

**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)

**Monday 12 January 2009  
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**

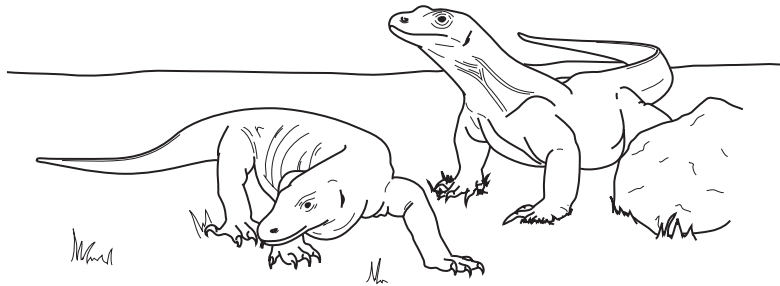
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **20** pages. Any blank pages are indicated.

**FOR EXAMINER'S USE**

Qu.	Max	Mark
1	7	
2	5	
3	2	
4	4	
5	4	
6	6	
7	6	
8	2	
9	6	
<b>TOTAL</b>	<b>42</b>	

Answer **all** the questions.

1 Read the newspaper article.



### Virgin Births

Flora is a Komodo dragon, the world's largest lizard. She lives alone at Chester zoo and has never been kept with a male Komodo dragon. Flora laid eleven eggs but three of the eggs died. All of the surviving eggs produced males.

(a) Which part of the egg cell contains the chromosomes?  
Put a tick (✓) in the box next to the correct answer.

- |           |                          |
|-----------|--------------------------|
| membrane  | <input type="checkbox"/> |
| cytoplasm | <input type="checkbox"/> |
| cell wall | <input type="checkbox"/> |
| nucleus   | <input type="checkbox"/> |

[1]

(b) How many copies of the sex chromosomes does each egg or sperm cell have?  
Put a tick (✓) in the box next to the correct answer.

- |    |                          |
|----|--------------------------|
| 0  | <input type="checkbox"/> |
| 1  | <input type="checkbox"/> |
| 2  | <input type="checkbox"/> |
| 4  | <input type="checkbox"/> |
| 23 | <input type="checkbox"/> |

[1]

- (c) Scientists think that Flora's eggs have been produced by asexual reproduction. Put a tick (✓) in the box next to the statement that **best** explains why they think this.

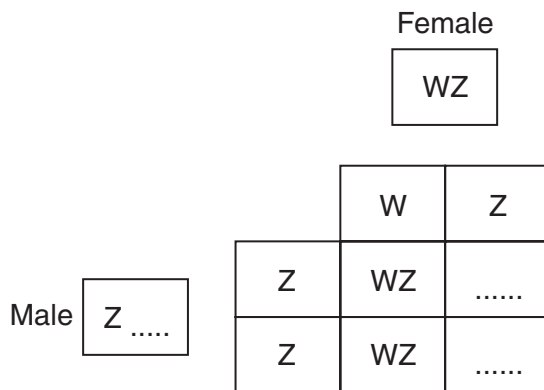
- Offspring are all the same sex.
- Only one parent was involved.
- Not all of the eggs survived.
- Flora laid eggs and did not give birth to live young.

[1]

- (d) The article continues ...

Sex in Komodo dragons is controlled by two chromosomes, W and Z.  
 Females are WZ.  
 Males are ZZ.

- (i) Complete the diagram to show how sex is inherited during sexual reproduction in Komodo dragons.



[2]

- (ii) What ratio of male to female offspring would you expect? Put a tick (✓) in the box next to the correct answer.

- 1:4
- 1:2
- 1:1
- 2:1
- 4:1

[1]

(e) In humans, sex is also determined by a pair of chromosomes.

Write down the combinations of sex chromosomes that are found in the cells of human males and females.

males .....

females .....

[1]

[Total: 7]

**5**  
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**Question 2 starts on page 6**

**PLEASE DO NOT WRITE ON THIS PAGE**

## 2 Read the newspaper article.

**Diabetes genes found**

1. Genes are involved in regulating insulin production.
2. Scientists have found a fault in a gene that puts people at risk of one type of diabetes.
3. Scientists will now be able to use a genetic test to predict people's risk of developing this type of diabetes.
4. If people know the risk they may be more likely to change things such as their diet to reduce their chance of developing diabetes.
5. It may be possible to treat some diabetes now we know which gene is faulty.

(a) Here are five statements about genes.

Write **T** in the box next to each **true** statement and **F** in the box next to each **false** one.

**Genes are ...**

statement	T (true) or F (false)
... made of DNA.	
... instructions to make DNA.	
... instructions to make proteins.	
... made of chromosomes.	
... found in chromosomes.	

[2]

(b) Not everyone with the faulty gene will get this type of diabetes.  
Our characteristics are affected by our genes and by our environment.

Which sentence in the article suggests an environmental factor which could affect people's risk of developing this type of diabetes?

sentence number .....

[1]

(c) Four friends are discussing the possibility of having a genetic test for this type of diabetes.



**Jon**  
Even after you have the results of the test you can't be certain you will get diabetes so the test is a waste of resources.



**Sanath**  
At least you would know you were at risk of diabetes and could try to do something about it.



**Chloe**  
I'm worried that my insurance company may hear that I have been having genetic tests.



**Yasmin**  
If I have the test then I could decide whether or not to have a family if I have the faulty gene.

Some of the friends make arguments for having a genetic test and some against having a test.

Write down in the table the names of the friends who are **for**, and **against**, testing.

for testing	against testing

[2]

[Total: 5]

## 3 Read the newspaper article.

**British team grows human heart valve from stem cells**

Scientists have grown part of a human heart from stem cells for the first time.

If a damaged part of the body can be replaced by tissue that is genetically identical to the patient there is no risk of tissue rejection.

Eventually they hope to be able to grow complete hearts.

This could solve the problem of the shortage of donated hearts for transplant.

Why have stem cells been used?

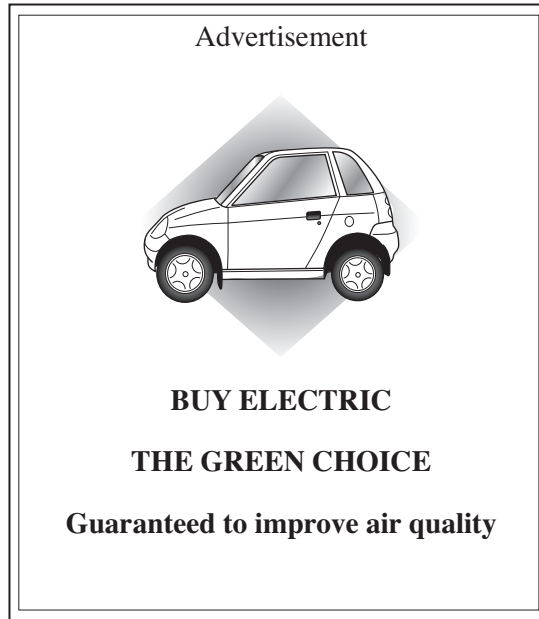
Make **one** sentence by using straight lines to link the correct boxes.

	... made from heart cells that ...	... can grow into new tissue types to ...	
Stem cells are ...	... specialised cells that ...	... have many jobs to do and ...	... produce new valves to treat disease.
	... unspecialised cells that ...	... need valves to work and ...	

[2]

[Total: 2]





Electric cars are powered by a battery.

They are often used in towns.

This is because they only travel 50 miles before the battery has to be recharged.

The batteries are recharged by plugging them into mains electricity.

- (a) Some people think driving electric powered cars rather than petrol powered cars will improve air quality.

Put a tick (✓) next to the **best** explanation for this.

They will reduce air pollution in towns.

They will reduce air pollution around power stations.

Less fossil fuels will be burned in power stations.

More fossil fuels will be burned by cars.

[1]

(b) The overall effect on air pollution of electric cars depends on how the electricity is produced.

(i) Which of the following ways of producing electricity causes **least** air pollution?

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

coal fired power station

hydroelectric power station

natural gas power station

oil fired power station

[1]

(ii) Joe knows that atmospheric pollution is lowered if we use less electricity.  
Joe has electric fires in his house and goes to work in his petrol driven car.

Which of the following will **lower** the amount of electricity he uses?

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

travel by public transport

use low energy light bulbs

lower the price of televisions

walk to work

insulate his house

[2]

[Total: 4]

5 The Earth has an atmosphere that is mainly oxygen, nitrogen and argon.

The lists show these gases and the percentage of each gas in the air.

(a) Draw a straight line from each **gas** to the correct **percentage** of that gas in the air.

gas	percentage
argon	78
nitrogen	21
oxygen	1

[2]

(b) Fuels used in cars are mainly hydrocarbons.

When hydrocarbons burn, carbon dioxide ( $\text{CO}_2$ ) is made.

(i) Which drawing represents a molecule of carbon dioxide ( $\text{CO}_2$ )? Put a ring around the correct answer.



[1]

(ii) What else is made when hydrocarbons burn? Put a ring around the correct answer.

hydrogen

oxygen

sulfur dioxide

water

[1]

[Total: 4]

- 6 Bridge Street, Castle Street and Mill Street are roads in the same city. The concentration of nitrogen dioxide in the air is measured on each road. The results are shown in the table.

		nitrogen dioxide concentration in $\mu\text{g}/\text{m}^3$		
time \ place	place	Bridge Street	Castle Street	Mill Street
	12.00 midnight	24	60	75
	3.00 am	20	60	70
	6.00 am	26	77	92
	9.00 am	34	98	116
	12.00 noon	24	75	90
	3.00 pm	26	80	85
	6.00 pm	38	98	124
	9.00 pm	28	70	92

- (a) Which of the three different places, **Bridge Street**, **Castle Street** or **Mill Street**, is most likely to be an open area next to a park?

..... [1]

Which of the following statements gives the best reason for your answer?

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

- Nitrogen dioxide pollution is not trapped by buildings.
- Nitrogen monoxide is removed by catalytic converters.
- Rain removes nitrogen dioxide from the air.
- Photosynthesis removes pollutants from the air.

[1]

- (b) What is the **range** of nitrogen dioxide concentration on Mill Street?

from ..... to .....

[1]

(c) Here are six statements, **A**, **B**, **C**, **D**, **E** and **F**, about nitrogen dioxide pollution in this city.

- A** It is difficult to measure nitrogen dioxide in the air.
- B** Nitrogen dioxide reacts with water and oxygen to make acid rain.
- C** Nitrogen dioxide levels are lower at night when everyone is sleeping.
- D** Nitrogen dioxide is made in a thunder storm.
- E** Nitrogen dioxide is made after nitrogen and oxygen react in a hot car engine.
- F** Nitrogen dioxide levels are higher when people are travelling to and from work.

(i) Which **two** statements are correlations between a factor and an outcome?  
..... and ..... [2]

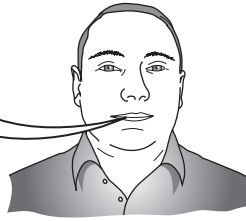
(ii) Which statement gives a cause for these correlations?  
..... [1]

[Total: 6]

7 Five astronomers are talking about asteroids in the Solar System.

**Alex**

Asteroids are made of materials left over when the Solar System formed. Studying asteroids gives information about the early days of the Solar System.



**Bernie**

We are tracking the orbits of asteroids that come near Earth. If an asteroid were to crash into the Earth it could have a devastating effect on the climate.



**Claire**

There are probably millions of asteroids orbiting the Sun between Mars and Jupiter. There are a few thousand with orbits near to the Earth.



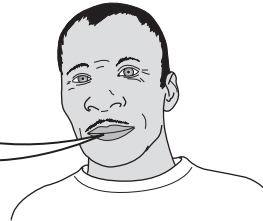
**Dan**

To explore further into space, we will need metals that are rare on Earth. We will be able to get these metals out of asteroids.



**Edward**

If you added together all the asteroids, the mass would probably be less than 5% of the mass of our Moon.



(a) Which astronomer is telling us that asteroids are small?  
Put a tick (✓) in the box next to the **one** correct answer.

Alex

Bernie

Claire

Dan

Edward

[1]

(b) Which **two** astronomers are talking about what asteroids are made of?

Put a tick (✓) in each of the boxes next to the **two** correct answers.

Alex	<input type="checkbox"/>
Bernie	<input type="checkbox"/>
Claire	<input type="checkbox"/>
Dan	<input type="checkbox"/>
Edward	<input type="checkbox"/>

[2]

(c) Which astronomer is describing a possible explanation for the extinction of the dinosaurs?

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

Alex	<input type="checkbox"/>
Bernie	<input type="checkbox"/>
Claire	<input type="checkbox"/>
Dan	<input type="checkbox"/>
Edward	<input type="checkbox"/>

[1]

(d) Which astronomers are giving reasons for doing scientific research into asteroids?

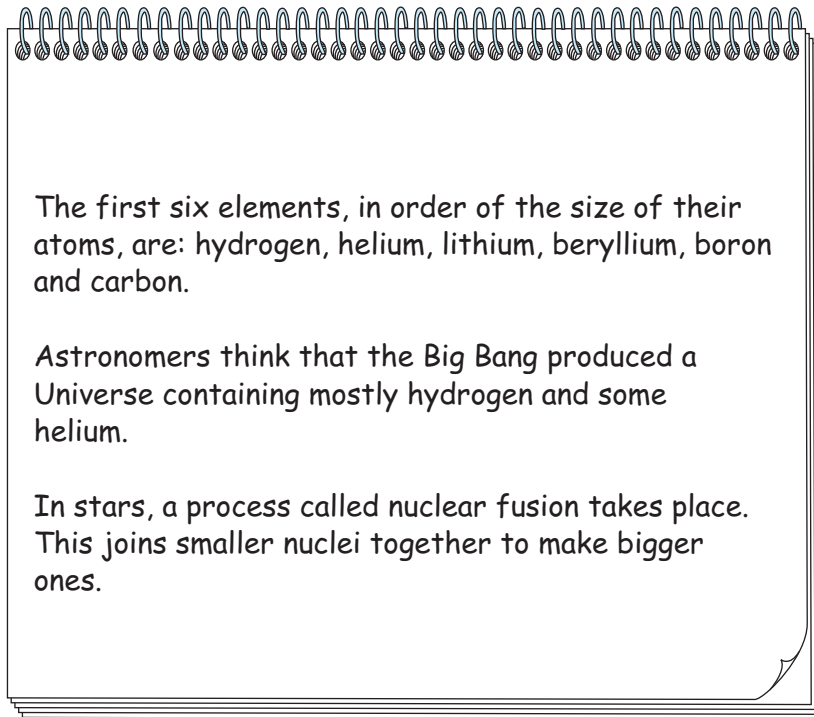
Put a tick (✓) in each of the boxes next to the **three** correct answers.

Alex	<input type="checkbox"/>
Bernie	<input type="checkbox"/>
Claire	<input type="checkbox"/>
Dan	<input type="checkbox"/>
Edward	<input type="checkbox"/>

[2]

[Total: 6]

- 8 Lucia has been making notes on the way elements were made in the Universe.



Draw straight lines to join each **element** to the **description** of the way elements were made in the Universe.

Each element should be joined to **one or two boxes**.

Use Lucia's notes, together with what you have learned about stars, elements and the Universe.

element	description
<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">Helium ...</div>	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">... is the 'fuel' that is powering our Sun.</div>
<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">Hydrogen ...</div>	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">... was present in the Universe before there were any stars.</div>
	<div style="border: 1px solid black; padding: 10px; width: fit-content; margin: 0 auto;">... is made inside stars.</div>

[2]

[Total: 2]

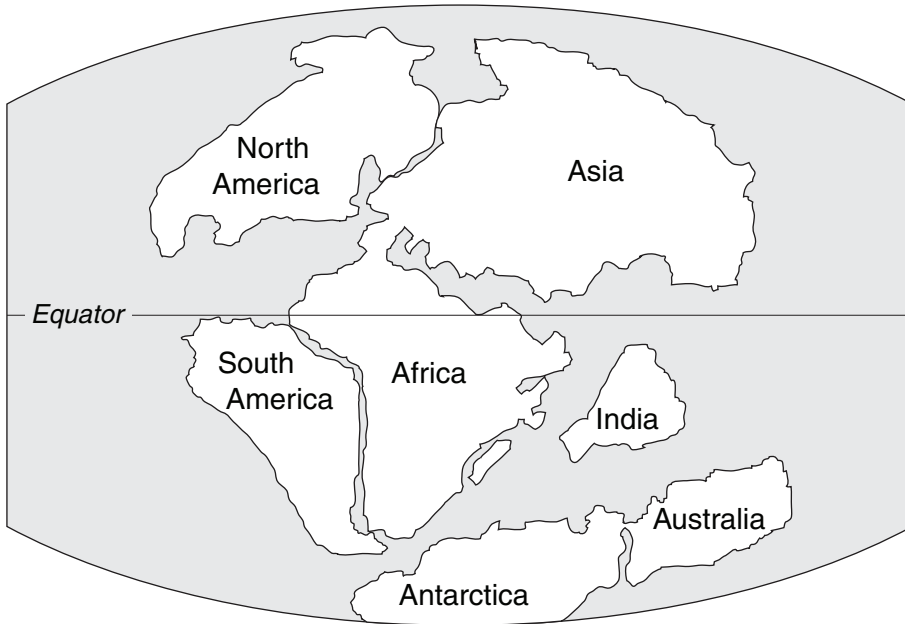


17  
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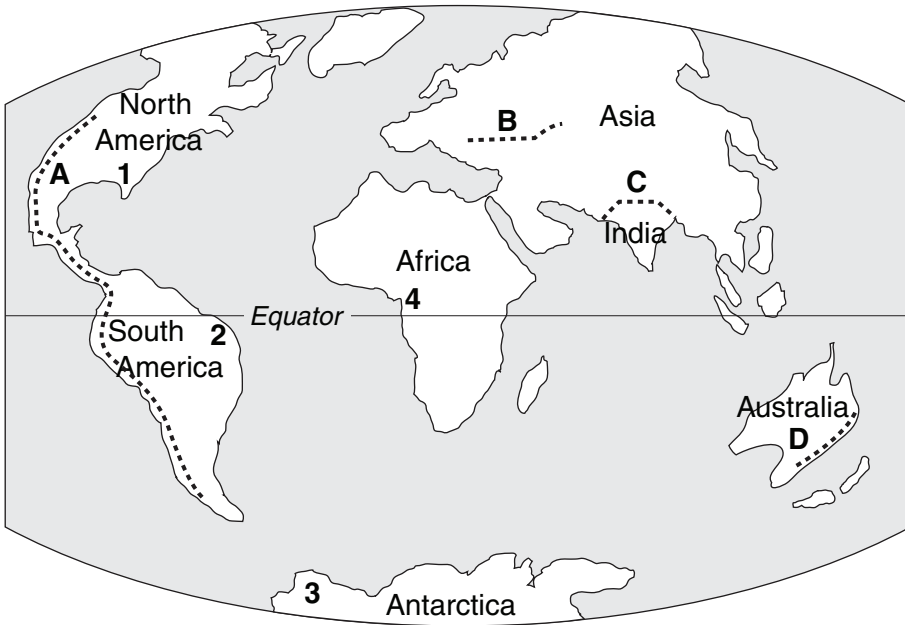
**Question 9 starts on page 18**

**PLEASE DO NOT WRITE ON THIS PAGE**

- 9 The positions of the continents are believed to have moved during time. This is called continental drift.



135 million years ago



mountains  
.....

the present day

(a) Who first suggested the theory of continental drift?

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

Charles Darwin

James Hutton

Alfred Wegener

[1]

(b) When continents move, mountains can be formed.

Mountains are formed where continents push their way through the oceans.

Mountains are also formed where continents collide with each other.

Look at the present day map.

It shows four chains of mountains **A, B, C** and **D**.

(i) Write down the letters for **two** mountain chains formed where continents push their way through the oceans.

Choose from **A, B, C** and **D**.

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

(ii) Write down the letter for **one** mountain chain formed where continents collide with each other.

Choose from **A, B, C** and **D**.

..... [1]

(c) One piece of evidence for the theory of continental drift was the way in which rocks in different parts of the world matched up.

This suggested that they were once joined together.

(i) The present day map shows four parts of the world, **1, 2, 3** and **4**.

Write down the numbers for **two parts** that were once joined together.

Choose from **1, 2, 3** and **4**.

..... and ..... [1]

- (ii) In these two parts of the World, rocks were not the only things which matched up. What else matched up in these two places?  
Put a tick (✓) in the box next to the **one** correct answer.

birds

fossils

buildings

[1]

[Total: 6]

**END OF QUESTION PAPER**