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Centre number						Candidate number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GCSE**

A211/02

**TWENTY FIRST CENTURY SCIENCE
SCIENCE A**

Unit 1: Modules B1 C1 P1 (Higher Tier)

TUESDAY 24 JANUARY 2012: Morning

DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**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)

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 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.**

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Answer ALL the questions.

1 Hugh has a DNA test.

This tests for genes that may increase his risk of developing certain diseases.

(a) Complete the sentence to describe a gene.

Put a tick (✓) in the box next to the correct answer.

A gene is ...

... a pair of chromosomes.

... a code for making DNA.

... a short section of protein.

... an instruction for making a protein.

[1]

(b) Some disorders such as Huntington's disorder are caused by alleles of a single gene.

Someone with the allele for Huntington's disorder will always develop the disease.

(i) Explain what is meant by PRE-IMPLANTATION GENETIC DIAGNOSIS.

[1]

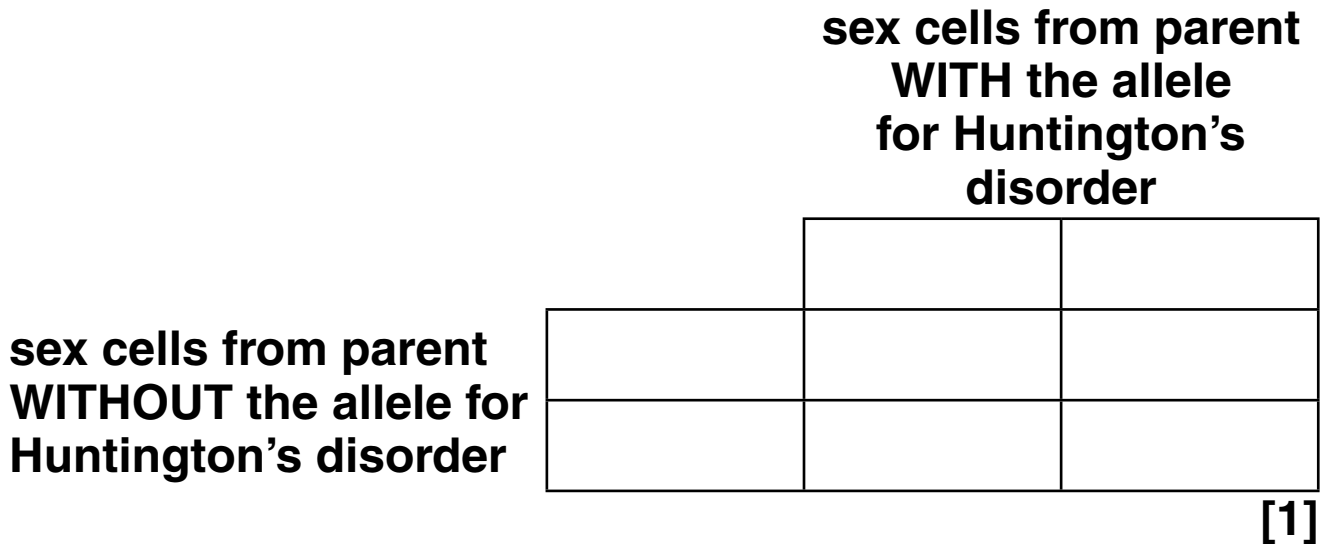
- (ii) Suggest why some people believe that **PRE-IMPLANTATION GENETIC DIAGNOSIS** is preferable to testing fetuses.

_____ [2]

- (c) (i) Complete the genetic diagram to explain the probability of a child inheriting Huntington's disorder if **ONE** parent has one copy of the allele for Huntington's disorder and the other parent has no copies of this allele.

Use

- H to represent the allele that causes Huntington's disorder.
- h to represent the normal allele.



- (ii) Write down the probability of a single child inheriting Huntington's disorder.

_____ [1]

- (iii) It is estimated that there are 12.4 cases of Huntington's disorder per 100 000 people.

If the population of the UK is 60 000 000, how many cases of Huntington's disorder does this estimate suggest?

Put a **ring** around the correct answer.

12.4

49.6

7 440

4 838 000

1 240 000

[1]

- (iv) Here are some reasons why the number of people with the allele for Huntington's disorder has been underestimated.

Put ticks (✓) in the boxes next to each reason to show whether it is a **TECHNICAL REASON** or a **VALUE JUDGEMENT**.

REASON	TECHNICAL REASON	VALUE JUDGEMENT
some people with the allele for Huntington's disorder died before they showed symptoms		
the allele responsible for Huntington's disorder was difficult to identify		
insurance companies required people to declare a positive Huntington's disorder test result		

[1]

[Total: 8]

2 Adam is similar to his parents in some ways but identical to neither.

Explain why Adam is similar to his parents but not identical to either of them.

Your answer should refer to

- **chromosomes**
- **sex cells**
- **alleles.**

[3]

[Total: 3]

3 (a) Embryonic stem cells have the potential to be used to treat some illnesses.

Put a tick (✓) in the box next to the best description of an embryonic stem cell.

a cell that can only develop into another unspecialised cell

a cell that can only divide to form gametes

a cell that can develop into any type of cell

an unfertilised egg cell

[1]

- (b) Embryonic stem cells could be cloned and used to treat some illnesses.**

People have different views about the use of embryonic stem cells.

Here is what some people say.

JON

The embryo would develop into a human being if we didn't use the cells. All human beings have the right to live.

SALEEMA

Where will all the embryos come from to use in this therapy?

JAYNE

I'm not sure about the science. I can't understand how it all works.

PHILIP

There are lots of people in the UK with incurable conditions. We must do what we can to help them. Using embryonic stem cells now may help many of them in the future.

CAIN

Using embryos for research is legal so it must be OK.

- (i) Which person thinks that the use of embryos to obtain stem cells is wrong in itself?**

answer _____ **[1]**

(ii) Which person thinks that the right thing to do is the action which will benefit the greatest number of people?

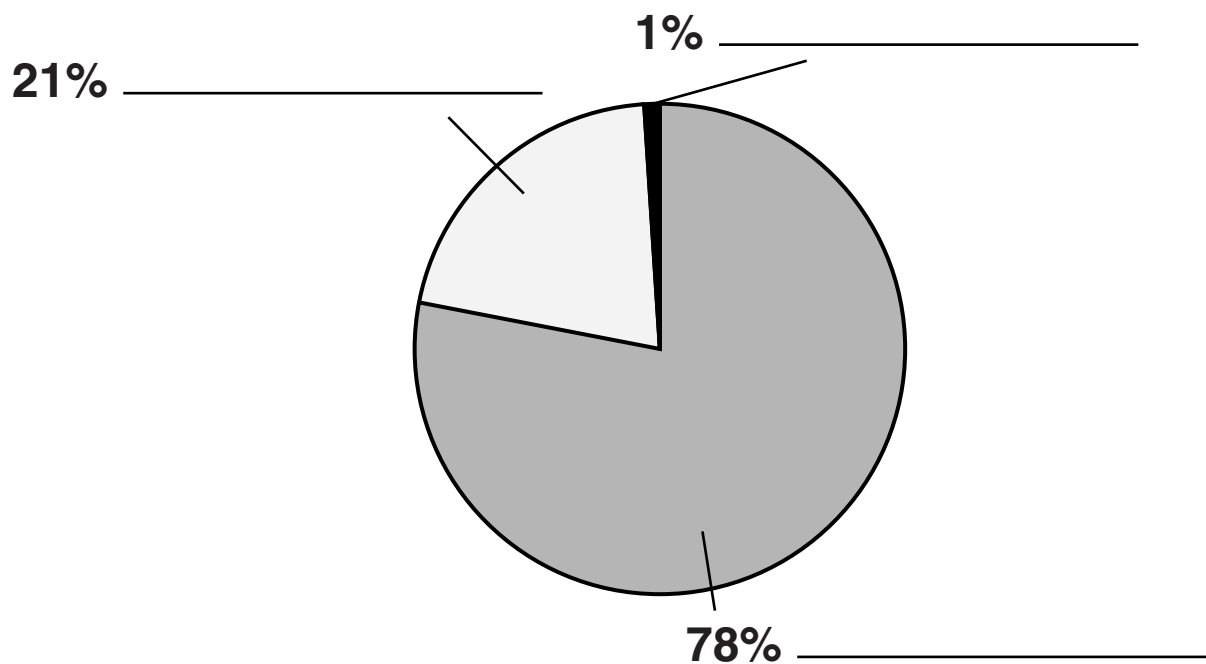
answer _____ **[1]**

[Total: 3]

4 This is a question about gases found in the air.

The pie chart shows the approximate percentages of three gases in the air.

(a) Label the pie chart to name these three gases.



[2]

(b) Other gases found in the air are pollutants.

These pollutants are made when fuels burn in motor vehicles or power stations.

(i) Draw a straight line from each POLLUTANT to HOW IT IS MADE.

Each HOW IT IS MADE box may be used once, more than once, or not at all.

POLLUTANT

HOW IT IS MADE

carbon monoxide

**complete combustion
of hydrocarbons**

nitrogen monoxide

**incomplete
combustion of
hydrocarbons**

particulate carbon

**reaction of impurities
in the fuel with
oxygen from the air**

sulfur dioxide

**reaction between two
gases from the air**

[3]

(ii) What happens to the nitrogen monoxide when exhaust gases from burning fuels enter the air?

Explain how this can harm people and the environment.

[3]

[Total: 8]

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5 In April 2010 an Icelandic volcano erupted.

A cloud of ash and sulfur dioxide was made.

Where this cloud travelled and where the ash landed depended on the weather conditions.

Measurements of particulates in the air were taken near an airport during the eruption.

Particulates include carbon and other solids.

Here are measurements at three different times in one day.

SAMPLE	PARTICULATES IN THE AIR IN $\mu\text{g}/\text{m}^3$		
	MORNING	AFTERNOON	EVENING
1	10	58	17
2	12	63	15
3	15	71	11
4	8	66	4
5	10	62	13
BEST ESTIMATE		64	14

- (a) (i) What is the best estimate of the true value of particulates in the air in the MORNING?**

Show your working.

best estimate = _____ $\mu\text{g}/\text{m}^3$ [2]

- (ii) Is there a REAL DIFFERENCE between the levels of particulates in the MORNING and EVENING?**

Use data from the table and your answer to part (i) to explain your answer.

[2]

(b) What other information would you need to know, to find out if the volcanic ash cloud could account for the pattern of data in the table?

Put a tick (✓) in the box next to EACH correct answer.

how many hours the Sun was shining for

the colour of particulates in the ash cloud

the direction of the wind

the locations of the volcano and airport

the size of the particulates

the speed of the ash cloud

[2]

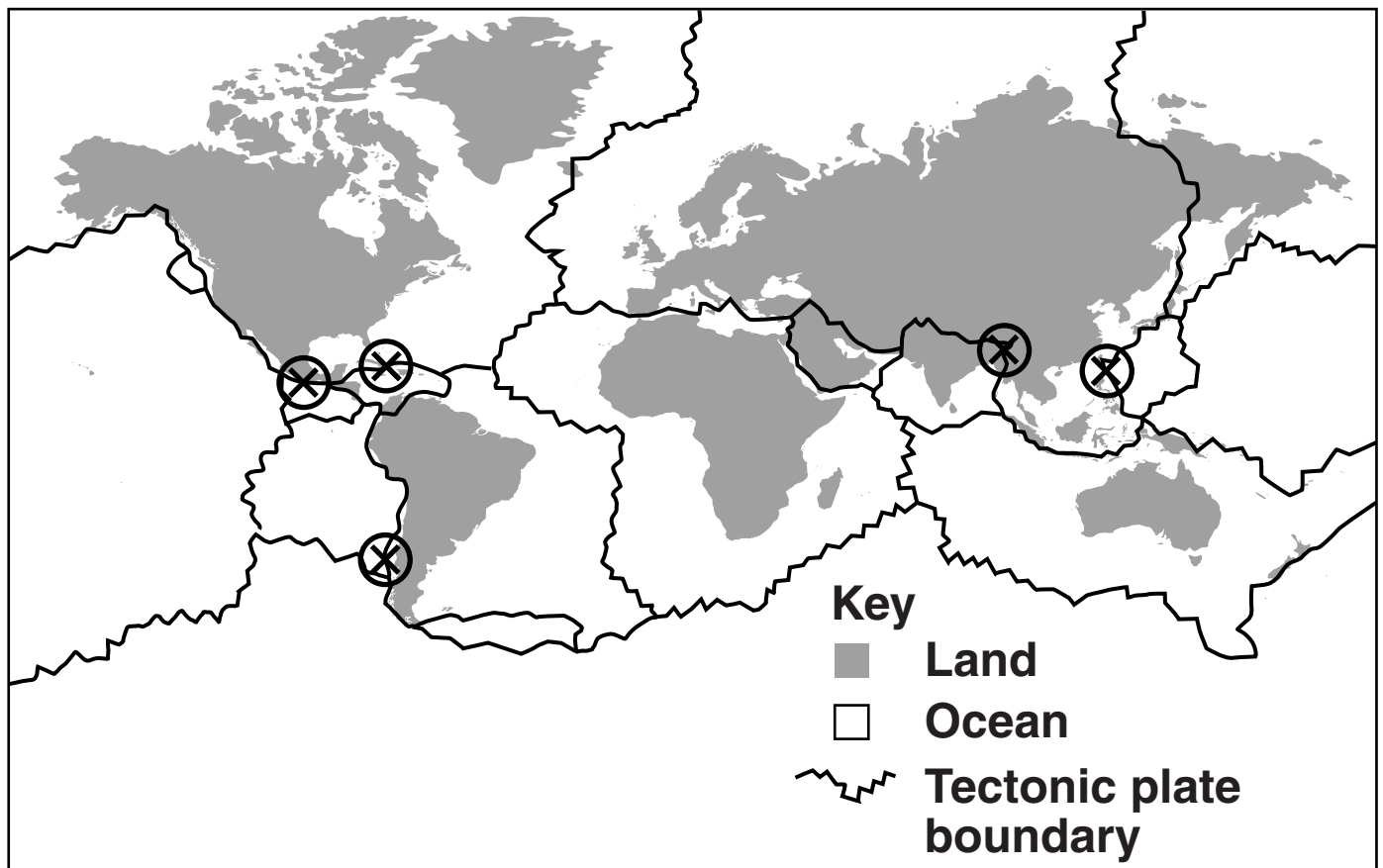
[Total: 6]

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6 In the first four months of 2010, there were five large earthquakes around the world.

Such large earthquakes do not usually happen so often.

The earthquakes took place at the points marked ⊗ on this map.



Read what these scientists say about the five earthquakes.

ANNA

Movements in the Earth's mantle create stresses between tectonic plates.

BRIAN

These earthquakes must have been linked in some way. Movement of two tectonic plates is bound to give the other plates a sudden jolt.

CHANDRA

Movement of tectonic plates is a random process. Sometimes random events do happen close together.

DANIEL

This is a very small sample. You need to look at more earthquakes before you can see any pattern.

(a) Who gives an **EXPLANATION** for five earthquakes happening in such a short time?

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

Anna

Brian

Chandra

Daniel

[1]

(b) Who suggests that the available data are insufficient to draw any conclusion?

Put a tick (✓) in the box next to the correct answer.

Anna

Brian

Chandra

Daniel

[1]

(c) Who suggests an explanation which applies to most earthquakes?

Put a tick (✓) in the box next to the correct answer.

Anna

Brian

Chandra

Daniel

[1]

[Total: 3]

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7 (a) Apart from the Sun, our nearest star is about 4 light-years away.

Here are five different distances.

A a light-year

B the diameter of the Earth

C the diameter of the Solar System

D the diameter of the Milky Way galaxy

E the amount an ocean floor spreads in 1000 years

Fill in the boxes to show the correct order.

SMALLEST

--	--	--	--	--

BIGGEST

[1]

(b) Complete the following sentences with the correct number of years.

Use numbers from this list.

4 000

5 000

9 000

12 000

14 000

16 000

The Universe began with a ‘Big Bang’ about

_____ million years ago.

The Solar System was formed about

_____ million years ago.

The oldest rocks on Earth are about

_____ million years old. [3]

[Total: 4]

8 Rocks give us evidence that the Earth has changed a lot since it was formed.

Give TWO examples of the evidence found in rocks, and explain how each one shows how the Earth has changed.

[2]

[Total: 2]

9 For many years, radio astronomers have been trying to detect signals which may have come from intelligent life far out in the Universe.

Explain why many scientists think it is likely that life does exist somewhere out in the Universe, and suggest why no evidence of life has been found so far.

[3]

[Total: 3]

10 Telescopes in space are now used to measure the distance to distant stars.

Which of the statements below explain why?

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

A telescope in space can avoid light pollution by pointing away from the Earth.

Light left these distant stars a very long time ago.

Small parallax movements of the stars are measured more accurately if the telescope is closer to them.

The Earth's atmosphere varies all the time and affects light passing through it.

The stars are very far away and cannot be seen clearly.

[2]

[Total: 2]

END OF QUESTION PAPER

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