

**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 19 May 2011  
Afternoon**

**Duration: 40 minutes**



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**MODIFIED LANGUAGE**

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- 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).
- Answer **all** the questions.
- Do **not** write in the bar codes.

**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.

Answer **all** the questions.

- 1 Friedreich's ataxia (FRDA) is a genetic disorder. People with this disorder have problems with balance and coordination. This is because their bodies are unable to produce a particular protein which is involved in nervous system control.

FRDA is inherited like cystic fibrosis. The FRDA gene has two alleles

**A** = normal allele

**a** = ataxia allele.

- (a) Complete the table to show the combinations of alleles **A** and **a** in three different people. One has been done for you.

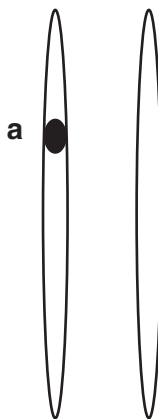
person	description	combination
1	has FRDA	
2	is a carrier of FRDA	<b>Aa</b>
3	has not got FRDA and is not a carrier	

[2]

- (b) FRDA is caused by a faulty allele on chromosome pair number 9.

The diagram shows the chromosome pair number 9 for a **carrier** of FRDA. The position of allele **a** has been marked.

On the diagram mark the position of allele **A**.



Chromosome pair number 9

[1]

(c) (i) Genes are instructions for a cell to make a particular type of chemical.

What type of chemical is produced?

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

- fat
- DNA
- protein
- carbohydrate

[1]

(ii) Scientists are doing research to develop **gene therapy** to treat FRDA.

They genetically alter mice to give them FRDA.

They then use a virus to move a **normal (A) allele** into these mice.

The mice show signs of recovery from FRDA within 4 weeks of treatment.

Some people are against this research and some people think it is a good idea.

Write down one argument **against** and one argument **for** this research.

.....

.....

.....

..... [2]

(iii) How does gene therapy treat FRDA in mice?

Put a tick (✓) in the box next to the **best** explanation.

The cells with a normal (A) allele ...

... are stronger than cells without the allele.

... make the missing protein.

... are made from the missing protein.

... are human cells not mouse cells.

[1]

(iv) Another possible way of treating genetic disorders is to use embryonic stem cells.

Put ticks (✓) in the boxes next to the **two** correct statements about embryonic stem cells.

Embryonic stem cells are ...

... specialised.

... unspecialised.

... always male.

... commonly found in adults.

... able to develop into any kind of cell.

... able to develop into eggs.

[2]

- (d) Jane and John are both carriers of FRDA.  
 They want to have a baby.  
 They know the baby might have FRDA.  
 It is now possible to test, select and implant embryos free of FRDA.

Some of their friends are discussing this process.  
 They are worried about the reliability, risks and ethics of this technology.

**Greta**  
 Many embryos are not used and are left to die. This is unacceptable.

**Richard**  
 The genetic tests can give false positive results.

**Barry**  
 This process is unnatural. We should not choose our children. None of us are perfect. Where will it all end?

**Sanjay**  
 Embryo selection involves IVF which has a relatively low success rate.

**Elaine**  
 This process can cause a miscarriage or damage the fetus.

Write the names of the friends concerned about **risk**, **reliability** and **ethics** in the correct columns.

risk	reliability	ethics

[3]

[Total: 12]

- 2 Occasionally **natural** human clones occur.

Explain what a clone is **and** how natural human clones occur.

.....

.....

..... [2]

[Total: 2]

- 3 This question is about gases found in the air.

(a) Answer the questions by choosing the correct gas or gases from the list.

Each gas may be used once, more than once or not at all.

**carbon dioxide**

**nitrogen**

**oxygen**

**sulfur dioxide**

(i) Which gas is used up when fuels burn?

answer ..... [1]

(ii) Which gas is removed from the air by photosynthesis?

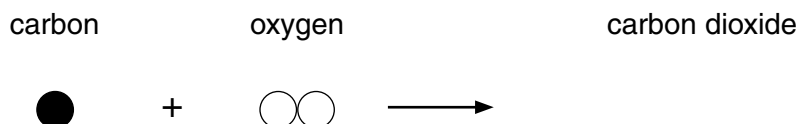
answer ..... [1]

(iii) Which **two** gases are removed from the air when they dissolve in rain water?

answer ..... and ..... [2]

(b) Carbon dioxide is made when carbon atoms react with oxygen.

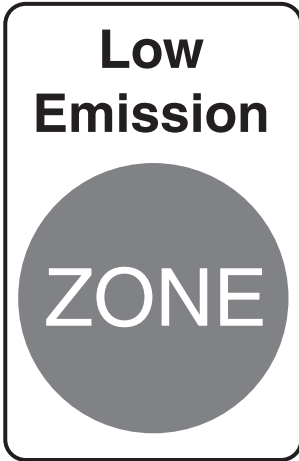
Complete the diagram to show this reaction.



[1]

[Total: 5]

4



In London there is a Low Emission Zone.

Pollutants in the exhaust gases of lorries and buses are measured.

These are

- carbon monoxide
- nitrogen oxides
- particulates.

Lorries and buses that make exhaust gases above a limit are made to pay a charge.

This should lower air pollution in London.

(a) Write about the problems caused by carbon monoxide and nitrogen oxides.

.....

.....

.....

..... [2]

(b) Kate is talking about the effects of Low Emission Zones.

Kate says "I do not think buses should be charged even though they have large diesel engines. Buses help to lower air pollution in our cities."

Suggest reasons why Kate says that using buses lowers air pollution.

.....

.....

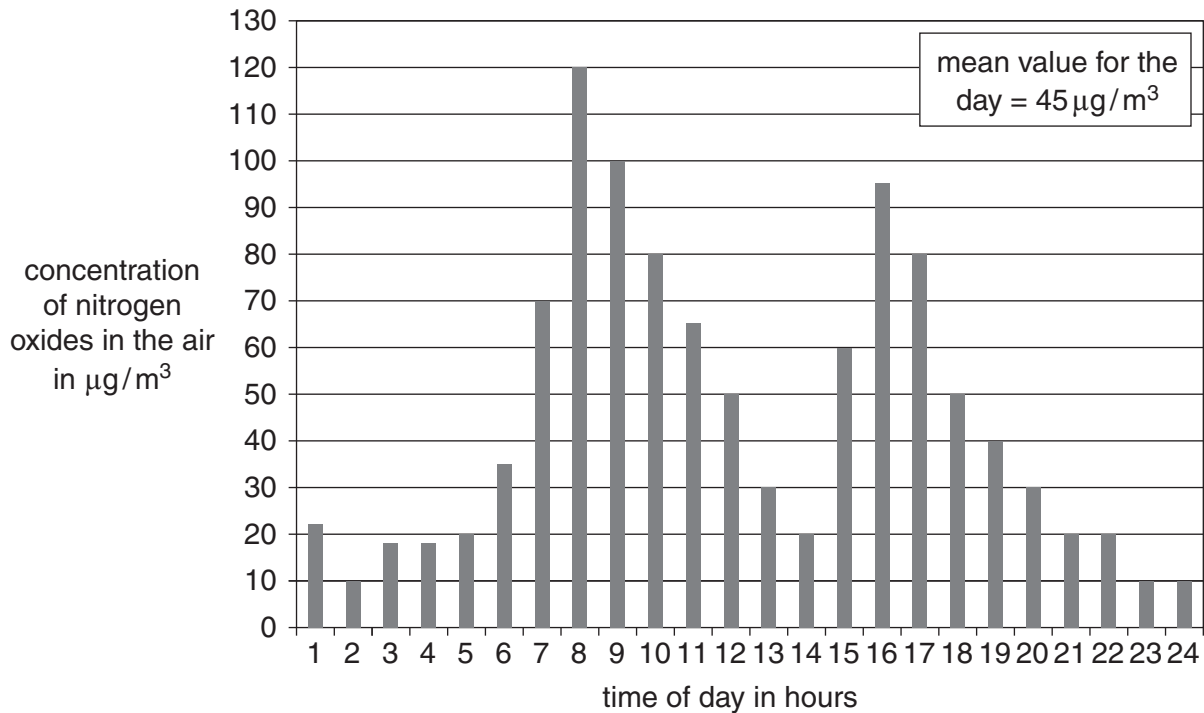
.....

..... [2]

[Total: 4]

- 5 Some of the gases that affect air quality are nitrogen oxides.

This graph shows how the amount of nitrogen oxides in air changes over a typical weekday in a city.



- (a) The mean of this data is  $45 \mu\text{g}/\text{m}^3$ .


What is the range of this data?

from ..... to .....  $\mu\text{g}/\text{m}^3$  [1]




(b) Six students are talking about this graph.


This is what they say.



**Josh**  
The maximum value for nitrogen oxides was at 8 hours.





**Hannah**  
Nitrogen oxides are made in gas ovens and boilers.




**Donna**  
There will be less traffic at the weekend.

**Rajid**  
Concentrations of nitrogen oxides are higher at times when there is more traffic.

**Gary**  
Rain increases the concentration of nitrogen.

**Sara**  
Nitrogen oxides made in vehicle engines escape into the air through the exhaust.



(i) Which **two** students are using data from the graph?  
..... and ..... [2]

(ii) Which student is describing a correct correlation?  
answer ..... [1]

(iii) Which student is describing a cause for this correlation?  
answer ..... [1]

[Total: 5]

**10**  
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- 6 Read this article on the search for life on distant planets.  
The different statements in the article are numbered 1–5.

**SETI**

- 1 For 25 years, the SETI (Search for ExtraTerrestrial Intelligence) project has looked for signs of alien life in the Universe.
- 2 SETI looks for radio signals from space to see if they have patterns in them.
- 3 Signals with patterns could have been sent as communication.
- 4 Results have been disappointing so far.
- 5 It takes many thousands of years for radio signals to reach us from the far side of the Milky Way.

(a) Which **two** statements contain data?

statement ..... and .....[2]

(b) Which **one** statement tells us that stars are very far apart?

statement .....[1]

[Total: 3]

- 7 Two scientists are discussing possible explanations for mass extinctions. A mass extinction is when many species suddenly die out.



**Dr Adams**

The dinosaurs died out about 65 million years ago.  
Geological evidence shows that a giant asteroid hit the Earth at about this time and made a huge crater in Mexico.

**Dr Baker**

The dinosaurs started to die out before the asteroid crashed into Mexico.  
Huge volcanic eruptions happened in India much nearer the time that the dinosaurs became extinct.



**Dr Adams**

Huge volcanic eruptions happened in Scotland 58 million years ago. There were no mass extinctions then.

**Dr Baker**

There were huge volcanic eruptions in Russia 250 million years ago. There was a mass extinction then.



- (a) Who gives evidence to support the **asteroid** explanation?

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

Dr Adams only

Dr Baker only

both scientists

neither scientist

[1]

(b) Who gives an explanation for the extinction of the dinosaurs?

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

Dr Adams only

Dr Baker only

both scientists

neither scientist

[1]

(c) Who uses data to support her explanation?

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

Dr Adams only

Dr Baker only

both scientists

neither scientist

[1]

(d) Who talks about peer review?

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

Dr Adams only

Dr Baker only

both scientists

neither scientist

[1]

[Total: 4]

- 8 (a) Wegener believed that the continents had moved about.

In Wegener's time, other scientists did not believe his idea.

What reason did they give for disagreeing with Wegener?

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

The continents move too fast.

Fossil animals are found in many countries.

There was not enough evidence to support his ideas.

They preferred a much more complicated explanation.

[1]

- (b) We now know that the Earth's crust consists of moving tectonic plates.

Which of the following are caused by two tectonic plates meeting?

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

deserts

earthquakes

rivers

volcanoes

waterfalls

[2]

[Total: 3]

- 9 Adrian knows that the Moon goes around the Earth, and that the planets go around the Sun. He wants to know more about astronomy.

**Adrian**  
I am unsure about stars, galaxies and asteroids.  
Where are they?  
How big are they?  
Do they move around the Sun?



Answer Adrian's questions about stars, galaxies and asteroids.

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 4]

**END OF QUESTION PAPER**

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