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A211/02

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**  
**TWENTY FIRST CENTURY SCIENCE**  
**SCIENCE A**

Unit 1 Modules B1 C1 P1 (Higher Tier)

**MONDAY 23 JUNE 2008**

Morning

Time: 40 minutes

\* C U P / T 6 1 3 0 6 \*

Candidates answer on the question paper.

**Additional materials (enclosed):** None

Calculators may be used.

**Additional materials (required):**

Pencil

Ruler (cm/mm)



Candidate  
Forename

Candidate  
Surname

Centre  
Number

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Candidate  
Number

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**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

**INFORMATION FOR CANDIDATES**

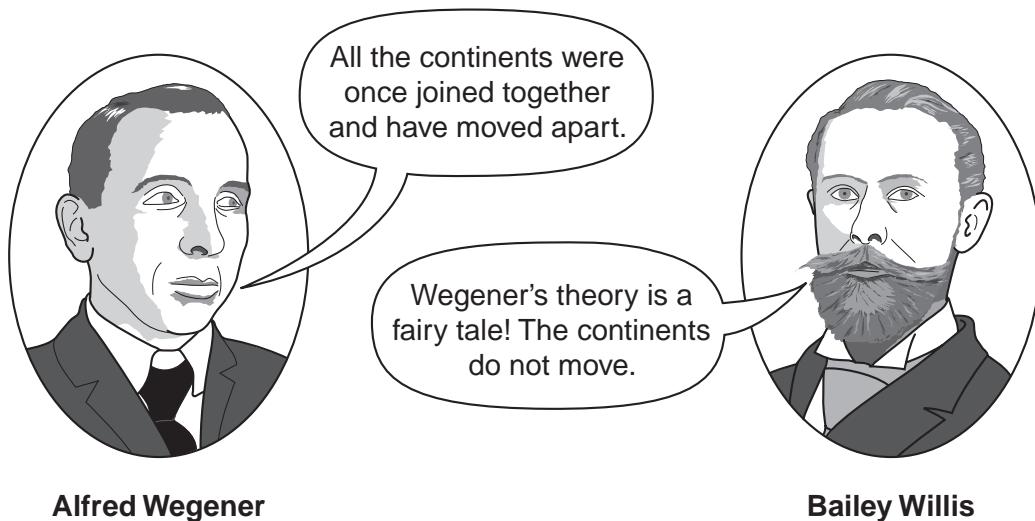
- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	7	
2	8	
3	5	
4	4	
5	5	
6	13	
<b>TOTAL</b>	<b>42</b>	

This document consists of **16** printed pages.

Answer **all** the questions.

1 In 1915, Alfred Wegener suggested his theory of continental drift. The American geologist Bailey Willis did not agree with him.



**Alfred Wegener**

**Bailey Willis**

(a) Here are some statements.

Each statement either supports Wegener or supports Willis.

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

	<b>supports Wegener</b>	<b>supports Willis</b>
There are similar fossils in America and Africa.		
The shapes of the continents look as if they fit together.		
The accepted geological theories in 1915 stated that continents cannot move.		
The rock layers have a similar pattern on each side of the Atlantic Ocean.		

[3]

**(b) (i)** The spreading of seafloors is the cause of continental drift.

Here are some distances.

**1 mm**

**100 mm**

**1 m**

**100 m**

**1 km**

Which one of these is the best estimate for the distance that continents move each year?

Draw a **ring** around the best estimate.

[1]

**(ii)** The following steps, **A**, **B**, **C**, **D** and **E**, show the stages in the formation of mountain chains.

They are not in the correct order.

- A** Magma erupts and solidifies.
- B** The crust under the sea spreads.
- C** The rising mantle melts under a mid-ocean ridge.
- D** The edge of the continental crust is forced upwards.
- E** The edge of the seafloor is forced under the adjacent tectonic plate.

Fill in the boxes to show the correct order. The first one has been done for you.

<b>C</b>				
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[3]

[Total: 7]

2 A new Earth satellite called Gaia has been planned. It will use a telescope to measure the distances from Earth to many stars.



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Four scientists discuss the Gaia satellite.

They have different opinions.



(a) Which **two** scientists are discussing data that the satellite may produce?

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

Bev

Matt

Sahid

Tracy

[2]

(b) Which **two** scientists are making statements which include an **explanation**?

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

Bev

Matt

Sahid

Tracy

[2]

(c) These scientists are stating different opinions about the Gaia project.

Put a tick (✓) in **each** correct box below.

	<b>says it can be done</b>	<b>says it can not be done</b>	<b>says it should be done</b>	<b>says it should not be done</b>
Bev				
Matt				
Sahid				
Tracy				

[4]

[Total: 8]

3 Read this article about traffic pollution.

## Clean air targets missed as traffic hotspot pollution soars

Nitrogen dioxide levels on some of the city's busiest roads are now more than double the EU's air quality targets.

More people are admitted to hospitals suffering with asthma when nitrogen dioxide levels increase.

In 2010, targets on air quality become law.

The city council faces being hit by fines expected to amount to thousands of pounds.

The council is thinking about these ways to reduce the pollution.

- using electric trams
- charging motorists for entering the city
- closing roads
- banning vehicles that don't meet strict emission limits
- charging large fines for polluting vehicles

(a) Which **one** of the following four statements is true?

Use information from the article to help you.

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

Nitrogen dioxide is the only pollutant that is harmful to humans.

There is a correlation between nitrogen dioxide levels and hospital admissions for asthma.

Nitrogen dioxide definitely causes asthma.

Changes in laws will reduce pollution.

[1]

(b) Here are six correct statements about trams.

Which **two** statements when put together explain why trams are a good way to reduce air pollution in the city?

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

Each tram can carry eighty people.

Trams are driven along rails.

Trams are very heavy vehicles.

Trams run on electricity.

You can only get on and off a tram at certain places.

Trams only need one driver.

[2]

(c) The chart shows three methods of reducing pollution.

Draw a straight line from the **method** to the **effect on pollution**.

**method**

**effect on pollution**

closing roads

same pollution per vehicle  
but fewer vehicles

charging motorists to  
enter the city

less pollution  
per vehicle

large fines for  
polluting vehicles

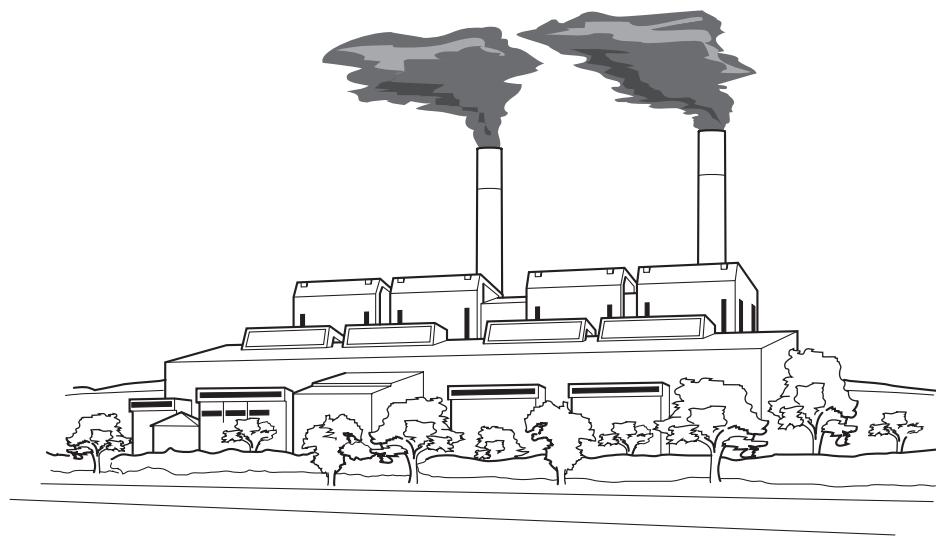
less pollution per vehicle  
and more vehicles

no vehicles so  
no pollution

[2]

[Total: 5]

4 This question is about a coal fired power station.



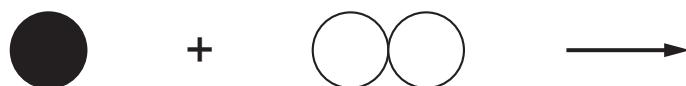
A coal fired power station is getting bad publicity about pollution.

(a) What is the main element in coal?

..... [1]

(b) If coal burns **completely** in oxygen from the air, the product is **carbon dioxide**.

Complete the diagram to show this reaction.

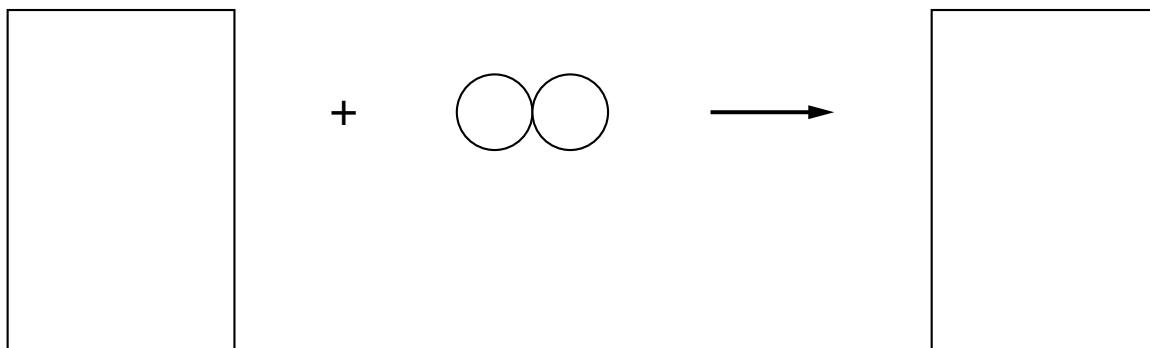


[1]

(c) When carbon is **incompletely** burned, it produces **carbon monoxide**.

The diagram shows this reaction.

Complete the diagram to show this as a **balanced** reaction.



[2]

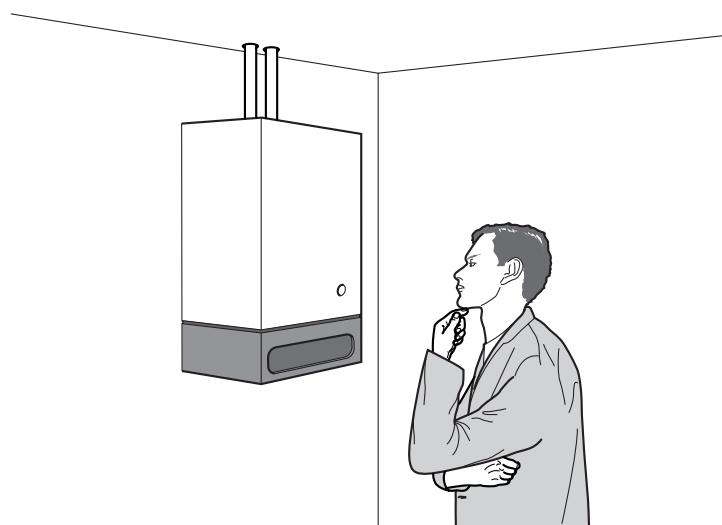
[Total: 4]

10

5 Andy is a gas engineer. He looks at a central heating boiler.

It is not working properly. He notices soot coming out of the chimney.

He tests the boiler to measure the amount of carbon in the soot.



(a) Here are Andy's measurements.

Test A						
measurement number	1	2	3	4	5	6
amount of carbon (mg/m <sup>3</sup> )	47	48	45	51	64	49

Which measurement is an outlier?

Put a ring around the correct answer.

45

47

48

49

51

64

[1]

(b) After the boiler is repaired he repeats the tests.

Here are his new measurements.

Test B					
measurement number	1	2	3	4	5
amount of carbon (mg/m <sup>3</sup> )	25	26	27	23	24

11

(i) Work out the best estimate of the true value.

..... [1]

(ii) Write down the range of these measurements.

from ..... to ..... [1]

(iii) There are differences in the second set of measurements.

Which of the statements below gives the **best** reason for these differences?

Put a tick (✓) in the box by the **best** answer.

The measurements were only taken during the day.

Andy took all the measurements.

The temperature of the central heating boiler changed slightly.

The chimney was very tall.

[1]

(c) Andy increases the flow of air going into the boiler.

He then repeats his measurements.

Here are the results. The mean of these results has been calculated.

Test C						
measurement number	1	2	3	4	5	mean
carbon particles (mg/m <sup>3</sup> )	16	15	11	10	13	13

Andy said there was a real difference in the amount of solid particles after he increased the flow of air.

Why is he able to say this?

The mean of test C is about half the mean of test B.

The range of test C is larger than the range of test B.

It is a fair test and the measurements are different.

The range of test C does not overlap the range of test B.

[1]

[Total: 5]

[Turn over]

12

6 William has just been told he has Huntington's disorder.

Huntington's disorder is an inherited condition.

It is caused by a dominant allele.

(a) Which of these sentences best describes the role of a dominant allele?

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

Both parents must carry the allele.

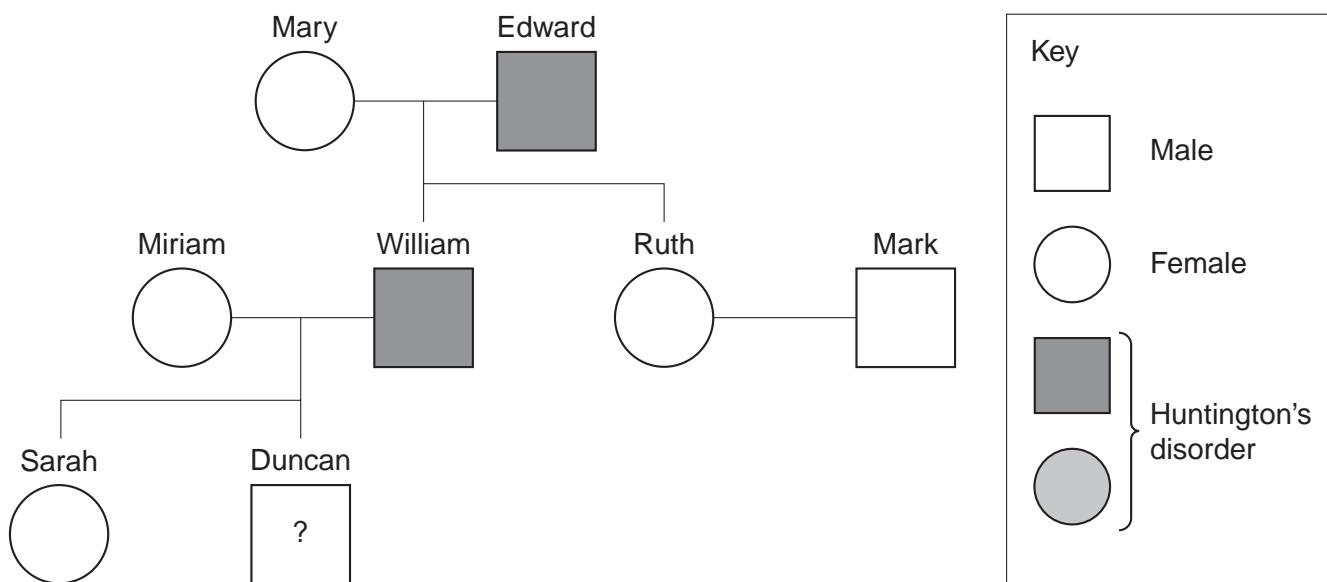
You must have two dominant alleles to inherit the condition.

Only one dominant allele is needed to inherit the condition.

Only male children can inherit the condition.

[1]

(b) Here is part of William's family tree.



What is the chance of each of William's children inheriting Huntington's disorder?

Put a (ring) around the correct answer.

25%

50%

75%

100%

[1]

(c) William is 58.

His son Duncan is 26.

Duncan is offered a test to see if he has inherited Huntington's disorder from William.

Sort the arguments below into reasons **for** and reasons **against** having the test.

Tick (✓) the **one** correct box in each row of the table.

argument	for	against	neither for nor against
It will help him decide whether or not to have children.			
He can make plans that will help him in the future.			
It could affect his chances of getting a good job in the future.			
The disorder doesn't start until middle age so there is plenty of time left.			

[4]

(d) Duncan finds out that he **has** the allele for Huntington's disorder.

Duncan's wife Sarah is pregnant.

A genetic counsellor says that Sarah's fetus can be tested.

They will know the results after 15 weeks of pregnancy.

If the fetus has the Huntington's allele then Sarah can have a termination.

Duncan and Sarah discuss their options with their family.



15

(i) Who is concerned about the safety of the test?

.....

(ii) Who is making an ethical point?

.....

(iii) Who is thinking about the economic effect on society?

.....

(iv) Which **two** people believe that Huntington's disorder is not a good reason to have a termination?

..... and .....

[4]

(e) Sarah decides to have her fetus tested. There are 2 ways to collect cells from the fetus.

**Amniocentesis.**

- A needle is passed through the abdominal wall into the uterus.
- A sample of amniotic fluid is removed containing fetal cells.
- The test is carried out after 14 weeks of pregnancy.
- There is a 0.5% risk of miscarriage.

**Chorionic villus test.**

- A tube is passed through the cervix.
- Cells from the placenta are removed by suction.
- The test is done after 10 weeks of pregnancy.
- There is a 2% risk of miscarriage.

Compare the relative risk of the two procedures by putting a tick (✓) in the correct column of the table.

risk	higher for amniocentesis	higher for chorionic villus test	no difference in risk
miscarriage			
damage to fetus			
may need to have termination late in pregnancy			

[3]

[Total: 13]

**END OF QUESTION PAPER**

**PLEASE DO NOT WRITE ON THIS PAGE**

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