

**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 14 January 2010**  
**Morning**

**Duration:** 40 minutes



Candidate Forename					Candidate Surname				
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Centre Number						Candidate Number			
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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, however additional paper may be used if necessary.

**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 **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 Read the article about stem cells.

### Grown to order

In the future it may be possible to repair damaged body parts using stem cells.

Scientists have added extra genes to skin cells.

The extra genes make the skin cells behave like embryonic stem cells.

Skin cells altered in this way have been used in mice to treat a disorder of the nervous system.

Making stem cells from skin cells might be useful.

It would no longer be necessary to use embryos to make stem cells.

(a) Use the words provided to complete the sentences.

**altered      disorders      genes      specialised      unspecialised**

Embryonic stem cells can develop into any kind of cell because they are .....

Usually during the development of multicellular organisms, cells become .....

The scientists reprogrammed skin cells to behave like embryonic stem cells

using .....

Scientists hope this kind of research will lead to treatment for .....

[4]

(b) Using human embryos to produce stem cells has caused a lot of argument and discussion.

Give arguments **for** and **against** the use of human embryo stem cells.

In your answer you should

- give examples of people who might benefit
- explain why some people object to the use of cells from human embryos.

.....

.....

.....

.....

.....

[3]

(c) At the moment, stem cells are taken from embryos produced by cloning.

Put a tick (✓) in the box next to the **best** description of a clone.

similar cells e.g. skin cells

cells produced by sexual reproduction

genetically identical cells or organisms

single cells

[1]

[Total: 8]

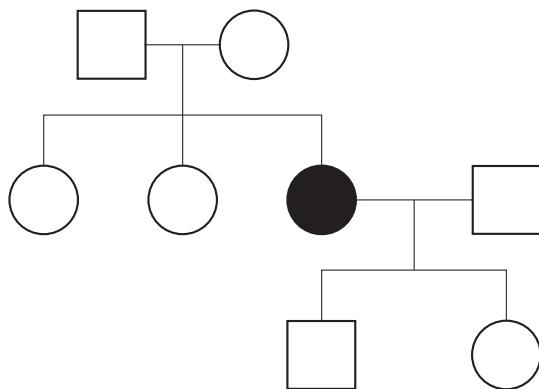
2 Phenylketonuria (PKU) is an inherited disorder.

PKU is caused by a faulty gene.

The faulty gene lets a chemical called phenylalanine build up in the body.

Too much phenylalanine causes serious health problems.

Look at this family tree.



□ = male without PKU

■ = male with PKU

○ = female without PKU

● = female with PKU

(a) Use straight lines to link the best **description** of the inheritance of PKU with the correct **two explanations**.

Join **one** description on the left to **two** explanations on the right.

**description**

**explanation**

PKU is inherited in a similar way to cystic fibrosis.

Parents can be carriers of PKU.

PKU is inherited in a similar way to Huntington's disorder.

PKU is caused by a dominant allele.

PKU is inherited in a different way from cystic fibrosis or Huntington's disorder.

Parents cannot be carriers of PKU.

PKU is caused by a recessive allele.

[2]

(b) Put a tick (✓) in the box next to the correct definition of a gene.

A gene is an instruction to enable a cell to make ...

... a DNA molecule.

... an allele.

... a protein.

... a chromosome.

[1]

(c) (i) Complete the sentence.

We all have ..... copies of each gene because we inherit ..... copy from each of our parents.

[1]

(ii) Males and females differ because they have different sex chromosomes.

Complete the table for the sex chromosomes of males and females.

sex chromosomes	
male	X .....
female	X .....

[1]

(d) In the UK, all children are screened for PKU soon after they are born.

They could also be tested for PKU while they are still fetuses.

Suggest **one** reason why fetuses are **not** tested for PKU.

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

[1]

**[Total: 6]**

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(a) There are plans to build a coal-burning power station in Kent.

Coal is made of carbon atoms.

Carbon burns completely in oxygen to make carbon dioxide.

(i) Complete the diagram to show this chemical reaction.



+



carbon

oxygen

carbon dioxide

[1]

(ii) Most of the carbon dioxide is removed from the air naturally.

Write about how carbon dioxide is removed naturally from the air.

.....

.....

.....

[2]

(b) Read the following extracts from a radio programme.

Two scientists are discussing the building of this coal-burning power station.



**Jane Jordan**

We should build this new power station. It will be much more efficient than the old one it replaces. Less fuel will be burned to release the same amount of energy.

This means the new power station will make much less pollution than the old one.

We should be able to stop all polluting gases such as carbon dioxide reaching the air.

This includes trapping the carbon dioxide and burying it in the ground.



**Mike Morris**

Coal-burning power stations make very large amounts of polluting carbon dioxide.

Nobody has ever built a power station that traps the carbon dioxide. I don't believe we can do it.

We should not be burning coal to produce electricity.  
We should only be using renewable sources of energy.

(i) Here are some statements about using coal in power stations.

Which scientist's comments support each of these statements?

Put **one** tick (✓) in each row of the table to show whether the statement is supported by **Jane Jordan**, **Mike Morris** or **both of them**.

statement	Jane Jordan	Mike Morris	both of them
Coal should <b>not</b> be used for electricity production.			
Carbon dioxide pollutes the atmosphere.			
Carbon dioxide from burning coal can be trapped.			

[3]

(ii) Use information from the radio programme to explain how a more efficient power station makes less pollution.

.....

.....

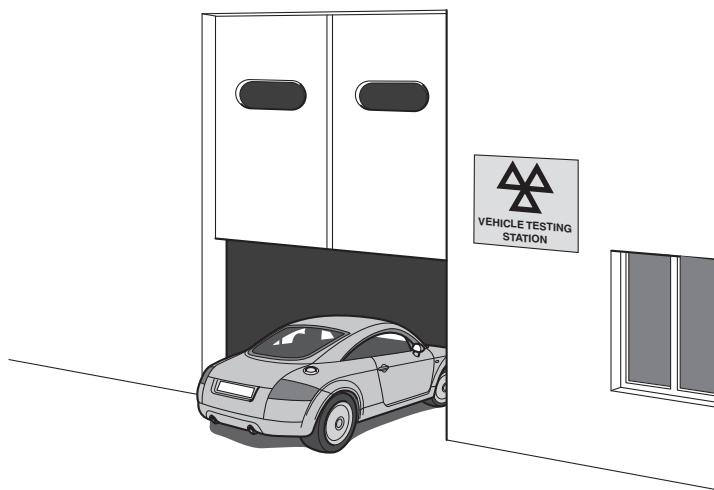
.....

.....

[2]

**[Total: 8]**

4 Kate takes her car for its MOT test.



At the garage, Mike measures the amount of polluting gases in the exhaust of the car.

(a) The car only passes the test if these gases are below a set value.

Why is this part of the MOT test?

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

so that more cars fail the MOT test

to reduce the pollution caused by cars

so dangerous cars are not allowed on the road

to reduce the number of cars on the road

[1]

11

(b) Mike checks the carbon monoxide released, in parts per million (ppm).

He uses an electronic detector.

He tests the car 5 times.

Here are the results for Kate's car.

test number	1	2	3	4	5
carbon monoxide in ppm	125	202	205	206	203

(i) He says that the first result is an outlier and he will ignore it.

Why does he think it is an outlier?

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

It was the first test.

It makes the other tests fair.

It is very different from the other values.

It is a lower result than the other values.

[1]

(ii) What is the range of the other four results?

range ..... to ..... [1]

(iii) What is the mean of the other four results?

Put a ring around the correct answer.

202

203

204

205

206

[1]

12

(c) When Mike tests a car exhaust, he always uses the same engine temperature and speed.

Why does he do this?

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

so he can calculate the mean temperature and speed

because these factors affect how noisy the engine is

so outliers can be clearly seen

because these factors change the amount of carbon monoxide made by the engine

[1]

(d) Why is carbon monoxide harmful to humans?

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

It is a choking gas.

It is a poisonous gas.

It causes acid rain.

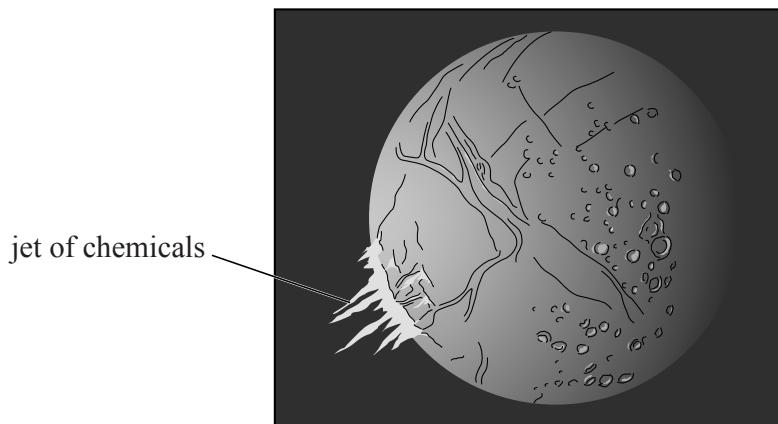
It cannot be removed from car exhausts.

[1]

[Total: 6]

5 Read the article about one of the moons of Saturn.

## Could there be life on Enceladus?



Enceladus is a moon of Saturn.

In March 2008, the Cassini space probe flew close to Enceladus.

Instruments on Cassini detected a jet containing water, carbon dioxide, methane and more complex chemicals.

They also detected lots of heat coming out of cracks on Enceladus. The heat means there could be liquid water under these cracks.

These results show that there may be life on Enceladus.

‘We see on Enceladus the three things you must have if there is to be life there,’ said one scientist. ‘There is water – although it may not be liquid – plus complex chemicals and heat.’

(a) Here are some statements from the article.

Three of these statements contain **data**.

Put ticks (✓) in the boxes next to the **three** statements that contain data.

**contains data?**

In March 2008, the Cassini space probe flew close to Enceladus.

Instruments on Cassini detected a jet containing water, carbon dioxide, methane and more complex chemicals.

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There could be liquid water under these cracks.

These results show that there may be life on Enceladus.

[2]

(b) Four space scientists are talking about the results from Cassini.

**Doctor Rogers**

I saw this on the TV News.

Life may be quite common in the Universe. So far we only know of one place with life on it – the Earth!



**Professor Cameron**

I'm looking forward to reading scientific papers on this. The information you get on the internet is not always very reliable.



**Doctor Fraser**

I was in a conference last week. One of the Cassini scientists told us all about the chemicals found on Enceladus.

I don't think that this proves there is life on Enceladus.



**Doctor Jones**

I've not heard these results as I've been busy with my own research.

I don't expect there is anything in it.

(i) Who says something about how scientists report their findings to other scientists?

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

Doctor Rogers

Professor Cameron

Doctor Fraser

Doctor Jones

[1]

15

(ii) Who suggests that **peer reviewed** information is more reliable?

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

Doctor Rogers

Professor Cameron

Doctor Fraser

Doctor Jones

[1]

(iii) Which scientist says that no evidence of alien life has so far been detected?

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

Doctor Rogers

Professor Cameron

Doctor Fraser

Doctor Jones

[1]

**[Total: 5]**

6 (a) Scientists use rocks to provide evidence about changes in the Earth.

Which one of the following does **not** provide evidence for these changes?

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

fossils

patterns of erosion

folding of rock layers

layers of sediments

radioactive waste

[1]

(b) Read this article about the Geological Society of London.

In 1807, a group of scientists formed The Geological Society of London. They discussed the formation of features such as mountains and valleys.

Two members of the society, Charles Lyell and William Buckland, argued about the time taken for these to form.



### Charles Lyell

I've been in Sicily, studying the volcano Etna. It is made of many layers of volcanic rocks, so Etna did not form all in one go.

Underneath the volcanic rocks, there are rocks full of fossils of modern-looking animals and plants.

This makes me believe the Earth is very, very old.



### William Buckland

I disagree with Charles Lyell. The Earth is not very old at all.

We often see tiny rivers in deep valleys. Those rivers could never have worn away their valleys. The valleys were all made in a single gigantic flood. The same deep flood explains why we see fossils of sea creatures high in mountains.

The following claims were made by **Charles Lyell**, or by **William Buckland**, or by **both**, or by **neither**.

Put a tick (✓) in the **one** correct box on each row to show who made each claim.

claim	Charles Lyell	William Buckland	both	neither
The Earth is very, very old.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Some rocks have fossils.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The valleys in the Earth were all formed at the same time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The rocks in the Earth formed gradually, over a very long time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

[4]

[Total: 5]

7 This question is about threats to life on Earth.

Asteroids collide with the Earth from time to time.

John worries about the risk of a large asteroid hitting the Earth.

Explain whether or not he should be worried.

Include in your answer

- the chance of a large asteroid colliding with the Earth
- the possible consequences of a large asteroid colliding with the Earth.

[4]

[Total: 4]

**END OF QUESTION PAPER**

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