

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

B721/01

**GATEWAY SCIENCE
ADDITIONAL SCIENCE B**

**Additional Science modules B3, C3, P3
(Foundation Tier)**

TUESDAY 10 JUNE 2014: Afternoon

**DURATION: 1 hour 15 minutes
plus your additional time allowance**

MODIFIED ENLARGED 24pt

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**Candidates answer on the Question Paper.
A calculator may be used for this paper.**

OCR SUPPLIED MATERIALS:

Periodic Table

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. 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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).

INFORMATION FOR CANDIDATES

The quality of written communication is assessed in questions marked with a pencil ().

A list of equations can be found on pages 4–5.

The Periodic Table is provided separately.

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.

Any blank pages are indicated.

EQUATIONS

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

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

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

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

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

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

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

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

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

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

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

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

power = force × speed

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

momentum = mass × velocity

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

GPE = mgh

$mgh = \frac{1}{2}mv^2$

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

Answer ALL the questions.

SECTION A – Module B3

1 This question is about blood and circulation.

(a) (i) The blood has parts that do different jobs.

Finish the table by writing in the name of the part of the blood which does each job.

One has been done for you.

Job	Part of the blood
transports food	plasma
clots blood	
carry oxygen	

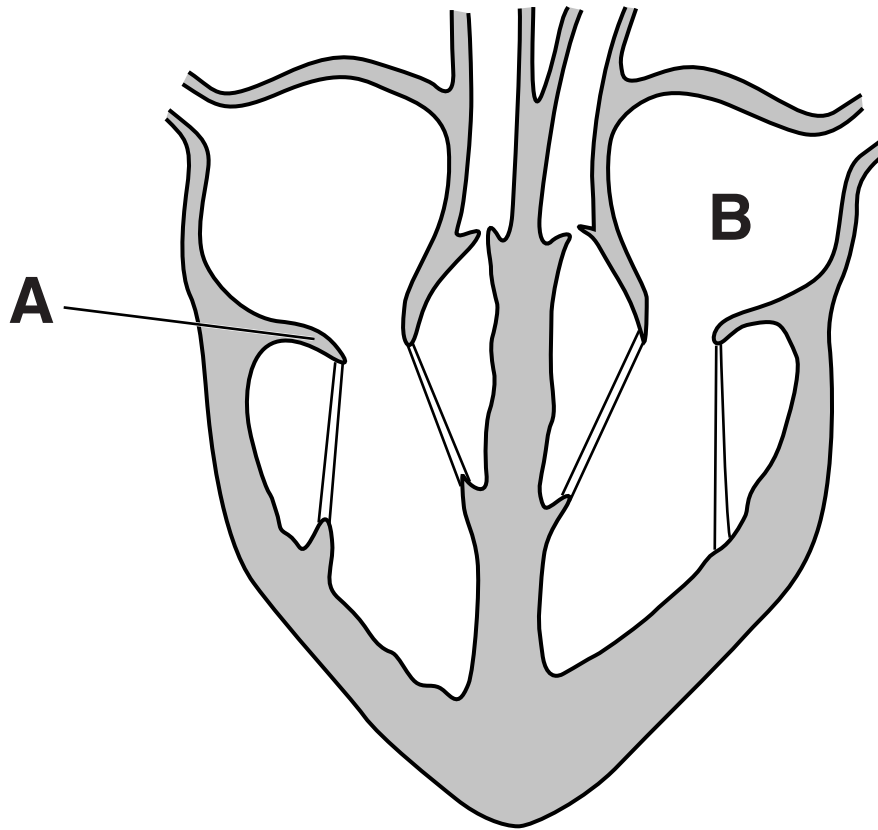
[2]

(ii) A person cuts their hand and it gets infected.

The person's cells will need to divide. Explain why

[2]

(b) Look at the diagram of a heart.



(i) Write down the names of A and B.

A _____

B _____

[2]

(ii) The heart pumps blood out of both the left and right sides.

Describe where the blood goes when it leaves EACH side of the heart.

[2]

[TOTAL: 8]

2 This question is about enzymes.

Enzymes are proteins.

(a) There are other examples of proteins.

Look at the list below.

Put ticks (✓) in the boxes next to TWO proteins.

amino acid

☐

cellulose

☐

glucose

☐

haemoglobin

☐

insulin

☐

lactic acid

☐

[2]

(b) Cells need energy to make proteins.

Write down the name of the reaction that provides cells with energy.

_____ **[1]**

(c) Pepsin and trypsin are enzymes in the digestive system that break down proteins.

In the stomach, the pH is between 1 and 2.

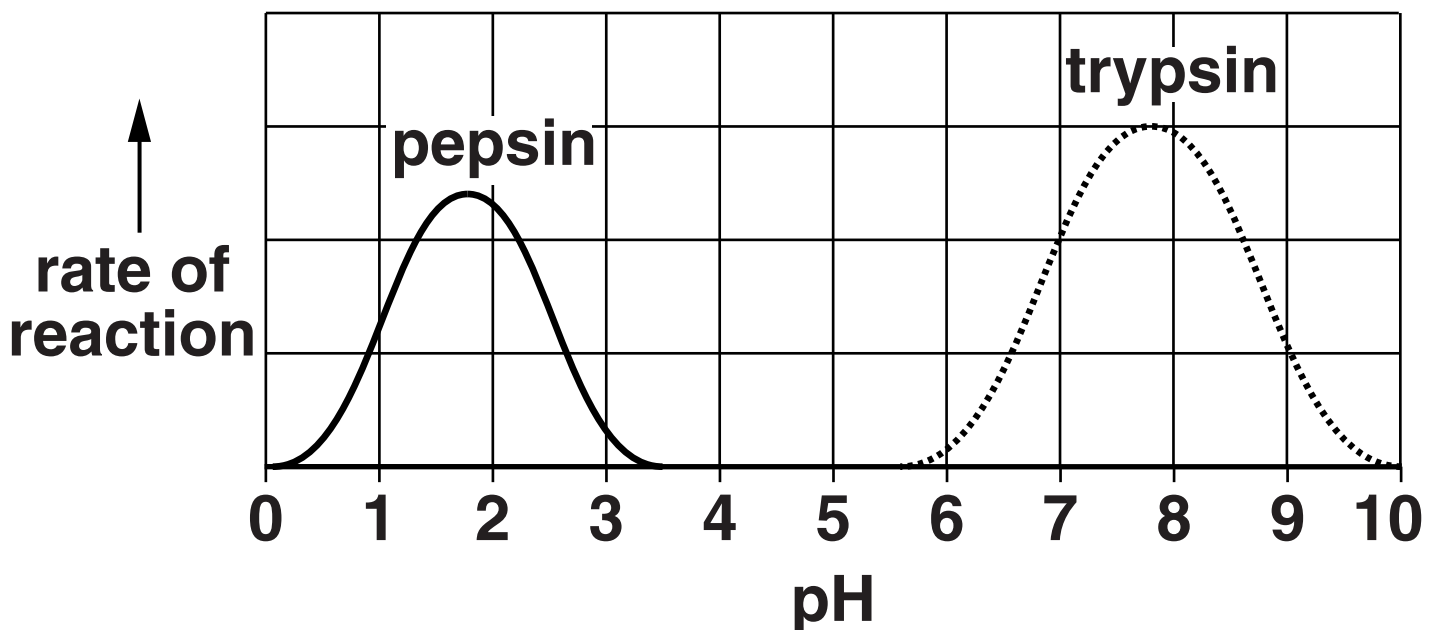
In the small intestine, the pH is between 7 and 8.

Look at the graph below.

It shows the rate of reaction of these enzymes when the pH is changed.

Pepsin works in the stomach.

Trypsin works in the small intestine.



Pepsin stops working when it reaches the small intestine.

Trypsin will NOT work in the stomach.

Explain these two observations.

Use data from the graph in your answer.

[3]

[TOTAL: 6]

3 This question is about genetic engineering.

A crop of corn is growing in a field.

Farmers try to produce the largest crop of corn.

The corn plants grow tall and need space between rows.

Weeds grow in the spaces and insects quickly spread and damage the crop.

Farmers usually spray their crops with chemicals to kill the weeds and insects.

Scientists can genetically engineer corn plants to improve them.

Write about the FEATURES that would be useful to add to the corn plant.

Suggest advantages AND risks from genetically engineered corn.



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

[6]

[TOTAL: 6]

4 Look at the graph below.

It shows the average height for males and females at different ages.

Key

— male

----- female



(a) Describe the pattern of growth in males.

[2]

(b) What is the maximum difference in height between males and females of the same age?

cm [1]

(c) An average 12 year old female needs MORE protein in her diet than an average 12 year old male.

Explain why.

[2]

[TOTAL: 5]

SECTION B – Module C3

5 This question is about different forms of carbon.

(a) Diamond is one form of carbon.

One PHYSICAL PROPERTY of diamond is that it is colourless.

Write about TWO OTHER physical properties of diamond.

[2]

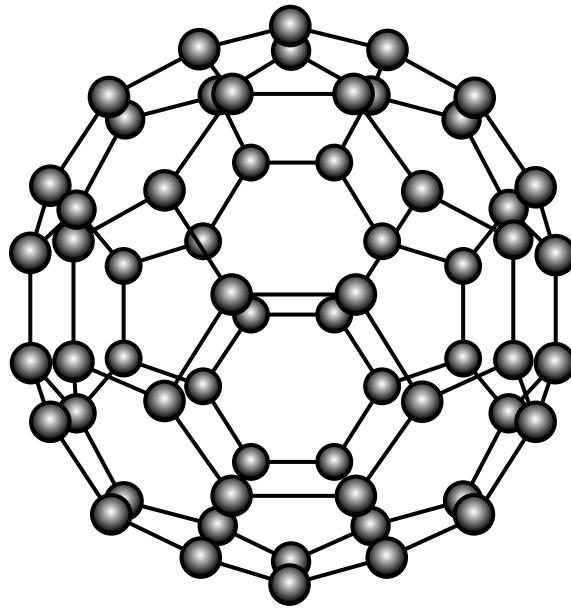
(b) Graphite is another form of carbon.

Graphite is used in pencil leads.

Explain why graphite is used in pencil leads.

[1]

- (c) Another form of carbon was first made in a laboratory over 25 years ago.**



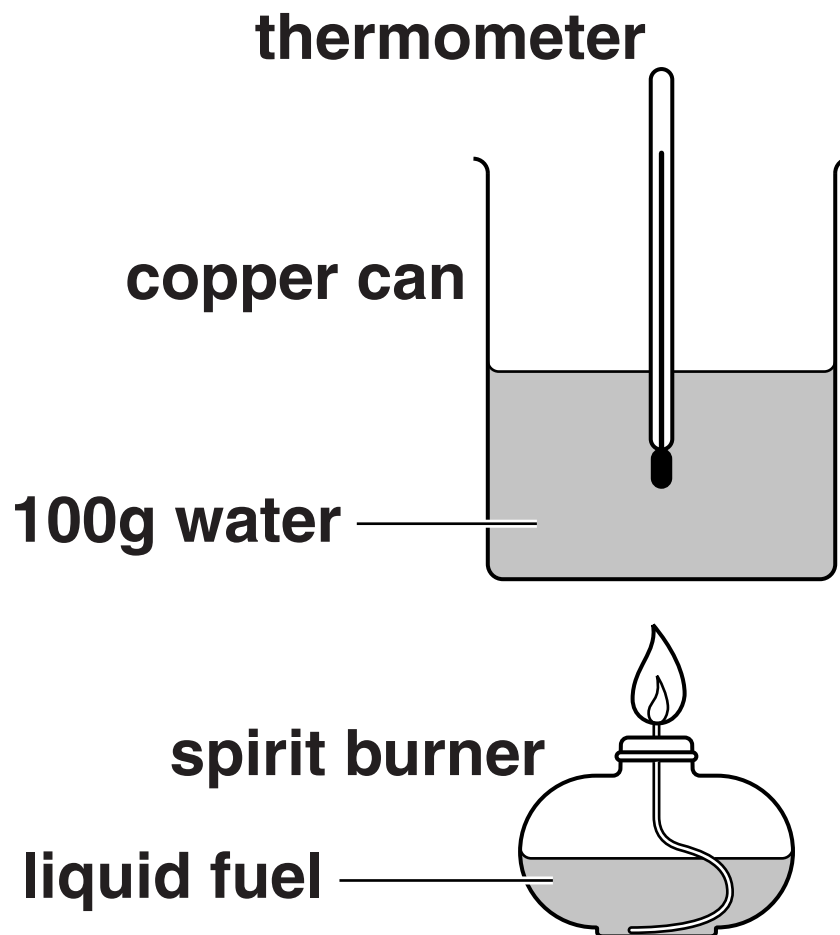
Write down the NAME of this form of carbon shown above.

_____ **[1]**

[TOTAL: 4]

6 Tim and Liz investigate the energy transferred by three different fuels.

Look at the diagram. It shows the apparatus they use.



- (a) Tim and Liz want to make their experiment a fair test.**

Write down TWO ways that help them to do this.

[2]

- (b) When fuels burn, energy is given out as heat.**

What is the name of the type of reaction that gives out heat?

Choose from the list below.

CATALYSED

CONTINUOUS

ENDOTHERMIC

EXOTHERMIC

answer _____ **[1]**

(c) Tim and Liz record their results in a table.

Fuel	Start temperature of water in °C	Final temperature of water in °C
ethanol	20	35
propanol	22	40
butanol	19	40

(i) Look at their results.

**Which fuel transfers MOST
energy to the water?**

Explain your answer.

[2]

(ii) Look at the results for PROPANOL.

Tim and Liz used 1.0 g of propanol to heat 100 g of water.

Calculate the energy supplied to the water by the propanol.

energy transferred = mass \times specific heat capacity \times temperature change

The specific heat capacity of water is 4.2 J/g °C.

Write your answer to TWO SIGNIFICANT FIGURES.

answer _____ J [2]

[TOTAL: 7]

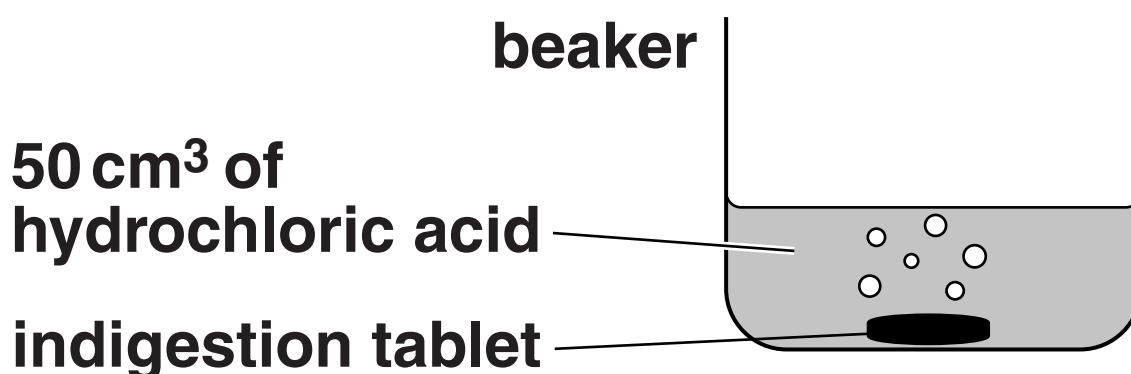
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7 This question is about rates of reaction.

Chris investigates indigestion tablets.

Indigestion tablets neutralise acids.

He adds an indigestion tablet to 50 cm³ of hydrochloric acid.



(a) The indigestion tablet contains calcium carbonate.

Calcium carbonate reacts with hydrochloric acid.

Calcium chloride, water and carbon dioxide are made.

Write the WORD equation for this reaction.

[1]

- (b) Chris measures the time it takes for the indigestion tablet to react completely.**

This is called the reaction time.

Look at his results opposite.

- (i) In EXPERIMENT 1 the reaction stops after 17 seconds.**

Explain why the reaction stops.

_____ **[1]**

- (ii) EXPERIMENTS 2 and 3 show that the volume of acid does not affect the reaction time.**

Explain how the results of EXPERIMENTS 2 and 3 show this.

_____ **[1]**

Experiment	Volume of acid in cm³	Relative concentration of acid	Temperature of acid in °C	Time for tablet to react in seconds
1	50	2.0	40	17
2	100	2.0	20	68
3	50	2.0	20	68
4	50	1.0	20	100

(iii) Chris uses his table of results to make a conclusion.

He says that “Increasing the TEMPERATURE of the acid DECREASES the reaction time”.

Which experiments support his conclusion?

Explain, using the reacting particle model, why INCREASING the temperature DECREASES the reaction time.



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

[6]

[TOTAL: 9]

- 8 Aspirin is a painkiller used to treat headaches and reduce fevers.**

A pharmaceutical company makes aspirin using the following reaction.

**salicylic acid + ethanoic anhydride →
aspirin + ethanoic acid**

- (a) A scientist reacts 6.9 g salicylic acid with 5.1 g of ethanoic anhydride.**

She makes 3.0 g of ethanoic acid and some aspirin.

Calculate the mass of aspirin that she makes. Use the principle of conservation of mass.

**mass of aspirin _____g
[2]**

(b) Another scientist at the company makes some aspirin.

His reaction does not make all the product he expects.

This is due to experimental loss of product.

What percentage yield indicates the GREATEST experimental loss?

Choose from the list below.

30%

50%

75%

100%

answer _____ [1]

(c) Look at these word equations for two reactions.

REACTION 1

**salicylic acid + ethanoic anhydride →
aspirin + ethanoic acid**

Ethanoic acid is a waste product in this reaction.

REACTION 2

carbon dioxide + hydrogen → methanol

Comment on the ATOM ECONOMY of each reaction.

Explain your answer.

[2]

[TOTAL: 5]

SECTION C – Module P3

9 This question is about a car stopping.

(a) Look at the description.

The distance travelled between the need to brake and the brakes starting to act.

Put a tick (✓) next to the name of this distance.

braking distance

☐

stopping distance

☐

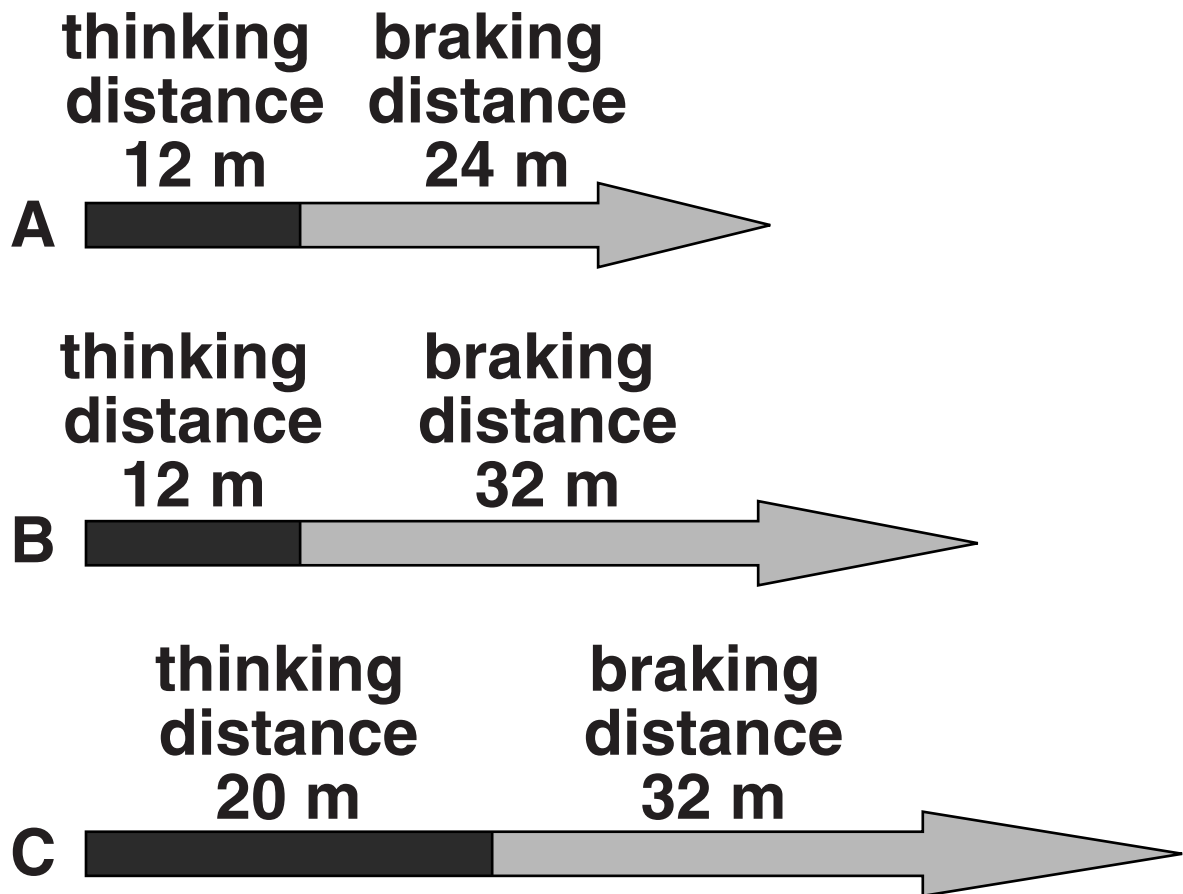
thinking distance

☐

[1]

(b) Look at diagrams A, B and C.

They show three stopping distances for the same car.



- (i) What is the LONGEST stopping distance shown in the diagrams?**

Choose your answer from

20 m

32 m

52 m

640 m

_____ **[1]**

- (ii) On two different days, the car travels along the same road at the same speed.**

The stopping distances for these two days are shown in diagram B and diagram C.

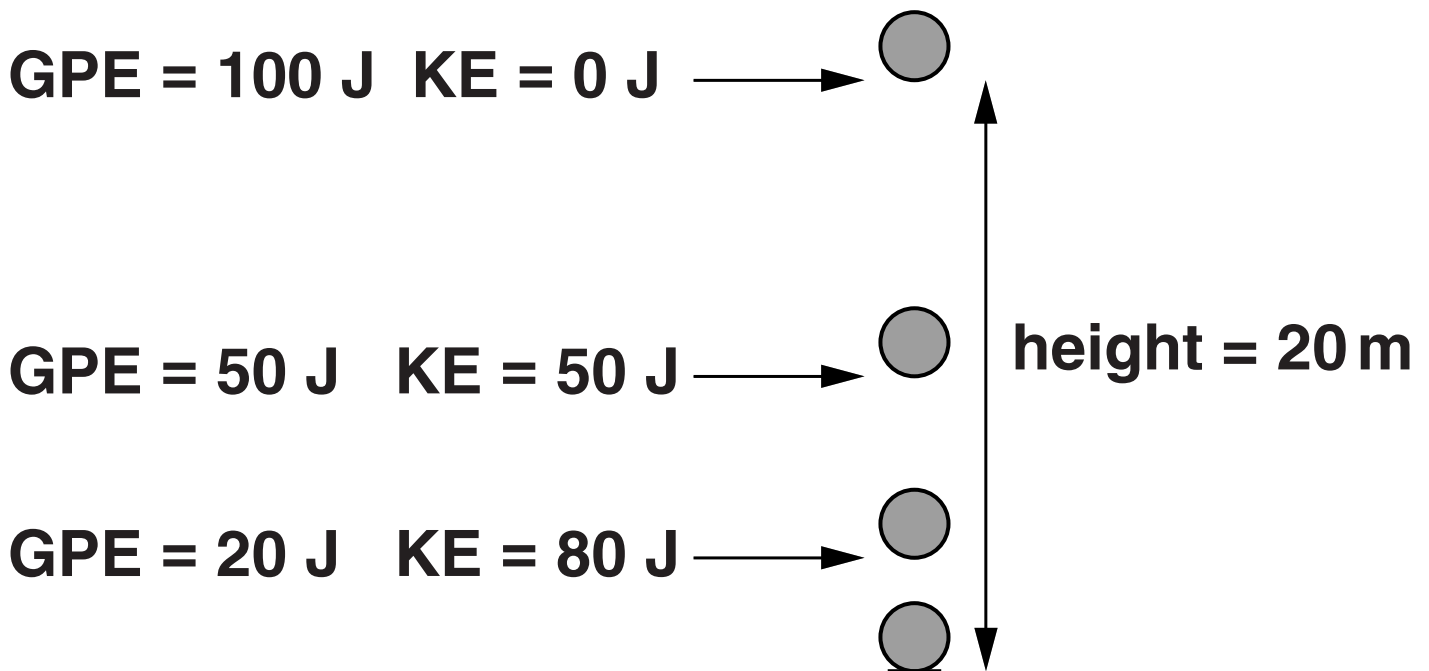
Name one factor that may have caused the change in the STOPPING DISTANCE shown between diagram B and diagram C.

_____ **[1]**

[TOTAL: 3]

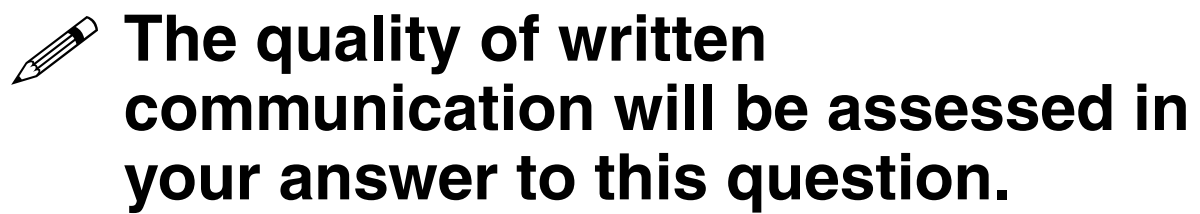
10 This question is about gravitational potential energy (GPE) and kinetic energy (KE).

Look at the diagram and information about a small ball falling from a height of 20 m.



Explain the changes in GPE and KE and describe what would happen to the GPE and KE if the mass of the ball was doubled.

Use equations to help explain your answer.



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

[6]

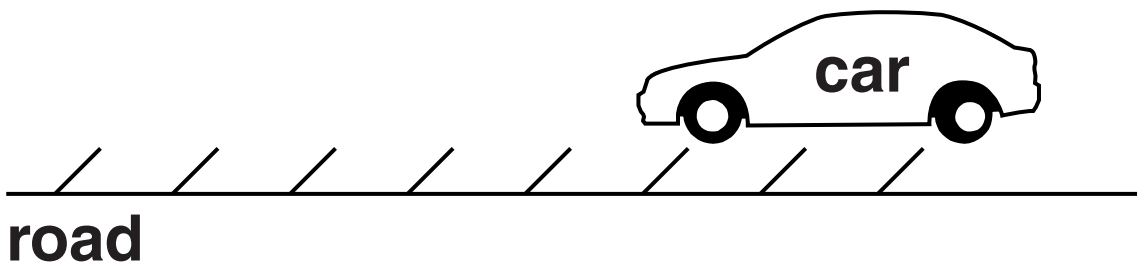
[6]

[TOTAL: 6]

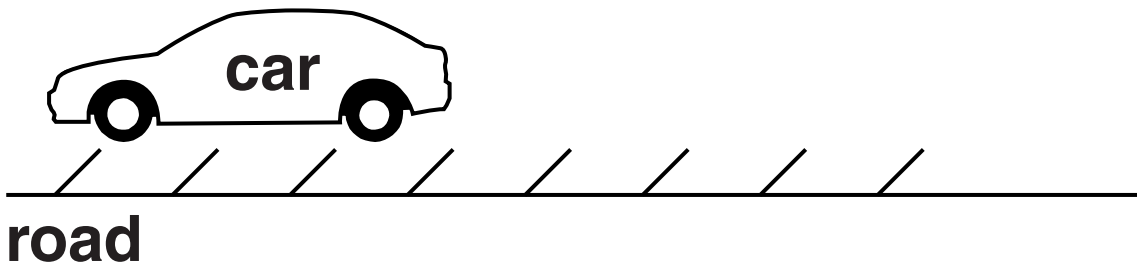
11 There are different types of speed cameras.

One type of speed camera takes two photographs of a car travelling along a road with lines marked on the side of the road.

photograph 1



photograph 2



(a) Why is it important for the photographs to show the lines on the road?

_____ [1]

(b) The time between the photographs is always 0.5 seconds.

(i) It is important for the time between each photograph to be checked regularly.

Explain why.

[2]

(ii) Suggest why a longer time of 4 seconds is NOT used in these cameras.

[1]

(c) Look at the data collected from this type of speed camera.

Car	Time between photographs in seconds	Distance travelled in m
A	0.5	4.4
B	0.5	5.0
C	0.5	6.2
D	0.5	3.8
E	0.5	4.2

The speed limit on the road is 9 m/s.

(i) Is car A speeding?

Explain your answer using a calculation.

[2]

(ii) How many cars are speeding?

Choose your answer from

1 CAR

2 CARS

3 CARS

4 CARS

5 CARS

_____ **[1]**

[TOTAL: 7]

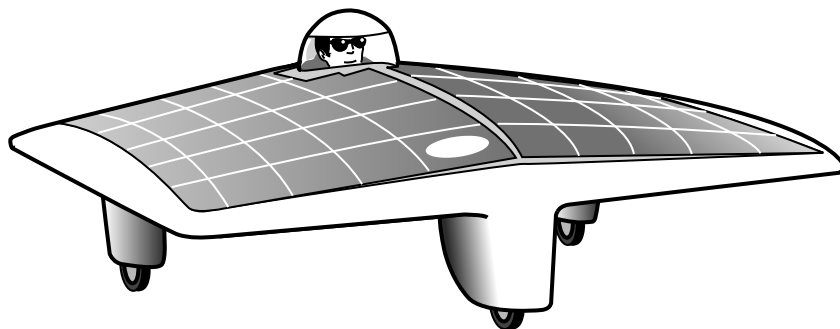
12 Cars need a source of energy to move.

(a) Write down the names of TWO fossil fuels used in cars.

_____ and _____ [1]

(b) Solar powered cars do NOT use fossil fuels.

Look at the picture of a solar powered car.



(i) How do solar powered cars get their energy?

_____ [1]

- (ii) This solar powered car races across Australia from Darwin to Adelaide.**



It takes 5 days for the solar powered car to reach the finish.

Suggest TWO reasons why it takes a long time.

[2]

- (iii) To win the race, the solar powered car must travel at the highest possible top speed.**

Describe how technology can be used to increase the top speed of the car.

In your answer consider the risks this has for the driver.

[2]

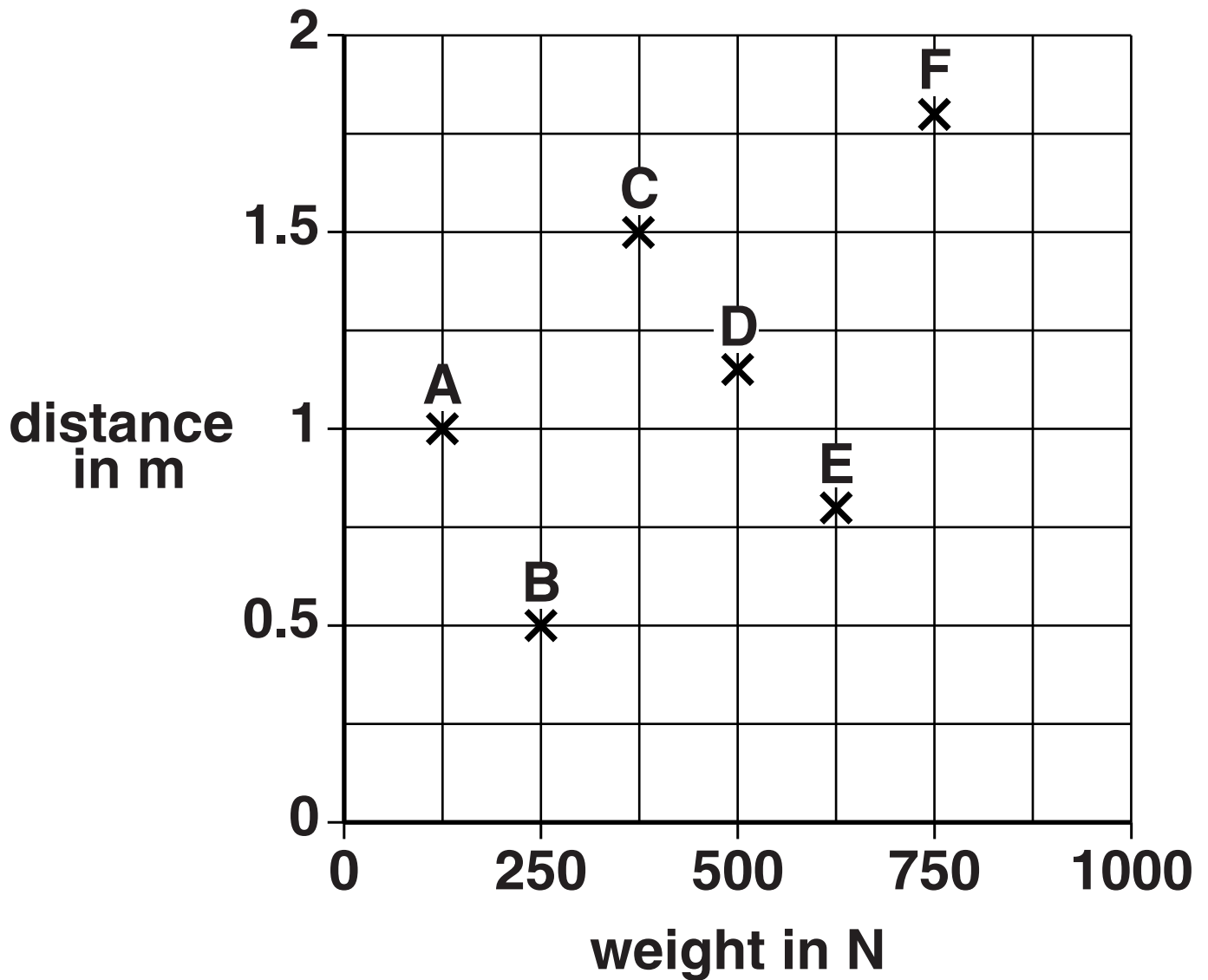
[TOTAL: 6]

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13 Deng is a weightlifter.

She lifts six different weights.

The plots on the graph show the distance she lifts each weight.



Deng does work to lift each weight.

For which lift did Deng do the most work?

Choose from A, B, C, D, E or F.

Lift _____

Use the graph and a calculation to explain your answer.

[3]

[TOTAL: 3]

END OF QUESTION PAPER



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