$\text{magnification} = \frac{\text{image size}}{\text{object size}}$$

$$l_e = l_b + l_c$$

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} =$$

$$\frac{\text{number of primary turns}}{\text{number of secondary turns}}$$

$$\text{power loss} = (\text{current})^2 \times \text{resistance}$$

$$V_p I_p = V_s I_s$$

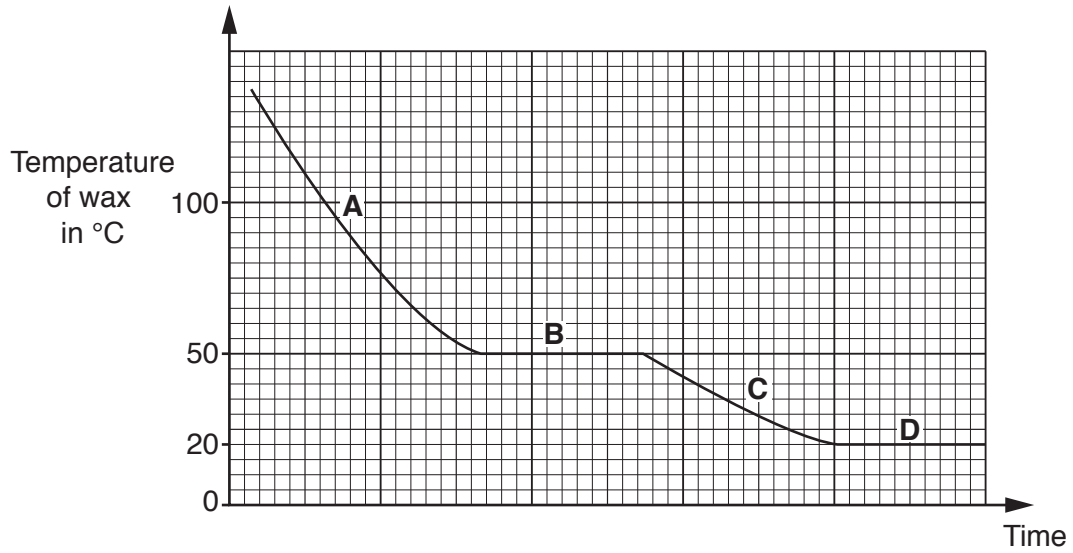
Answer **all** the questions.

**SECTION A – Module P1**

1 Fin lets some **liquid** wax cool until it reaches room temperature at 20°C.

He measures the temperature of the wax as it cools.

Look at the graph of his results.



(a) Explain what happens at **B** on the graph.

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

(b) Explain why the graph is constant at **D**.

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

2 Steve investigates different types of insulation.

Look at the table of his results.

Type of insulation	Initial cost in £	Yearly saving in £
double glazing	9000	90
loft insulation	300	150
cavity wall insulation	450	150
draught-proofing	20	40

Steve wants to install insulation in his home.

Use the information in the table to suggest which type of insulation Steve should install first.

Include calculations and an explanation in your answer.

.....

.....

.....

.....

..... [3]



(b) Some scientists are concerned about the effects of using mobile phones.

The scientists publish the results of their investigations.

Explain why publishing results is a good idea.

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

(c) (i) Sue thinks about buying a digital (DAB) radio.

Describe the difference between analogue signals and digital signals.

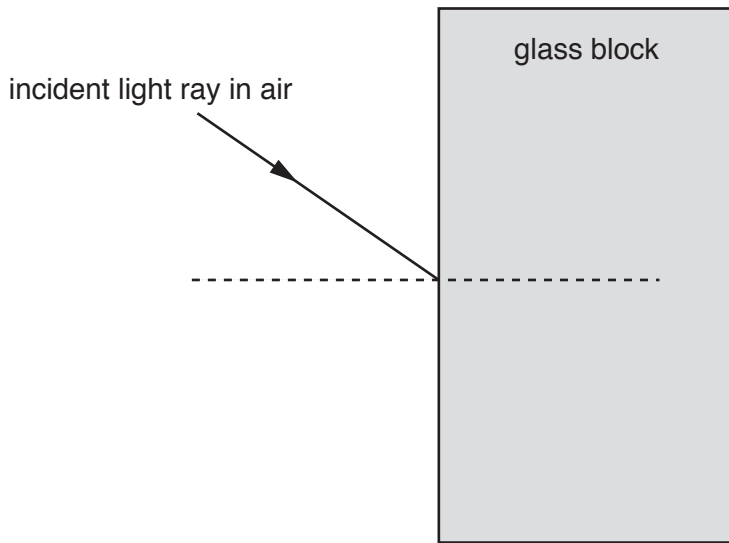
You may draw a diagram to show your answer.

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

(ii) Describe **one** advantage of DAB broadcasts.

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

4 A light ray passes from air through a glass block.



(a) Complete the ray diagram for this light ray as it travels into **and** out of the glass block. [3]

(b) A water wave has a frequency of 5.0 Hz and a wavelength of 3.0 m.

Calculate the speed of the water wave.

.....  
.....  
.....

Answer ..... m/s [1]

5 Exposure to ultraviolet radiation can be dangerous.

(a) State two effects of ultraviolet radiation on people.

1 .....

2 .....

[2]

(b) Suggest **one** way that people can reduce exposure to ultraviolet radiation.

..... [1]

SECTION B – Module P2

6 Electricity is produced using different methods.

(a) Some methods produce direct current (DC) and some methods produce alternating current (AC).

Write down which of the following methods produce alternating current (AC) and which produce direct current (DC).

generator .....

photocell .....

battery ..... [2]

(b) A generator produces electricity.

Then the electricity is distributed to homes, factories and offices.

Describe the main stages in the production **and** distribution of electricity.

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

(c) A power station with an energy **input** of 100 MJ has a useful energy output of 30 MJ.

Calculate the efficiency of this power station.

.....  
.....  
.....

Answer ..... [2]





8 The Universe is made up of many different objects.

(a) Models of the Universe have changed over time.

For example, Ptolemy and Copernicus had different ideas.

Describe the **differences** between the Ptolemy model and the Copernicus model of the Universe.

.....

.....

.....

..... [2]

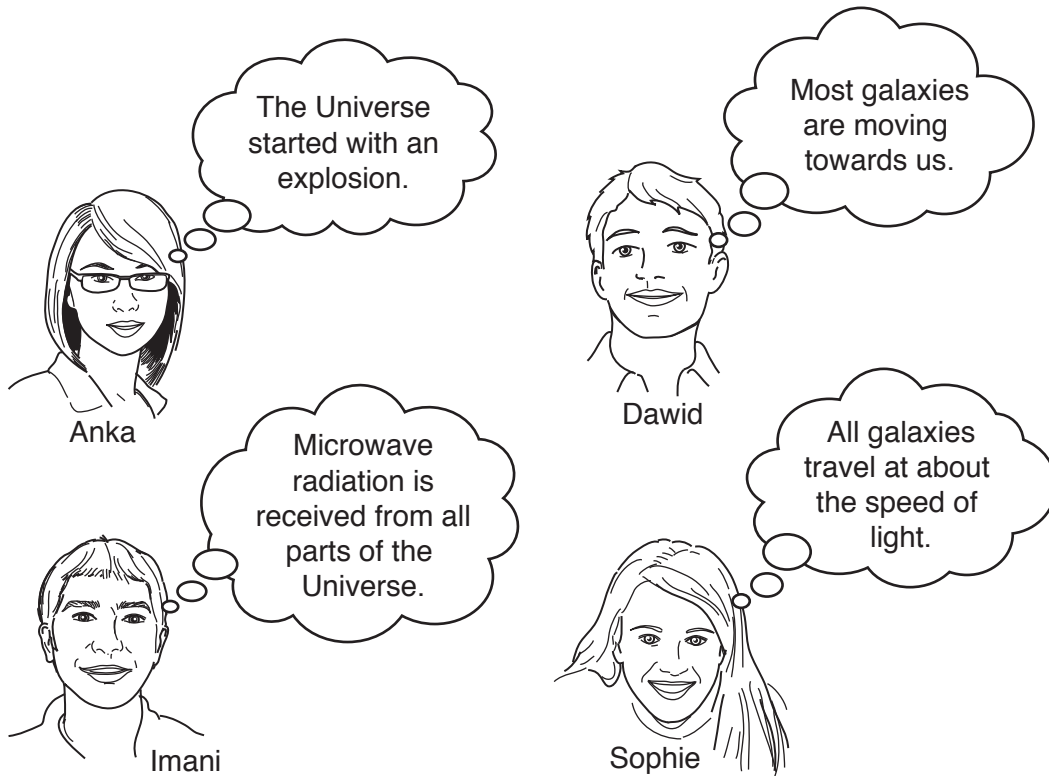
(b) Suggest **one** technological advance which helped to change the model of the Universe.

.....

..... [1]

(c) Four students discuss ideas about the origin of the Universe.

Look at their ideas.



Only two students have correct ideas about the origin of the Universe.

(i) Which **two** students have correct ideas about the origin of the Universe?  
..... and ..... [2]

(ii) For one of the **incorrect** ideas, write the correct information.  
.....  
..... [1]

(d) What is a Near Earth Object (NEO)?  
.....  
..... [1]

9 Ralph investigates radioactive sources.

He puts different barriers between the sources and the radiation detector.

He measures the count rate from each source with the different barriers.

Look at the table.

Source	Amount of radiation (counts per minute)			
	No barrier	Paper barrier	Thin aluminium barrier	Thick lead barrier
<b>A</b>	542	541	10	10
<b>B</b>	257	255	255	9

(a) Write down the type of radiation emitted by source **A** and source **B**.

Source **A** emits ..... radiation.

Source **B** emits ..... radiation. [2]

(b) Radioactive materials need to be used safely.

Describe safe ways to use radioactive sources.

.....

.....

.....

..... [2]

(c) Ralph thinks that waste from nuclear power stations contributes to global warming.

Harry thinks deforestation contributes to global warming.

Explain who is correct.

.....

.....

..... [1]

SECTION C – Module P3

10 Jim investigates the acceleration of his new car.

His car starts from rest and reaches 26 m/s in 13 seconds.

(a) (i) Calculate the acceleration of his car.

Include the unit for acceleration with your answer.

.....  
.....  
.....

Answer ..... unit ..... [3]

(ii) Jim finds that the acceleration of his car is less than advertised by the maker.

Why is it important that the person testing the car is **independent** from the maker?

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

(b) The maker of the car wants to increase the acceleration of the car.

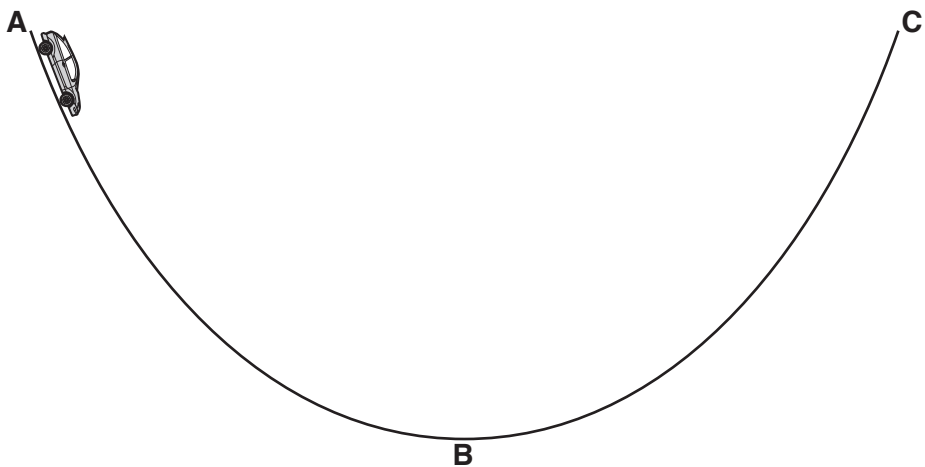
Suggest **one** factor they could change to **increase** the acceleration of the car.

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

11 Rosie investigates the motion of a toy car along a curved track.

Rosie releases the toy car from A.

Look at the diagram of the curved track.



Describe how the kinetic energy and the potential energy of the toy car change as it moves from A to B and from B to C.



*The quality of written communication will be assessed in your answer to this question.*

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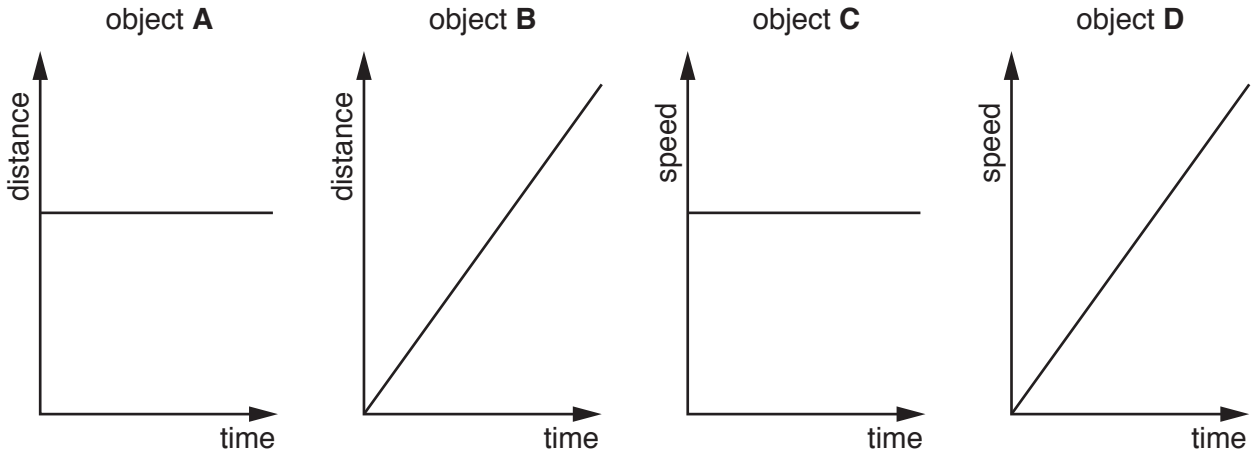
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[6]

12 Gio draws motion graphs for objects **A**, **B**, **C** and **D**.

Look at her four graphs.



(a) Which **two** objects move with constant speed?

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

(b) Which object increases speed?

..... [1]

(c) Which object is **not** moving?

..... [1]

13 Haroon completes a project about work done.

Look at his project.

Work Done

Work is done when you lift weights, climb stairs, pull a sledge or lean against a wall.

Work done depends on the distance moved and the time it takes to move the object.

The unit for work done is the joule.

Energy is never transferred when work is done.

There are three mistakes in Haroon’s homework.

(a) Write down the **three** mistakes.

.....

.....

..... [3]

(b) Choose **one** of the mistakes and write down the correct information.

.....

..... [1]



14 Sami rides a scooter at different speeds.

He calculates the kinetic energy of the scooter at four different speeds.

Look at the table.

Speed in metres per second	Kinetic energy in joules
5	1 250
10	5 000
15	11 250
20	20 000

(a) Describe the pattern between the speed and the kinetic energy of the scooter.

.....

.....

..... [2]

(b) Kinetic energy depends on speed.

Write down one **other** thing kinetic energy depends on.

..... [1]

(c) Sami rides his scooter on a road with 'average speed cameras'.

Explain how average speed cameras work.

.....

.....

.....

.....

..... [3]

**END OF QUESTION PAPER**

**ADDITIONAL ANSWER SPACE**

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

A large area of lined paper for writing. It consists of a vertical solid line on the left side, creating a margin. To the right of this line, there are numerous horizontal dotted lines spaced evenly down the page, providing a guide for writing.

A large rectangular area with a solid vertical line on the left side and horizontal dotted lines extending across the page, providing a template for writing.

A large area of the page is reserved for writing, featuring a vertical solid line on the left side and horizontal dotted lines extending across the page.



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