

**GENERAL CERTIFICATE OF SECONDARY EDUCATION** **H** **B651/02**  
**GATEWAY SCIENCE**  
**PHYSICS B**  
 Unit 1 Modules P1 P2 P3  
 HIGHER TIER  
**MONDAY 18 JUNE 2007**

Morning  
Time: 1 hour

Calculators may be used.  
 Additional materials: Pencil  
 Ruler (cm/mm)



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0  
6  
4  
5  
\*

Candidate  
Name

Centre  
Number

--	--	--	--	--

Candidate  
Number

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**INSTRUCTIONS TO CANDIDATES**

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- A list of physics equations is printed on page two.

FOR EXAMINER'S USE		
Section	Max.	Mark
A	20	
B	20	
C	20	
<b>TOTAL</b>	<b>60</b>	

This document consists of **22** printed pages and **2** blank pages.

## EQUATIONS

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

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

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

$$\text{fuel energy input} = \text{waste energy output} + \text{electrical energy output}$$

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

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

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

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

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

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

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

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

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

$$\text{kinetic energy} = \frac{1}{2} mv^2$$

$$\text{potential energy} = mgh$$

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

**3**  
**BLANK PAGE**

**Question 1 begins on page 4.**

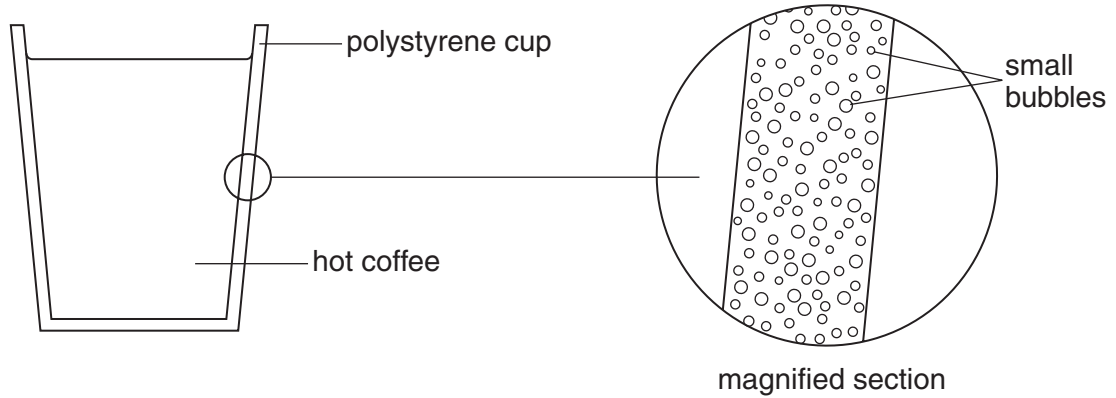
**PLEASE DO NOT WRITE ON THIS PAGE**

Answer **all** the questions.

**Section A – Module P1**

1 Look at the diagram of a coffee cup.

It shows a section of the cup wall.



(a) The cup wall helps to keep the coffee hot.

Explain how.

.....

.....

.....

..... [3]

(b) Some cups are made of **thin** plastic.

The coffee cools quickly.

Heat energy is lost by conduction through the walls of the cup.

Explain how.

.....

.....

.....

..... [2]

(c) Anya pays £300 to insulate her loft.

Her energy bills are £100 less each year because of the loft insulation.

Calculate the payback time.

.....

.....

.....

.....

..... [2]

[Total: 7]

2 (a) Ewan listens to music from his CD player.

The CD player contains a laser.

Laser light is different from the light given out by a filament lamp.

What is different about the laser light?

Write down **two** differences.

1 .....

2 ..... [2]

(b) The sound from Ewan's CD travels at 330 m/s in air.

The frequency of a sound is 256 Hz.

The frequency of the sound increases to 412 Hz.

What happens to the **wavelength**?

Choose from:

**decreases**

**increases**

**stays the same**

..... [1]

[Total: 3]

3 This question is about transmitting radio waves.

(a) Complete the sentences below using words from the list.

**amplification**

**diffraction**

**dispersion**

**interference**

**reflection**

**refraction**

Radio waves can be transmitted from one part of the earth to another by .....  
from the ionosphere. There is signal loss from the edge of the transmitter dish caused by  
..... One of the main advantages of digital radio is that there is  
high quality sound due to less .....

[3]

(b) There is a layer of ozone gas in the upper atmosphere.

The release of CFCs into the atmosphere is making the ozone layer thinner.

In some places the layer has been depleted so much that there is a hole in the layer.

Scientists are worried about this hole.

Give **two** reasons why.

reason 1 .....

.....

reason 2 .....

..... [2]

[Total: 5]

4 This question is about heat energy.

Fiona has two identical beakers containing water.

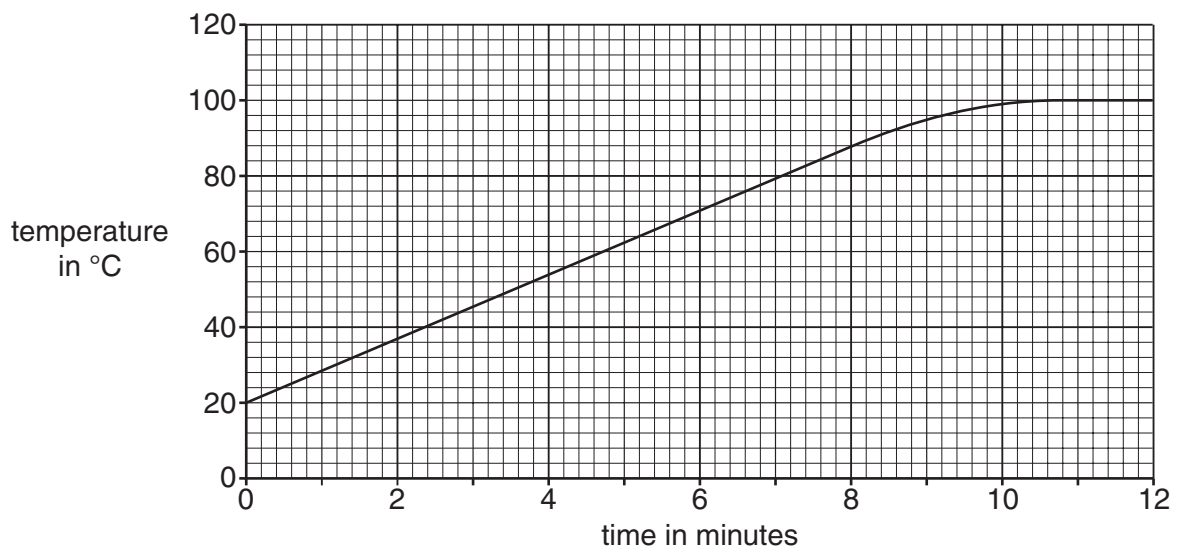
She heats the beakers for 12 minutes.

Look at the information.

	mass in g	specific heat capacity in J/kg °C	starting temperature in °C	time heated in minutes
<b>beaker 1</b>	500	4200	20	12
<b>beaker 2</b>	250	4200	20	12

She measures the temperature every minute and plots a graph of her results for **beaker 1**.

Look at the graph.



On the graph, draw the line that you would expect from the results for heating **beaker 2**.

[2]

[Total: 2]



5 This question is about transmitting information.

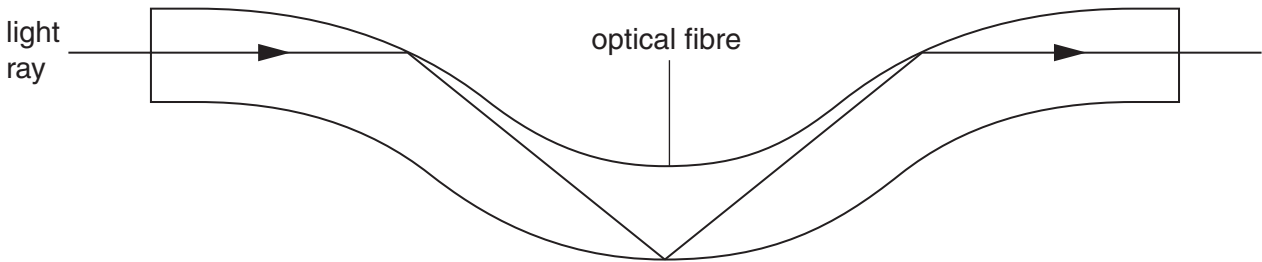
(a) Information can be transmitted as analogue or digital signals.

What is meant by an **analogue** signal?

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

(b) Optical fibres allow data to be transmitted at high speed.

Look at the diagram.



Describe how light travels along the optical fibre.

Use the diagram to help your answer.

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

[Total: 3]

Section B – Module P2

6 Amrit uses a renewable source of energy in her house.

(a) She has a wind turbine near the house.



This generates electricity from renewable energy.

This is an advantage.

Wind turbines have other advantages and disadvantages.

(i) Write about **one other advantage** of using wind turbines.

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

(ii) Write about **one disadvantage** of using wind turbines.

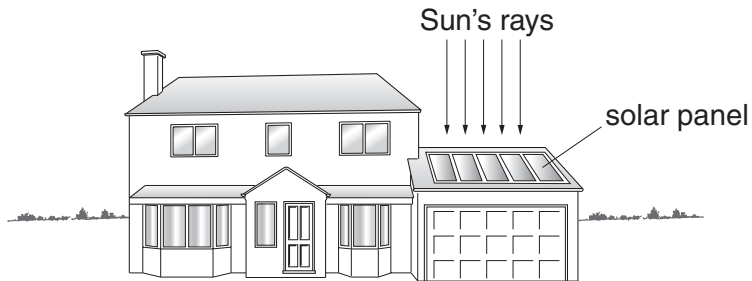
.....  
..... [1]

(b) Megan has a solar **panel** on the roof of her house.

This absorbs heat energy from the Sun.

This energy is used to heat water for her house.

Look at the diagram.



The Sun moves across the sky during the day.

The panel gets maximum energy from the Sun only in the afternoon.

She needs to get the maximum energy from the Sun all day.

There is no room to make the solar panel larger.

Suggest how she can get more energy from this solar panel.

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

(c) Megan uses **passive** solar heating to help keep the house warm.

Look at the diagram.



The large area of glass helps with passive solar heating.

Explain how this passive solar heating system works.

.....

.....

.....

..... [3]

[Total: 6]

7 Power stations produce electrical energy.

(a) Look at the six stages in a power station.

**electrical energy produced**

**fuel burns**

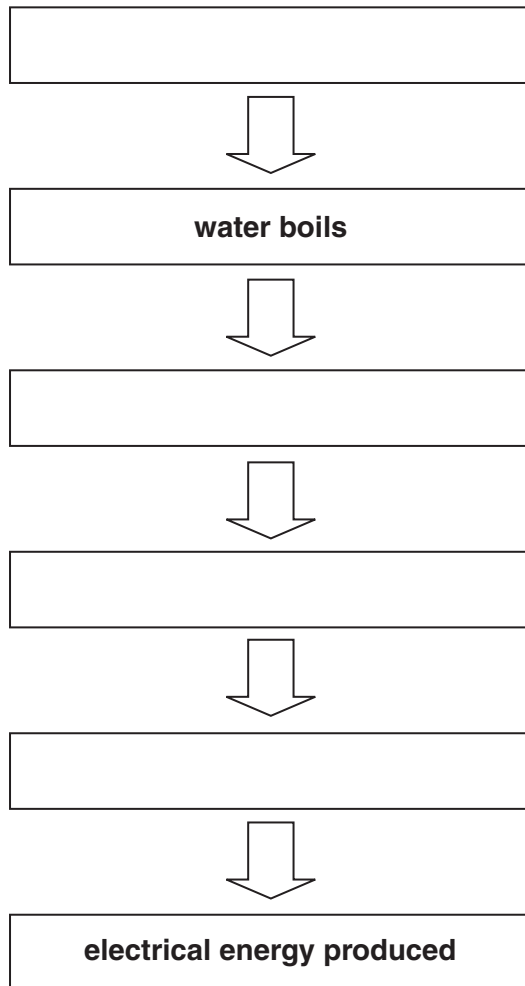
**steam drives turbine**

**steam made**

**turbine spins the generator**

**water boils**

Put the stages in the correct order. Two have been done for you.



[3]

- (b) The electrical power output of the generator is 5 MW (5 000 000 W).  
The current produced is 250 A.

Calculate the output voltage of the generator.

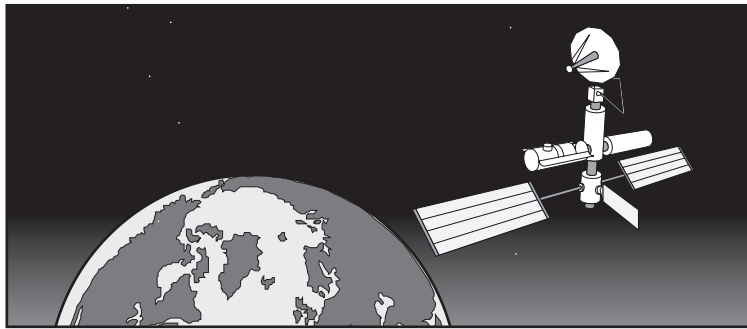
.....  
.....

answer ..... V [3]

[Total: 6]

8 This question is about space.

Artificial satellites are used for telecommunications.



Solar flares from the Sun can interfere with satellite signals.

(a) What is a solar flare?

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

(b) How does this interfere with satellite signals?

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

[Total: 2]

9 (a) Asteroids orbit the Sun. They are made of hard rock.

(i) Where is the asteroid belt?

Choose from the list.

**between the Sun and Mercury**

**between Venus and Earth**

**between Mars and Jupiter**

**between Saturn and Neptune**

answer ..... [1]

(ii) In the past, asteroids have hit the Earth.

What evidence is there to suggest that asteroids have hit the Earth?

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

(b) Comets orbit the Sun. The tail of a comet is a trail of debris.

Look at the picture.



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(i) What are comets made of?

..... [1]



(ii) What **shape** is a comet's orbit?

..... [1]

(iii) What happens to the **speed** of comets in orbit?

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

[Total: 6]

Section C – Module P3

10 (a) The stopping distance of a car is made up of two distances.

These are the **thinking** distance and the **braking** distance.

(i) Write down **one** factor that can **increase** the braking distance.

..... [1]

(ii) Write down **one** factor that can **increase** the thinking distance.

..... [1]

(b) New cars have a lot of active safety features.

One active safety feature is the seat belt.

Seat belts can reduce injuries in a crash.

Explain how.

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

(c) There are now more electrically powered cars on the road.

Suggest **one advantage** and **one disadvantage** of using electrically powered cars.

advantage .....

.....

disadvantage .....

..... [2]

[Total: 6]

11 Emma goes shopping.



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She pushes her shopping trolley to the car.

She uses a steady force of 85 newtons to move the trolley.

The trolley moves 50 m.

Calculate the work done in pushing the trolley 50 m.

.....

.....

.....

.....

.....

.....J [3]

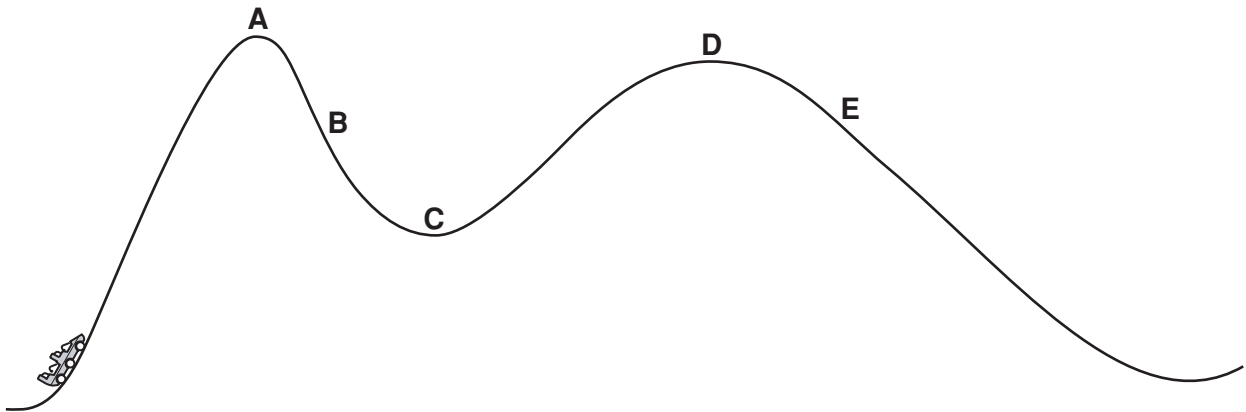
[Total: 3]

12 This question is about kinetic and gravitational potential energy.

(a) Look at the diagram of a roller coaster ride.

It shows the height at different parts of the ride.

The car is slowly pulled up to A and then released.



(i) Where does the car have the greatest gravitational **potential** energy?

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

..... [1]

(ii) Where does the car have the greatest **speed**?

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

..... [1]

(b) Motor cars are sometimes damaged in a crash.

The damage depends on their mass and speed.

The police say that for a particular car in an accident the damage caused at 30 m/s is more than twice the damage at 15 m/s.

Explain why.

Use ideas about kinetic energy in your answer.

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

[Total: 4]

13 Cathy and Colin have identical cars.

They use the same sort of fuel.

Colin's car uses more fuel to cover 100km than Cathy's car.

Suggest reasons why.

In your answer, write about the factors affecting fuel consumption.

.....

.....

.....

.....

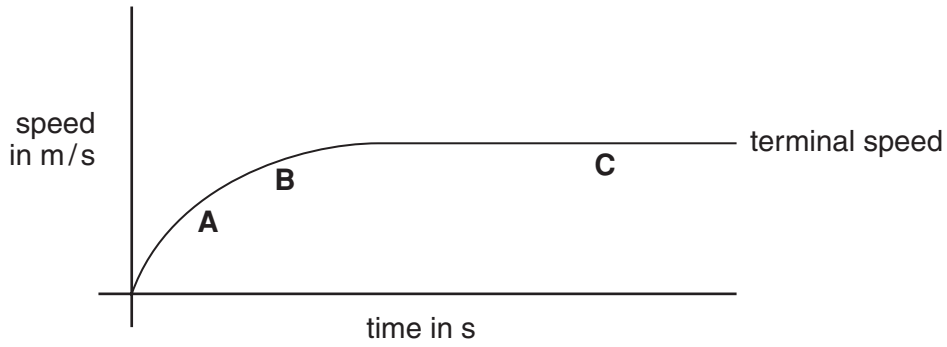
.....

.....

..... [3]

[Total: 3]

14 (a) Elaine drops a twig from a bridge.



Look at the graph of its speed.

It reaches a **terminal speed**.

(i) Write about the forces on the twig at **A**.

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

(ii) Write about the forces on the twig at **C**.

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

(b) When a sheet of paper is dropped from the same bridge, it reaches a different terminal speed from the twig.

Explain why.

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

[Total: 4]

**END OF QUESTION PAPER**

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