

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

**A211/01**

Unit 1: Modules B1 C1 P1 (Foundation Tier)

**Thursday 13 January 2011  
Morning**

**Duration: 40 minutes**

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)



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. 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 Instructions for how an organism develops are found on the chromosomes in cells.

(a) Use words from the list to complete the sentences about chromosomes.

**carbohydrate**

**cytoplasm**

**DNA**

**gene**

**membrane**

**nucleus**

The part of the cell that contains the chromosomes is called the .....

A chromosome is a very long molecule of .....

A section of a chromosome is called a .....

[3]

(b) Tom and John are brothers.

They have a friend called Paul.

Tom and John look more like each other than like Paul.

Put a tick (✓) in the box next to the statement that **best** explains why.

Paul goes to a different school from Tom and John.

Tom and John live in the same house.

Tom and John have more identical alleles.

Paul has been brought up in a different environment.

[1]

(c) Tom, John and Paul are all boys.

Complete the sentences about Tom, John and Paul's sex chromosomes.

Tom, John and Paul all have two sex chromosomes.

From their mothers they inherited the ..... chromosome and

from their fathers the ..... chromosome.

[2]

[Total: 6]

2 Huntington’s disorder and Cystic fibrosis are both inherited conditions.

They are both caused by faulty alleles.

(a) Complete the table to show the combination of alleles each type of individual could have.

Use these symbols

H = allele that causes Huntington’s disorder  
 h = allele that does not cause Huntington’s disorder

B = allele that does not cause Cystic fibrosis  
 b = allele that causes Cystic fibrosis

disorder	combination of alleles present in...		
	... an individual without the disorder	... an individual with the disorder	... a carrier of the disorder
Huntington’s disorder	.....	Hh or .....	no carriers
Cystic fibrosis	Bb or .....	.....	.....

[2]

(b) Read the article about gene therapy.

**A gene therapy cure for Cystic fibrosis (CF) is closer**

At the present time CF cannot be cured.  
 People with CF cannot make a protein called CFTR.  
 One hope for curing genetic disorders like CF is gene therapy.  
 Scientists are trying to use a virus to deliver in to cells a working gene to replace the faulty gene.  
 This should cure CF.  
 This idea has been used to treat other disorders but the use of a virus has caused side effects in some patients.

Write down **one** reason for using gene therapy and **one** reason against using gene therapy.

Use information from the article.

for .....

.....

against .....

.....

[2]

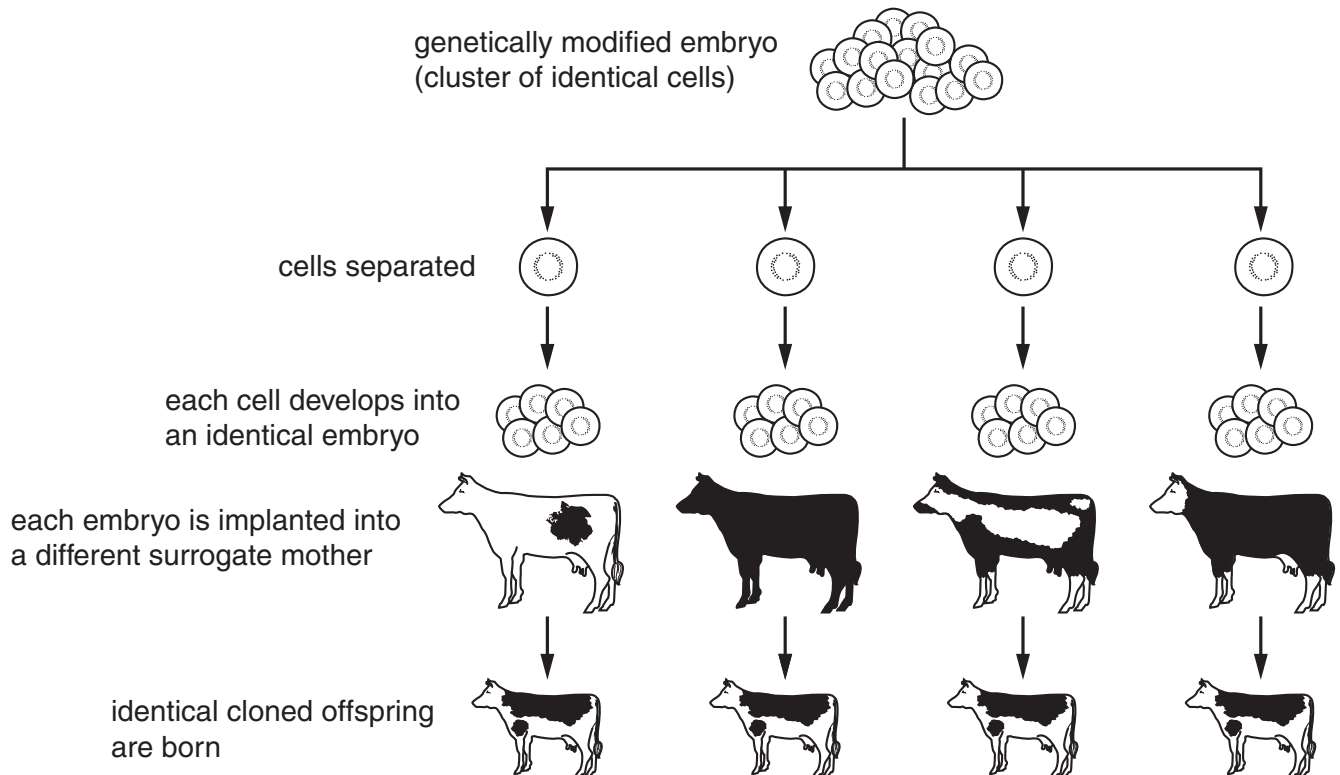
[Total: 4]

Turn over

- 3 (a) A cow embryo can be genetically modified so that it contains the gene to make human insulin.

Copies of this embryo can then be made by cloning.

The adult cows will produce human insulin.



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

The **cloned offspring** will be identical to ...

- ... their biological mothers.
- ... their biological fathers.
- ... their surrogate mothers.
- ... each other.

[1]

(ii) Embryo cloning uses **embryonic stem cells**.

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

the egg cell from which an embryo develops

a specialised cell in an early embryo

a cell with no sex chromosomes

an unspecialised cell in an early embryo

[1]

(b) Read the news flash from the internet.

Scientists researching fertility problems in men claim to have made human sperm in the laboratory.  
The scientists claim that this will allow an infertile man to father a child.  
Other experts do not think that fully developed sperm have been made.  
It will be several years before the technique can be used.  
The scientists used stem cells from human embryos donated following IVF treatment.  
The stem cells were removed when the embryos were a few days old.  
The stem cells were stored in liquid nitrogen.

Explain

- who would benefit from this scientific breakthrough
- why some people may be against this kind of research.

.....  
.....  
.....  
.....

[2]

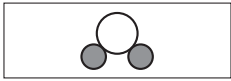



[Total: 4]

- 4 (a) The boxes show the names of some of the gases found in car exhausts.





They also show diagrams of their molecules.

Draw a straight line from each **gas** to its correct **diagram**.

One has been done for you.

gas	diagram
carbon monoxide	
carbon dioxide	
nitrogen monoxide	
water vapour	

Key

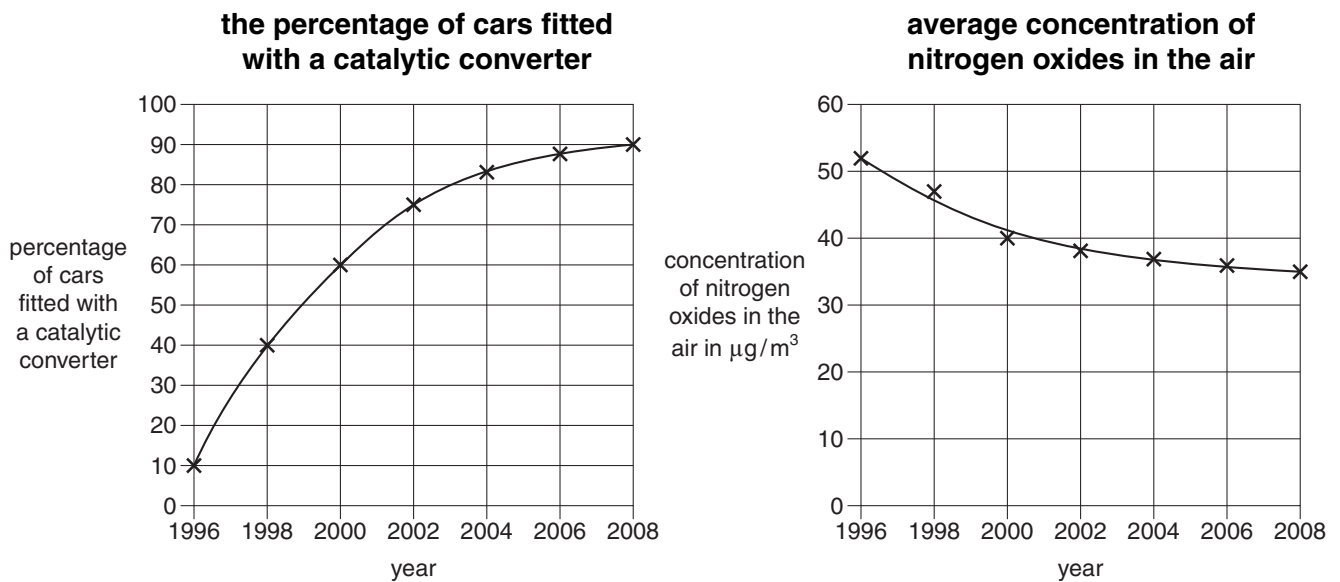
-  carbon
-  hydrogen
-  nitrogen
-  oxygen

[2]

- (b) Catalytic converters are used to remove nitrogen **monoxide** and other pollutants from car engine exhausts.

Catalytic converters have been fitted to new cars since 1994.

Look at the graphs.



Use the graphs to answer the following questions.

- (i) In what year did 60% of cars have a catalytic converter?

answer ..... [1]

- (ii) What was the concentration of nitrogen oxides in the air when 50% of cars had a catalytic converter?

answer ..... [1]

- (iii) There is a **correlation** between the two graphs.  
What is the **best** description of this correlation?

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

Nitrogen oxides in the air decrease from 52% to 35%.

The percentage of cars with a catalytic converter has no effect on nitrogen oxides in the air.

As the percentage of cars with a catalytic converter increases, nitrogen oxides in the air decrease.

As the number of cars on the roads increases, nitrogen oxides in the air decrease.

As the percentage of cars with a catalytic converter increases, nitrogen oxides in the air increase.

[1]

- (iv) Today more than 90% of cars have a catalytic converter but nitrogen oxides have only fallen by about 30%.  
What is the reason for this?

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

Polluting gases are never removed from the air.

Catalytic converters do not remove sulfur dioxide in car exhausts.

Factories, power stations and homes still pollute the air with nitrogen oxides.

Car engines are less efficient now than they were in 1996.

[1]

[Total: 6]

5 A power station burns fuel oil.

Fuel oil is a mixture of hydrocarbons.

(a) Complete the sentences by choosing the **best** words from the list.

- argon
- carbon dioxide
- nitrogen
- oxygen
- sulfur dioxide
- water

When fuels burn they react with ..... in the air.

Carbon atoms in the fuel react to make .....

Hydrogen atoms in the fuel react to make ..... [2]

(b) A scientist measures the amount of particulate carbon in the flue gases of the power station.

She takes five samples on Monday.

She takes another five samples at the same time on Tuesday.

Here are her results.

	particulate carbon in $\mu\text{g}/\text{m}^3$					
sample	1	2	3	4	5	mean
Monday	55	59	63	101	67	61
Tuesday	132	132	134	131	136	

(i) Look at the results for Monday.

The scientist did not use the result for **sample 4** when calculating the mean.

Explain why she did not use this result.

.....

.....

.....

..... [2]



(ii) What is the best estimate of the true value for the level of particulate carbon in the flue gases on **Tuesday**?

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

- 131
- 132
- 133
- 134
- 135

[1]

(iii) What is the range of values for Tuesday shown by the table of results?

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

- 55 to 101
- 55 to 136
- 131 to 136
- 132 to 134

[1]

(c) Fuel oil also contains sulfur atoms.

Sulfur atoms burn to make sulfur dioxide.

Sulfur dioxide harms the environment.

How does sulfur dioxide harm the environment?

Include in your answer

- what happens when sulfur dioxide is released into the atmosphere
- how this harms the environment.

.....

.....

.....

.....

.....

.....

..... [2]

[Total: 8]

6 Alfred Wegener suggested the idea of continental drift in 1912.

(a) Which of the following facts support Wegener's theory?

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

All continents have mountains.

Continents are separated by oceans.

Some African fossils are identical to some South American fossils.

Rock layers on some continents match those found on other continents.

Some continents may have been joined by land bridges.

[2]

(b) Wegener's theory was not accepted by geologists of his time.

Write down the reasons why these geologists did not accept Wegener's theory.

.....

.....

.....

.....

.....

..... [3]

[Total: 5]

7 (a) Read this article about the Kepler mission.

**Kepler space probe looks for new Earths**



In March 2009 the Kepler space probe was launched. It follows the Earth's orbit around the Sun, but it is a long way behind the Earth.

It will search for Earth-like planets around distant stars.

It is expected that Kepler will be able to detect the small changes in brightness when a planet moves in front of its star. This is very difficult to observe from the Earth's surface.

Scientists have looked for life in other places in our Solar System.

**Apart from the Earth**, on how many planets and moons of our Solar System have scientists found life?

Put a (ring) around the correct number.

0      1      2      4

[1]

(b) Another space probe was launched in 2009 to find out about the beginning of the Universe. The probe may also help scientists to predict how the Universe will end.

Discuss what scientists understand about the changing Universe.

In your answer you should mention

- what scientists think was the beginning of the Universe
- why the end of the Universe is difficult to predict.

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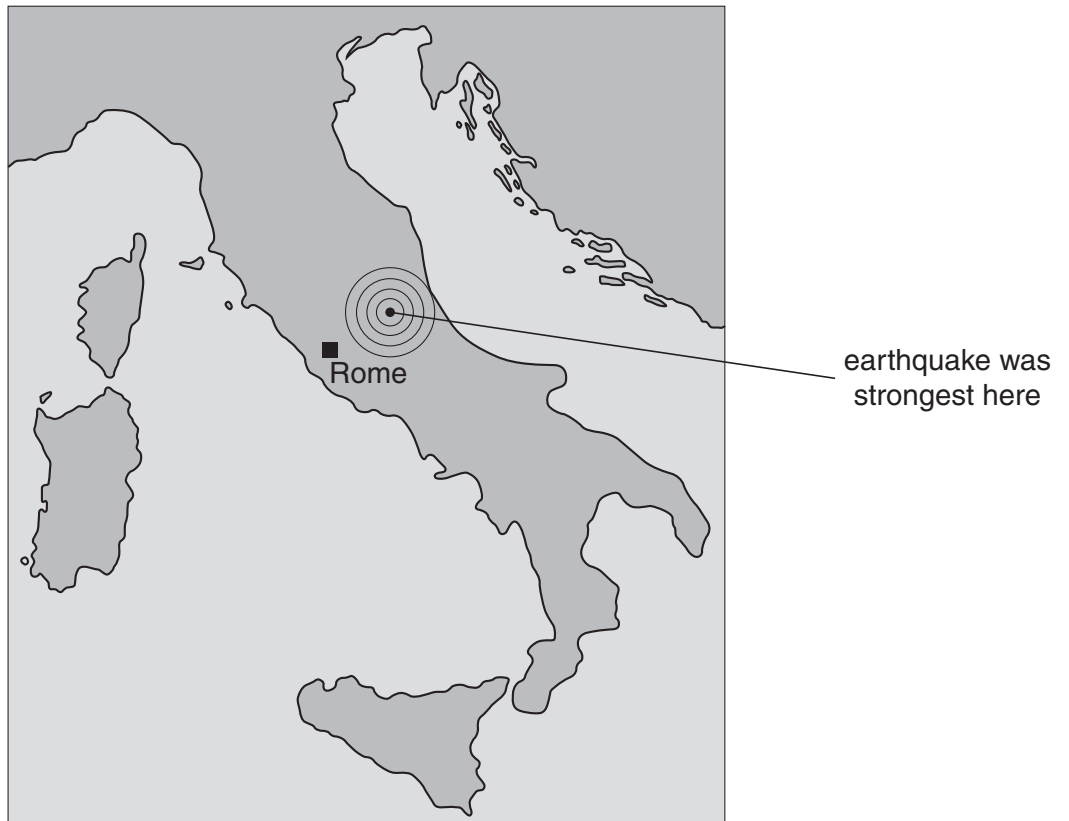
.....

.....

..... [2]

[Total: 3]

8 A serious earthquake struck central Italy in April 2009.



(a) Italy often has earthquakes.

Which of the following best explains this?

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

It is surrounded by sea.

It is in southern Europe.

Italy has many large cities.

It is close to where two tectonic plates meet.

[1]

(b) Which of the following are often found where earthquakes are common?

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

- deserts
- lakes
- mountains
- rivers
- volcanoes

[2]

(c) A laboratory technician had predicted that there would be an earthquake.

My job is measuring radon gas given out by the rocks. There has been much more given out recently. The rocks must be moving for this to happen. This makes me think there will be an earthquake.



(i) What is the **data** that he used to make his prediction?

..... [1]

(ii) What is the **explanation** for the prediction?

..... [1]

(d) Many scientists think that the technician's prediction was correct just by chance.

Which of the following best explains their opinions?

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

Earthquakes do not affect the rocks.

Earthquakes happen every day in this part of Italy.

Radon gas cannot escape from rocks in the ground.

Radon levels often change when there is no earthquake.

[1]

[Total: 6]

**END OF QUESTION PAPER**

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