

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
GATEWAY SCIENCE  
PHYSICS B**

**B651/01**

Unit 1 Modules P1 P2 P3  
(Foundation Tier)

**Wednesday 10 June 2009  
Afternoon**

**Duration: 1 hour**

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)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**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 **24** pages. Any blank pages are indicated.

**EQUATIONS**

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

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

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

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

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

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

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

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

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

3

Answer **all** the questions.

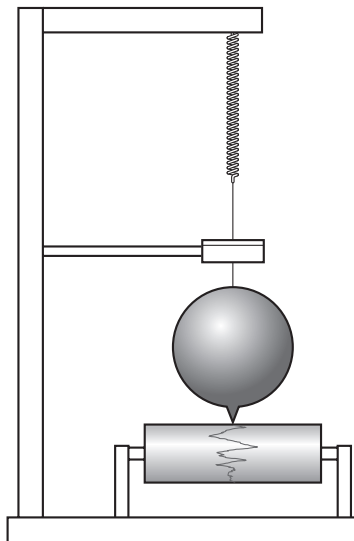
**Section A – Module P1**

1 Earthquakes produce shock waves.

These shock waves can cause damage.

(a) Scientists use a special instrument to measure the size of an earthquake.

Look at the diagram.



What is the name of the instrument?

Put a **ring** around the correct answer.

**joulemeter**

**endoscope**

**radiometer**

**seismometer**

[1]

(b) There are two types of shock wave.

These are called **p-waves** and **s-waves**.

(i) P-waves are **longitudinal** waves.

What **type** of wave is an s-wave?

..... [1]

(ii) P-waves travel through solids and liquids.

What will **s-waves** travel through?

..... [1]

(iii) The s-wave from an earthquake travels at a speed of 4000 m/s.

Suggest the speed of a p-wave.

Put a **ring** around the correct answer.

**10 m/s**

**300 m/s**

**3000 m/s**

**4000 m/s**

**6000 m/s**

[1]

[Total: 4]

2 (a) Mel is on holiday.

She has taken her laptop computer with her.

She uses her laptop to send emails.

The laptop uses **wireless** technology.

Write about the **advantages** of wireless technology.



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

(b) At home Mel uses a mouse to control her laptop.

The mouse uses infrared radiation.

(i) She points her mouse away from the laptop. It still works. Why?

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

The infrared radiation is absorbed by the walls of her room.

The infrared radiation is digitalised by the walls of her room.

The infrared radiation is reflected by the walls of her room.

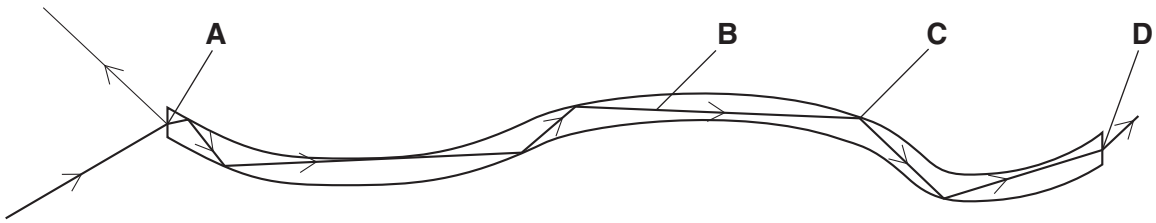
The infrared radiation is refracted by the walls of her room.

[1]

(ii) Write down one **other** household device controlled using infrared radiation.

..... [1]

(iii) Infrared radiation can be transmitted along an optical fibre.



Which point shows total internal reflection?

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

answer .....

[1]

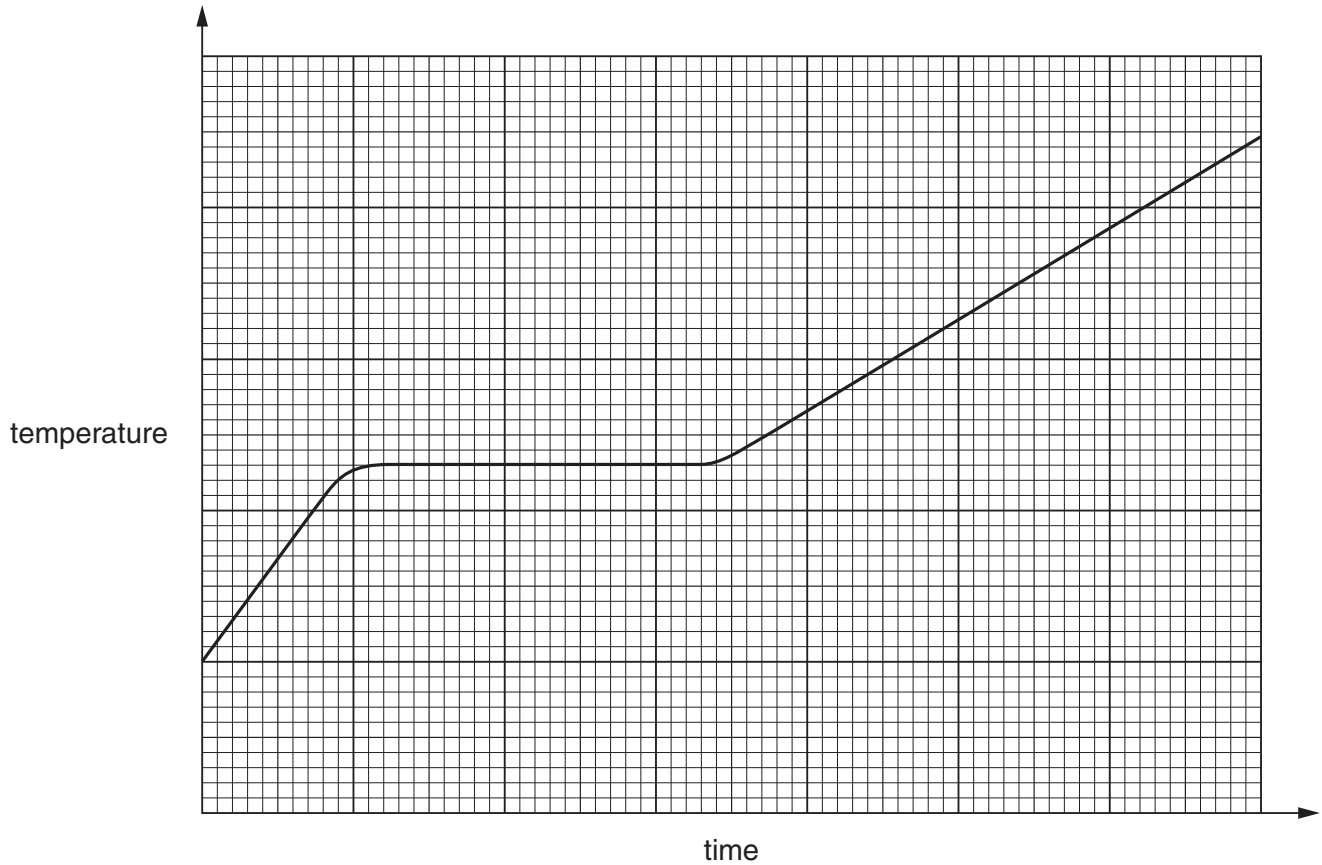
[Total: 5]

3 Jack heats a beaker containing some ice.

He measures the temperature of the contents of the beaker every 30 seconds and records the results.

He draws a graph to show how the temperature changes.

This is his graph.



(a) (i) Write the letter **M** on the graph to show clearly when the ice is melting. [1]

(ii) Explain why you have written the letter **M** here.

..... [1]

(b) What is the unit of temperature?

..... [1]

8

(c) Complete the sentence. Choose words from this list.

**energy**

**mass**

**state**

**temperature**

**time**

The specific latent heat of ice is the ..... needed to change 1 kg of ice  
into water without a change in .....

**[2]**

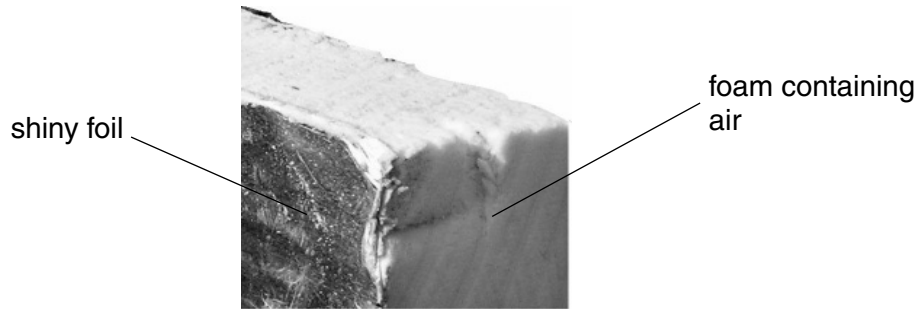
**[Total: 5]**



4 Foam is used to reduce energy loss from a home.

Blocks of foam are put in the cavity wall.

They are placed between the outer and inner walls.



(a) Why does **air** in the foam help to prevent energy loss?

..... [1]

(b) What does the shiny foil do to infrared waves?

..... [1]

(c) What type of energy transfer does shiny foil reduce?

Put a **ring** around the correct answer.

**conduction**

**convection**

**dispersion**

**radiation**

[1]

(d) Energy loss from different parts of a home can be reduced in a number of ways.

Finish the table by suggesting how energy loss can be reduced.

The first one has been done for you.

energy loss from	can be reduced by
walls	cavity wall insulation foam
floors	
windows	
loft	

[3]

[Total: 6]

Turn over

Section B – Module P2

- 5 (a) Photocells change the energy from the Sun into electricity.

The Sun's energy can be changed into useful energy in other ways.

Write down one **other** way.

..... [1]

- (b) The Sun's energy will not run out for billions of years.

Its energy will always be available.

Complete the sentence.

Some energy sources do **not** run out.

Scientists call these ..... energy sources. [1]

[Total: 2]

6 (a) Look at the list of stages in the production and distribution of electricity.

They are **not** in the correct order.

- A electricity is generated
- B electricity is sent along power lines to consumers
- C consumers such as homes, factories and farms use electricity
- D fuels such as oil and coal are burnt in a power station

Complete the boxes below to put the stages in the correct order.

first stage

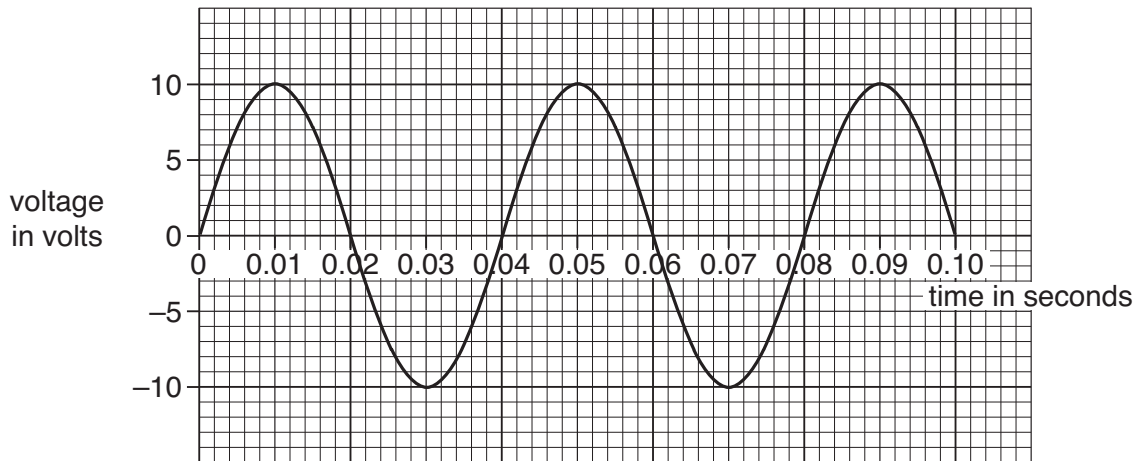
second stage

third stage

fourth stage

[2]

(b) Look at the graph of the output from a transformer.



(i) What is the peak output voltage?

answer ..... volts [1]

(ii) How long does it take for one complete cycle of alternating current (AC)?

answer ..... seconds [1]

[Total: 4]

7 Fuels are energy sources.

(a) Oil and natural gas are **fossil** fuels.

(i) Write down the name of one **other** fossil fuel.

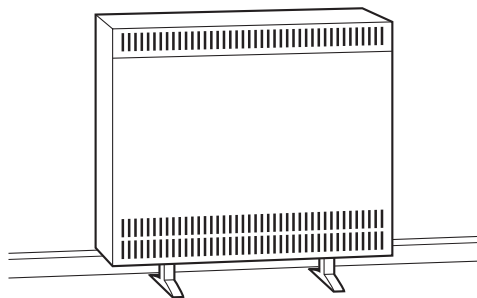
..... [1]

(ii) Wood is a **renewable** fuel.

Write down the name of one **other** renewable fuel.

..... [1]

(b) Sian has an electric heater.



The heater is connected to the 230 volt mains.

When it is switched on, a current of 13 amps passes through the heater.

Calculate the power of the heater.

The equations on page 2 may help you.

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

answer ..... watts [2]

[Total: 4]

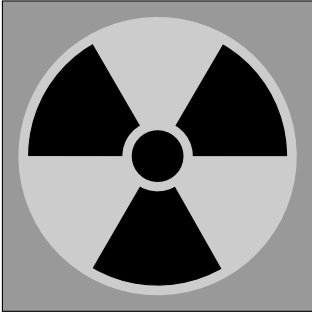
8 The three types of nuclear radiation are alpha ( $\alpha$ ), beta ( $\beta$ ) and gamma ( $\gamma$ ).

(a) Draw a straight line from each **radiation** to its correct **use**.

radiation	use
alpha	sterilising equipment
beta	paper thickness gauge
gamma	smoke detectors

[2]

(b) Look at the safety information about nuclear radiation.



- Do not touch radioactive sources
- Hold radioactive sources using tongs
- Wear protective clothing when using radioactive sources

Describe **one** harmful effect of nuclear radiation.

.....

..... [1]

[Total: 3]

9 (a) The Earth orbits the Sun.

Artificial satellites orbit the Earth.

Write down one **use** of artificial satellites.

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

(b) Write down the name of one **natural** satellite that orbits the Earth.

..... [1]

(c) Spacecraft are used to explore the Solar System.

Spacecraft can be manned or unmanned.

It can be easier and cheaper to use **unmanned** spacecraft.

Give reasons why.

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

[Total: 4]

10 (a) Asteroids orbit the Sun.

Most asteroids are between Mars and Jupiter.

What is an asteroid made of?

Choose from:      **dust**      **gas**      **ice**      **rock**

answer ..... [1]

(b) Scientists are studying near-Earth objects (NEO).

Which one of the following best describes an NEO?

- A** They are asteroids or comets that may collide with Earth.
- B** They are planets that may collide with Earth.
- C** They are shooting stars that may collide with Earth.
- D** They are galaxies that may collide with Earth.

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

answer ..... [1]

(c) The Universe started its life with the Big Bang.

How does a star start its life?

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

[Total: 3]

Section C – Module P3

11 This question is about measuring speeds.

(a) David and Jo measure the speed of cars as they go past their school.

(i) What equipment do they use to measure **distance**?

..... [1]

(ii) What equipment do they use to measure **time**?

..... [1]

(b) A speed camera uses radar to detect when a car is speeding.

There are lines painted on the road in front of the camera to measure distance.

The camera takes **two** photographs of a speeding car as it passes over the lines to confirm the speed.





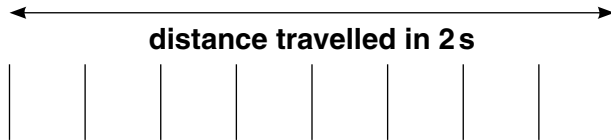
Mr Green is accused of speeding. The speed limit is 13.5 m/s (30 mph).

He is shown the two photographs taken by the speed camera.

The time between the photographs is 2 s.

The distance between each of the lines on the road is 4 m.

The photographs show that his car passed over 9 lines in the time between when the two photographs were taken.



Calculate the speed of his car.

The equations on page 2 may help you.

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

answer ..... m/s

[3]

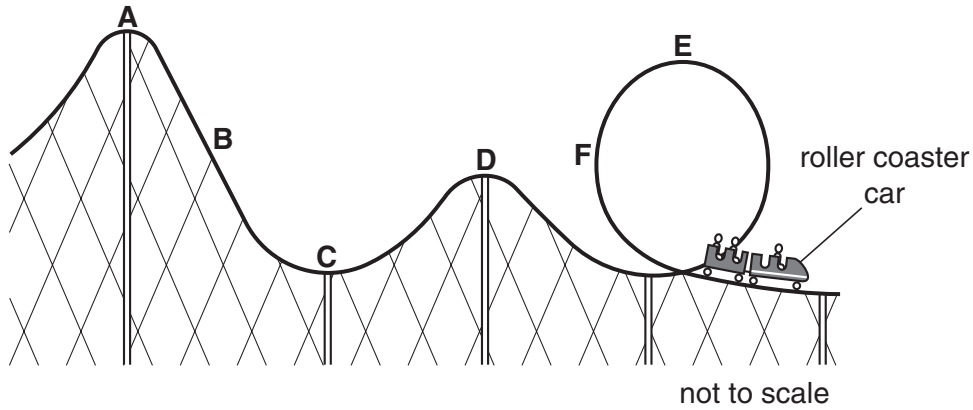
[Total: 5]

12 Mark rides on a roller coaster.

The roller coaster car is lifted to the top of the ride.

It is then released at point **A**.

The diagram shows the roller coaster with the car at the end of the ride.



(a) Where does the car have the most gravitational potential energy?

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

answer .....

[1]

(b) Where is the car moving fastest?

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

answer .....

[1]

(c) At maximum speed the kinetic energy of the car is 200 kJ.

More people then get into the car.

The total **mass** doubles.

The maximum speed stays the same.

What is the maximum kinetic energy now?

answer ..... kJ

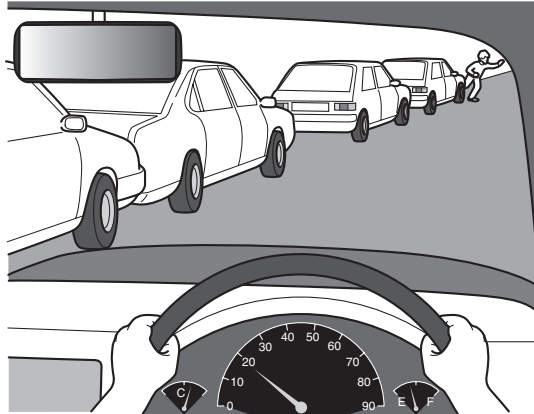
[1]

[Total: 3]

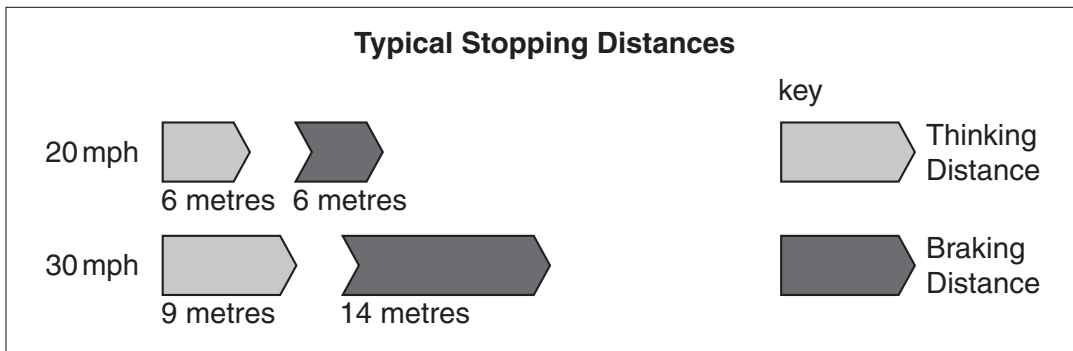
13 Mrs Brown is driving her car slowly because she is near a school.

A child runs out into the road.

The car stops safely.



The chart shows typical stopping distances when a car is travelling in a town.



(a) At 20 mph, Mrs Brown's thinking distance is 6 metres.

Her braking distance is also 6 metres.

(i) What is meant by **thinking** distance?

..... [1]

(ii) What is meant by **braking** distance?

..... [1]

(iii) Calculate the car's **stopping** distance.

..... [1]

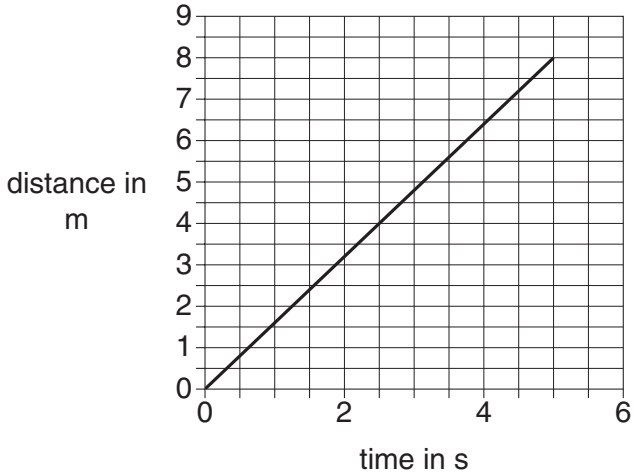
(b) Mrs Brown continues her journey.

The car changes speed from 0 m/s to 8 m/s.

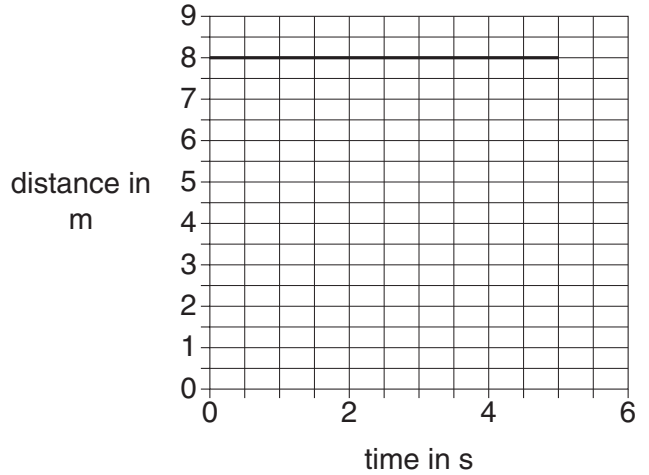
(i) What do we call a change in speed? ..... [1]

(ii) Look at the graphs.

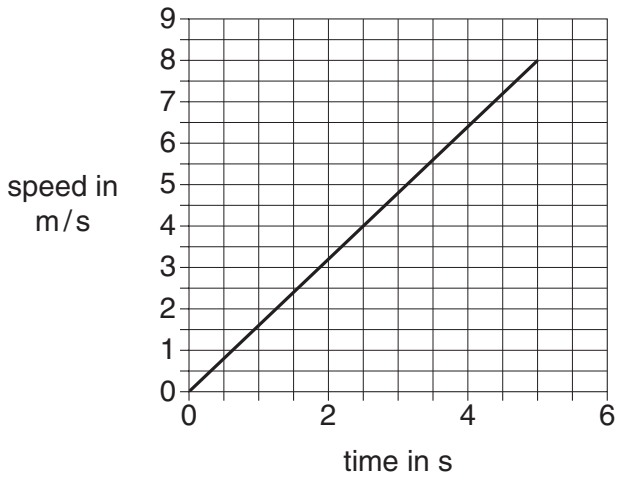
**A**



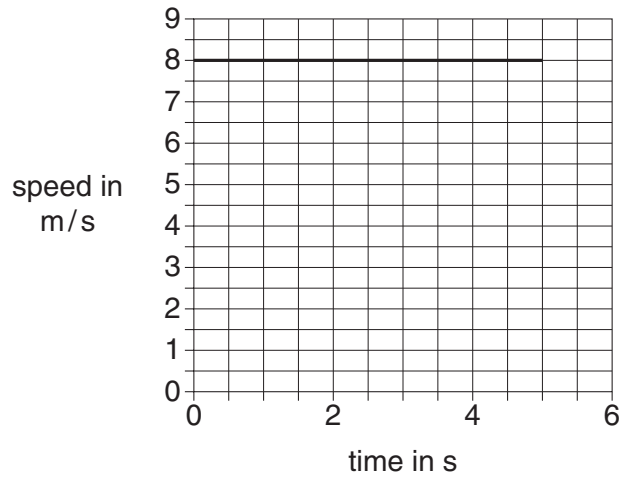
**B**



**C**



**D**



Which graph, **A**, **B**, **C** or **D**, shows this change in speed?

answer ..... [1]

[Total: 5]

14 Modern cars have air bags and seat belts.

A car is in a crash.



Describe how both the airbag **and** the seat belt reduce injuries.

.....

.....

..... [2]

[Total: 2]

15 Steve is a member of the Red Devils free fall display team.



- (a) What happens to Steve's speed when he first jumps out of the aeroplane?  
..... [1]
- (b) What force causes him to fall to the ground?  
..... [1]
- (c) Air resistance (drag) acts on Steve as he falls.
  - (i) What effect does air resistance have on Steve as he falls?  
..... [1]
  - (ii) How can Steve change the position of his body to reduce air resistance?  
..... [1]
- (d) Steve gets nearer to the ground.  
He needs to slow down.  
What does Steve do to slow down?  
..... [1]

[Total: 5]

**END OF QUESTION PAPER**

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