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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9	
10	
11	
12	
13	
14	
TOTAL	

General Certificate of Secondary Education
Foundation Tier
January 2012

Science A 2

SCA2FP

Unit 6

F

Wednesday 18 January 2012 9.00 am to 10.30 am

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

You may use a calculator.

Time allowed
- 1 hour 30 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 spaces 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 13(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.

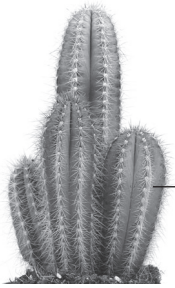
Advice
- In all calculations, show clearly how you work out your answer.

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

Biology Questions

1 Plants have adaptations that help them to survive.

1 (a) Draw **one** line from each plant in **List A** to the adaptation that helps the plant to survive in **List B**.

List A Plant	**List B How the adaptation helps the plant to survive**
Azalea  Large colourful flowers with a strong scent	The plant is able to absorb lots of light
Cactus  Swollen stem	The plant prevents other plants growing too close
Fern  Releases poisons into the soil	The plant attracts insects to help it to reproduce
	The plant is able to store lots of water

(3 marks)

1 (b) All organisms compete for resources to survive.

Give **three** factors plants compete for.

1 .....

2 .....

3 .....

(3 marks)

6

Turn over for the next question

2 Darwin's theory of evolution states that all species of living things have evolved from simple life forms.

2 (a) Draw a ring around the correct answer in the box to complete the sentence.

Simple life forms first developed on Earth more than

3 thousand
3 million
3 billion

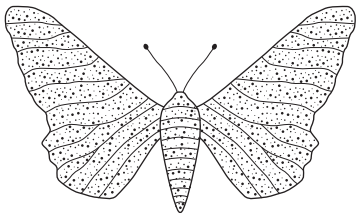
years ago.

(1 mark)

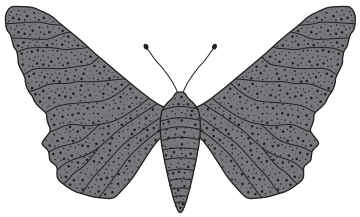
2 (b) Before the 19th Century, almost all peppered moths in the UK were light-coloured. During the 19th Century, factories began to pollute the environment with soot. A dark-coloured form of the moth then became more common.

Birds feed on both types of moth.

Pale form
(light-coloured)



Dark form
(dark-coloured)



Use words from the box to complete each sentence.

evolution	**mutation**	**selection**	**variation**

The change in a gene that produced the dark-coloured moth was caused by

..... .

In the late 19th Century, birds ate mainly the light-coloured moths. More of the dark-coloured moths survived.

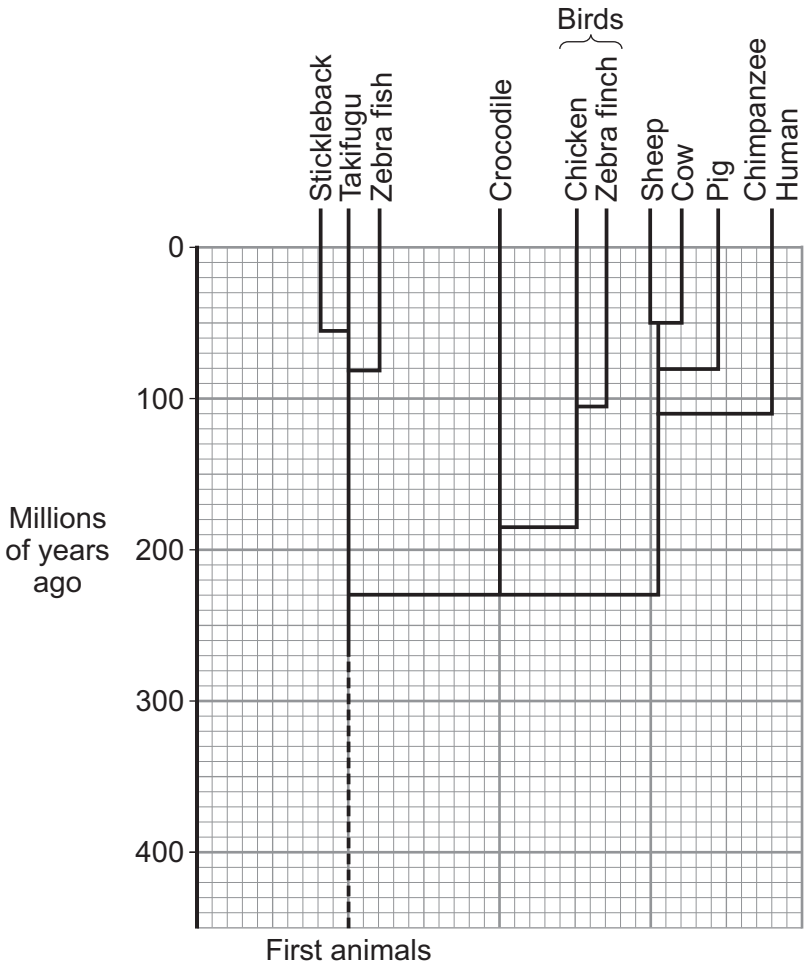
This is an example of ..... .

Over a long period of time, new species of moths develop.

This is an example of ..... .

(3 marks)

2 (c) The diagram shows how and when some different types of animal are thought to have evolved.



2 (c) (i) Which animal is most closely related to birds?

.....

(1 mark)

2 (c) (ii) How long ago did pigs evolve?

.....

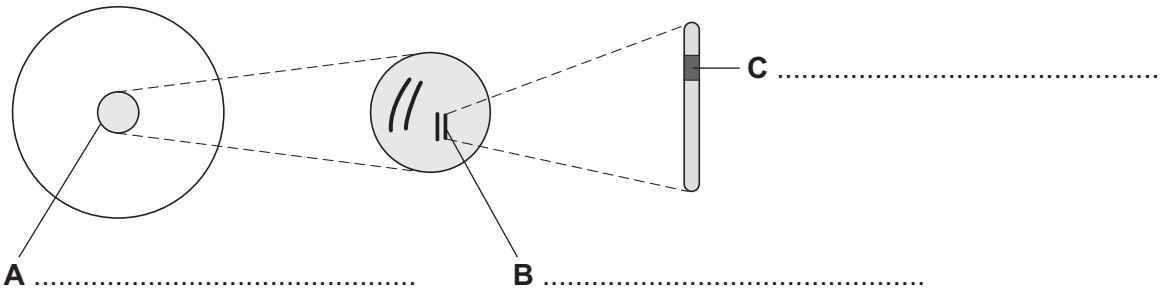
(1 mark)

6

Turn over ▶

3 **Diagram 1** shows an animal cell and some of the structures inside the cell.

Diagram 1



3 (a) Use words from the box to label structures **A**, **B** and **C**, on **Diagram 1**.

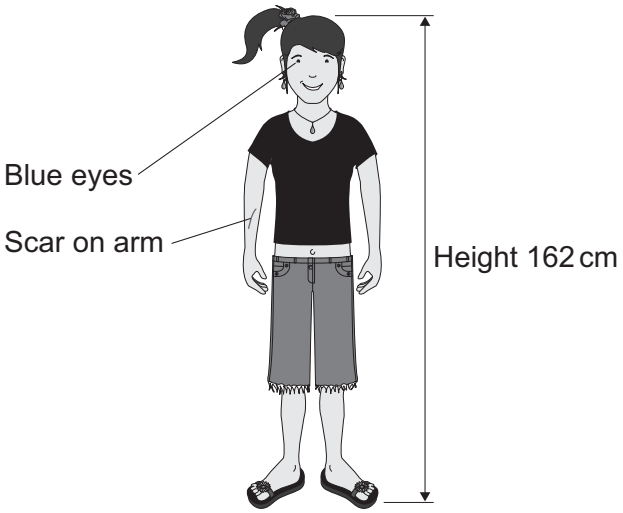
Characteristic	**Chromosome**	**Gamete**	**Gene**	**Nucleus**

(3 marks)

3 (b) Factors that may affect characteristics include genes and the environment.

Diagram 2 shows some of the characteristics of a girl.

Diagram 2



Draw **one** line from each characteristic in **List A** to the factor(s) that affect the characteristic in **List B**.

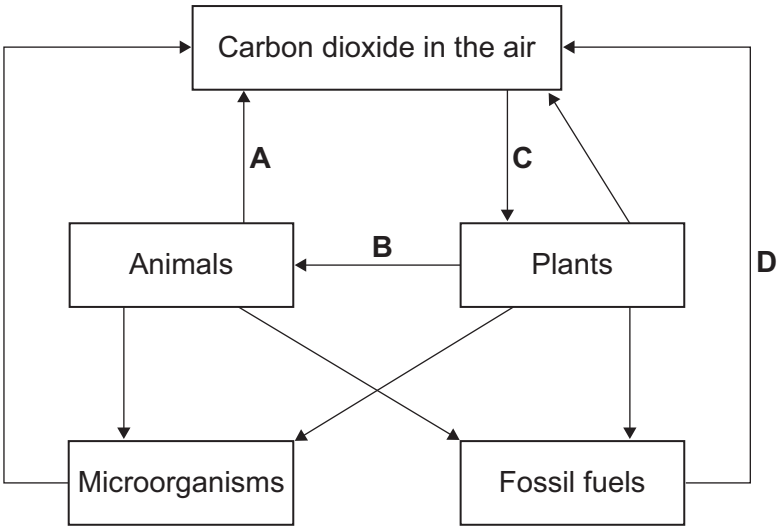
List A **Characteristic**	**List B** **Factor(s) that affect the characteristic**
Blue eyes	Affected by genes only
Height 162 cm	Affected by environment only
Scar on arm	Affected by both genes and the environment
	Affected by neither genes nor the environment

(3 marks)

6

Turn over for the next question

4 The diagram shows part of the carbon cycle.



Name the processes labelled **A**, **B**, **C** and **D**, on the diagram.

A .....

B .....

C .....

D .....

(4 marks)

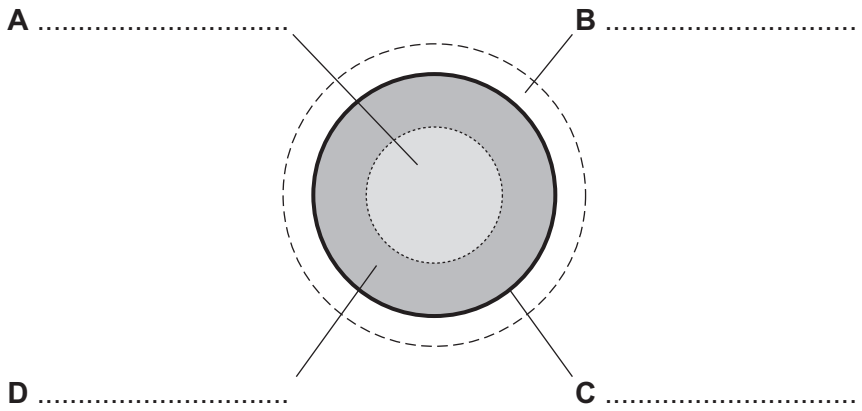
4

Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Chemistry Questions

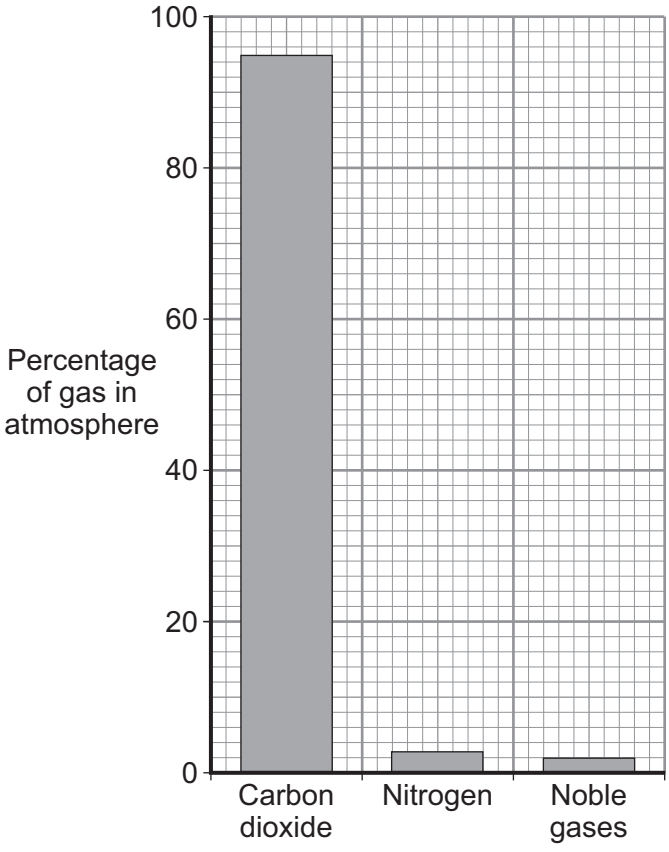
5 The diagram shows a section through the Earth and the layer that is above the Earth's surface.



5 (a) Name the parts labelled **A**, **B**, **C** and **D**, on the diagram.

(4 marks)

5 (b) The bar chart shows the composition of the atmosphere on Mars.



Complete each sentence to give **three** differences between the composition of the atmospheres on Mars and on Earth.

The atmosphere on Mars has a much higher percentage

of ..... .

The atmosphere on Mars has a much lower percentage

of ..... .

The atmosphere on Mars has no ..... .

(3 marks)

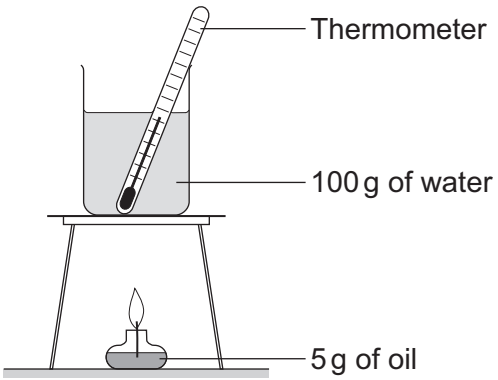
7

Turn over for the next question

6 Vegetable oils have many uses.

6 (a) A student designed an investigation to compare the amount of energy transferred when two different oils, **A** and **B**, were burned.

The diagram shows the apparatus that the student used.



The student allowed each oil to burn for 10 minutes.

The student's results are shown in the table.

	Oil A	**Oil B**
Mass of oil at start of the experiment	5 g	5 g
Mass of oil at end of the experiment	1 g	2 g
Initial temperature of water in the beaker	20 °C	20 °C
Final temperature of water in the beaker after heating	46 °C	45 °C

6 (a) (i) What mass of oil **A** burned during the 10 minutes?

.....

Mass of oil **A** that burned = ... g

(1 mark)

6 (a) (ii) How much did the temperature of the water rise when oil **B** was burned for 10 minutes?

.....

Temperature rise when oil **B** was burned = ... °C

(1 mark)

6 (a) (iii) Write **two** conclusions that can be drawn from the student's investigation.

.....

.....

.....

.....

(2 marks)

6 (b) The table below gives information about some vegetable oils.

	Fat content (%)		
Vegetable oil	**Saturated fat**	**Unsaturated fat**	**Melting point in °C**
Olive	11	89	–12
Palm	52	48	35
Rapeseed	12	88	5
Sunflower	14	86	–18

6 (b) (i) Which vegetable oil is solid at room temperature?

.....

(1 mark)

6 (b) (ii) Which vegetable oil is the **least** healthy to eat?

.....

Give a reason for your answer.

.....

(2 marks)

6 (c) Cooking food in vegetable oils is quicker than cooking food in water.

Give **one** reason why.

.....

.....

(1 mark)

8

7 Hydrocarbons are cracked to produce smaller molecules.

7 (a) Use words from the box to complete each sentence.

alkanes	**emulsions**	**fuels**	**monomers**	**polymers**

Some of the products of cracking can be used in cars as ..... .

The products of cracking include alkenes and saturated hydrocarbons

called ..... .

Alkenes can be used in reactions to make large molecules

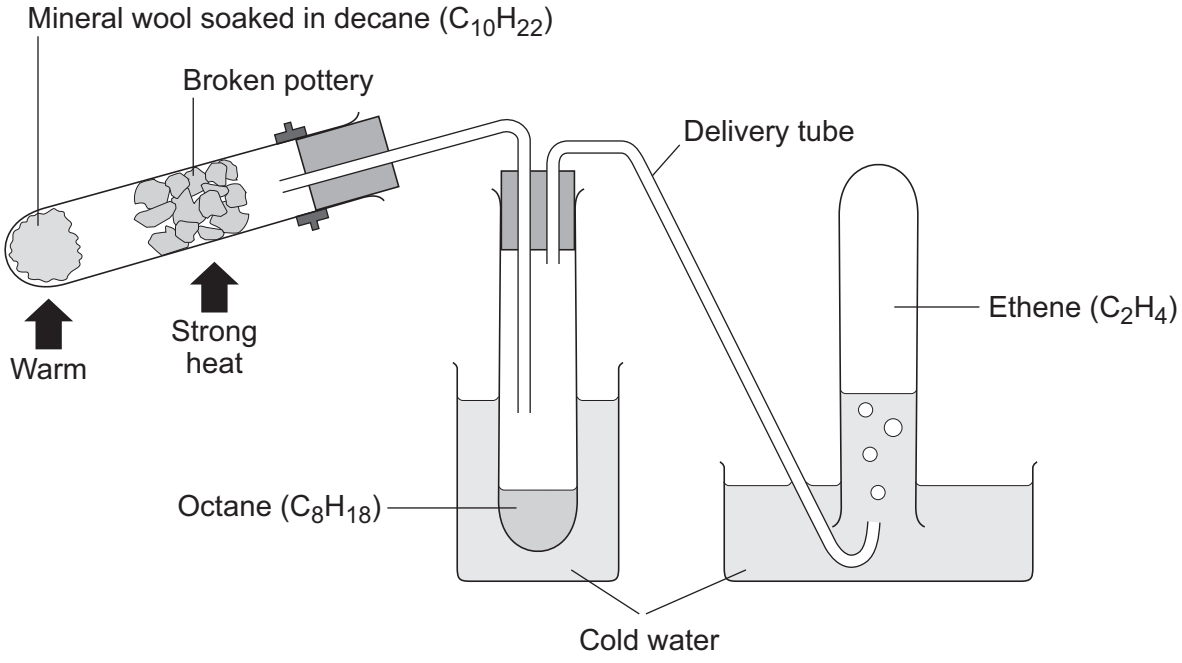
called ..... .

The many small molecules that join up to form a large molecule are known

as ..... .

(4 marks)

7 (b) The diagram shows an experiment to demonstrate cracking.



Complete each sentence below.

The broken pottery acts as a ..... .

The name of the liquid hydrocarbon produced by the cracking

is ..... .

The name of the alkene produced by the cracking is ..... .

(3 marks)

7

Turn over for the next question

Physics Questions

8 Waves have many different properties.

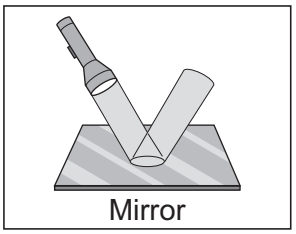
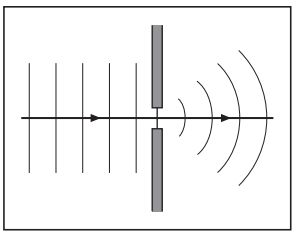
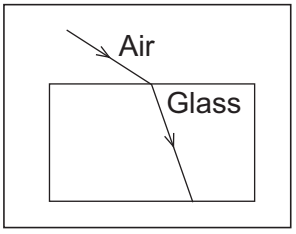
8 (a) Draw a ring around the correct answer in the boxes to complete each sentence.

Light waves	are longitudinal. are transverse. may be either longitudinal or transverse.
Sound waves	are longitudinal. are transverse. may be either longitudinal or transverse.

(2 marks)

8 (b) Waves can be refracted and reflected.

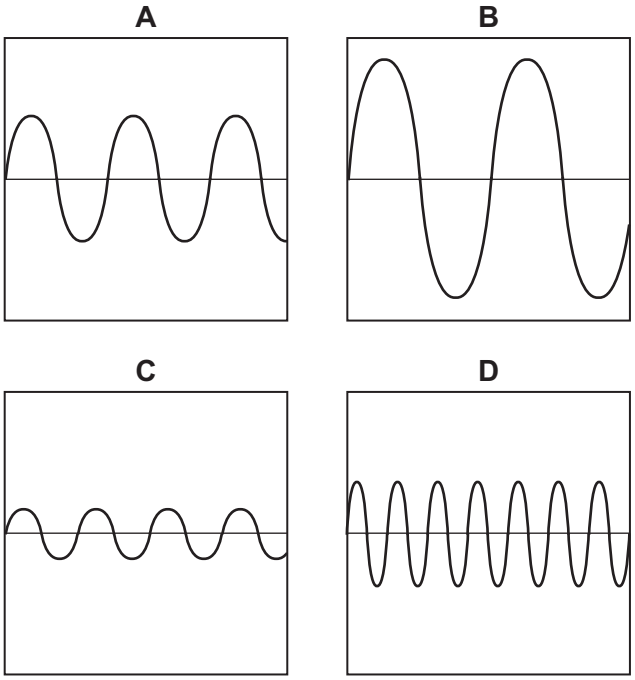
Draw **one** line from each property in **List A** to the correct diagram in **List B**.

List A	List B
Refraction	
Reflection	
	

(2 marks)

8 (c) Diagrams **A**, **B**, **C** and **D** show oscilloscope traces of four different sound waves.

The oscilloscope settings are the same each time.



8 (c) (i) Give the letter of the loudest sound. ☐

(1 mark)

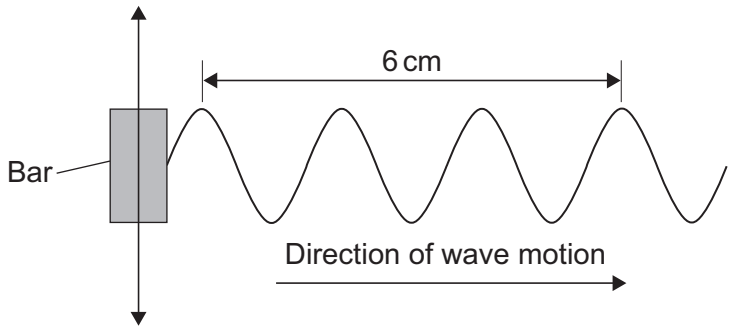
8 (c) (ii) Give the letter of the highest pitch sound. ☐

(1 mark)

6

Turn over for the next question

9 A ripple tank is used to investigate the behaviour of water waves.
A bar moves up and down to make the waves.



9 (a) What is the wavelength of each wave in the diagram?

Draw a ring around the correct answer.

2 cm **3 cm** **6 cm**

(1 mark)

9 (b) The ripple tank produces 10 waves in 2 seconds.

What is the frequency of the waves?

.....

.....

Frequency = ... hertz
(1 mark)

9 (c) The bar is made to move faster.
It now produces waves with:

- a frequency of 20 hertz
- a wavelength of 0.5 cm.

Calculate the speed of the water waves in cm/s.

Use the correct equation from the Physics Equations Sheet.

Show clearly how you work out your answer.

.....

.....

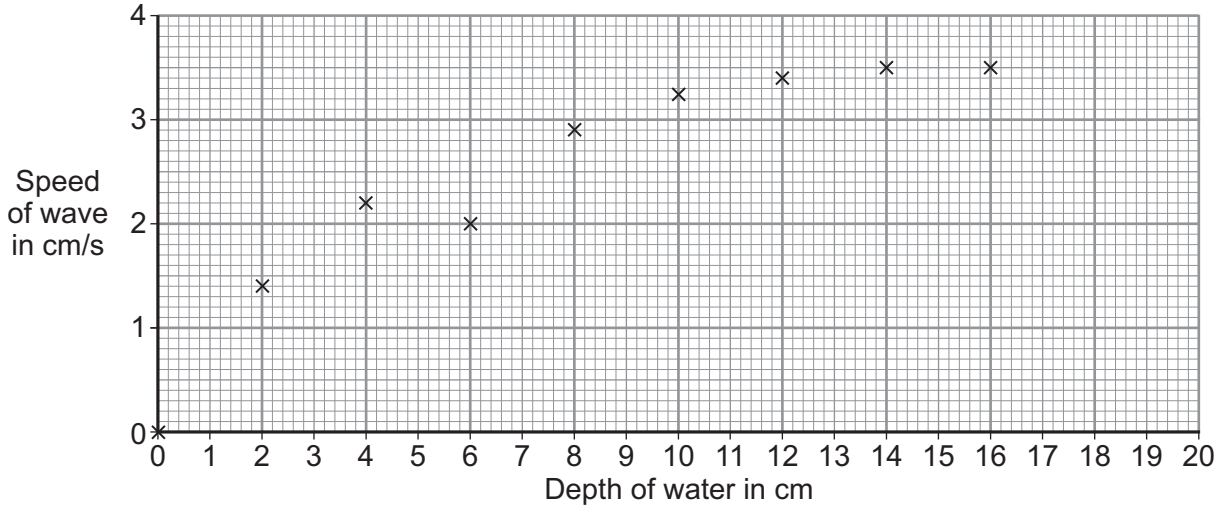
.....

.....

Speed = ... cm/s
(2 marks)

9 (d) A student uses the ripple tank to investigate the relationship between depth of water and speed of waves.

The graph shows the student's results.



9 (d) (i) There is one anomalous result.

On the graph, draw a ring around this anomalous result.

(1 mark)

9 (d) (ii) On the graph, draw a line of best fit.

(1 mark)

9 (d) (iii) Use your line of best fit to find the speed of the wave at a depth of 20 cm.

Wave speed = ... cm/s

(1 mark)

7

Turn over ▶

10 (a) The diagram shows the electromagnetic spectrum.

Two types of wave have been missed out.

Write the names of the missing waves in the empty boxes.

	X-rays	Ultraviolet rays		Infrared rays	Microwave	Radio waves

(2 marks)

10 (b) Different types of waves are used by different types of communications equipment.

Draw **one** line from each situation in **List A** to the wave used to communicate in **List B**.

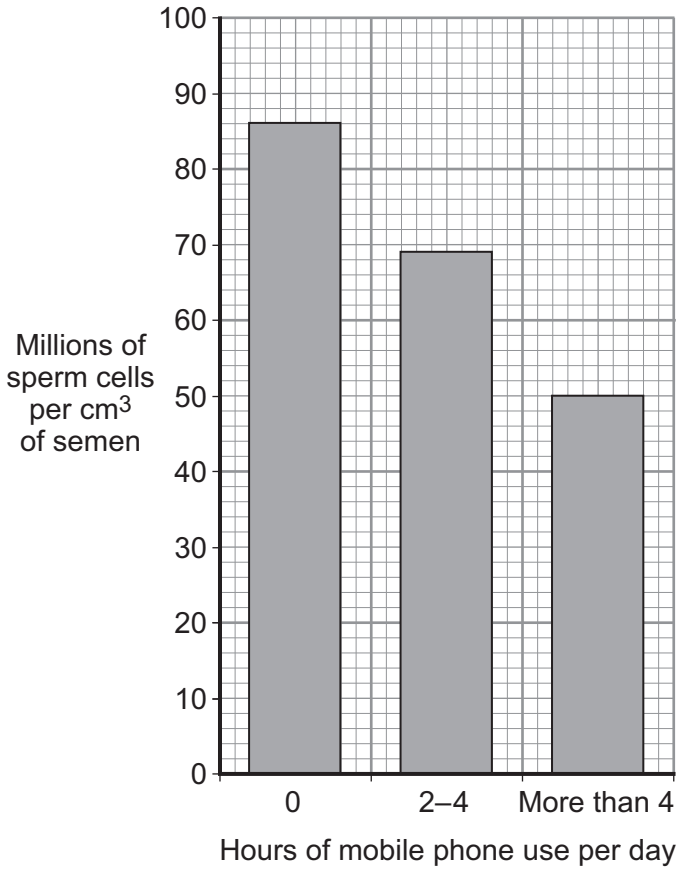
List A **Situation**	**List B** **Wave used to communicate**
TV remote control	Microwave
Satellite TV	Infrared rays
Terrestrial TV	Radio waves
	Ultraviolet rays

(3 marks)

5

11 Scientists investigated whether using mobile phones affects the number of sperm cells that men produce.

The graph shows some of the results of their investigation.



The results were taken from 364 men who were being treated at a fertility clinic.

11 (a) Write a conclusion to the scientists' results.

.....

.....

(1 mark)

11 (b) Suggest **two** ways in which the investigation could be improved.

.....

.....

.....

.....

(2 marks)

3

Turn over ▶

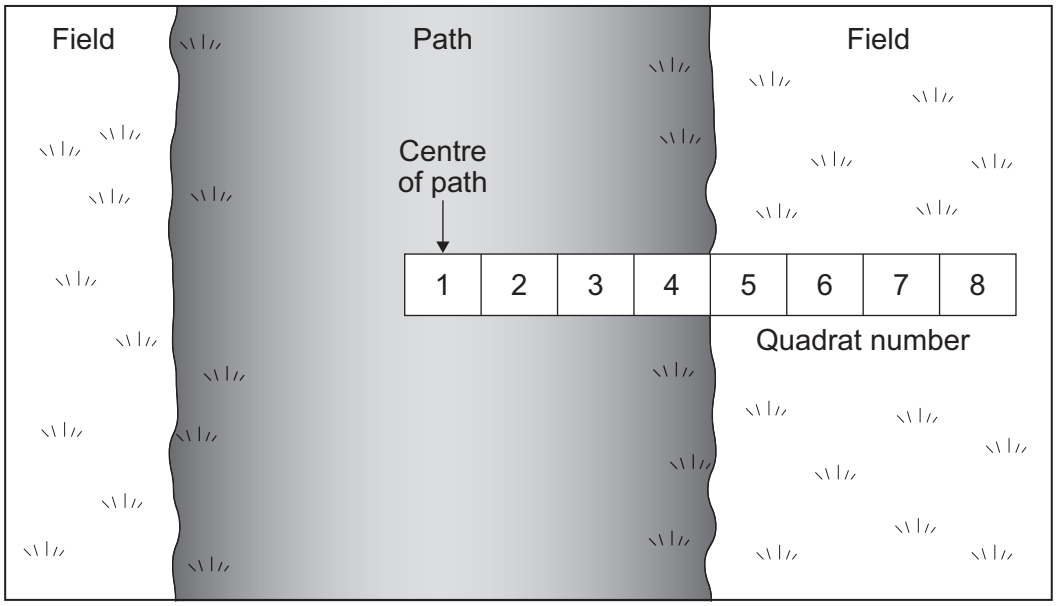
Biology Questions

12 Greater plantain and Ribwort plantain are two types of plant.

Students investigated the distribution of these two plants across a path.

The students wanted to find out how the two plants were affected when people walked along the path. The students used a grid called a quadrat.

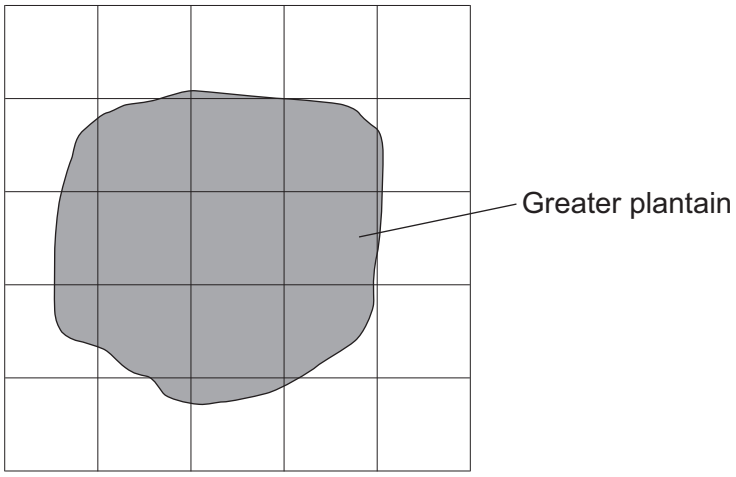
The diagram shows where the students put the quadrats.



Each quadrat was divided into 25 smaller squares.

The students used the squares to estimate the percentage cover of each type of plantain within the quadrat.

12 (a) Estimate the percentage of the quadrat covered by Greater plantain.



.....

.....

Percentage = ...

(2 marks)

12 (b) The results are shown in the table.

	Mean percentage cover							
Quadrat number	1	2	3	4	5	6	7	8
Greater plantain	31	28	28	19	3	2	1	1
Ribwort plantain	3	4	6	29	29	37	40	39

12 (b) (i) Use information from the table to describe the distributions of Greater plantain and Ribwort plantain.

.....

.....

.....

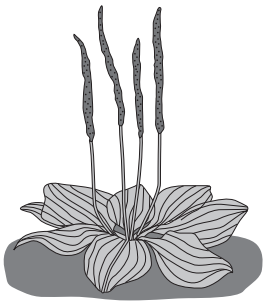
.....

(2 marks)

Question 12 continues on the next page

12 (b) (ii) The drawings show the two types of plantain.

Ribwort plantain



Greater plantain

Use information from the drawings to suggest why there is the difference in the distribution of the two types of plantains you described in part **(b)(i)**.

.....

.....

.....

.....

(2 marks)

12 (c) The students decided to investigate the distribution of these two types of plantain in two areas of the school grounds.

- Area 1 – the school football pitch.
- Area 2 – grass in an area where nobody walks.

Predict what the students would find out.

Give the reason for your prediction.

.....

.....

.....

.....

(2 marks)

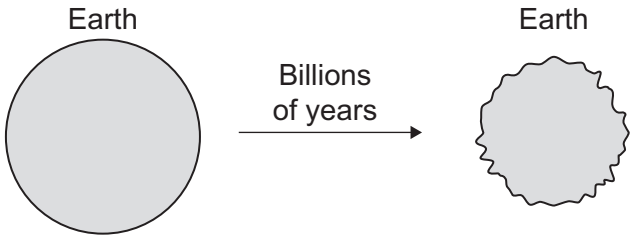
8

Chemistry Questions

13 The surface of the Earth has changed slowly over billions of years.

13 (a) **Diagram 1** shows one theory of how mountains are formed.

Diagram 1



13 (a) (i) Describe this theory of mountain formation.

.....

.....

(1 mark)

13 (a) (ii) Most scientists accepted this theory of mountain formation until about 60 years ago.

Suggest why most scientists accepted this theory.

.....

.....

(1 mark)

Question 13 continues on the next page

13 (b) **Diagram 2** shows the positions of the continents 250 million years ago.

Diagram 2

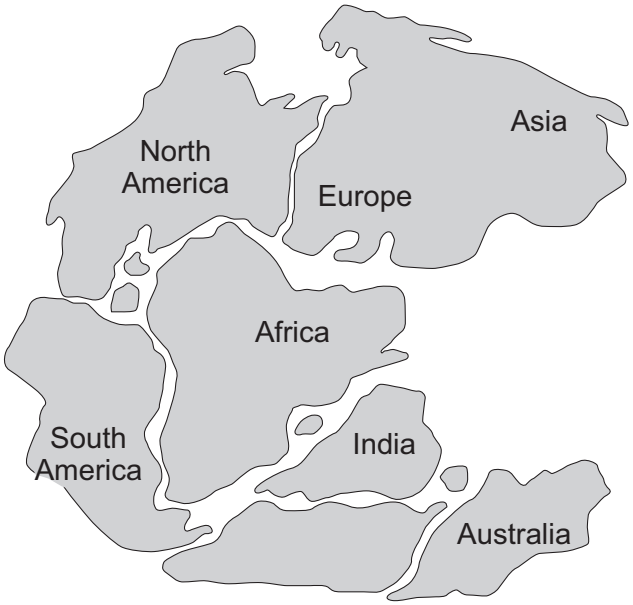
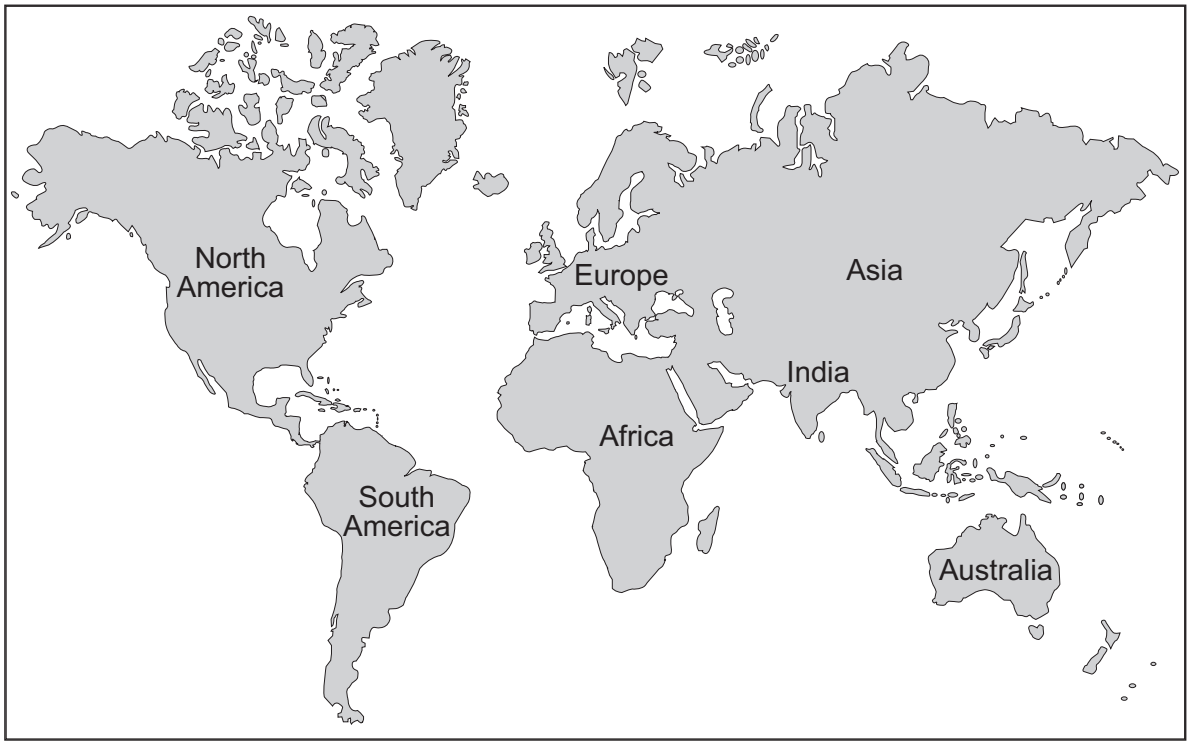


Diagram 3 shows the positions of the continents today.

Diagram 3



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

Describe how the positions of the continents have changed over the last 250 million years and explain the processes that have brought about these changes in position.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

8

Turn over for the next question

Physics Questions

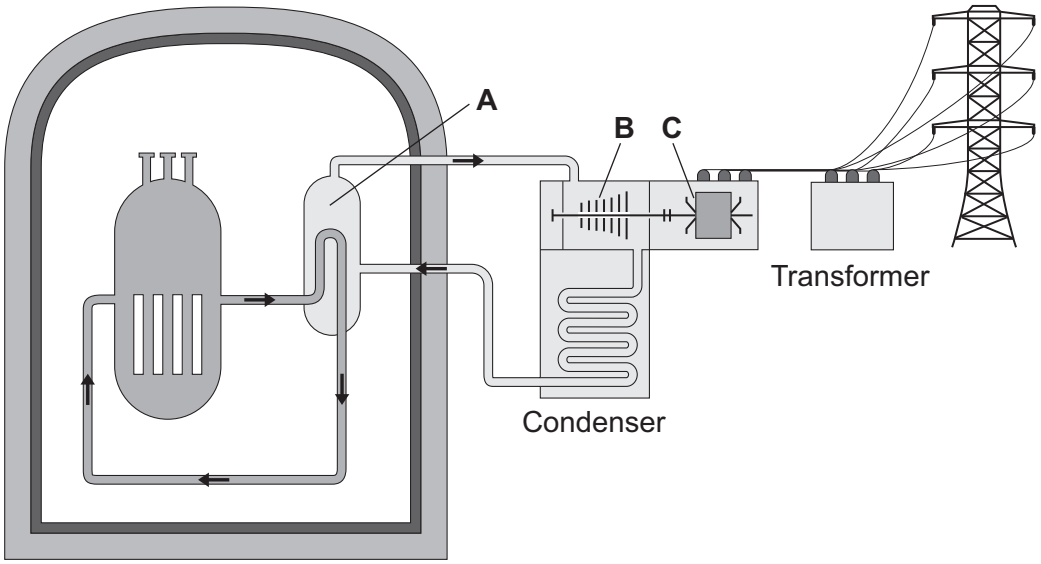
14 A nuclear power station generates electricity using nuclear fuel.

14 (a) Name **one** nuclear fuel that is used.

.....

(1 mark)

14 (b) The diagram below shows a nuclear power station.



Name the parts of a nuclear power station labelled **A**, **B** and **C** on the diagram.

A .....

B .....

C .....

(3 marks)

14 (c) The transformer changes the voltage of the electricity generated by the power station.

14 (c) (i) What type of transformer is shown in the diagram?

.....

(1 mark)

14 (c) (ii) Changing the voltage increases the efficiency of the power transmission.

Explain how.

.....

.....

.....

.....

(2 marks)

14 (d) A country generates 80 % of its electricity using fossil fuel power stations.

The country's government is considering replacing all of its fossil fuel power stations with nuclear power stations.

Suggest **two** factors that the country's government will have to consider in making a decision.

.....

.....

.....

.....

(2 marks)

9

END OF QUESTIONS

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