OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE SCIENCE A

A211/01

Unit 1: Modules B1 C1 P1
(Foundation Tier)

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)

Thursday 14 May 2009
Afternoon

Duration: 40 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

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.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

1 Read the article.

> **Rare quads born**
>
> A Canadian woman has given birth to four genetically identical daughters, Autumn, Brooke, Calissa and Dahlia.
>
> The odds of producing quads like this are estimated to be 1 in 13 million.
>
> The girls were conceived naturally.
>
> They have an older brother, Simon.

(a) How were the identical quads conceived?

Put a tick (✔) in the box next to the correct statement.

Four eggs were released and were fertilised by a single sperm cell.	☐
Four eggs were released and fertilised by four sperm cells.	☐
One egg was released and fertilised by a single sperm cell.	☐
One egg was released and fertilised by four sperm cells.	☐

[1]

(b) Complete the sentences below.

Choose the best number or group of letters from the list.

1 **2** **4** **23** **XX** **XXX** **XY** **XXY** **YY**

(i) Each sex cell has ..... copy/copies of each chromosome. **[1]**

(ii) Each fertilised egg cell has ..... copy/copies of each gene. **[1]**

(iii) Simon is male because he has ..... chromosomes. **[1]**

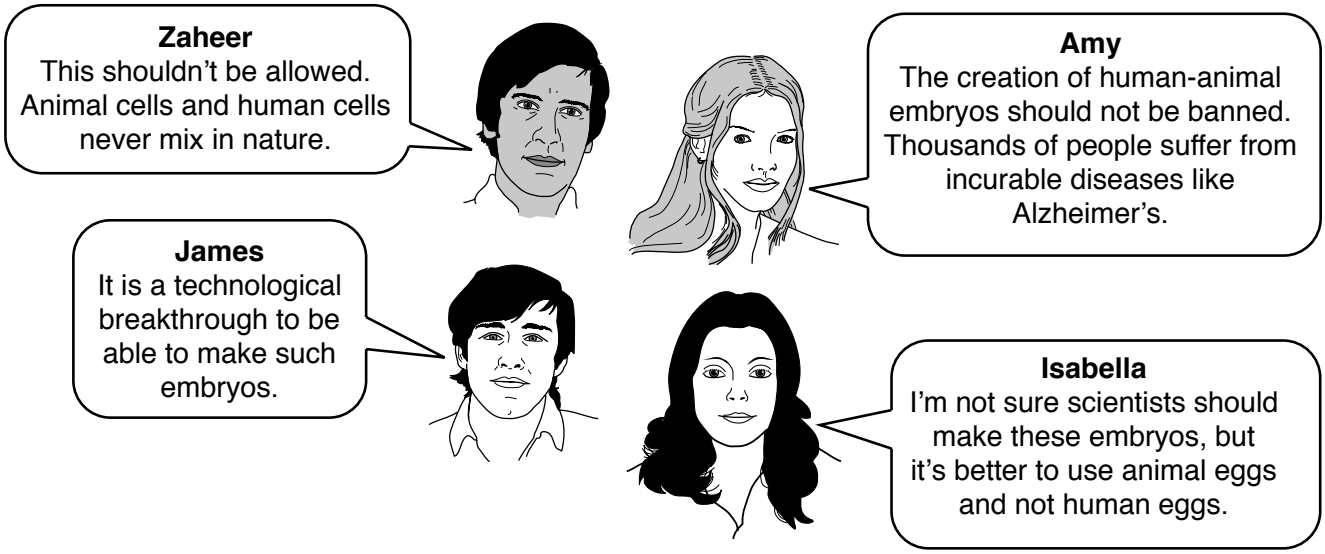
(iv) The quads are female because they have ..... chromosomes. **[1]**

[Total: 5]

2 Read the newspaper article.

> **Should human-animal embryos be banned?**
>
> The government is considering plans to ban the creation of embryos which are made from a human cell nucleus and an animal egg.
>
> Many MPs and scientists do not want this research to be banned.
>
> There are many more animal eggs available for research than human eggs.
>
> Some scientists believe that stem cells from these human-animal embryo clones could help develop treatments for disorders such as cystic fibrosis and Alzheimer's.

Some friends are discussing the article.



(a) (i) Write down the name of the person who thinks that making human-animal embryos is unnatural and wrong.

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

(ii) Write down the names of the two people who are concerned about ethics but say that the research should go ahead.

..... and .....**[1]**

(iii) Write down the name of the person who thinks the right decision is the one that leads to the best outcome for the largest number of people.

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

(b) Which statement explains why embryonic stem cells could help develop treatments for disorders such as cystic fibrosis and Alzheimer's?

Put a tick (✔) in the box next to the **one** correct statement.

Embryonic stem cells cannot be cloned.	☐
Embryonic stem cells are specialised cells.	☐
Embryonic stem cells are unspecialised cells.	☐
Embryonic stem cells cannot develop into any kind of cell.	☐

[1]

[Total: 4]

3 Huntington's disorder is caused by a **dominant** allele.

Read the newspaper article.

The article contains a mistake in the science.

New hope in search for Huntington's cure.

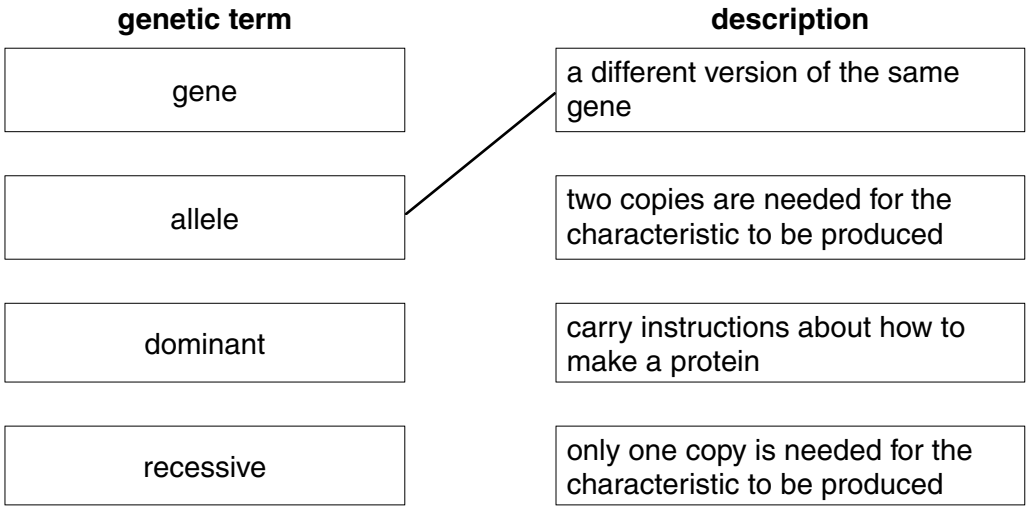
1 Scientists have made a breakthrough in the search for a cure for Huntington's disorder.
2 About 8000 people in the UK have Huntington's disorder.
3 Symptoms develop between the ages of 30 and 50 years.
4 The symptoms are caused by a build up of a wrongly-formed protein in the brain.
5 This only happens if both copies of the gene which code for the protein are defective.
6 A new drug has shown signs of treating the symptoms of Huntington's disorder in mice.

(a) The day after this article was first printed a correction was published.

Write down the number of the sentence containing the mistake. ..... **[1]**

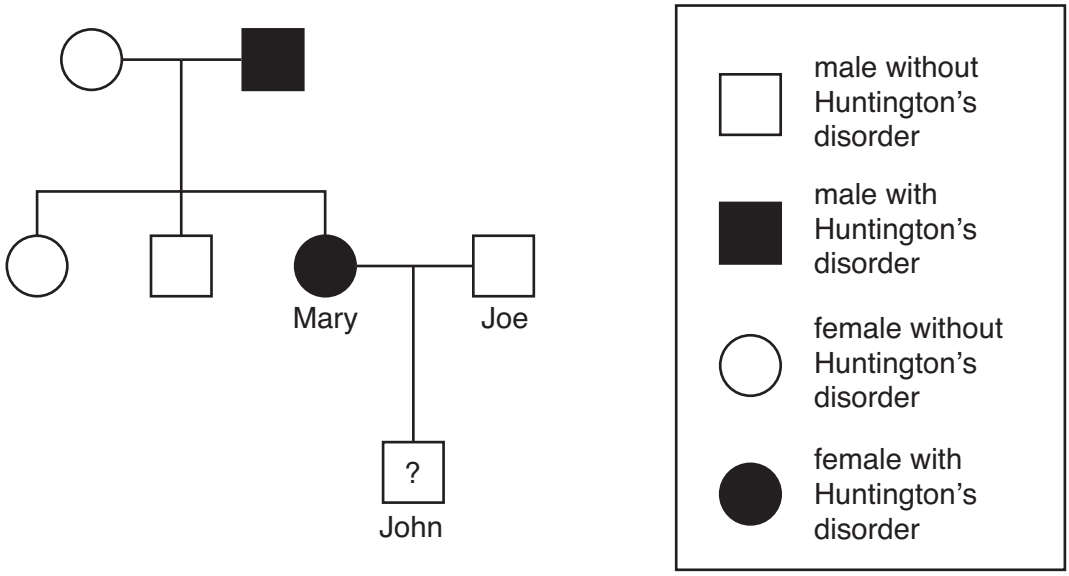
(b) Use straight lines to link each **genetic term** to its correct **description**.

One has been done for you.



[2]

(c) The diagram shows a family tree.



John is not old enough to have shown symptoms of Huntington's disorder.

What is the chance that John will have inherited Huntington's disorder from his mother?

Put a (ring) around the correct percentage.

0 % **25 %** **50 %** **75 %** **100 %**

Complete the genetic diagram to explain your answer.

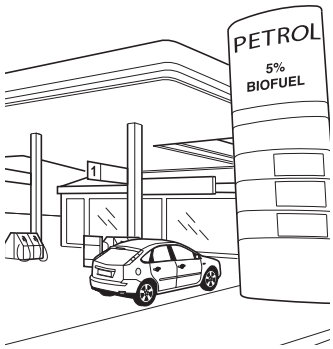
H = Huntington's allele and **h** = normal allele

	Mary Hh: H	Mary Hh: h
Joe hh: h		
Joe hh: h		

[2]

[Total: 5]

4 Read the article on biofuels.



Cars and lorries cause a quarter of the UK's atmospheric pollution.

The UK government wants all petrol and diesel sold by 2010 to contain 5% biofuel.

Biofuels are made from crops such as cereals, soya bean, rape seed, sugar cane and palm trees.

Biofuels are carbon neutral. The amount of carbon dioxide released when biofuels are burned in an engine, is the same as the amount of carbon dioxide absorbed by the plants when they were growing.

Environmentalists are worried about the land needed for growing these crops. This could damage ecosystems such as rainforests and reduce the area available for food crops in developing countries.

(a) Give **two** examples of plants mentioned in the article that can be made into biofuels.

.....

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

(b) The article says that biofuels are 'carbon neutral'.

Why are biofuels called carbon neutral?

Put a tick (✔) in the box next to the **best** answer.

Biofuels do not make carbon dioxide when they are burned. ☐

Crops for biofuels take in as much carbon dioxide when they grow as they give out when they are burned. ☐

Developing countries cannot grow as much food if land is used for biofuels. ☐

Rain forests are being cut down so that biofuel crops can be grown. ☐

[1]

(c) What problems are there in producing **more** biofuel?

Use information from the article.

Put ticks (✔) in the boxes next to the **two** best answers.

Rainforest habitats may be destroyed.	☐
Biofuels are carbon neutral.	☐
Only 5% of biofuel will be added to diesel.	☐
The amount of food grown may decrease.	☐
It will increase atmospheric pollution.	☐

[2]

(d) **(i)** Using biofuels will not reduce the amount of nitrogen oxides made in car engines.

Complete these sentences to explain how nitrogen oxides are made.

Use words from this list.

air

biofuel

car

cold

dilute

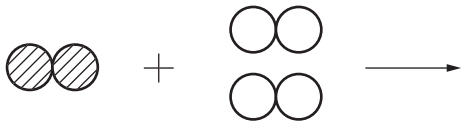
hot

Nitrogen and oxygen from the ..... react.

The gases react in the car engine because it is ..... . **[2]**

(ii) Nitrogen reacts with oxygen to make nitrogen dioxide, NO_2.

Complete the diagram to show this change.



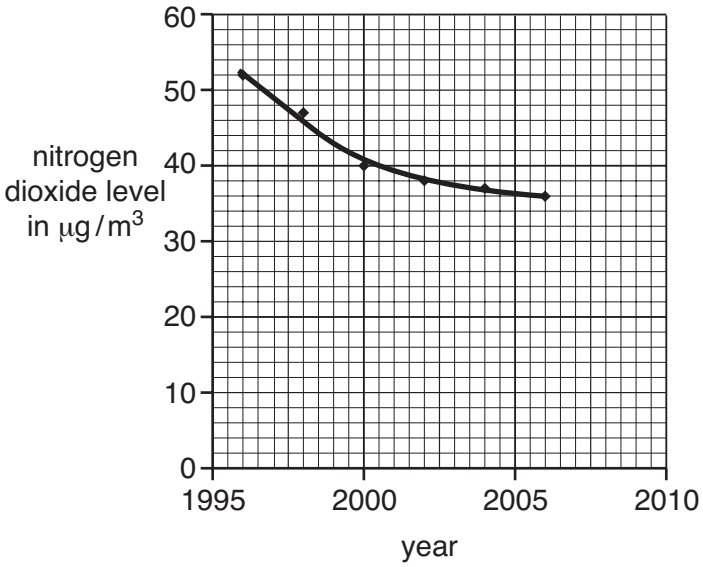
nitrogen oxygen nitrogen dioxide

[2]

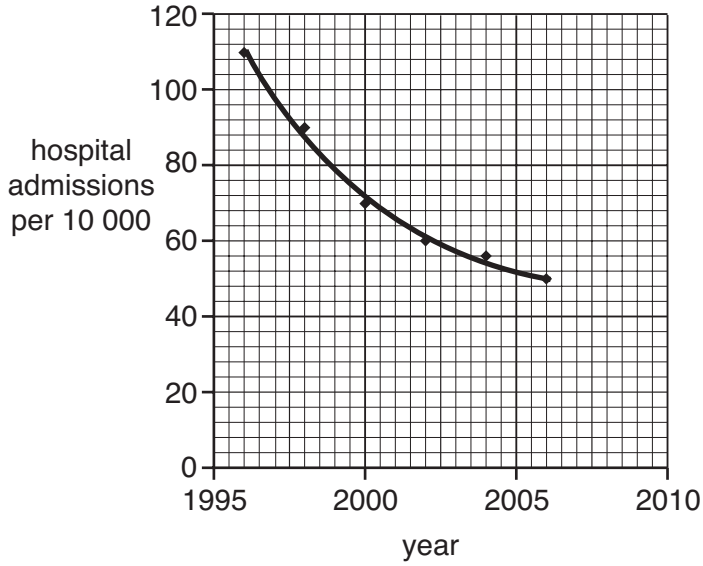
[Total: 8]

5 The graphs show nitrogen dioxide pollution in the air and the number of hospital admissions for asthma between 1996 and 2006.

average nitrogen dioxide levels in UK towns



hospital admissions for asthma



(a) (i) What was the average nitrogen dioxide level in UK towns in 2000?

.....μg/m^3 **[1]**

(ii) Use the graph to estimate the number of hospital admissions for asthma per 10 000 people in 2010.

Put a (ring) around the **best** estimate.

200 **65** **50** **35** **0**

[1]

(b) Look at the statements about the graphs.

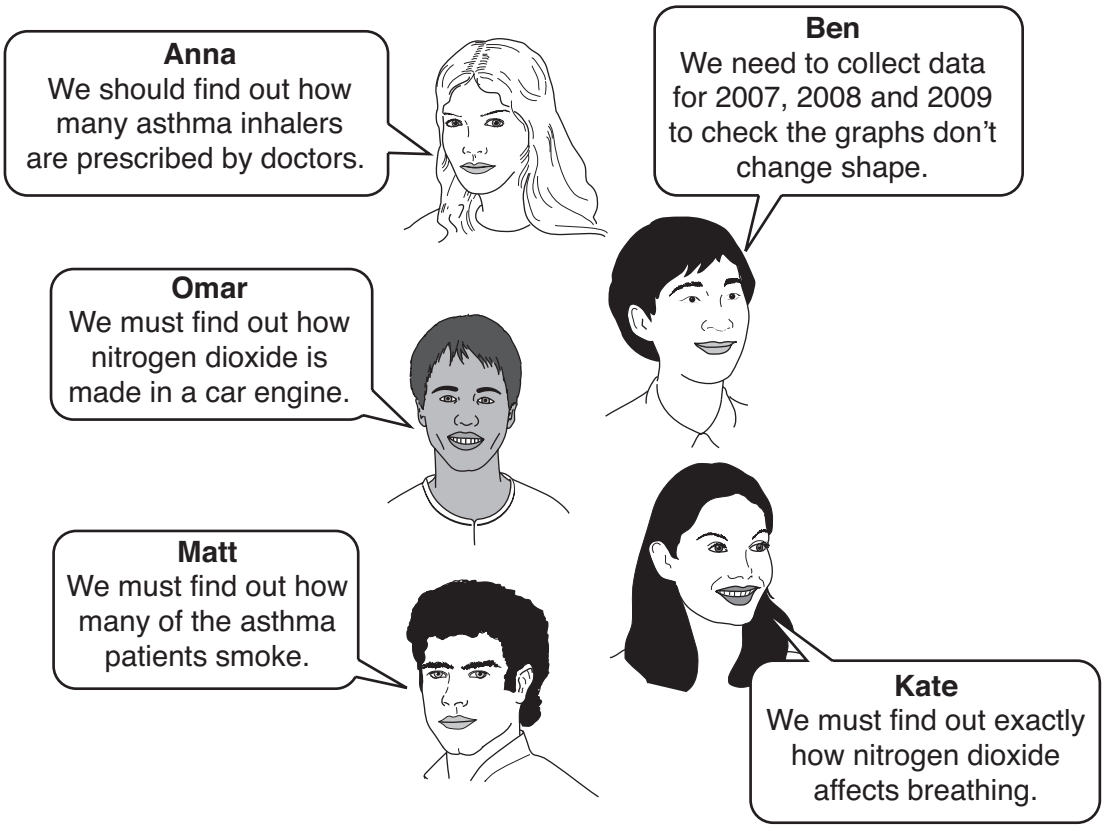
Put a tick (✔) in the correct box for each statement.

	true	false
Data is given for the same period of time.	☐	☐
As the level of nitrogen dioxide decreased, the number of hospital admissions stayed the same.	☐	☐
There is a correlation between the nitrogen dioxide levels and the number of asthma patients.	☐	☐

[2]

(c) Students are discussing how to investigate the link between nitrogen dioxide pollution and asthma.

This is what they say.



(i) Name **one** person who is talking about a factor other than nitrogen dioxide that might affect the number of people suffering from asthma.

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

(ii) Which person suggests investigating whether nitrogen dioxide **causes** asthma?

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

[Total: 6]

6 In the 1950s, there were two main theories about how the Universe began.

Martin Ryle

The Universe started as a burst of energy at one point and rapidly got bigger. Galaxies are all moving outwards from this 'Big Bang'.

Fred Hoyle

I agree that galaxies are moving apart, but I don't think the Universe had a beginning like you say. It has always been the same. New galaxies are being made all the time. They form in the gaps between old galaxies, which are dying out.

(a) Here are some astronomical statements.

Each statement agrees with what is being said by **Ryle**, or by **Hoyle**, or by **both** of them, or by **neither** of them.

Put a tick (✔) in the **one** correct box after each statement.

	Ryle	**Hoyle**	**both**	**neither**
Galaxies are moving apart from each other.				
In the past, all the galaxies would have been close together.				
Older galaxies have newer galaxies between them.				
The Universe will eventually stop expanding.				

[4]

(b) In the 1960s, the Big Bang theory became accepted as correct.

The boxes on the left show possible **stages in accepting a scientific theory**.

Link each one to the correct box in the **development of the Big Bang theory**.

One has been done for you.

stages in accepting a scientific theory	development of the Big Bang theory
1. Observations are made.	Astronomers observed that galaxies were all moving away from each other.
2. Someone thinks up a scientific explanation to account for these observations.	Big Bang theory suggested that the Universe should now be filled with microwave radiation.
3. This explanation is used to make predictions.	Scientists found microwave radiation coming from all directions in space.
4. New observations match the predictions.	Big Bang theory showed how galaxies started at one point and why they are now moving apart.

[2]

[Total: 6]

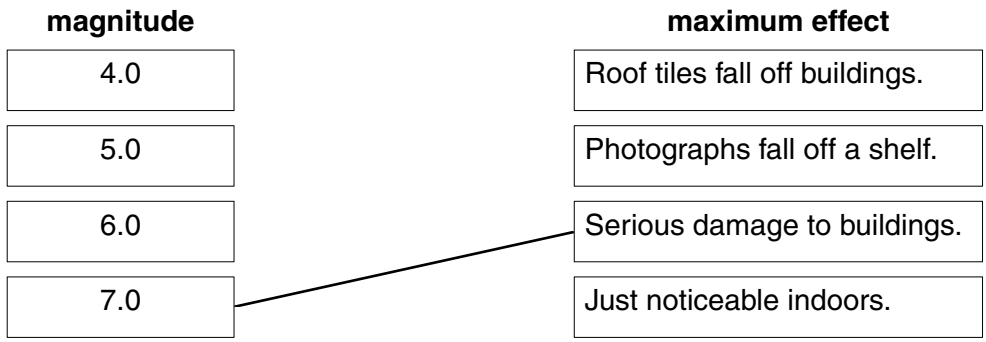
7 This question is about interpreting the data related to earthquakes.

The damage caused by earthquakes is related to their magnitude.

magnitude	how often they happen	effect
under 3.5	800 000 each year	Detected only by seismometers.
3.5 – 4.2	30 000 each year	Just about noticeable indoors.
4.2 – 4.8	4800 each year	Most people notice them. Windows rattle.
4.8 – 5.4	1400 each year	Everyone notices them. Dishes fall off shelves.
5.4 – 6.1	500 each year	Slight damage to buildings.
6.1 – 6.8	100 each year	Much damage to buildings.
6.8 – 7.1	15 each year	Serious damage. Bridges twist, walls break.
7.1 – 8.0	4 each year	Great damage. Most buildings collapse.
more than 8.0	one every 5 to 10 years	Total damage. Surface waves seen, objects thrown in the air.

(a) (i) Draw a straight line to link the **magnitude** of the earthquake to its **maximum effect**.

One has been done for you.



[2]

(ii) How many earthquakes per year would you expect people to notice?

Put a (ring) around the closest estimate.

1400 **4800** **30 000** **37 000**

[1]

(b) Earthquakes are quite common in certain parts of the world.

(i) Which one of these places is most likely to have earthquakes?

Put a tick (✔) in the box next to the **one** correct place.

	earthquakes likely here
in the mantle of the Earth	☐
where two tectonic plates meet	☐
near the centre of a tectonic plate	☐

[1]

(ii) In countries where earthquakes are common, it is important that the governments take action to reduce earthquake damage.

Draw a straight line to link each **action** to the **effect** it should produce.

action	**effect**
Make sure all buildings are earthquake-proof.	The whole population knows what to do when an earthquake strikes.
Educate all the people about emergency procedures.	Fewer buildings will fall down.
Emergency services practise what to do when an earthquake happens.	Trained staff go into action quickly.

[2]

[Total: 6]

8 About 200 years ago, James Hutton looked carefully at the layers in some rocks.

He realised that the Earth was much older than most people thought.

The statements show Hutton's ideas about how these layers form.

They are not in the correct order.

Put them in the correct order to give Hutton's argument for thinking that the Earth is very old.

Two have been done for you.

A Rivers carry clay, sand and mud into the sea.

B Mountains are slowly worn down by the weather.

C Clay, sand and mud form sediments at the bottom of the sea.

D Clay, sand and mud are produced when mountains are worn down.

E The sediments at the bottom of the sea slowly turn into layered rocks.

F Very thick layered rocks must have taken a very long time to build up.

B					F

[2]

[Total: 2]

END OF QUESTION PAPER