



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
NAME

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**TWENTY FIRST CENTURY SCIENCE**

**0608/03**

Paper 3

**October/November 2010**

**1 hour 30 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.  
Write in dark blue or black pen.  
You may use a pencil for any diagrams or graphs.  
Do not use staples, paper clips, highlighters, glue or correction fluid.  
**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.  
At the end of the examination, fasten all your work securely together.  
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
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6	
7	
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9	
<b>Total</b>	

This document consists of **15** printed pages and **1** blank page.



1 Sickle cell anaemia is a genetic condition caused by a recessive allele.

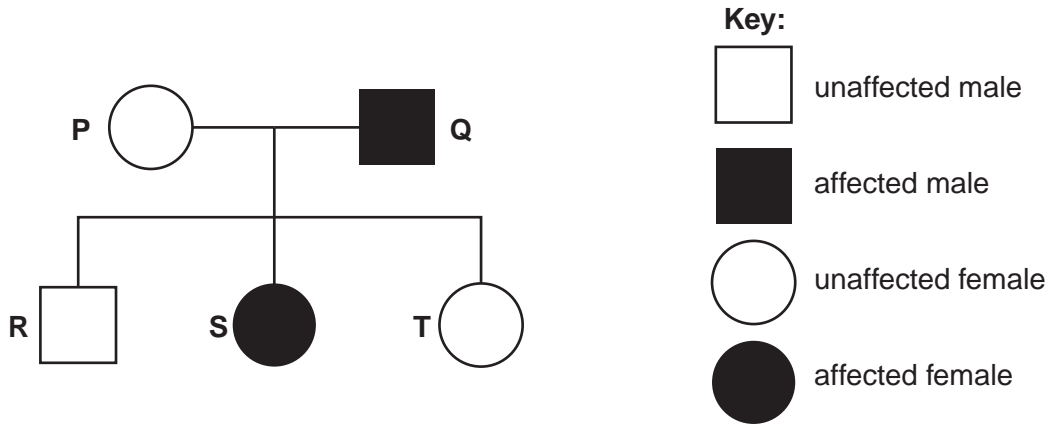
(a) (i) What is the main symptom of sickle cell anaemia?

..... [1]

(ii) Explain why people with sickle cell anaemia have this symptom.

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

(b) The diagram of a family tree shows the inheritance of sickle cell anaemia.



(i) Person **Q** has sickle cell anaemia.

Write down the combinations of alleles that person **Q** has.

Use **a** for the recessive allele for sickle cell anaemia and **A** for the dominant allele.

..... [1]

(ii) Which other person on the family tree, **P**, **R**, **S** or **T**, has the same combination of alleles as **Q**?

..... [1]

(iii) T marries a man with sickle cell anaemia.

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Complete the genetic diagram to show the possible combinations of alleles that their children could have.

<b>Key:</b> <b>A</b> = normal allele <b>a</b> = sickle cell anaemia allele		MOTHER	
		A	a
FATHER	a		
	a		

[2]

(c) People can have a genetic test for the recessive allele that causes sickle cell anaemia. This testing has ethical implications.

(i) Suggest **one** reason why someone might want to be tested.

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

(ii) Suggest **one** reason why someone might **not** want to be tested.

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

[Total: 8]

2 Scientists are always developing new drugs. This can take many years of research and testing.

(a) Name the type of drug used to kill bacteria.

..... [1]

(b) Give **two** reasons why all new drugs must be tested before they can be given to the general public.

1. ....

.....

2. ....

..... [2]

(c) Look at the statements **A**, **B**, **C** and **D**.

They describe the four stages of testing used in drug development.

They are in the wrong order.

- A** Tests on humans with the illness
- B** Tests on animals
- C** Tests on human cells in the laboratory
- D** Tests on healthy human volunteers

Write a letter, **A**, **B**, **C** or **D**, in each box to put the statements in the correct order.

The first one has been done for you.

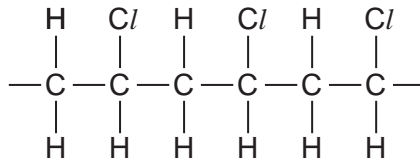
<b>C</b>			
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[2]

[Total: 5]

- 3 PVC is made by the polymerisation of the monomer chloroethene,  $C_2H_3Cl$ , also known as vinyl chloride.

Part of a chain of the polymer PVC is shown below.



- (a) Chloroethene and PVC are **not** hydrocarbons.

Explain why.

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

- (b) Explain what is meant by the term *polymerisation*.

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

- (c) PVC is a material that is not made from living things.

Which of these materials are also **not** made from living things?

Put a **ring** around each of the **two** correct answers.

**asbestos**      **cotton**      **paper**      **polythene**      **silk**      **wool**      [2]

- (d) (i) A chemical can be added to PVC to make it more flexible. Flexible PVC sheeting can be made to look like leather. This 'artificial leather' is used to make shoes, handbags and briefcases.

What type of chemical is added to PVC to make it more flexible?

..... [1]

- (ii) Rigid PVC is used to make window frames.

Why is the chemical not added to the PVC used to make window frames?

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

[Total: 8]

- 4 (a) (i) The first living things evolved from simple molecules.

What could these simple molecules do which made evolution possible?

..... [1]

- (ii) Which of the following provide evidence to support that evolution has taken place?

Put ticks (✓) in the boxes next to the **two** correct answers.

analysis of similarities and differences in DNA

competition between organisms

fossils found in rocks

some animals have not changed for millions of years

variation between organisms

[2]

- (iii) Many species of animals and plants have become extinct.

Explain the meaning of the term *extinct*.

..... [1]

(b) Lamarck was a French scientist who suggested an explanation for evolution before Darwin.

Read these sentences about Lamarck.

- 1. He studied hundreds of living things and found that they were different from each other.
- 2. He suggested that living things developed new characteristics during their lifetime.
- 3. He believed that a giraffe stretches up to reach leaves high in the trees and this causes their necks to become longer.
- 4. He suggested that the giraffe passes the characteristic of a long neck to its offspring.

(i) Which **one** of the sentences, **1**, **2**, **3** and **4**, is Lamarck's explanation of why giraffes have long necks?

.....[1]

(ii) Which **one** of the sentences **1**, **2**, **3** and **4**, contain data?

.....[1]

(iii) Which of the sentences, **1**, **2**, **3** and **4**, agree with Darwin's ideas about evolution due to natural selection?

.....[1]

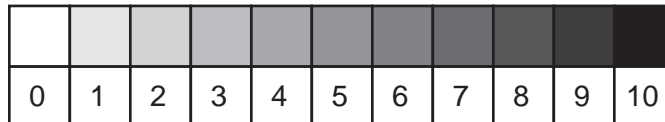
**[Total: 7]**

- 5 When diesel fuel is burned in a vehicle engine, very small particles of carbon, called particulates, are released into the air.

Scientists compare the level of air pollution by particulates next to a quiet country road and in the centre of a city.

They use apparatus that passes air through a paper filter. The particulates turn the paper from white to grey.

The scientists then match the grey colour of the filter with one on a card printed with shades of grey between 0 (white) and 10 (black).



Their results are shown in the table.

	shade of grey						mean
	sample 1	sample 2	sample 3	sample 4	sample 5	sample 6	
city centre	6	5	4	9	5	5	5
country road	2	1	1	3	2	3	

- (a) One of the measurements made in the city centre is an outlier.

Which sample is this?

sample ..... [1]

- (b) (i) To increase the reliability of their best estimates for the level of air pollution by particulates, the scientists take several measurements at each location.

How does this make their best estimates more reliable?

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

- (ii) The scientists' measurements are not all the same at each location.

Suggest **one** reason why the measurements in each set of results are not identical.

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



- (iii) The scientists get a best estimate for the level of air pollution by particulates next to the country road. They do this by calculating the mean (average) of the results.

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Work out a best estimate for the level of air pollution by particulates next to the country road.

best estimate = .....[2]

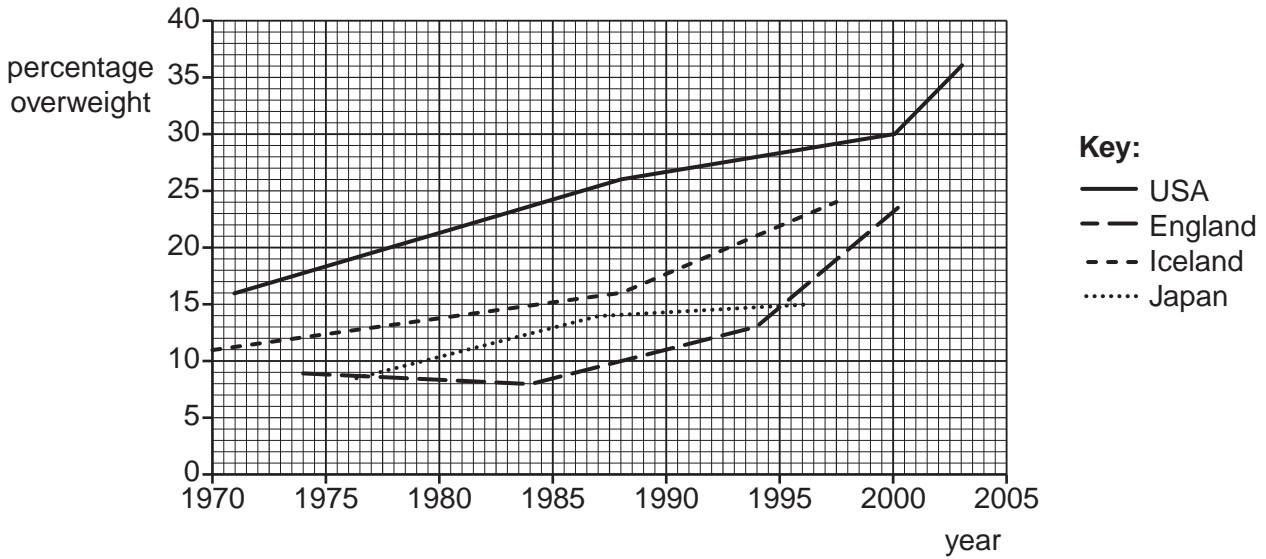
- (c) Particulates do not stay in the air forever.

What happens to these particulates?

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

**[Total: 7]**

6 Childhood obesity is a problem in many countries. The graph shows how childhood obesity increased in four countries over a period of time.



(a) (i) Describe what is meant by a *balanced diet*.

.....

.....

.....

..... [2]

(ii) Suggest what food types in the diet of children in these four countries may be helping to cause their obesity.

.....

.....

.....

..... [2]

(b) Obese children often become obese adults.

Name **one** disease linked to adult obesity.

..... [1]

[Total: 5]

7 In 1912, Alfred Wegener presented his idea of continental drift.

(a) (i) What is meant by *continental drift*?

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

(ii) Wegener had evidence to support his theory.

Write down two facts that supported Wegener's theory.

1. ....  
.....

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

(iii) Wegener did not have any training in geology.

Suggest why most geologists did not believe Wegener's theory in 1912.

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

(b) Wegener's theory is now accepted. The Earth's crust is made up of tectonic plates.

Scientists use the theory to understand where earthquakes are likely to happen.

(i) Where are earthquakes most likely to happen?

..... [1]

(ii) Understanding where earthquakes happen allows governments to prepare for them before they happen. One way is to build better buildings.

Choose the correct word from the list to complete the sentence

**stronger      thinner      taller      weaker**

In a place where earthquakes happen, a better building needs to be

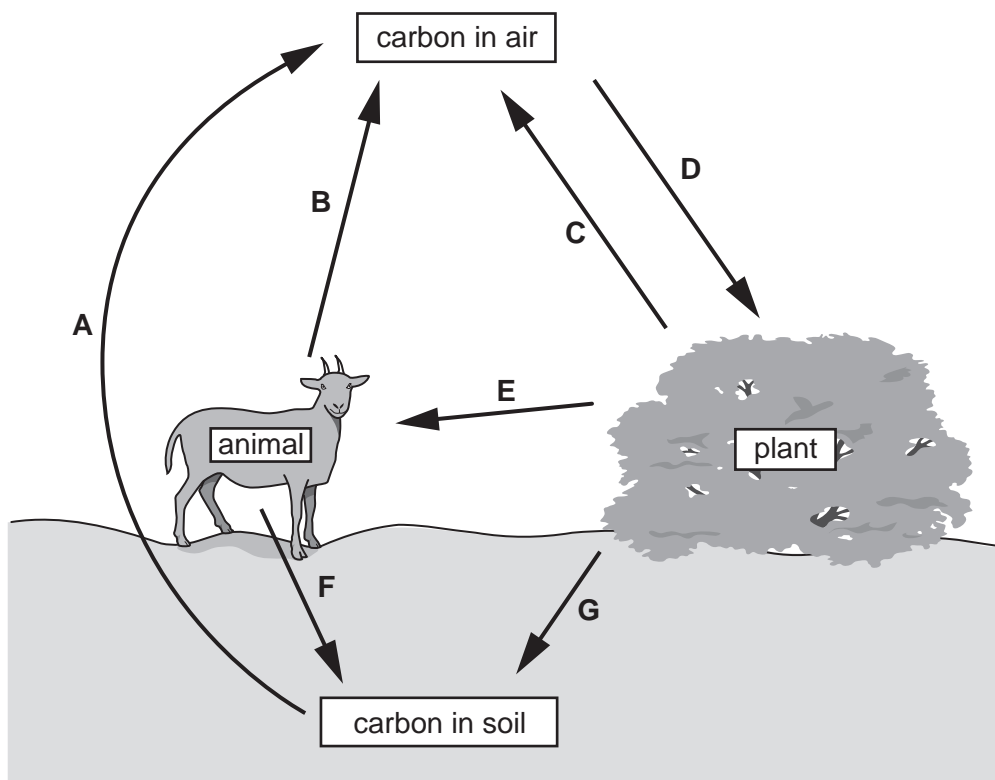
..... [1]

**[Total: 6]**

8 This question is about carbon dioxide in the Earth's atmosphere.

The diagram shows part of the carbon cycle, with processes labelled with the letters **A** to **G**.

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(a) Use the letters **A** to **G** from the diagram to answer the following questions.

(i) Which process is photosynthesis?

.....[1]

(ii) Which processes are respiration?

.....[1]

(b) Use the letters **A** to **D** from the diagram to explain why the amount of carbon dioxide in the atmosphere stayed constant for thousands of years.

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

.....[2]

(c) Two scientists disagree about global warming.

**Dr Chang**  
I've looked at the measurements for carbon dioxide and the temperature of the atmosphere. I don't think there is any pattern in the data.

**Dr Salim**  
I disagree. There is a pattern. Whenever the amount of carbon dioxide in the atmosphere went up, the temperature went up as well.

Which scientist is using the idea of correlation?

Dr .....

What is meant by the term *correlation*?

.....

.....

.....

..... [1]

(d) Human activities have greatly increased the amount of carbon dioxide in the atmosphere during the past two hundred years.

State one activity that has caused this increase.

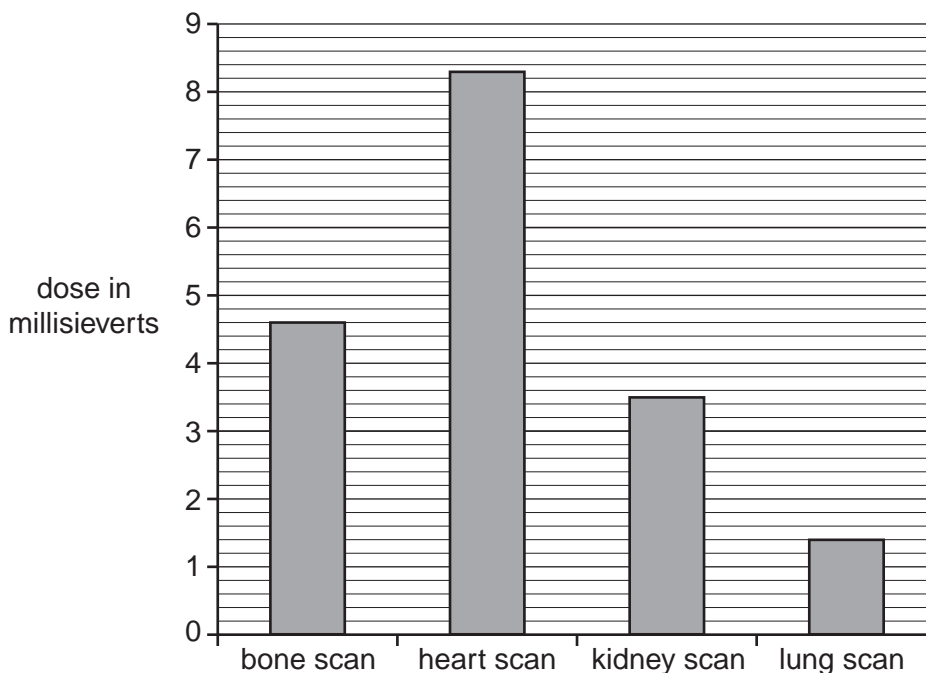
..... [1]

**[Total: 6]**

9 This question is about the risk to patients and staff in hospitals due to radioactive materials.

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(a) The bar chart shows the typical dose that a patient gets from different treatments.



(i) Which type of scan gave the **smallest** dose?

The ..... scan [1]

(ii) Which types of scan gave a dose greater than 3 millisieverts?

..... [2]

(iii) Write down the dose received in a bone scan.

..... millisieverts [1]

(iv) Each of these treatments involves injecting a radioactive chemical into the body.

A heart scan and a lung scan give the patient quite different doses of radiation.

Suggest two reasons for this.

Your answer should consider the type and amount of radioactive chemical used and the time it is in the body.

1. ....

2. .... [2]

(b) The patient may be willing to have the heart scan, even though radiation may be dangerous.

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Explain why the patient is willing to have the scan.

Use ideas of **risk** and **benefit** in your answer.

.....

.....

..... [2]

**[Total: 8]**

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