

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
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

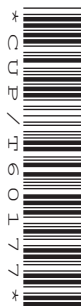
OCR Supplied Materials:
None

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

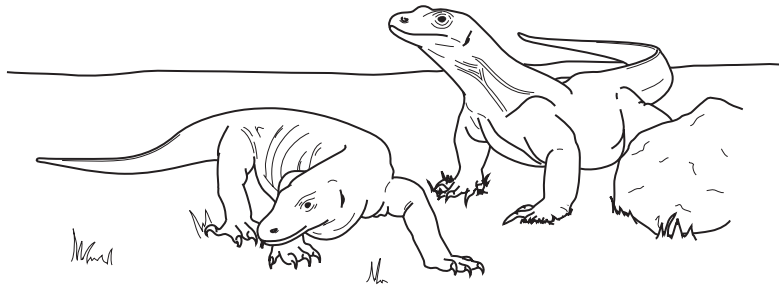
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	7	
2	7	
3	8	
4	6	
5	6	
6	2	
7	6	
TOTAL	42	

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.

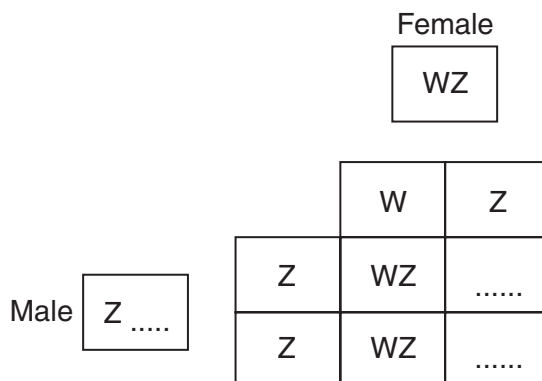
Flora has laid eleven eggs but has never been kept with a male Komodo dragon.

Three of the eggs died. Tests on the dead eggs showed they were not clones of Flora but had been produced by asexual reproduction.

All of the surviving eggs produced males.

- (a) (i) Sex in Komodo dragons is controlled by two chromosomes, W and Z.
Females are WZ.
Males are ZZ.

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?

.....

[1]

3

- (b) Flora produces eggs in the usual way.
The chromosomes in the original egg are copied during asexual reproduction.

Put a tick (✓) in the box next to possible combinations of sex chromosomes in asexually produced eggs.

WWZZ	<input type="checkbox"/>
WW, ZZ, WZ	<input type="checkbox"/>
WW, ZZ	<input type="checkbox"/>
WZ, ZZ	<input type="checkbox"/>
WZ	<input type="checkbox"/>

[1]

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

Complete the following sentences to describe how a human embryo either develops into a male or a female.

A gene controls the production of male sex hormone.

This gene is found on the chromosome.

Male sex hormone causes the embryo's sex organs to develop into

If no male sex hormone is present the embryo's sex organs develop into

.....

[3]

[Total: 7]

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 genes will get this type of diabetes.
Our characteristics are affected by our genes and by our environment.

Write down **one** environmental factor given **in the article** which will affect people's risk of developing this type of diabetes.

.....

[1]

5

(c) Different techniques may be used in the future to help to treat or avoid this genetic disorder.

Draw straight lines to join each **technique** to the correct **description**.

technique**description**

therapeutic cloning

helps select embryos

gene therapy

produces stem cells for treatment

pre-implantation genetic
diagnosis

replaces the faulty alleles

[2]

(d) A genetic test for this type of diabetes could be developed.

Use a straight line to link each **test result** to a **possible outcome**.

test result**possible outcome**

positive for faulty gene

unnecessary worry

false positive results

effective treatment

a false negative result

don't receive any treatment

[2]

[Total: 7]

6

- 3 Propane can be used as a fuel.
This drawing represents a molecule of propane.



● carbon atom
○ hydrogen atom

- (a) What kind of molecule is propane?

Put a ring around the correct answer.

carbonate

carbohydrate

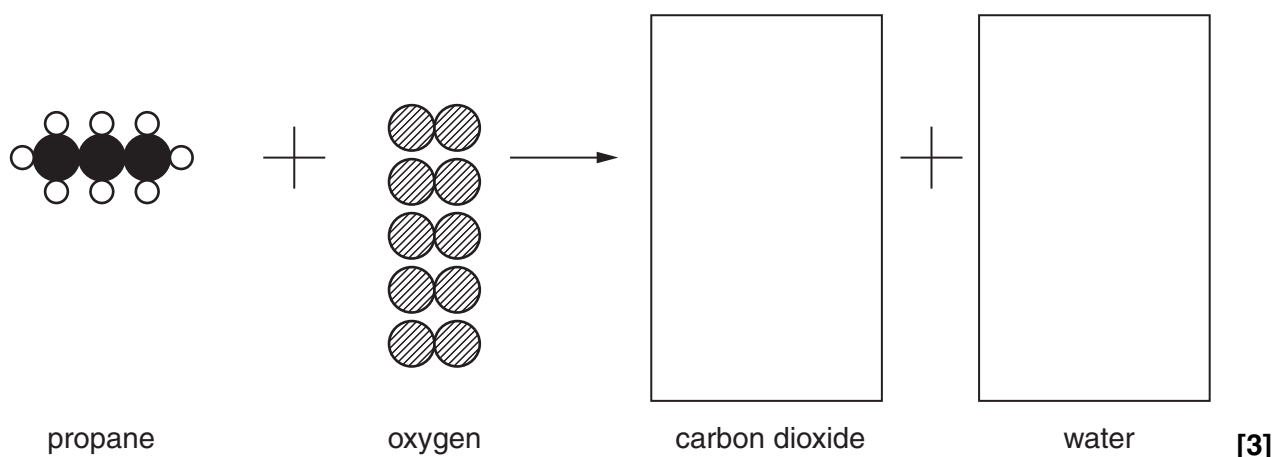
hydrocarbon

polymer

protein
[1]

- (b) In the complete combustion of propane, carbon dioxide and water are produced.

Complete this diagram to show the complete combustion of propane.



- (c) Burning is incomplete if there is not enough oxygen.

What two additional products would be made by the incomplete combustion of propane?

..... and [2]

7

(d) The amount of carbon dioxide in the Earth's atmosphere is increasing.

It is not increasing as much as expected from the increased burning of fossil fuels.

Why is this?

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

Carbon dioxide is soluble.

☐

Carbon dioxide is an unstable gas.

☐

Carbon dioxide increases the rate of photosynthesis in plants.

☐

Carbon dioxide is removed from the air by catalytic converters.

☐

Carbon dioxide reacts with oxygen in the air.

☐

[2]

[Total: 8]

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

from..... to

[1]

- (b) 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]

- (c) Data is used to find out if there is a real difference between the concentrations of nitrogen dioxide on the three streets.

The table shows five readings for each street taken at 6.00 pm.

		nitrogen dioxide concentration in $\mu\text{g}/\text{m}^3$		
reading \ place	place	Bridge Street	Castle Street	Mill Street
1		35	90	107
2		38	92	146
3		39	95	105
4		40	108	132
5		38	105	130
mean		38	98	124

The list shows statements about whether there is a real difference and a reason for this statement.

One of these statements is correct.

Draw **one** straight line from the correct **statement** to the **reason**.

statement

reason

There is a real difference between nitrogen dioxide concentration in Castle Street and Mill Street.

The range of values for Castle Street is outside the range of values for Mill Street.

There is a real difference between nitrogen dioxide concentration in Bridge Street and Mill Street.

The range of values for Bridge Street and Mill Street overlap.

There is a real difference between nitrogen dioxide concentration in all three streets.

The mean values for all three streets are different.

There is **no** real difference between nitrogen dioxide concentration in Bridge Street and Castle Street.

The range of values for Bridge Street is outside the range of values for Mill Street.

There is **no** real difference between nitrogen dioxide concentration in all three streets.

The mean value for Mill Street is outside the range of Castle Street.

[2]

[Total: 6]

5 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.



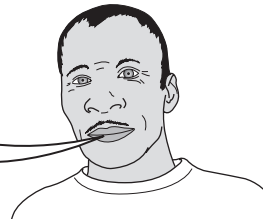
Dan

To explore further into space, we will need metals that are rare on Earth. I believe 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 astronomers are giving reasons for studying asteroids?

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

Alex

☐

Bernie

☐

Claire

☐

Dan

☐

Edward

☐

[2]

- (b) Some current research suggests that some of the asteroids between Mars and Jupiter are made of the same material as comets. Comets are made of ice and dust.

Which **two** of the astronomers would find this data most useful?

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"/>

[1]

- (c) Which **two** astronomers are making statements which contain data without an explanation?

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]

- (d) Which **two** astronomers are making statements which, when taken together, provide an explanation of how the dinosaurs may have become extinct?

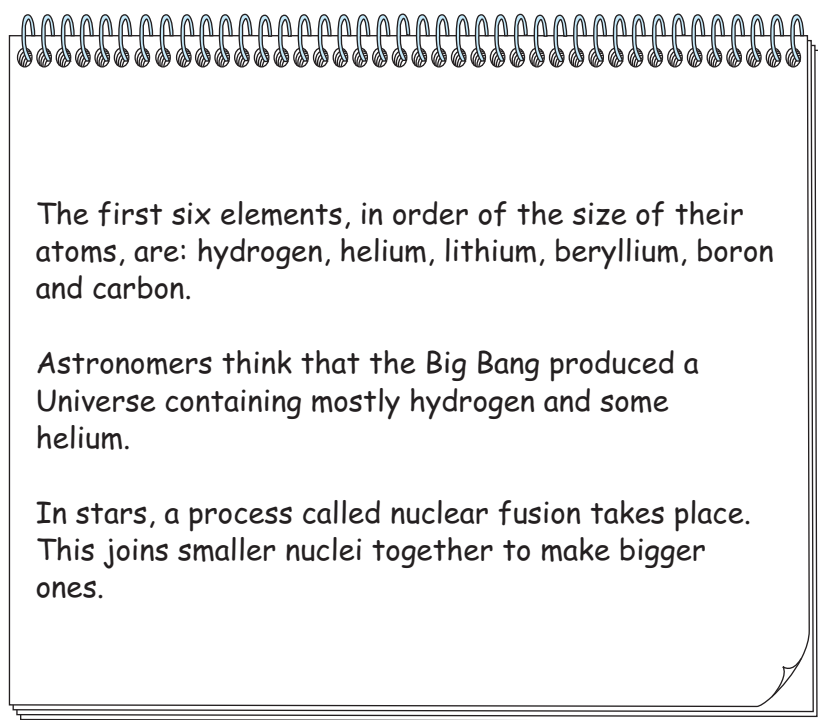
Put a tick (✓) in each of the boxes next to the **two** correct answers.

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

[1]

[Total: 6]

- 6 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: 150px; margin: 10px auto;">Helium ...</div>	<div style="border: 1px solid black; padding: 10px; width: 200px; margin: 10px auto;">... is the 'fuel' that is powering our Sun.</div>
<div style="border: 1px solid black; padding: 10px; width: 150px; margin: 10px auto;">Hydrogen ...</div>	<div style="border: 1px solid black; padding: 10px; width: 200px; margin: 10px auto;">... was present in the Universe before there were any stars.</div>
	<div style="border: 1px solid black; padding: 10px; width: 200px; margin: 10px auto;">... is made inside stars.</div>

[2]

[Total: 2]

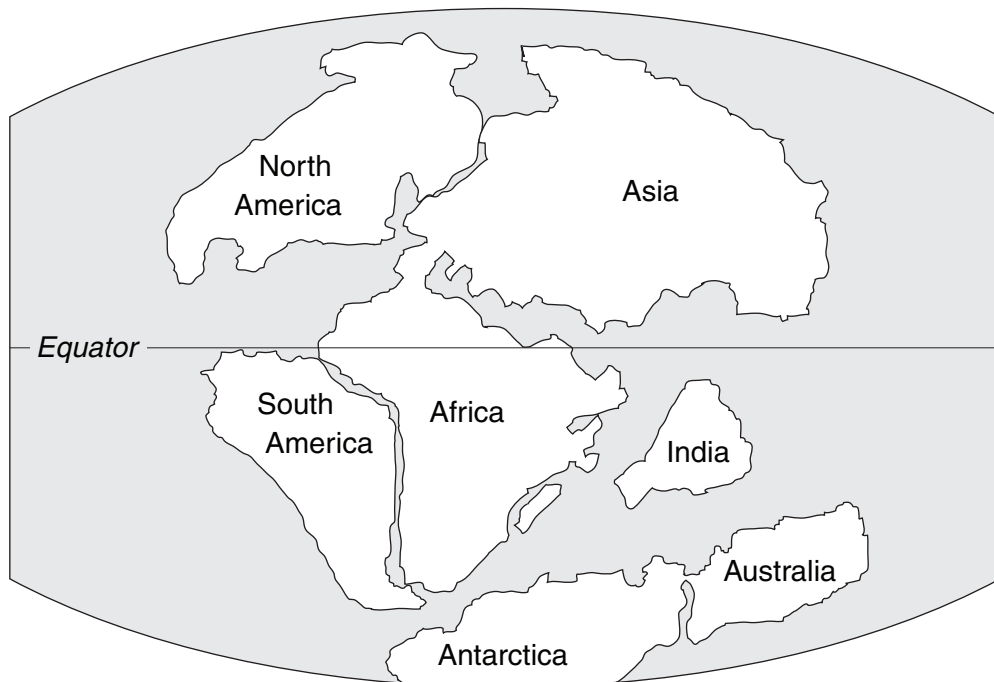
13

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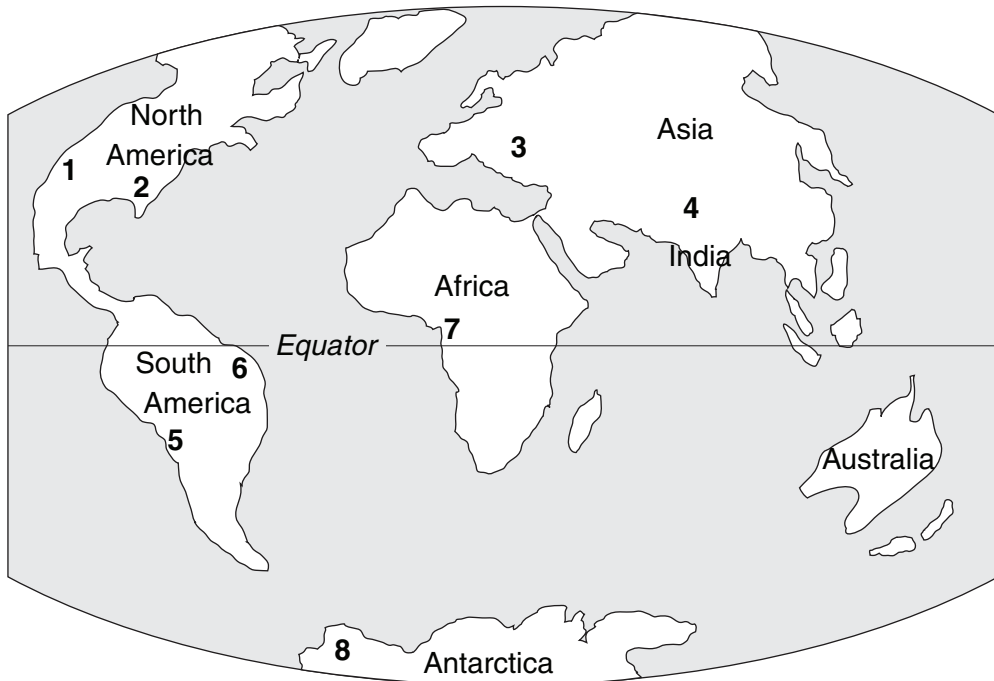
Question 7 starts on page 14

PLEASE DO NOT WRITE ON THIS PAGE

- 7 These two pictures show how scientists now believe the continents on the Earth have moved.



135 million years ago



the present day

15

(a) Use the numbers **1 – 8** on the map to answer the following questions.

- (i) Which **one** number is a mountain chain formed where continents collided with each other?

..... [1]

- (ii) Which **two** numbers could be mountain chains formed where continents push their way through the oceans?

..... and [2]

- (b) In which **two** continents would you expect to find similar fossils supporting the theory of continental drift?

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

North America and Africa

☐

North America and S America

☐

South America and Africa

☐

India and Asia

☐

[1]

- (c) The following statements explain how the theory of continental drift became established. They are not in the correct order.

A This is explained by seafloor spreading.

B There was no evidence that continents could move.

C This proved that there was movement in the solid mantle.

D One explanation of the data is that the continents were once joined.

E Alfred Wegener noticed matching rock patterns in different parts of the World.

F In the 1960s, bands of reversed magnetism were found in the middle of the oceans.

Use the letters **A to F** to fill in the boxes below, putting the stages in the correct order. Two have been done for you.

B					C
---	--	--	--	--	---

[2]

[Total: 6]

END OF QUESTION PAPER

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Q1 BBC News, *Virgin lizard becomes new parent*, 24 January 2007, © BBC News, <http://news.bbc.co.uk>.

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