OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

PHYSICS B

Unit 1 Modules P1 P2 P3 (Higher Tier)

B651/02

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)

Wednesday 20 January 2010
Morning

Duration: 1 hour

OCE/17754

B6510 2

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.

DC (SHW (DJ) 00507 6/09) 17754/4

EQUATIONS

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

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage × current

energy supplied = power × time

energy (kilowatt hours) = power (kW) × time (h)

wave speed = frequency × wavelength

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

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

force = mass × acceleration

work done = force × distance

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

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

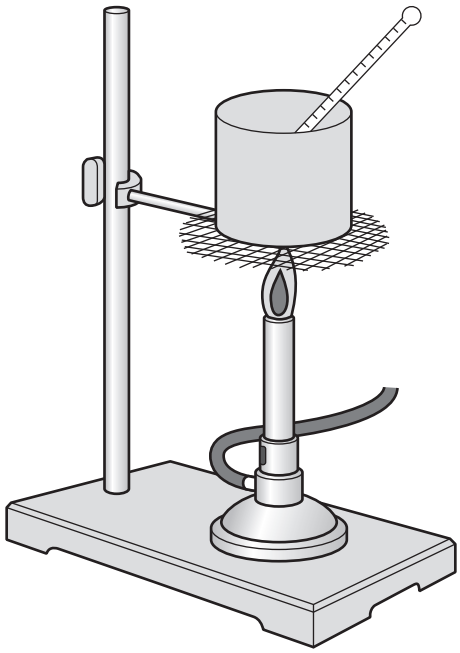
potential energy = mgh

weight = mass × gravitational field strength

Answer **all** the questions.

Section A – Module P1

1 Ben heats a can containing a substance **X**.



The temperature of substance **X** stays the same even though it is being heated.

(a) Suggest **two** things that may be happening to substance **X**.

1 .....

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

(b) Temperature and heat are different.

Finish the sentences by choosing the **best** words from this list.

an absolute

a chosen

energy

hotness

a positive

power

Temperature in °C is a measurement of …… on …… scale.

Heat in J is a measurement of …… on …… scale. **[2]**

[Total: 4]

2 Tom's house has cavity walls.

Foam is injected into the gap between the inner and outer brick walls.

(a) Air is a good insulator. It reduces energy loss by **conduction**.

Describe how energy is transferred by conduction.

Write about **particles** in your answer.

.....

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

(b) It is better to have foam in the cavity than just air.

Explain why foam is better than just air.

.....

.....

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

(c) It costs £500 to have the foam injected into Tom's house.

This saves Tom's family £125 per year on their energy bills.

The **payback time** is four years.

What is meant by payback time?

.....

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

(d) The radiators in Tom's house radiate energy towards the walls.

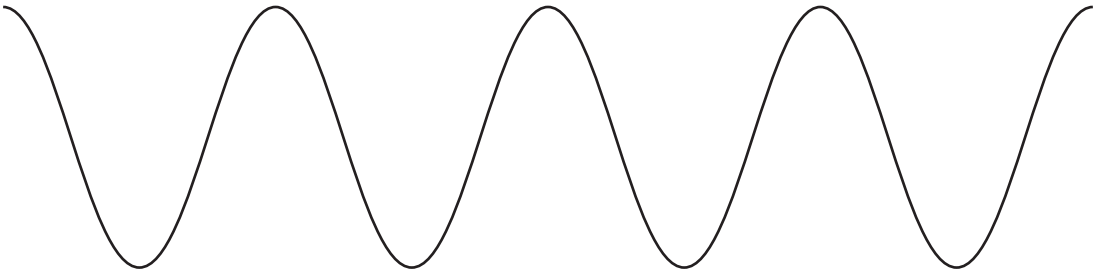
This increases the energy loss from the house.

Suggest how he can reduce this energy loss by radiation.

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

[Total: 5]

3 The diagram shows a transverse wave.



Water waves, light waves and radio waves are all transverse waves.

(a) The wavelength of a transverse water wave is 0.15 m.

The frequency of the wave is 5 Hz.

Calculate the speed of the wave.

The equations on page 2 may help you.

.....

.....

.....

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

(b) Many years ago, people communicated using light waves.

One example is sending smoke signals.

Explain **one** advantage of using radio waves instead of light waves as a method of communication.

.....

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

[Total: 3]

4 Wireless technology is used to transmit information.

Debbie is listening to her radio. The radio is an example of a device that uses wireless technology.

(a) Write down the name of one **other** device that uses wireless technology.

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

(b) Debbie's radio receives **analogue** signals.

Other radios use **digital** signals.

Write about analogue signals **and** digital signals. Explain how they are different.

.....

.....

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

(c) Debbie is listening to her favourite programme on her radio.

She can hear the music from another radio station as well as her favourite programme.

The waves from the two radio stations cause interference.

Why does **interference** happen?

.....

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

[Total: 4]

5 Mobile phones transmit information using microwaves.

Information is also transmitted to satellites in space using microwaves.

Mobile phone masts are often less than 1 km apart in towns.

Many people are concerned about the position of these masts.

> **Protest over mobile phone mast**
>
> Hundreds of children were kept off school on the first day of term in a protest about the siting of a mobile telephone mast. The protestors say they will not stop until the mast goes.

(a) Some people do not want mobile phone masts close to a school. Suggest why.

.....

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

(b) Microwave signals are able to reach satellites in space.

Mobile phone masts must be placed close together in towns because of signal loss.

Explain what causes this signal loss.

.....

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

(c) The picture shows a city skyline.

A mobile phone mast is to be placed on the roof of one of the buildings.

Write the letter **M** above the best building for the phone mast. Explain your choice.

.....

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

[Total: 4]

Section B – Module P2

6 This question is about the life of a star.

(a) Finish the sentences by choosing the **best** words from this list.

black hole

neutron star

planetary nebula

red giant

supernova

white dwarf

Our Sun is a medium weight star.

When the Sun ends its life, it will become a …… .

When a heavy weight star ends its life it will become a ……

or a …… . **[2]**

(b) A star gives out large amounts of energy during its main sequence stage.

Write down the name of the process that produces this energy.

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

[Total: 3]

7 **(a)** Waste products from nuclear reactors give out nuclear radiation.

(i) Why is this nuclear radiation **dangerous**?

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

(ii) **Plutonium** is a waste product from a nuclear reactor.

One use for plutonium is as a fuel in some types of reactor.

Give one **other** use for plutonium.

.....

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

(b) Radioactive waste from a nuclear reactor must be disposed of carefully.

Describe **one** method of radioactive waste disposal.

.....

.....

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

[Total: 3]

8 This question is about our Solar System.

The Sun produces solar flares.

(a) **(i)** What are solar flares?

.....

.....

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

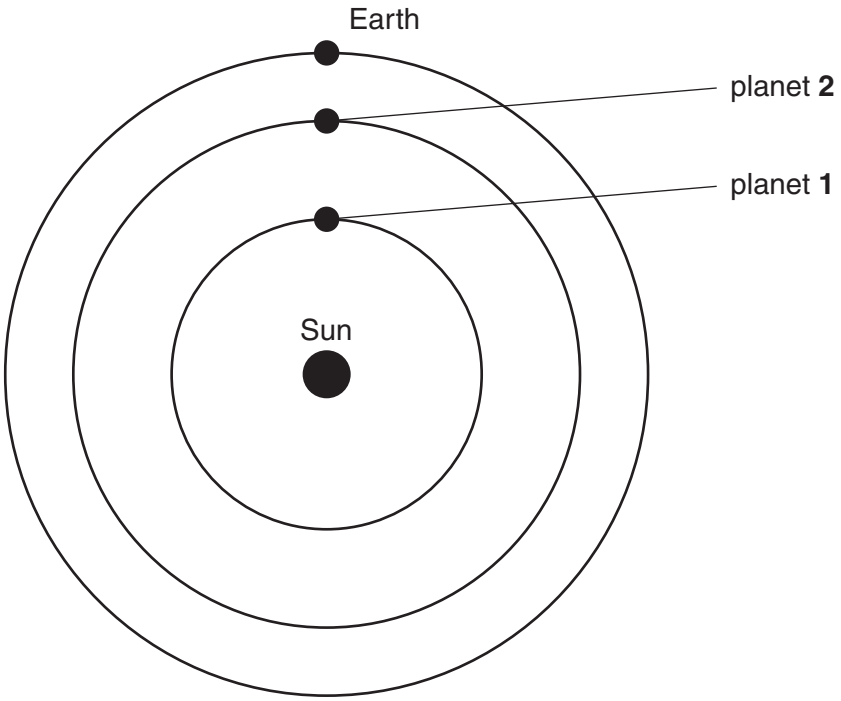
(ii) What effect does a solar flare have on satellite communication?

.....

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

(b) Look at the diagram.

It shows some of the planets in our Solar System.



Write down the names of planets **1** and **2**.

planet **1** .....

planet **2** ..... **[1]**

(c) Write down the name of the force that keeps the planets in orbit.

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

[Total: 5]

9 Ocraville needs a new power station.

The residents have a choice of coal, nuclear power or wood as the energy source.

You are a scientist asked to give them advice.

(a) Complete the table.

Give an advantage and a disadvantage for each energy source.

energy source	advantage	disadvantage
coal	…… …… ……	…… …… ……
nuclear	…… …… ……	…… …… ……
wood	…… …… ……	…… …… ……

[3]

(b) Ocraville power station will generate electricity 24 hours a day.

It will supply off-peak electricity to homes.

Explain one **advantage** and one **disadvantage** of off-peak electricity.

.....

.....

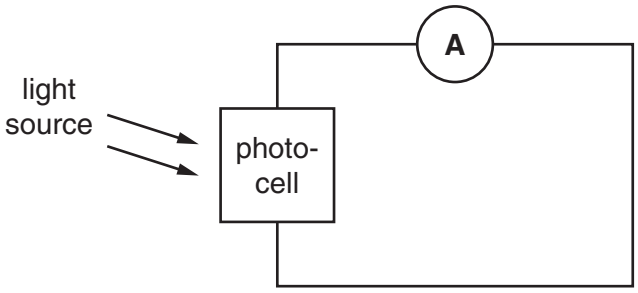
.....

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

[Total: 4]

10 Dale investigates the current produced by a photocell.

Look at the circuit he uses.



He moves the light source away from the photocell.

This affects the current through the ammeter.

Look at his results.

distance between light source and photocell in cm	1	2	3	4	5
current in mA	100	25	11	6	4

(a) Describe how the current produced depends on the distance between the light source and the photocell.

.....

.....

.....

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

(b) In a science lesson Becky makes a model electrical generator.

The electrical output from the generator is very low.

Write down two ways in which she could **increase** the electrical output of her generator.

1 .....

.....

2 .....

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

(c) The generator at a power station produces alternating current (AC) with a frequency of 50 Hz.

Complete the following sentence to explain what is meant by **frequency**.

Frequency is the .....

.....

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

[Total: 5]

Section C – Module P3

11 Students in a science class are finding out who can run the fastest.

(a) The table shows how far each student runs in 60 seconds.

name	distance in metres
Alana	344
Brian	401
Cassie	394
David	455
Ellie	360

What is **Ellie's** average speed?

The equations on page 2 may help you.

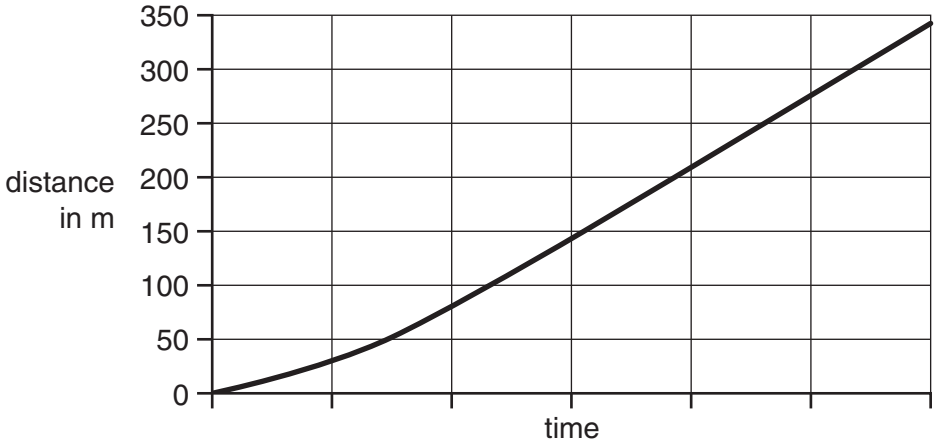
.....

.....

.....

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

(b) The graph shows how Alana's distance from the start changed with time.



(i) What is happening to Alana's **speed** during the first 100 m?

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

(ii) Between 200 m and 300 m, Alana's speed is constant.

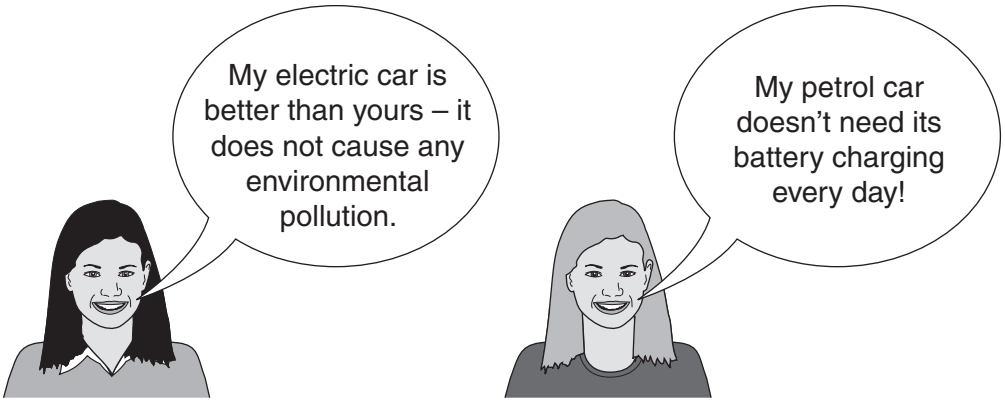
How does the graph show this?

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

[Total: 4]

12 Tracey and Sharon have both bought new cars.

Tracey's new car is **battery** driven. Sharon has bought a car that uses **petrol**.



(a) Tracey charges her car battery from the mains electrical supply.

Where is this electricity made?

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

(b) Tracey's statement about her electric car is **not** correct.

Explain why.

.....

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

(c) Tracey's car has paddle controls on the steering wheel that allow her to adjust her radio.

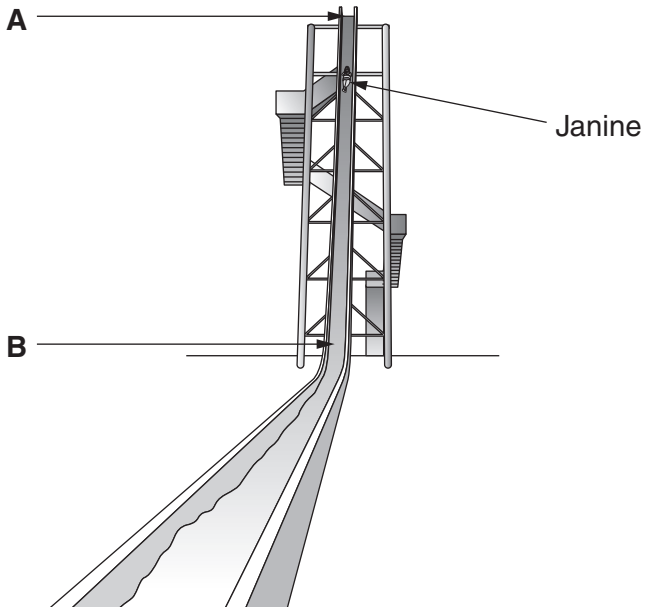
Sharon's car does not have paddle controls on the steering wheel.

How does using a paddle control help Tracey to drive more safely?

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

[Total: 3]

13 Janine is on a water slide.



(a) Janine has a mass of 50 kg.

She has 12 500 J of gravitational potential energy at the top of the slide.

Gravitational field strength (g) is 10 N / kg.

Calculate the height of the water slide.

The equations on page 2 may help you.

.....

.....

.....

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

(b) What happens to her gravitational potential energy as she moves from **A** to **B**?

.....

.....

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

Turn over for the remainder of question 13

(c) Janine's father has a mass of 90 kg and he is nearly twice her height.

Like Janine, he comes down the water slide lying flat on his back.

He travels slower down the water slide than Janine.

Explain why his speed is reduced.

.....

.....

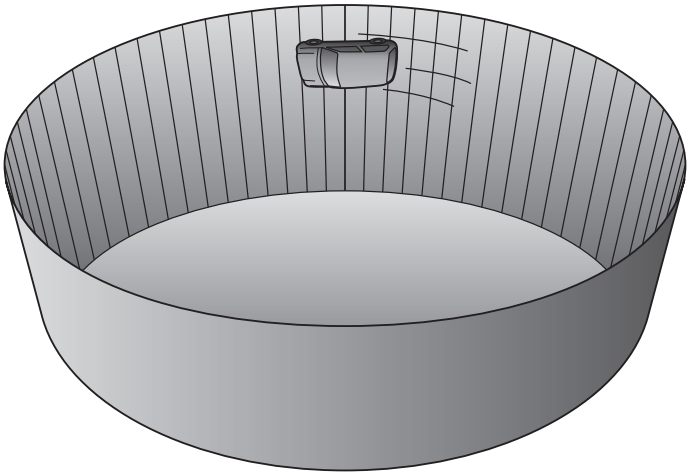
.....

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

[Total: 6]

14 This question is about speed and acceleration.

(a) A car drives in a circle around the wall of death. It travels at a constant speed.



Explain how the car can be **accelerating** as well as travelling at a **constant** speed.

.....

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

(b) A BMW car has an acceleration of 3.2 m/s^2.

How much time does it take to accelerate from 0 to 28 m/s?

The equations on page 2 may help you.

.....

.....

.....

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

(c) Air bags absorb energy in a car crash.

They reduce injuries by reducing the force of impact.

Explain how the **force** is reduced.

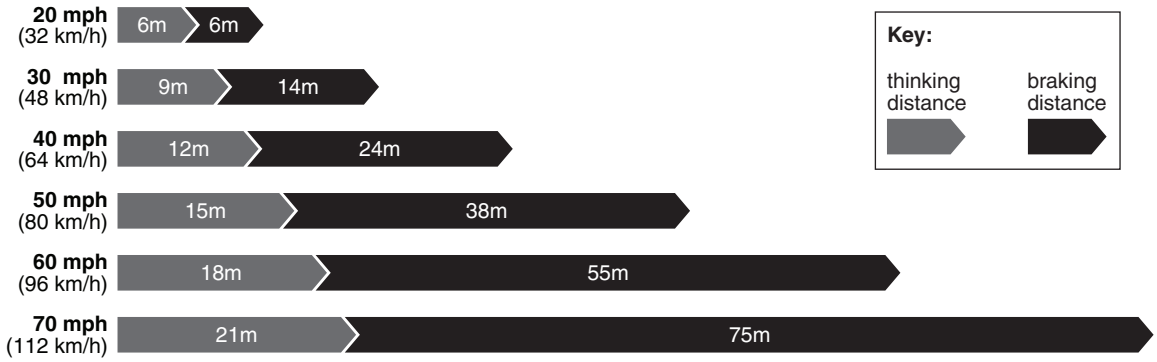
.....

.....

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

[Total: 4]

15 The diagram shows a chart from the Highway Code.



The braking distance for a car travelling at 30 mph is 14 m.

(a) What is the **braking** distance of a car travelling at 70 mph?

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

(b) What is the **stopping** distance of a car travelling at 70 mph?

Use the chart to calculate your answer.

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

(c) In dry conditions, car drivers are advised to leave at least a **two second** gap between them and the car in front.

Explain why the advice is to leave at least a **four second** gap when roads are wet.

.....

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

[Total: 3]

END OF QUESTION PAPER