OCR
RECOGNISING ACHIEVEMENT

**F**

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

# GATEWAY SCIENCE

**B651/01**

# PHYSICS B

Unit 1 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)

**Monday 19 January 2009**
**Morning**

**Duration:** 1 hour



| Candidate Forename | | Candidate Surname | |
|---|---|---|---|

| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|

**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**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.

| FOR EXAMINER'S USE | | |
|---|---|---|
| **Section** | **Max.** | **Mark** |
| **A** | **20** | |
| **B** | **20** | |
| **C** | **20** | |
| **TOTAL** | **60** | |

## EQUATIONS

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

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

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

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

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

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

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

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

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

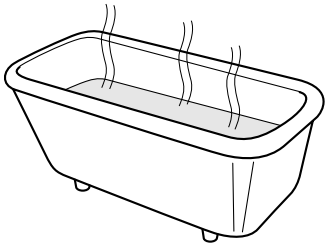
Answer **all** the questions.

## Section A – Module P1

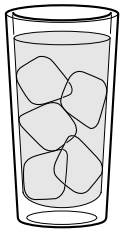
**1 (a)** Look at the diagrams and temperatures of three objects.

The objects are in a room at 20 °C.

cup of tea at 80 °C



bath of hot water at 30 °C



glass of water at 0 °C

Which object cools the fastest?

Choose from the list.

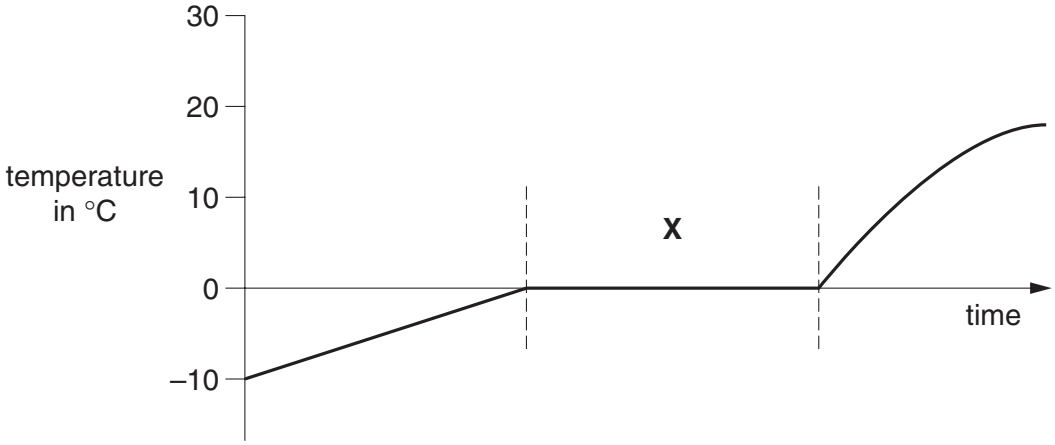
**cup of tea** **bath of water** **glass of water**

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

**(b)** Molly takes a block of ice from her freezer.

She puts it in a warm room at 20 °C.

Look at her graph of how the temperature changes with time.




What is happening to the ice in the part of the graph marked **X**?

Choose from the list.

**boiling**

**condensing**

**evaporating**

**freezing**

**melting**

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

**[Total: 2]**

**2** **(a)** Look at the table of some objects in Kevin's house.

They are made from different materials.

Some materials are **good** conductors of heat.

Some materials are **bad** conductors of heat.

Put a tick (✓) in the correct box to show if the material is a good or bad conductor of heat.

The first one has been done for you.

| material | good conductor | bad conductor |
|---|---|---|
| **steel** radiator | ✓ | |
| **copper** pan | | |
| **wooden** handle | | |
| **glass** dish | | |
| **aluminium** kettle | | |
| **polystyrene** foam | | |

**[2]**

**(b)** Kevin wants to save money by insulating his house.

He wants to reduce the energy lost by conduction.

Suggest **one** way he could reduce the energy lost by **conduction**.

.....

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

**(c)** To save more money Kevin replaces the light bulbs in his house with 'low-energy bulbs'.

One of the light bulbs uses 40 000 joules of electrical energy in one hour.

It gives out 10 000 joules of light energy in one hour.

Calculate the **efficiency** of the bulb.

The equations on page 2 may help you.

.....

.....

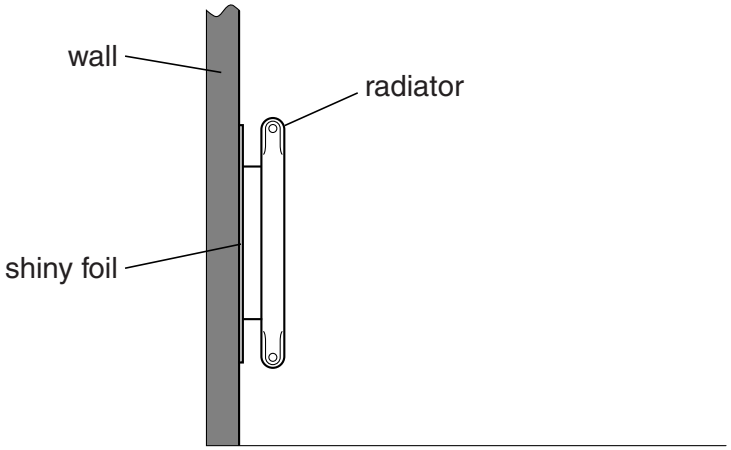
.....

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

**[Total: 5]**

**3** This question is about radiation.

Look at the diagram of a radiator.




**(a)** The air touching the radiator is heated and moves away.

Draw an **arrow** on the diagram to show the **direction** of the air as it moves away. **[1]**

**(b)** The radiator gives out infrared radiation.

Shiny foil stops the radiation going through the wall.

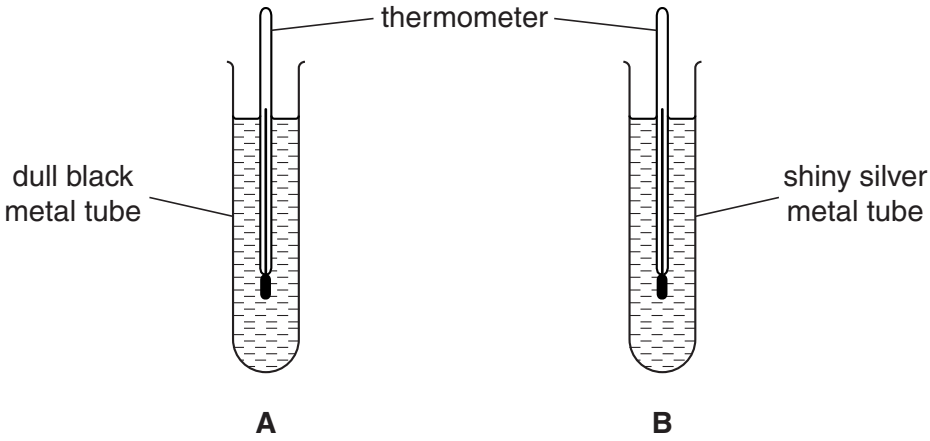
Explain how.

.....

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

**(c)** Rob investigates heat loss by radiation.

Look at the apparatus.



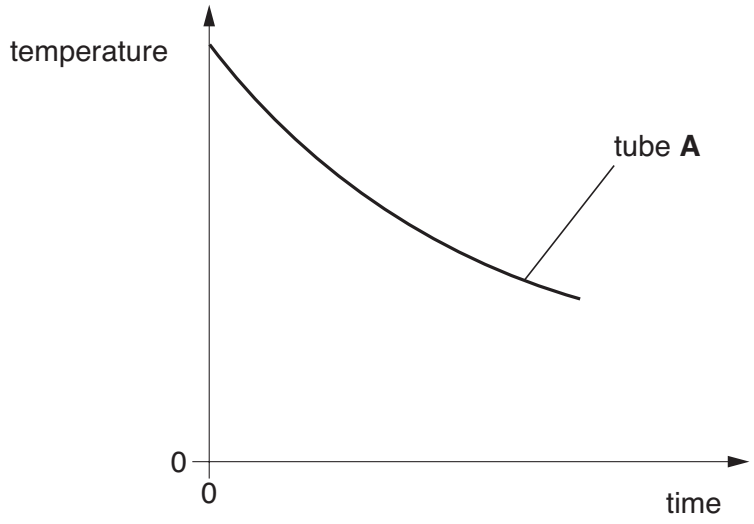

He puts the same amount of hot water into each tube.

Both tubes start at the same temperature.

He takes the temperature in each tube every minute.

Look at the graph of his results.

Look at the line for tube **A**.




On the graph, draw the line that you would expect for tube **B**. **[2]**

**[Total: 4]**

**4** This question is about different electromagnetic waves.

**(a) (i)** Louis cooks a large potato.

The middle of the potato gets hot more quickly if he uses a microwave oven instead of a conventional oven.

Explain why.

.....

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

**(ii)** Microwaves are used for cooking.

Write down one **other** use of microwaves.

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

**(b) (i)** The Sun gives out ultraviolet rays.

These rays affect the human body.

Write down **two** ways in which ultraviolet rays affect humans.

1 .....

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

**(ii)** Explain how we can reduce the effects of ultraviolet rays on the human body.

.....

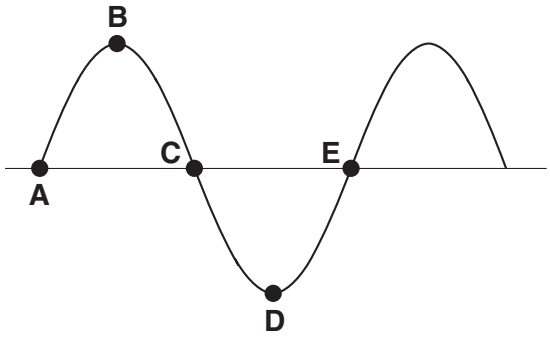
.....

.....

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

**[Total: 6]**

**5** Look at the diagram of a wave.




**(a)** Complete the following sentences by using letters from the diagram.

**(i)** A **crest** is shown by letter …… **[1]**

**(ii)** The **wavelength** is the distance between letter ……and letter …… **[1]**

**(b)** CD players use laser beams.

The light is reflected from a shiny surface.

This produces a digital signal.

What is a digital signal?

.....

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

**[Total: 3]**

## Section B – Module P2

**6** Some road signs have lights.

These lights are powered by photocells.

The picture shows one of these signs.




**(a)** Complete these sentences about **photocells**.

Photocells transfer …… energy into …… energy.

Photocells produce the same **type** of current as batteries.

This is …… current. **[3]**

**(b)** Using photocells has **advantages** and **disadvantages**.

Describe **one** advantage and **one** disadvantage of using photocells.

advantage .....

.....

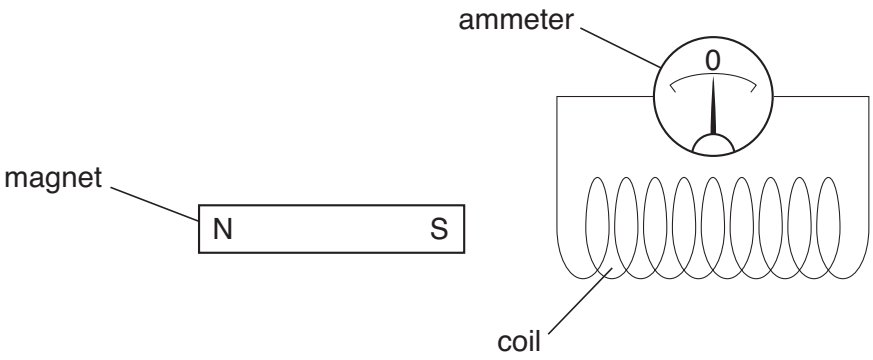
disadvantage .....

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

**[Total: 5]**

**7** Lloyd does an experiment to investigate the **dynamo effect**.

Look at the diagram of the equipment Lloyd uses.




Electricity can be generated using this equipment.

Describe two **different** things that Lloyd can do to generate electricity.

1 .....

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

**[Total: 2]**

**8** This question is about electrical power.

Sam has many electrical appliances in his house.

The table shows some of them. Look at the table.

| appliance | power in watts |
|---|---|
| deep fat fryer | 2000 |
| electric cooker | 5000 |
| kettle | 3000 |
| microwave | 1000 |
| radio | 50 |

**(a)** Sam uses each appliance for three minutes.

**(i)** Which appliance costs **exactly** twice as much to run as the microwave?

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

**(ii)** Explain your answer.

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

**(b)** The electric cooker has a power of 5 kW (5000 watts).

It is switched on and used for 3 hours.

Electricity costs 12 p for each unit.

Calculate the **cost** of using the electric cooker for 3 hours.

The equations on page 2 may help you.

.....

.....

.....

answer = .....pence **[2]**

**[Total: 4]**

**9** This question is about the Earth, the Moon and other objects in the Universe.

This is a photograph of the Earth-Moon system.



**(a)** The Earth is a planet.

Astronomers have found other planets and moons in the Universe.

Name two **other** types of object that they have found in the Universe.

1 .....

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

**(b)** Some scientists think that our Earth-Moon system was formed after a collision.

They think that billions of years ago something hit the Earth.

Describe how our Earth-Moon system could have been formed in this way.

.....

.....

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

**[Total: 4]**

**10** This question is about space.

Draw lines to connect each **object / event** to the correct **statement** about it.

| object / event | statement |
|---|---|
| artificial satellites | Universe began with an explosion |
| cosmic rays | causes solar flares |
| Sun | ionising radiation from space |
| Big Bang | used for weather forecasting |

**[3]**

**[Total: 3]**

**11** Charlotte's teacher shows her class an experiment with nuclear radiations.

There are **three** types of **nuclear** radiation.

Complete the following statement.

Choose from the list.

**protons**

**x-rays**

**gamma rays**

**radio waves**

**beta particles**

**alpha particles**

The **three** types of nuclear radiation are

1 .....

2 .....

3 ..... **[2]**

**[Total: 2]**

## Section C – Module P3

**12 (a)** Mark calculates the average speed of pupils running on the school field.

He needs to measure

- **distance**
- **time**.

Name the equipment that Mark needs to measure distance and time.

He measures distance with a ..... .

He measures time with a ..... . **[2]**

**(b)** Look at the results for one of the runners.

| **distance = 120 metres** | **time = 20 seconds** |
|---|---|

Calculate the average **speed** of this runner.

The equations on page 2 may help you.

.....

.....

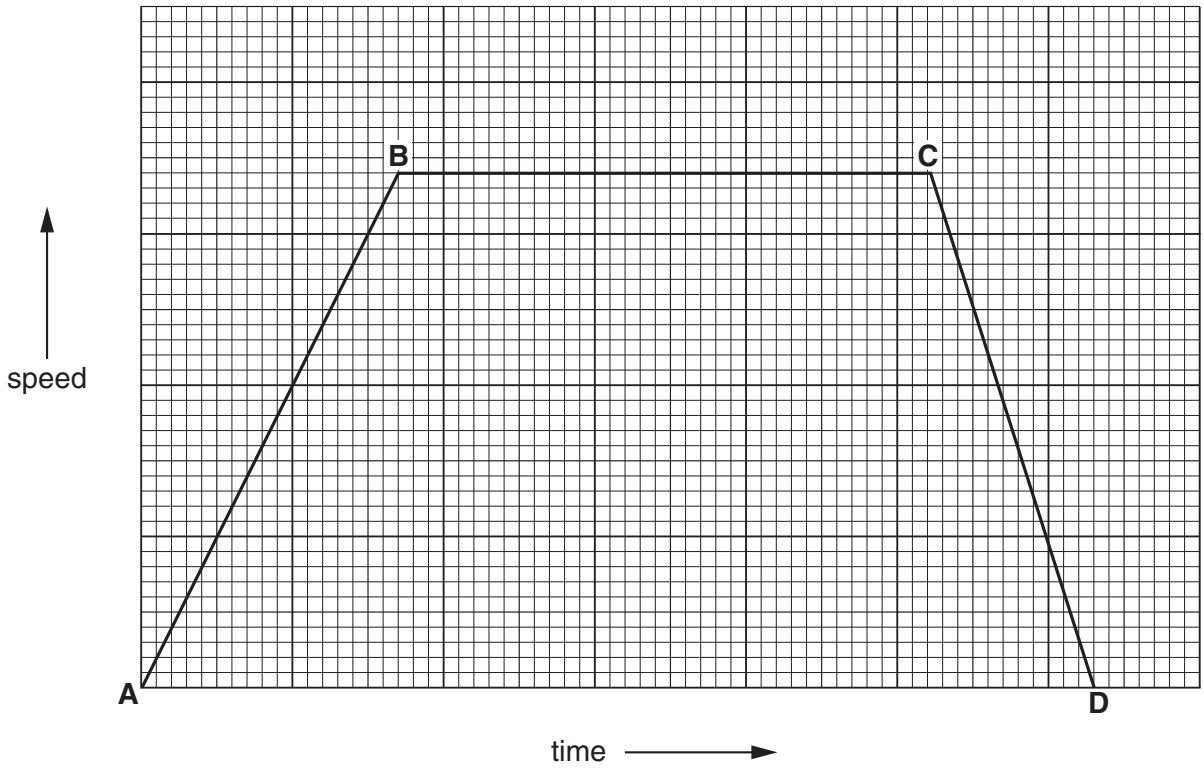
.....

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

**(c)** Mark measures the speed and time for Tom running.

He draws a graph of the results.

Look at the speed-time graph for Tom.




**(i)** Which **part** of the graph shows Tom running at a **steady** speed?

Choose from the list.

**A – B** **B – C** **C – D**

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

**(ii)** Which **letter** shows when Thomas **stopped** running?

Choose from the list.

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

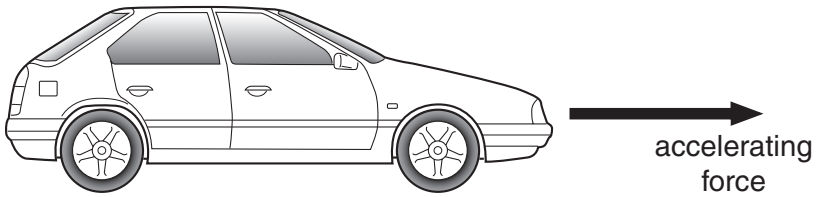
answer ..... **[1]**

**[Total: 6]**

**13** This question is about forces and motor cars.

Emily is going to drive her car.

Look at the diagram of Emily's car.




**(a)** Emily starts her car and drives forwards.

The car accelerates at 3 metres per second squared ($m/s^2$).

Calculate the accelerating **force** on the car.

The equations on page 2 may help you.

.....

.....

.....

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

**(b)** When Emily's car is moving it has **kinetic energy (KE)**.

How could she **increase** the KE of her car?

Write down **two** things that she could change.

1 .....

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

**(c)** Emily's car uses a fuel for its energy.

This fuel is made from a fossil fuel.

What fuel could Emily put into her car?

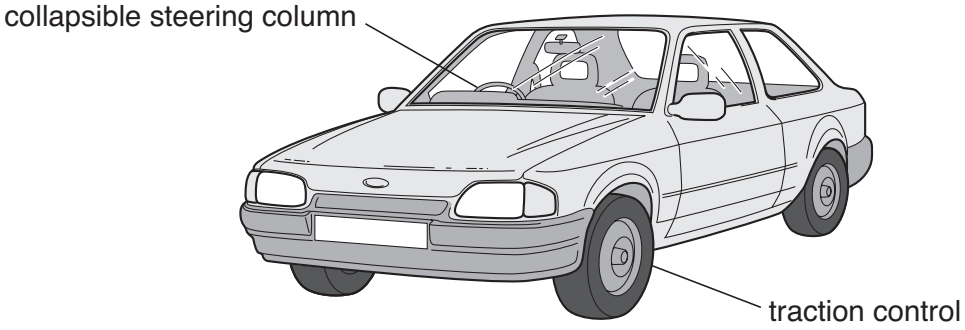
..... **[1]**

**[Total: 5]**

**14** This question is about car safety and power.

**(a)** Modern cars have many safety features.

Look at the diagram.




There are two types of safety features

- **active** (for example, traction control)
- **passive** (for example, collapsible steering column)

Write down three **other** active or passive safety features in modern cars.

1 .....

2 .....

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

**(b)** Cars transfer energy from the fuel into kinetic energy.

Different cars do this at different rates.

This determines the power rating of each car.

Complete the following sentences.

Choose from the list.

**higher watts lower work battery fuel joules**

Power measures how quickly …… is being done.

Power is measured in …… .

Cars with bigger engines have …… power ratings.

This gives them larger ……consumptions. **[3]**

**[Total: 6]**

**15** Britney is a skydiver.

Skydivers jump out of planes.

They fall for several seconds before they open a parachute.

**(a)** What happens to Britney's **speed** just after she jumps out of the plane?

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

**(b)** What **force** is causing Britney to fall towards the ground?

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

**(c)** Britney opens her parachute. She slows down.

What **force** is causing her to slow down?

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

**[Total: 3]**

**END OF QUESTION PAPER**

**PLEASE DO NOT WRITE ON THIS PAGE**