Specimen paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
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10	
11	
12	
13	
14	
15	
16	
TOTAL	

General Certificate of Secondary Education
Foundation Tier

Additional Science 1
Unit 5

F

For this paper you must have:
- a ruler
- the Chemistry Data Sheet (enclosed)
- the Physics Equation Sheet (enclosed).

You may use a calculator.

Time allowed
- 90 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

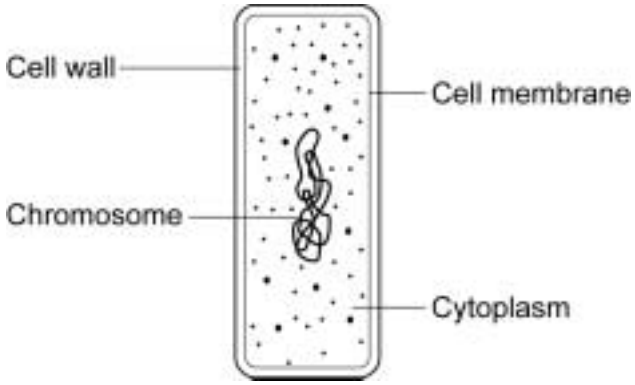
Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 16(b) should be answered in continuous prose. In this question you will be marked on your ability to:
  –use good English
  –organise information clearly
  –use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

Biology questions

1 The drawing shows the cell of a bacterium.



1 (a) **List A** gives the three structures labelled on the diagram.

List B includes information about each structure.

Draw **one** line from each structure in **List A** to the correct information about the structure in **List B**.

List A Structure	**List B Information**
Cell membrane	controls the passage of substances in and out of the cell
Cell wall	where most of the chemical reactions take place
Cytoplasm	strengthens the cell
Chromosome	where there are genes
	helps the bacterium to move

(4 marks)

1 (b) Give **two** differences between an animal cell and the cell of a bacterium.

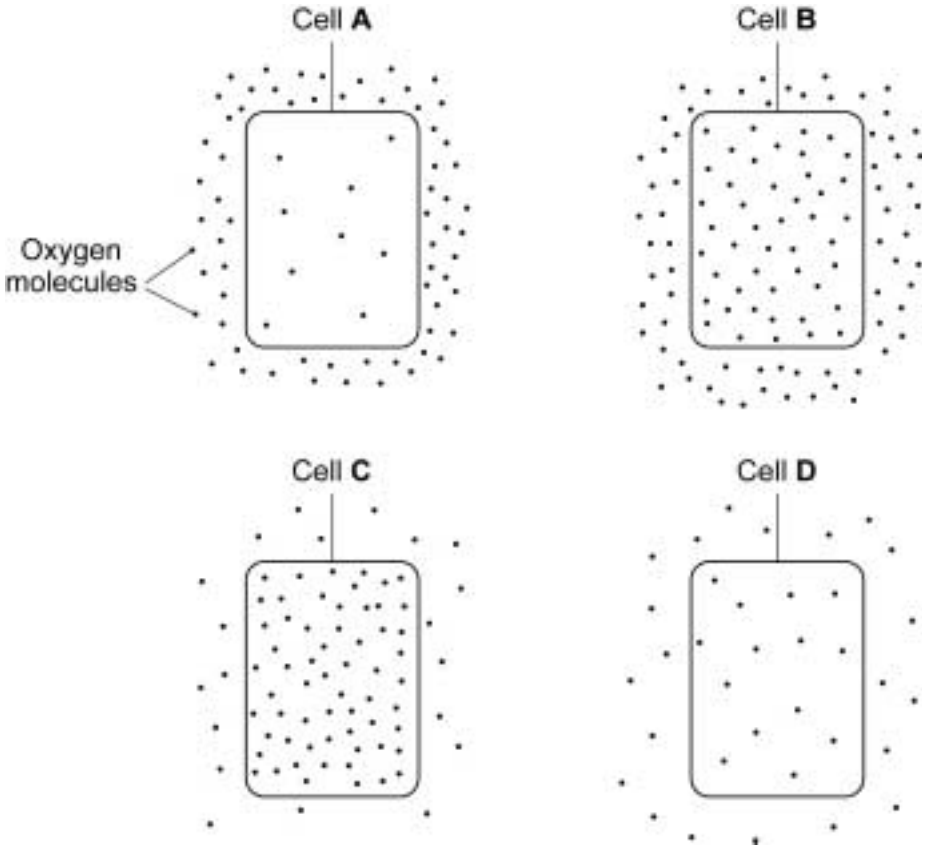
1 .....

2 .....

(2 marks)

1 (c) The diagrams show cells containing and surrounded by oxygen molecules.

Oxygen can move into cells or out of cells.



Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

Write the correct letter, **A**, **B**, **C** or **D**, in the box. ☐

(1 mark)

1 (d) Complete the following sentence.

Oxygen is taken into the cell by the process of ..... .

(1 mark)

8

Turn over▶

2 Plants and animals have tissues which carry out different functions.

List A gives three tissues in living organisms.

List B includes information about each tissue.

Draw **one** line from each tissue in **List A** to the correct information about the tissue in **List B**.

List A **Tissue**	**List B** **Information**
	Transports substances around a plant
Muscular	
	Covers roots, stems and leaves
Xylem	
	Contracts to cause movement
Glandular	
	Produces enzymes

(3 marks)

3

Turn over for the next question

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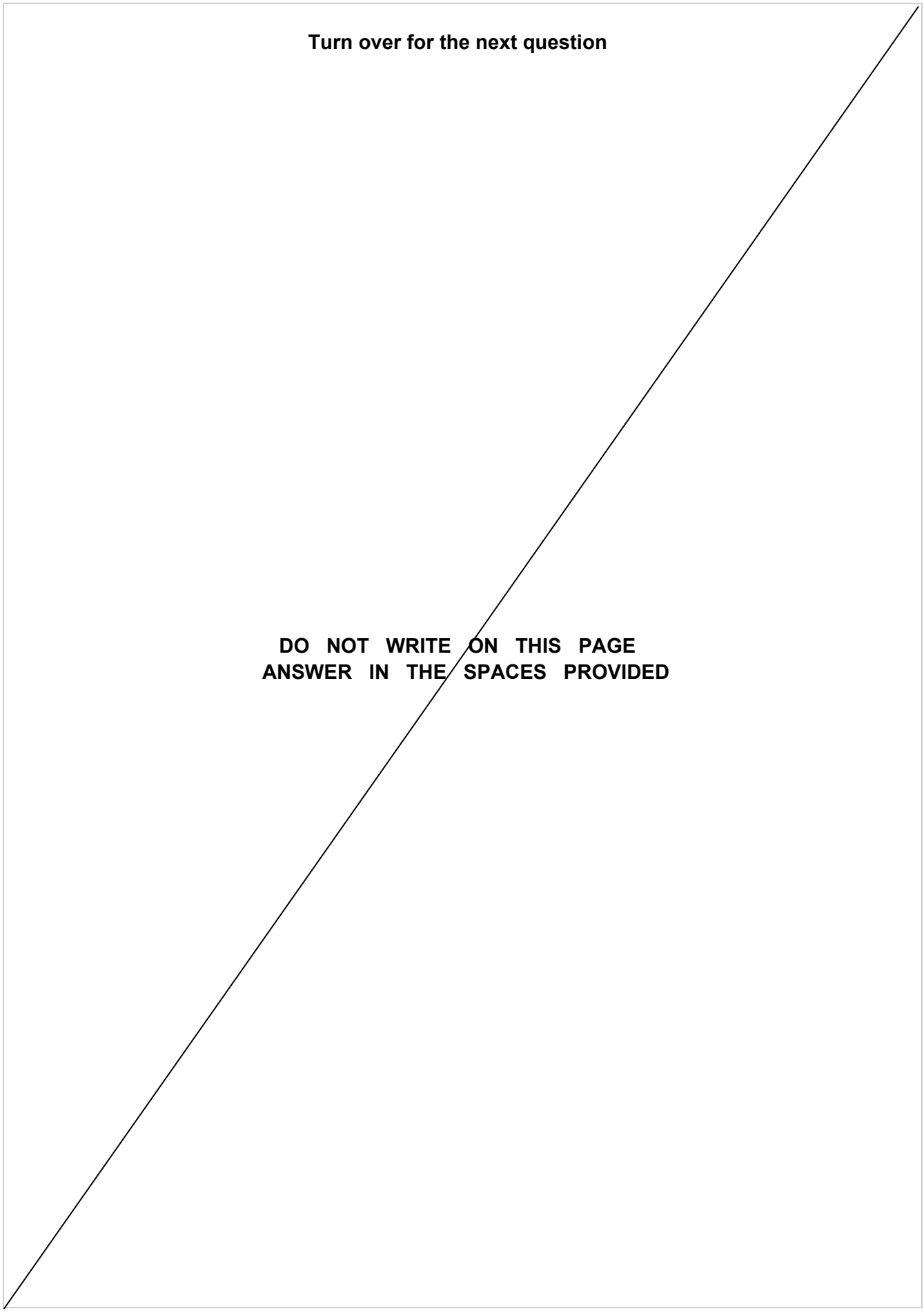
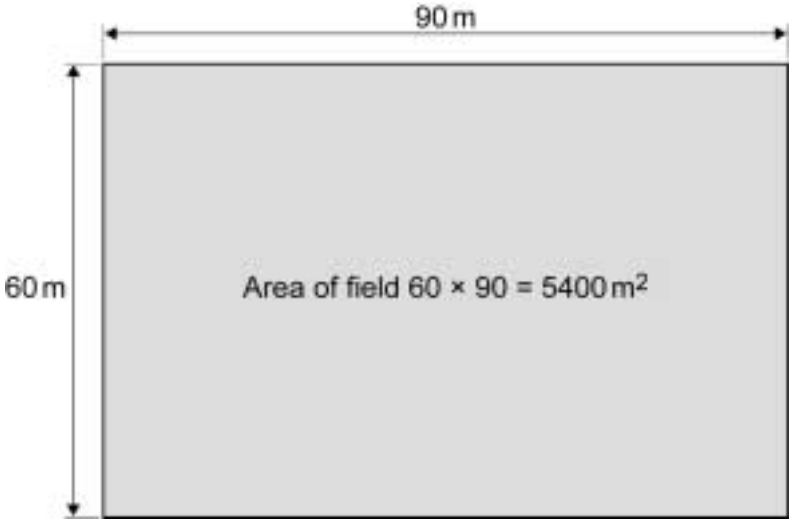
ANSWER IN THE SPACES PROVIDED



3 A class of students was set the task of estimating the number of dandelions on the school field.

To do this, they decided to use sampling squares called quadrats.
Each quadrat had an area of $1\,m^2$.

The diagram shows the dimensions of the school field.



3 (a) Which is the best way of using quadrats in this investigation?

Tick (✓) **one** box.

Statement	Tick (✓)
Place all the quadrats where there are lots of plants.	
Place all the quadrats randomly in two different sample areas.	
Place all the quadrats where only dandelions are growing.	

(1 mark)

3 (b) Each student collected data by using 10 quadrats.

These are the results for one student, Mary.

Quadrat number	Number of dandelions
1	3
2	3
3	6
4	2
5	1
6	2
7	0
8	3
9	2
10	0

Calculate the mean number of dandelions per quadrat counted by Mary.
Show clearly how you work out your answer.

.....

.....

Mean number of dandelions .....

(2 marks)

3 (c) Another student, Sharon, calculated a mean of 2.8 dandelions per quadrat from her results.

Estimate the number of dandelions in the whole field by using:

- a mean of 2.8 dandelions per quadrat
- information from the diagram on the opposite page
- the equation below.

Show clearly how you work out your answer.

estimated number of dandelions on field = mean number of dandelions per quadrat × number of quadrats that would fit into the field

.....

.....

Estimated number of dandelions.....

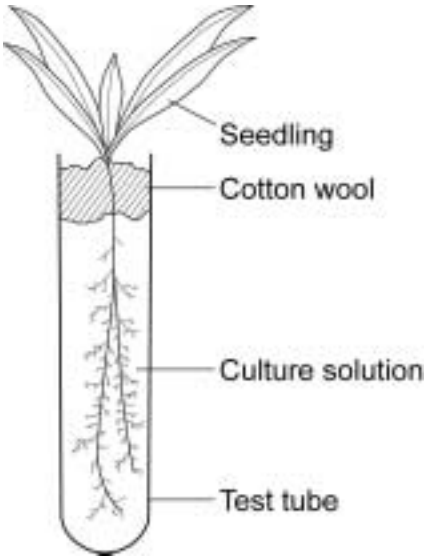
(2 marks)

5

Turn over▶

4 Some students investigated the effect of nitrates on the growth of seedlings.

The diagram shows the apparatus the students used.



The students set up three test tubes.

- Tube **A** contained pure water.
- Tube **B** contained all the mineral salts that a seedling needs for healthy growth.
- Tube **C** contained all the mineral salts that a seedling needs for healthy growth, but **no** nitrate.

4 (a) Why did the students set up tubes **A** and **B**?

.....

.....

(1 mark)

4 (b) To make it a fair test, what should each of the tubes, **A**, **B** and **C**, contain?

.....

.....

(1 mark)

4 (c) The table shows the students' results.

Tube	Solution in test tube	Mass of seedling after 14 days in g
A	Pure water	0.10
B	All the mineral salts a seedling needs for healthy growth	0.45
C	All the mineral salts a seedling needs for healthy growth but **no** nitrate	0.30

Give **two** conclusions that you can make from the students' results.

1 .....

.....

2 .....

.....

(2 marks)

4

Turn over for the next question

Chemistry questions

5 The diagram shows how the atoms are joined in part of a diamond.

5 (a) Draw a ring around the correct answer to complete each sentence.

5 (a) (i) Diamond has a high melting point because [some / a few / all] of the atoms are joined by strong bonds.

(1 mark)

5 (a) (ii) Each atom is joined to [one / two / four] other atoms.

(1 mark)

5 (a) (iii) The bonds are [covalent. / ionic. / metallic.]

(1 mark)

5 (b) Complete the sentence.

Diamond is used in cutting tools because it is . . . . . .

(1 mark)

5 (c) Diamond is made of carbon.

Name a gas produced when carbon reacts with oxygen.

.....

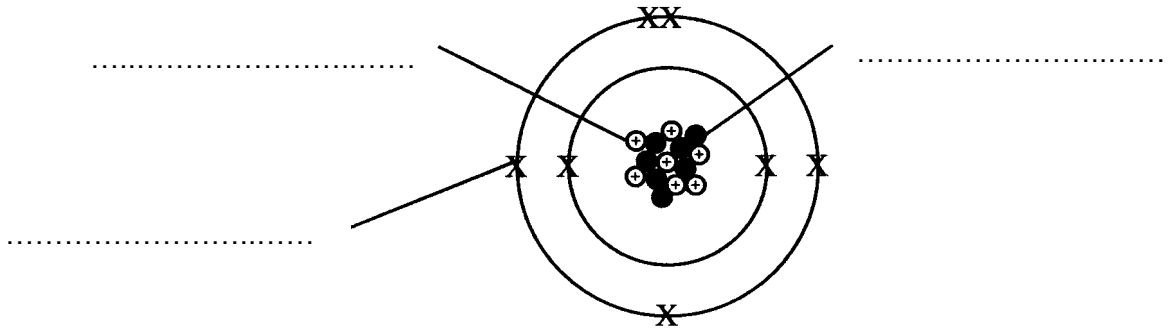
(1 mark)

5

Turn over for the next question

6 (a) The diagram represents an atom of nitrogen.

Label the diagram.



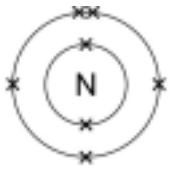
(3 marks)

6 (b) Ammonia has the formula NH_3. It is made from nitrogen and hydrogen.

How many atoms are in an ammonia molecule? .....

(1 mark)

6 (c) The diagrams show the electron arrangement in nitrogen and hydrogen.

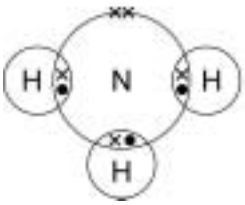


Nitrogen

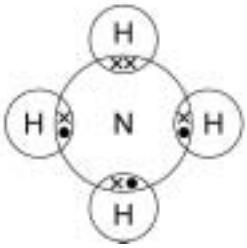
Hydrogen

Which diagram below, **A**, **B**, **C** or **D**, represents an ammonia molecule?

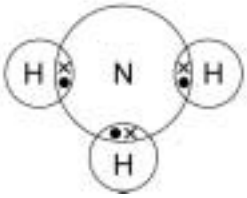
A



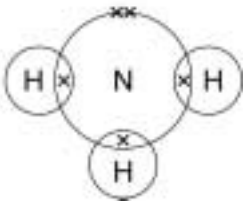
B



C



D



Write your answer in the box. Diagram ☐

(1 mark)

5

Turn over for the next question

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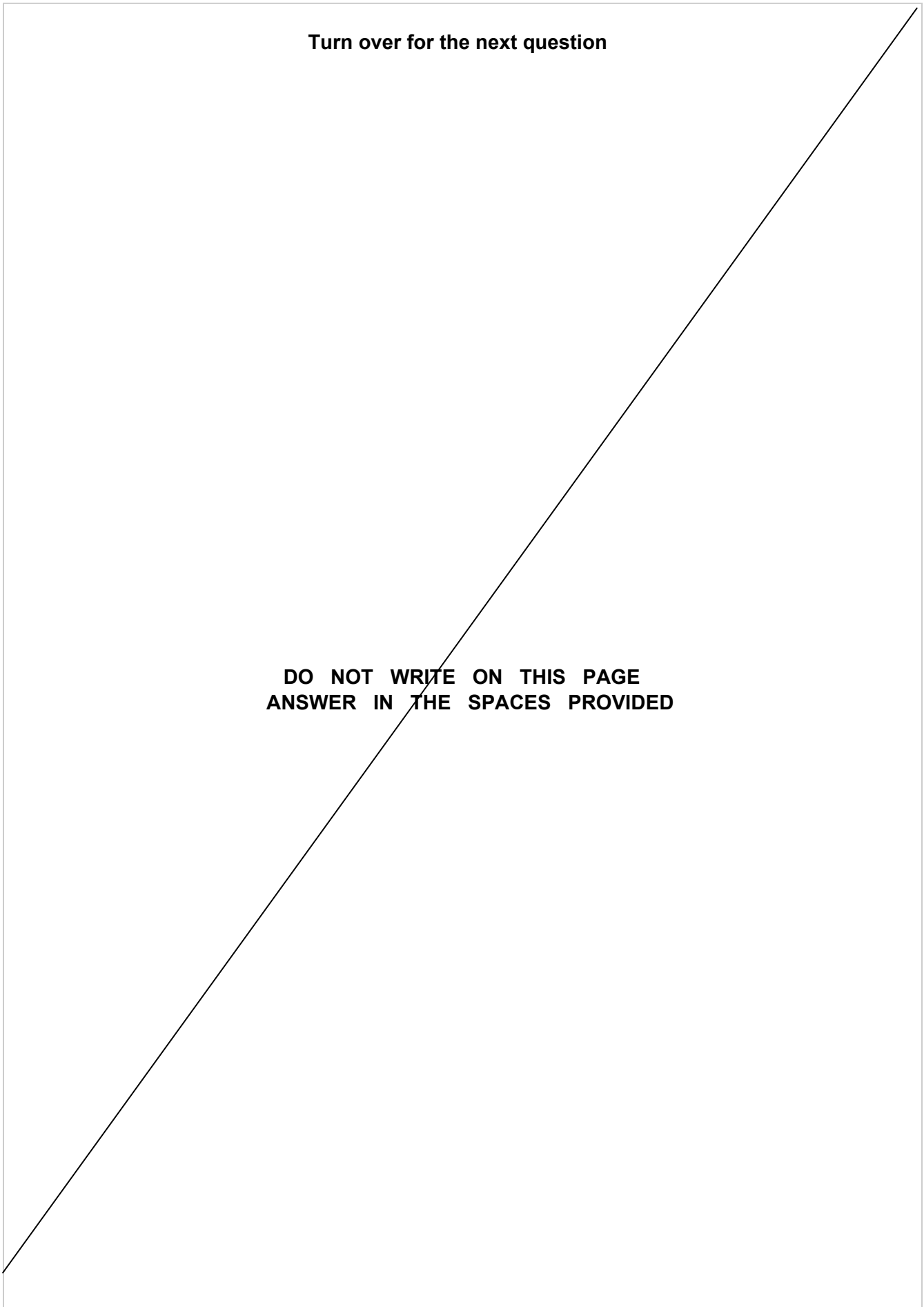
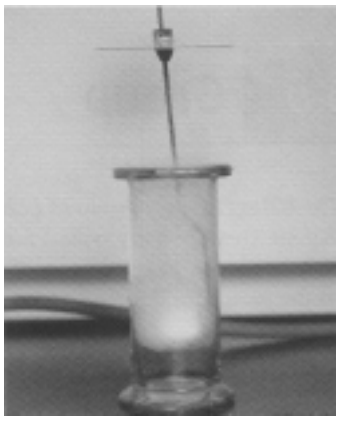
ANSWER IN THE SPACES PROVIDED



7 The picture shows sodium reacting with chlorine. The reaction forms sodium chloride.



7 (a) Use words from the box to answer the questions.

compound	**element**	**hydrocarbon**	**mixture**

Which word best describes:

7 (a) (i) sodium .....

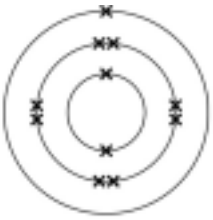
(1 mark)

7 (a) (ii) sodium chloride? .....

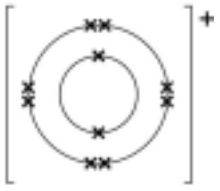
(1 mark)

7 (b) When sodium reacts with chlorine the sodium atoms change into sodium ions.

The diagrams below represent a sodium atom and a sodium ion.



Sodium atom (Na)



Sodium ion (Na^+)

Use the diagrams to help you explain how a sodium atom turns into a sodium ion.

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.....

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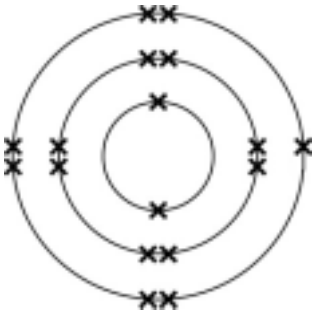
(2 marks)

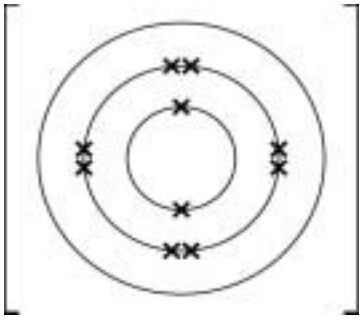
7 (c) (i) The diagram below represents a chlorine atom.



When chlorine reacts with sodium the chlorine forms negative chloride ions.

Complete the diagram below to show the outer electrons in a chloride ion and show the charge on the ion.

(*2 marks*)



7 (c) (ii) Chloride ions are strongly attracted to sodium ions in sodium chloride.

Explain why.

.....

.....

(1 mark)

7

8 Read the information in the box and then answer the questions.

Sun Creams

Sun creams contain titanium oxide. This compound absorbs harmful radiation.

Traditional sun creams contain normal-sized particles of titanium oxide. Normal-sized particles of titanium oxide are known to be safe to put on the skin.

Many new sun creams contain nano-sized particles of titanium oxide.

Experiments suggest that nano-sized particles might pass through the pores of the skin more easily than normal-sized particles.

8 (a) Suggest why there is a possible risk to using these sun creams.

.. ..

.. ..

.....

.....

(2 marks)

8 (b) Give **two** uses of nanoparticles, other than in sun creams.

1 .....

.....

2 .....

.....

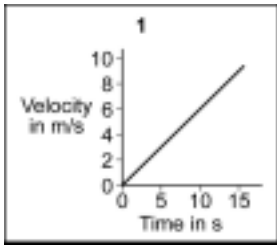
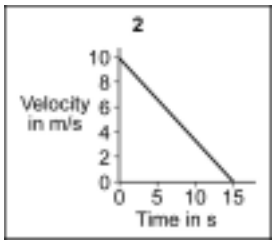
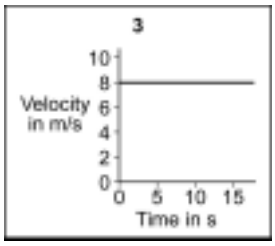
(2 marks)

4

Physics questions

9 The graphs in **List A** show how the velocities of three vehicles change with time.
The statements in **List B** describe different motions.

Draw **one** line from each graph in **List A** to the description of the motion represented by that graph in **List B**.

List A **Velocity–time graphs**	**List B** **Descriptions of motion**
	Constant velocity
	Constant acceleration
	Not moving
	Constant deceleration

(3 marks)

3

Turn over▶

10 The diagram shows the forces acting on a skydiver.

Draw a ring around the correct answer to complete the following sentences.

10 (a) Force **J** is caused by

air resistance.

friction.

gravity.

(1 mark)

10 (b) Force **K** is caused by

air resistance.

gravity.

weight.

(1 mark)

10 (c) When the skydiver jumps from the aircraft, force **J** is

bigger than

the same as

smaller than

force **K**

and the skydiver

accelerates downwards.

accelerates upwards.

falls at a steady speed.

(2 marks)

4

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

11 (a) The diagram shows the horizontal forces acting on a car travelling along a straight road.

11 (a) (i) Calculate the size of the resultant force acting on the car.

Show clearly how you work out your answer.

.....

.....

Resultant force = ... N

(2 marks)

11 (a) (ii) Describe the motion of the car when the forces shown in the diagram act on it.

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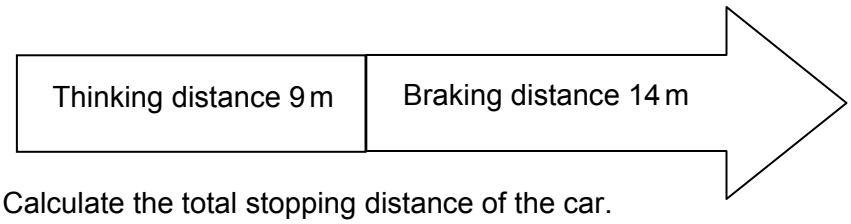
(2 marks)

11 (b) A car driver makes an emergency stop.

The chart shows the 'thinking distance' and the 'braking distance' needed to stop the car.



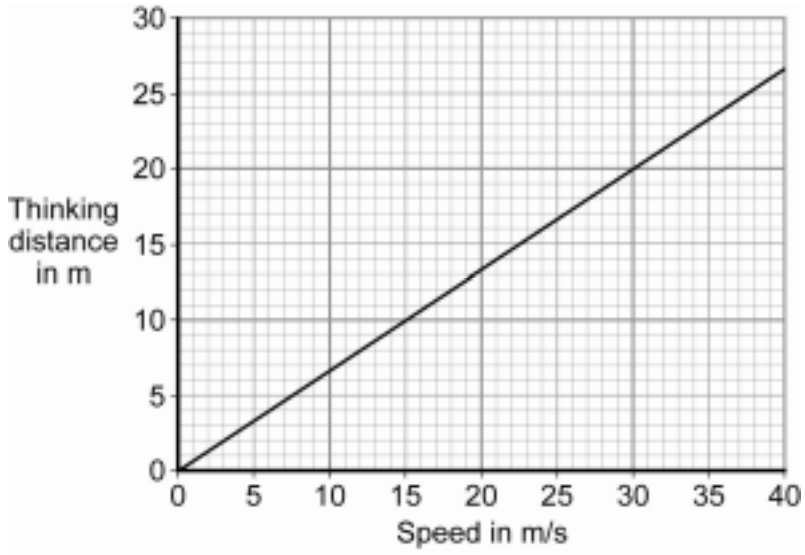
11 (b) (i) Calculate the total stopping distance of the car.

.....

Stopping distance = ... m

(1 mark)

11 (b) (ii) The graph shows that speed affects thinking distance.



Use the graph to find the thinking distance for a car driven at 30 m/s.

Thinking distance = ... m

(1 mark)

11 (b) (iii) Give **two** further factors that will affect the thinking distance.

.....

.....

.....

.....

(2 marks)

8

Turn over▶

12 The diagram shows a supermarket worker stacking jars of coffee onto a shelf.

12 (a) The mass of each jar of coffee is 0.4 kg.

Calculate the weight of each jar of coffee.

gravitational field strength = 10 N/kg

Write down the equation you use, and then show clearly how you work out your answer.

.....

.....

.....

.....

Weight = ... N

(2 marks)

12 (b) The distance between the floor and the middle shelf is 1.2 m.

Calculate the work done to lift one jar of coffee from the floor onto the shelf.

Write down the equation you use, and then show clearly how you work out your answer and give the unit.

.....

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Work done = ...

(3 marks)

5

Turn over for the next question

Biology questions

13 Describe the uses made by plants and algae of the glucose produced during photosynthesis.

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(4 marks)

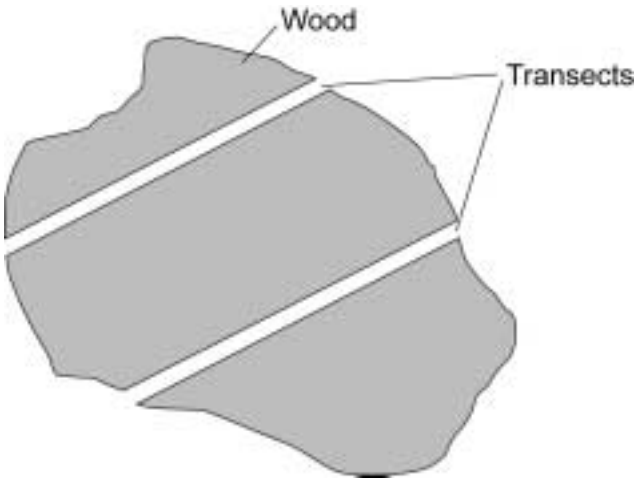
4

14 Red squirrels live in trees. They eat seeds from the cones of conifer trees. Squirrels store cones in 'larders' on the ground. These larders provide food through the winter. Each red squirrel makes and defends one larder.

Scientists monitor squirrel numbers to find the best habitats for the squirrels' survival. In one investigation, scientists estimated the numbers of squirrels in different types of woodland. Each woodland contains a different species of conifer tree.

Here is their method.

- Ten woods of each type of woodland were surveyed.
- In each wood scientists measured out two transects (strips), each 600 m long and 10 m wide.
- A scientist walked slowly down the centre of each transect, recording the number of squirrel larders he could see.



14 (a) Name **one** variable that was controlled in this investigation.

.....

(1 mark)

14 (b) (i) The scientists recorded the number of larders instead of the number of squirrels they saw.

How could this have increased the accuracy of the investigation?

.....

.....

(1 mark)

14 (b) (ii) This method of counting the number of larders could have led to an inaccurate estimate of the number of squirrels.

Explain how.

.....

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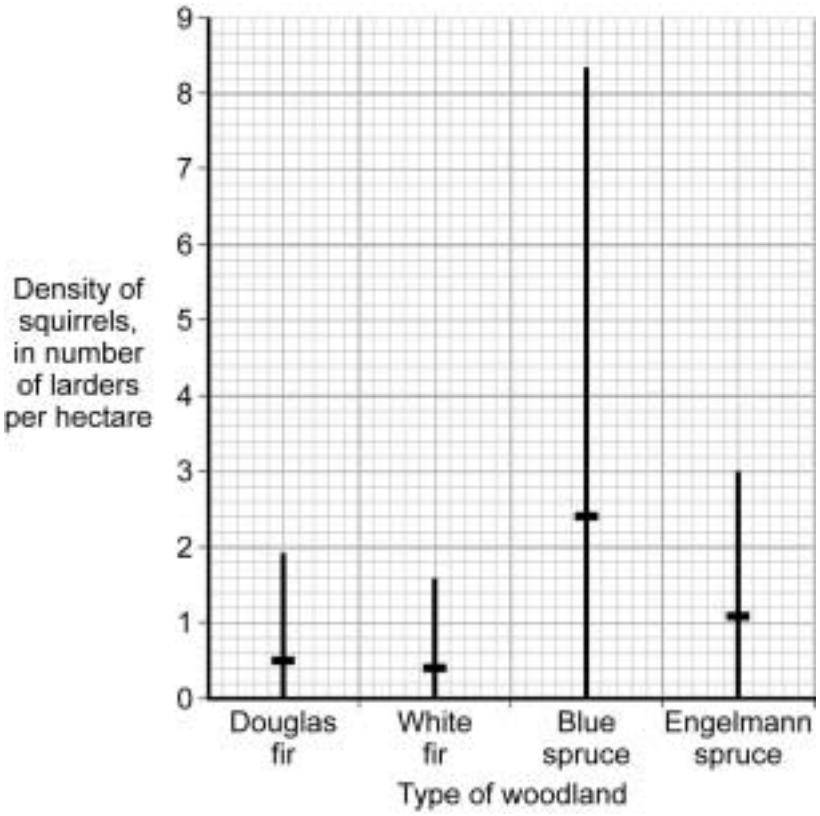
.....

(2 marks)

Question 14 continues on the next page

14 (c) The results of the investigation are shown on the graph.



Each bar represents the range of the number of larders in each type of woodland.

The horizontal mark on each bar represents the mean number of larders per hectare of woodland.

14 (c) A student concluded '*You will always find more squirrels in spruce woodland than in fir woodland.*'

Is the student's conclusion justified by the data in the graph?

Explain the reasons for your answer.

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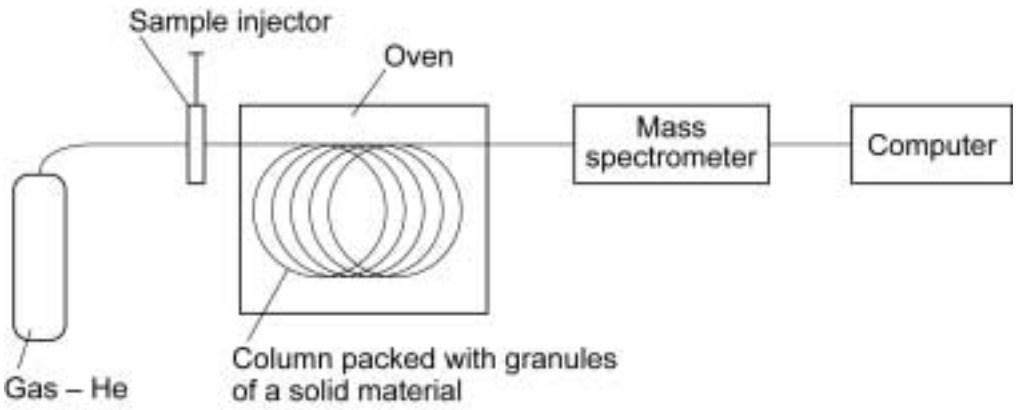
(2 marks)

6

Chemistry questions

15 The diagram shows the main parts of an instrumental method called gas chromatography linked to mass spectroscopy (GC-MS).



This method separates a mixture of compounds and then helps to identify each of the compounds in the mixture.

15 (a) In which part of the apparatus:

15 (a) (i) is the mixture separated .....

(*1 mark*)

15 (a) (ii) is the relative molecular mass of each of the compounds in the mixture measured?

.....

(*1 mark*)

Question 15 continues on the next page

15 (b) (i) Athletes sometimes take drugs because the drugs improve their performance. One of these drugs is ephedrine

Ephedrine has the formula:

$C_{10}H_{15}NO$

What relative molecular mass (M_r) would be recorded by GC-MS if ephedrine was present in a blood sample taken from an athlete?

Show clearly how you work out your answer.

Relative atomic masses: H = 1; C = 12; N = 14; O = 16.

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.....

.....

Relative molecular mass = ...

(2 marks)

15 (b) (ii) Another drug is amphetamine which has the formula:

$C_9H_{13}N$

The relative molecular mass (M_r) of amphetamine is 135.

Calculate the percentage by mass of nitrogen in amphetamine.

Relative atomic mass: N = 14

.....

.....

Percentage of nitrogen = ... %

(2 marks)

15 (c) Athletes are regularly tested for drugs at international athletics events.

An instrumental method such as GC-MS is better than methods such as titration.

Suggest **two** reasons why.

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.....

(2 marks)

15 (d) When a blood sample is taken from an athlete the sample is often split into two portions. Each portion is tested at a different laboratory.

Suggest why.

.....

.....

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.....

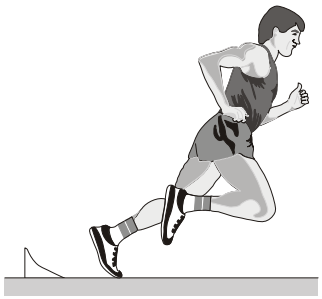
(2 marks)

10

Turn over for the next question

Physics questions

16 The diagram shows an athlete at the start of a race. The race is along a straight track.



In the first 2 seconds, the athlete accelerates constantly and reaches a speed of 9 m/s.

16 (a) Calculate the acceleration of the athlete.

Write down the equation you use.

Show clearly how you work out your answer.

Give the unit.

.....

.....

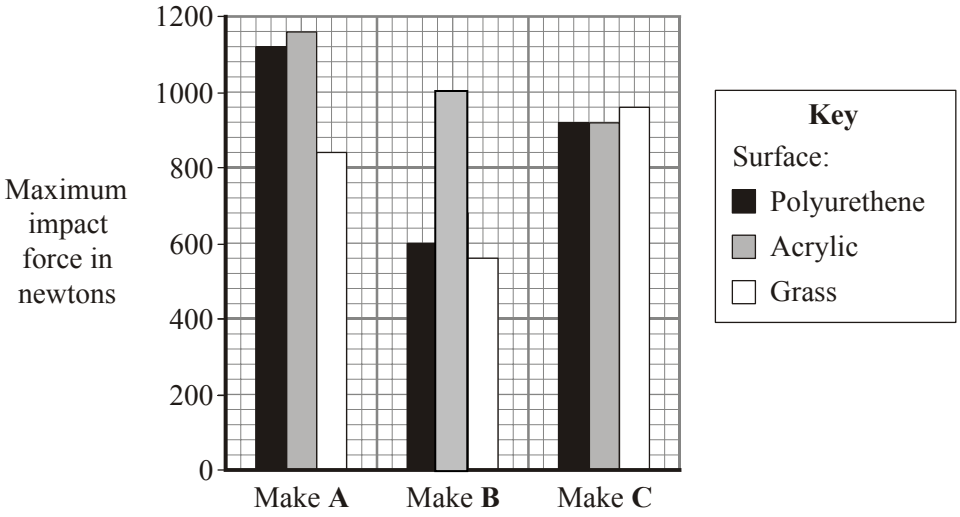
.....

Acceleration = ...

(3 marks)

16 (b) Many running shoes have a cushioning system. This reduces the impact force on the athlete as the heel of the running shoe hits the ground.

The bar chart shows the maximum impact force for three different makes of running shoe used on three different types of surface.



In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Analyse and evaluate the performance of the running shoes on the three surfaces.

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(6 marks)

END OF QUESTIONS

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GCSE Physics Equations Sheet

Unit 5 F and H

$a = \frac{F}{m}$ or $F = m \times a$	F resultant force m mass a acceleration
$a = \frac{v - u}{t}$	a acceleration v final velocity u initial velocity t time taken
$W = m \times g$	W weight m mass g gravitational field strength
$F = k \times e$	F force k spring constant e extension
$W = F \times d$	W work done F force applied d distance moved in the direction of the force
$P = \frac{E}{t}$	P power E energy transferred t time taken
$E_p = m \times g \times h$	E_p change in gravitational potential energy m mass g gravitational field strength h change in height

$E_k = {}^1/_2 \times m \times v^2$	E_k kinetic energy m mass v speed
$p = m \times v$	p momentum m mass v velocity
$I = \frac{Q}{t}$	I current Q charge t time
$V = \frac{W}{Q}$	V potential difference W work done Q charge
$V = I \times R$	V potential difference I current R resistance
$P = \frac{E}{t}$	P power E energy t time
$P = I \times V$	P power I current V potential difference
$E = V \times Q$	E energy V potential difference Q charge