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**Tuesday 15 May 2012 – Morning**

**GCSE TWENTY FIRST CENTURY SCIENCE  
SCIENCE A**

**A211/02** Unit 1: Modules B1 C1 P1 (Higher Tier)

Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**Duration:** 40 minutes

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**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. 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).
- 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 (a) Genes are instructions for a cell that describe how to make proteins.

These proteins may have different functions.

Complete the sentences.

Proteins that speed up chemical reactions are called .....

Other proteins are structural and are used for ..... [1]

(b) Hamish and Fred are brothers.

The sex of Hamish and Fred is determined by a gene on which chromosome(s)?

Put a (ring) around the correct answer.

X                      Y                      Z                      X and Y                      X, Y and Z                      [1]

(c) This gene determines sex by stimulating the development of a specific organ.

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

- kidney
- muscle
- ovary
- stomach
- testis

[1]

(d) There are different versions of each gene.

These different versions of a gene are called alleles.

How many different alleles of a gene could one person have?

Put a (ring) around the correct answer.


2                      4                      6                      8                      [1]

[Total: 4]


2 (a) Animals can be cloned.

Four students were asked to describe how artificial clones can be produced.


Which student gives a correct step in the process?




**Amrit**  
A nucleus from a zygote is placed in a fertilised egg.



**Beatrice**  
A nucleus from an adult body cell is transferred into an empty unfertilised egg cell.



**Caroline**  
Sperm nuclei enter the egg cell. The egg is transferred into an adult body cell.



**Derek**  
An egg and a sperm produce nuclei which are allowed to join together.

answer ..... [1]

(b) Scientists are trying to grow new brain cells.

They choose to use stem cells to grow new brain cells.

Which two statements, when taken together, explain why?

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

- Brain cells are unspecialised.
- Unspecialised cells can develop into any type of cell.
- Stem cells are similar to brain cells.
- Stem cells contain only the genes needed to make brain cells.
- Stem cells are unspecialised.

[1]

[Total: 2]

3 Huntington's disorder is a genetic disorder.

George is 58 years old and shows symptoms of Huntington's disorder.

He has only one allele for the disorder.

His daughter Mary is 20 years old and shows no symptoms of the disorder.

Mary's mother does not have the allele for this genetic disorder.

(a) (i) Draw a genetic diagram to show how Mary might have inherited the alleles from her parents.

Use the symbols **H** for the dominant allele and **h** for the recessive allele.

[2]

(ii) What is the probability that Mary has the disorder?

..... [1]

(b) Mary may have Huntington's disorder but not show symptoms.

Why is this?

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

Mary's grandmother does not have the disorder.

The symptoms do not show until later in life.

The allele for Huntington's disorder is recessive.

Environmental factors might prevent the disorder from developing.

[1]

[Total: 4]

4 A woman's eggs can be fertilised by sperm in a test tube.

The embryos produced can be tested for certain genetic disorders.

Healthy embryos can then be selected.

(a) What is this type of genetic screening for embryo selection called?

..... [1]

(b) Describe possible implications of selecting embryos in this way.

.....  
.....  
.....  
.....  
..... [3]

[Total: 4]

- 5 (a) Many town councils want to lower carbon dioxide pollution from motor vehicles.

They ask people to use buses instead of driving their cars.

They only allow buses, cyclists and walkers into town centres.

This lowers carbon dioxide pollution.

Explain why.

.....

.....

.....

.....

.....

.....




.....

.....

..... [2]

- (b) (i) Motor vehicles give out carbon dioxide and other pollutants.  
The diagrams represent molecules of some pollutants.  
Write the **formula** for each pollutant in the box next to its diagram.

**Key:** ● carbon    ● nitrogen    ○ oxygen

pollutant	formula
	
	
	

[2]

(ii) Car engines cause nitrogen dioxide pollution in the air. Explain how this nitrogen dioxide is made.

Your answer should include

- where the atoms that make up nitrogen dioxide come from
- what reactions happen
- where the reactions happen.

.....

.....

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.....

..... [3]

(iii) Most of the carbon dioxide and nitrogen dioxide from car engines does not stay in the air.

These sentences describe ways that **both** gases could be removed from the air.

Only one of them is correct.

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

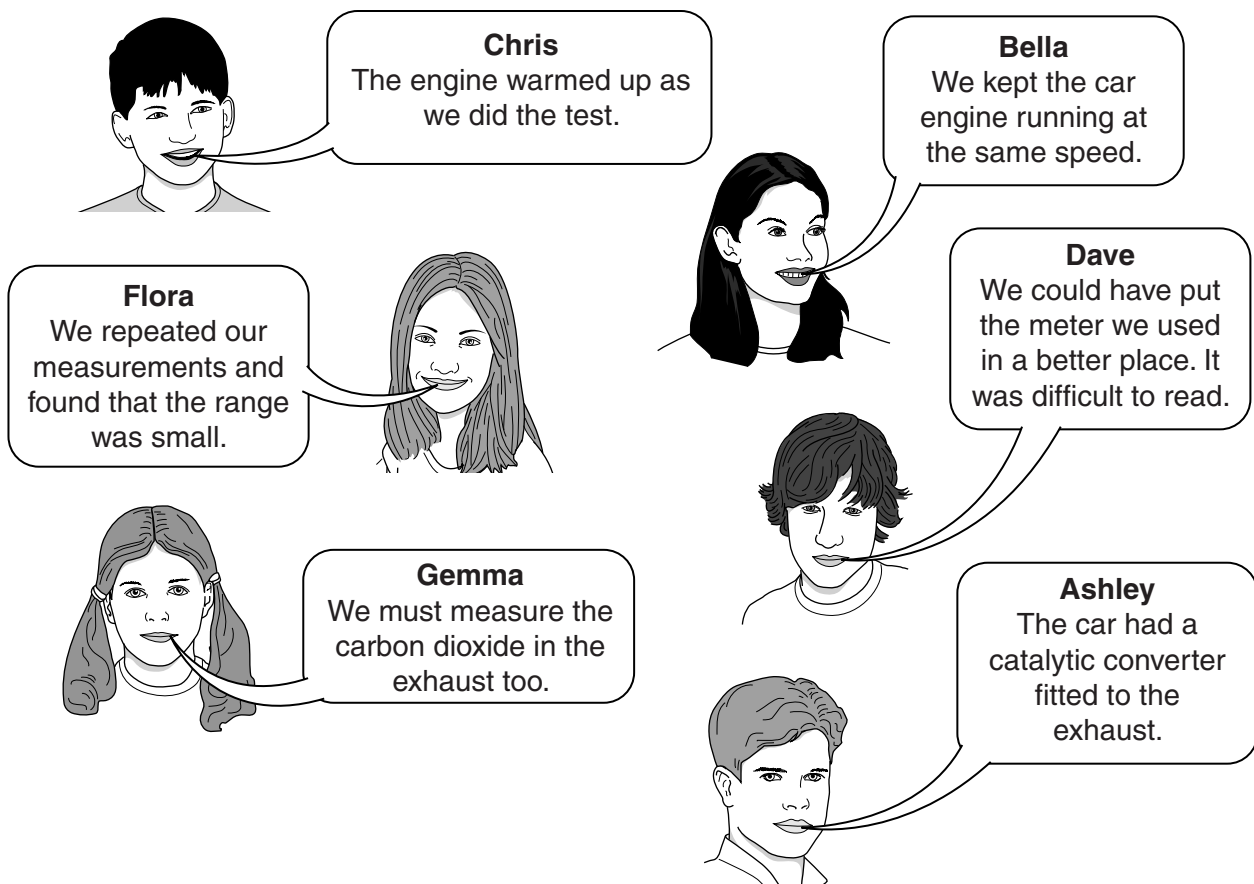
- They react together in catalytic converters.
- They are both used in photosynthesis.
- They are both heavier than air, so they are deposited on surfaces, making them dirty.
- They both dissolve in rain water.
- They are both lighter than air, so they move away from the Earth.

[1]

- (c) Nitrogen oxides are also pollutants from cars. Some students measure the amount of nitrogen oxides in the exhaust gases of a car. They repeat the test on the same car five times. Look at their results.

Test number	1	2	3	4	5
Percentage of nitrogen oxides in the exhaust	0.25	0.25	0.23	0.23	0.21

Here are the students talking about the tests.



- (i) Which two students are giving reasons why the measurements vary?  
students ..... and ..... [1]
- (ii) Which student is talking about checking the reliability of the data?  
student ..... [1]

[Total: 10]



## 6 (a) Mark is a scientist.

He measures air pollution next to a motorway.

He measures the concentration of carbon particulates in the air at different distances from the motorway.

Here are his results.

<b>Distance from the motorway in m</b>	10	30	50	70	90
<b>Concentration of carbon particulates in <math>\mu\text{g}/\text{m}^3</math></b>	10.0	8.0	6.5	5.0	4.0

(i) What is the **correlation** shown by these measurements?

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

As the distance from the motorway increases, the concentration of carbon particulates increases.

The nearer the motorway, the fewer the carbon particulates.

The concentration of carbon particulates decreases by  $2\mu\text{g}/\text{m}^3$  every 20m from the motorway.

The further away from the motorway, the smaller the concentration of carbon particulates.

[1]

(ii) Mark says that these results do **not** prove that motorway traffic causes the carbon particulate pollution.

What reason might Mark have for saying this?

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

There is no data on the number of vehicles on the motorway.

Mark has taken the wrong measurements.

Mark has not calculated the true value of the carbon particulate concentration.

The carbon particulates may not have come from the motorway traffic.

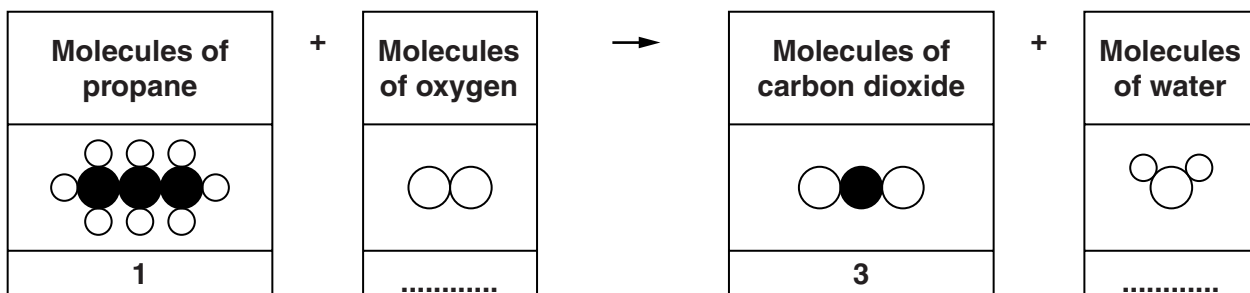
Other air pollutants were not measured.

[1]

- (b) Propane is a hydrocarbon fuel.  
Propane reacts with oxygen to make carbon dioxide and water.

The boxes show the four types of molecule in this reaction.

Complete each box to show the number of molecules in the balanced reaction.



[2]

[Total: 4]

- 7 In 1912, Alfred Wegener presented his theory of continental drift. It was not believed at the time.

State **two** reasons why geologists did not believe Wegener's theory when he published it.

.....

.....

.....

.....

.....

[2]

[Total: 2]

- 8 Our Solar System was formed approximately 5 thousand million years ago.

Describe how it was formed.

.....

.....

.....

.....

[2]

[Total: 2]

11  
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**Question 9 begins on page 12**  
**PLEASE DO NOT WRITE ON THIS PAGE**

9 Two scientists are discussing mass extinctions.

**Dr Adams**

A huge asteroid landed in Mexico 65 million years ago. It sent up huge dust clouds that would have blocked out the Sun. The dinosaurs became extinct at about this time.



**Dr Baker**

Massive volcanic eruptions in India happened much closer in time to the dinosaur extinction. These eruptions would also block out the Sun.

**Dr Adams**

A study of the crater in Mexico was published in the journal 'Science' recently. It showed that the asteroid collision was such an enormous impact that it would have had world-wide effects.



**Dr Baker**

Recently I went to a conference about a different, and more serious, mass extinction. It happened at the same time as an enormous volcanic eruption in Russia.

(a) Who is using observations and data to explain the extinction of the dinosaurs?

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

only Dr Adams

only Dr Baker

both scientists

neither scientist

[1]

(b) Who talks about a way in which scientists report their findings?

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

only Dr Adams

only Dr Baker

both scientists

neither scientist

[1]

(c) Who refers to information that has been peer reviewed?

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

only Dr Adams

only Dr Baker

both scientists

neither scientist

[1]

(d) Who talks about a consequence of moving tectonic plates?

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

only Dr Adams

only Dr Baker

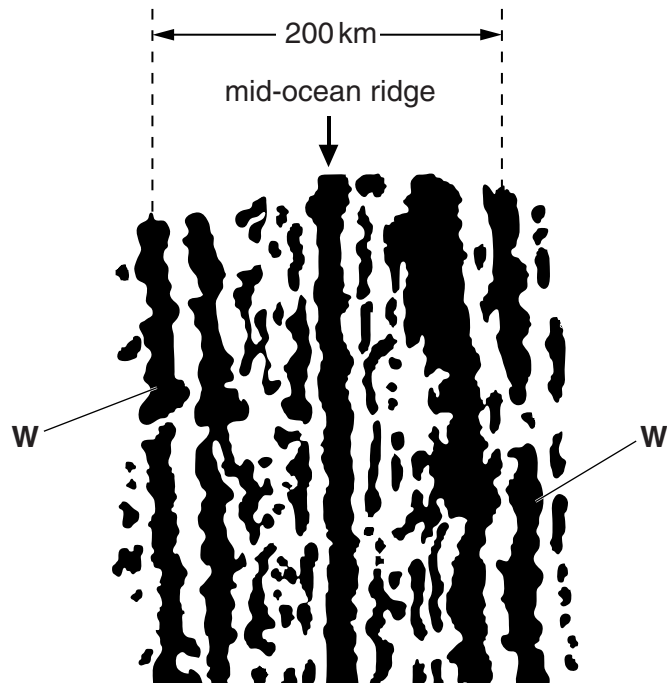
both scientists

neither scientist

[1]

[Total: 4]

- 10 The diagram shows magnetic stripes near the mid-ocean ridge on the floor of the Atlantic Ocean. It is viewed from above.



Rocks with normal magnetism are shown black in the diagram, while rocks with reversed magnetism are shown white.

- (a) The Atlantic Ocean is currently getting wider at a rate of 2 cm per year.

Which of the following is the best estimate, in years, of the age of the rocks labelled **W**?

Put a ring around the correct answer.

100                      200                      100 000                      200 000                      10 000 000                      20 000 000

[1]

- (b) Which of the following assumptions must be made in order to do the calculation in (a)?

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

The depth of the ocean has not changed.

The spreading rate has stayed constant.

The Earth's magnetism reverses at regular time intervals.

Erosion of the sea floor has not taken place.

[1]

(c) The magnetic stripes are evidence for plate tectonic theory.

Which of the following is the explanation for this?

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

They show that continents are moving apart.

They provide a mechanism for the movement of tectonic plates.

They show that magnetic changes had occurred in the past.

They prove that there was no 'land bridge' between continents.

[1]

[Total: 3]

11 Which of the following statements about galaxies are true?

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

Some distant galaxies are moving towards us.

Galaxies contain thousands of millions of stars.

The galaxies started moving apart 20 million years ago.

The Universe contains thousands of millions of galaxies.

Scientists can accurately predict how galaxies will move until the Universe ends.

Although galaxies are moving through space, space itself is fixed in size.

On average, galaxies which are 5 million light-years away are moving half as fast as galaxies 10 million light-years away.

[3]

[Total: 3]

**END OF QUESTION PAPER**

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