

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

**A212/01**

Unit 2: Modules B2 C2 P2  
(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)

**Wednesday 17 June 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.

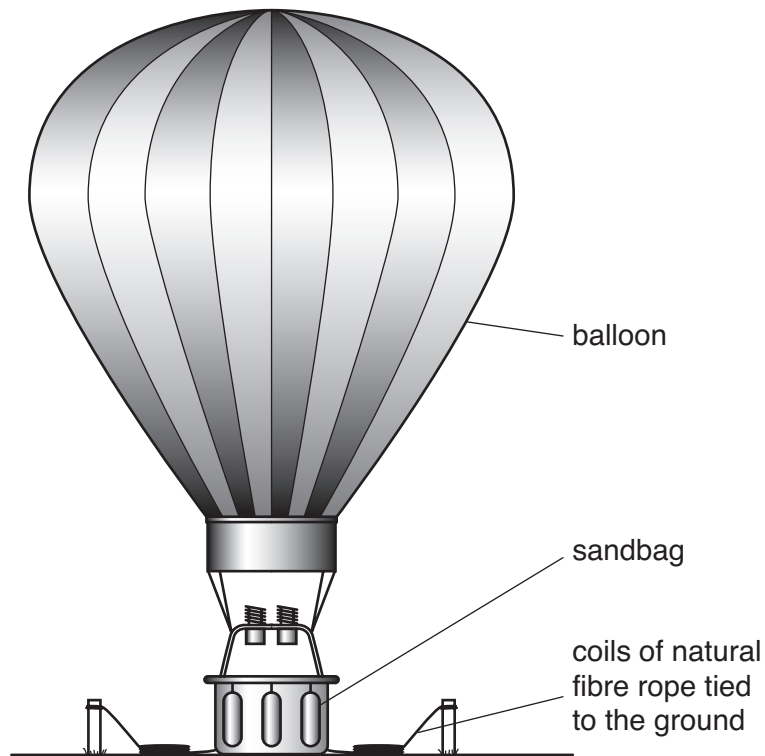
**INFORMATION FOR CANDIDATES**

- 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.

2

Answer **all** the questions.

1



People climb into the basket of this hot air balloon.  
The sandbags are dropped from the basket and the balloon rises.  
The long ropes then stop the balloon from going too high.

**(a)** Why are sandbags hung on the basket?

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

Sand has a high melting point.

The sandbags are heavy.

The sandbags absorb water.

The sandbags are flexible.

<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

**[1]**

3

- (b) The natural fibre ropes uncoil and allow the balloon to rise.  
What property of natural fibre ropes allows this to happen?

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

They are weak.

☐

They absorb water.

☐

They rot easily.

☐

They are flexible.

☐

[1]

- (c) Nylon ropes are now much more commonly used than natural fibre ropes.  
The table compares properties of natural fibre and nylon ropes.

	resistance to rotting	flexibility	strength	water absorption
natural fibre	low	high	high	high
nylon	high	high	very high	low

What **two** properties make nylon ropes better than natural fibre ropes for this use?

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

They are weaker.

☐

They do not rot easily.

☐

They are stronger.

☐

They absorb more water.

☐

They have the same flexibility.

☐

[2]

[Total: 4]

2

4



Helen and Sam are testing carrier bags made from cotton, nylon and poly(ethene). They are finding the maximum weight the bags will carry. Each bag is identical in size with the same shape of handle. Weights are added to the bags until the bags break. Five bags of each material are tested.

(a) Why do Helen and Sam test five bags of each material?

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

To make sure the test is fair.

☐

They are learning to measure correctly.

☐

The more they test, the more accurate they are.

☐

To make sure the results are reliable.

☐

[1]

(b) The readings from these tests are shown in the table.

test material	weight to break bag in newtons					
	1	2	3	4	5	mean
cotton	235	248	228	232	242	237
nylon	375	385	372	95	388	380
poly(ethene)	64	68	69	71	68	68

Sam says that one of the readings in the table is an outlier.

Put a ring around the outlier in the table.

[1]

5

- (c) Helen says that it is better to buy a cotton bag than a nylon one. She says that cotton is a sustainable resource and nylon is not. Which statements **support** Helen?

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

New cotton plants can be grown.

☐

Cotton feels softer.

☐

Nylon is made from a non-renewable resource.

☐

30% of nylon is recycled.

☐

[2]

- (d) The Life Cycle Assessments (LCA) of cotton and nylon bags are different. Which of these comparisons **explain** the difference in the LCA?

Put ticks (✓) in the boxes next to the **three** comparisons.

cotton	nylon	
made from plants	made from crude oil	
made for over 5000 years	made since 1950s	
usually replaced after 2 years	usually replaced after 10 years	
soft	shiny and harder	
made into threads	made in different shapes and styles	
biodegradable	non-biodegradable	

[2]

[Total: 6]

- 3 The material for car tyres is made by heating natural rubber with sulfur. The sulfur atoms form **crosslinks** between the polymer chains.



- (a) Use words from the list to complete the sentences about making rubber for car tyres.

**flexible**

**hard**

**help**

**make**

**start**

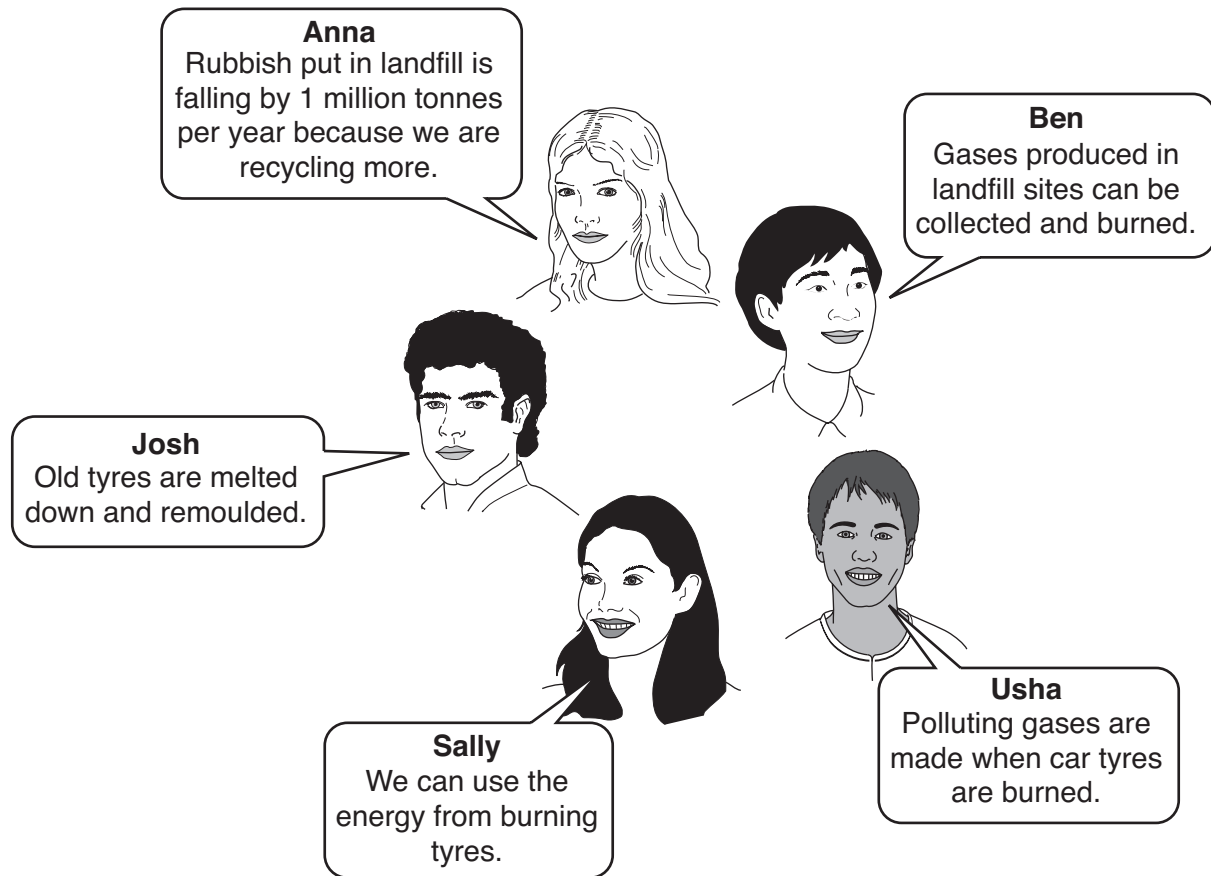
**stop**

Crosslinks between polymer chains ..... the chains slipping past each other.

This makes the rubber less .....

[1]

- (b) Students in a science class are discussing the disposal of used tyres.  
Read what they say.



- (i) Who is talking about a disadvantage of the disposal of tyres?  
answer ..... [1]
- (ii) Who is using changes in waste disposal to explain data?  
answer ..... [1]
- (iii) Who is talking about how tyres are recycled?  
answer ..... [1]

[Total: 4]

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- 4 Read this article from a newspaper.

### **The hole in the ozone layer is bigger than ever**

The hole in the ozone layer is bigger than any other on record, a satellite image has revealed.

The ozone layer in the atmosphere shields Earth from the Sun's harmful ultraviolet rays. The layer gets thinner over the South Pole every winter. This is mostly because human-made chemicals destroy ozone in the upper atmosphere.

However, there is good news. Concentrations of the chemicals which destroy ozone have been decreasing since 1995. Scientists estimate the hole in the ozone layer will be gone by 2065.

- (a) The ozone layer shields us from harmful ultraviolet.  
Which **two** of the following statements explain why ultraviolet is harmful?

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

Ionising radiation can damage living cells.

☐

Radiation heats any material that absorbs it.

☐

The Sun's radiation allows photosynthesis to happen.

☐

Ultraviolet radiation is absorbed by ozone.

☐

Ultraviolet radiation is ionising radiation.

☐

[2]

- (b) Some British people in the street were interviewed by local radio to find out what they thought about the hole in the ozone layer.



**Iris**  
I'm afraid we'll get a lot more skin cancer here in Britain. Still, it's good news that the ozone layer will be back to normal eventually.

**Omar**  
The hole in the ozone layer is caused by space travel. All those rockets going through the atmosphere!

**Melanie**  
I don't know much about ozone but I haven't noticed any difference where I live.

**Shaun**  
If the ozone layer is thinner we may be exposed to more ultraviolet. Some people are more likely to get skin cancer.

**Robert**  
If ultraviolet is absorbed by the ozone layer, it must make the upper atmosphere hotter.

- (i) Which of these people suggests that a thinner ozone layer increases the risk for people in Britain?

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

Iris	<input type="checkbox"/>
Melanie	<input type="checkbox"/>
Omar	<input type="checkbox"/>
Robert	<input type="checkbox"/>
Shaun	<input type="checkbox"/>

[2]

11

(ii) Which of these people describes a **correlation**?

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

Iris

☐

Melanie

☐

Omar

☐

Robert

☐

Shaun

☐

[1]

(iii) Which one of these people is making an **incorrect** statement?

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

Iris

☐

Melanie

☐

Omar

☐

Robert

☐

Shaun

☐

[1]

[Total: 6]

- 5 In June 2007, Britain had more rainfall than usual, and there were many floods. Experts did not agree that this happened because of global warming.



**Professor Morgan**

It is impossible to say if global warming is responsible for specific events. But you can see patterns.

We are getting much heavier bursts of rain from the Atlantic Ocean. The atmosphere is warmer and able to hold more moisture. That points to global warming.



**Professor Rankin**

Global warming explanations are nonsense. Britain's weather depends on what happens over the Atlantic Ocean and Europe. This month, winds brought in lots of rain from the Atlantic.

In Britain, more and more countryside is being built on. Land covered with concrete cannot soak up the extra rain. This makes the rivers overflow.

- (a) Which of these scientists believes that changes in weather are caused by global warming?

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

Professor Morgan

☐

Professor Rankin

☐

both scientists

☐

[1]

- (b) The scientists were talking about the wet weather in June 2007.  
Which of these statements are supported by **Professor Morgan**, **Professor Rankin** or **both scientists**?

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

statement	Professor Morgan	Professor Rankin	both scientists
Rain came in from the Atlantic.			
Warm air can hold more water than cold air.			
Rivers are overflowing more than they used to.			

[3]

- (c) The following paragraph describes the way in which most scientists believe global warming happens. Use the words from the list below to complete the paragraph.

**absorbed**

**carbon dioxide**

**electromagnetic**

**fossil fuels**

**hydrogen**

**increased**

**nitrogen**

**nuclear**

**plutonium**

**uranium**

The Sun warms the Earth's surface.

The warm Earth then gives out ..... radiation.

Some of this radiation is ..... by greenhouse gases in the Earth's atmosphere.

One greenhouse gas is .....

A lot of this gas is produced by burning .....

[4]

[Total: 8]

- 6 (a) In a heart attack some heart muscle dies.  
The heart muscle dies because its blood supply is blocked.

What does heart muscle **need** from the blood?

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

carbon dioxide

☐

food

☐

nitrogen

☐

oxygen

☐

urea

☐

[2]

- (b) The risk of developing heart disease is affected by lifestyle factors.  
Which lifestyle factor **decreases** the risk of heart disease?

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

drinking alcohol in large amounts

☐

eating fatty foods

☐

smoking cigarettes

☐

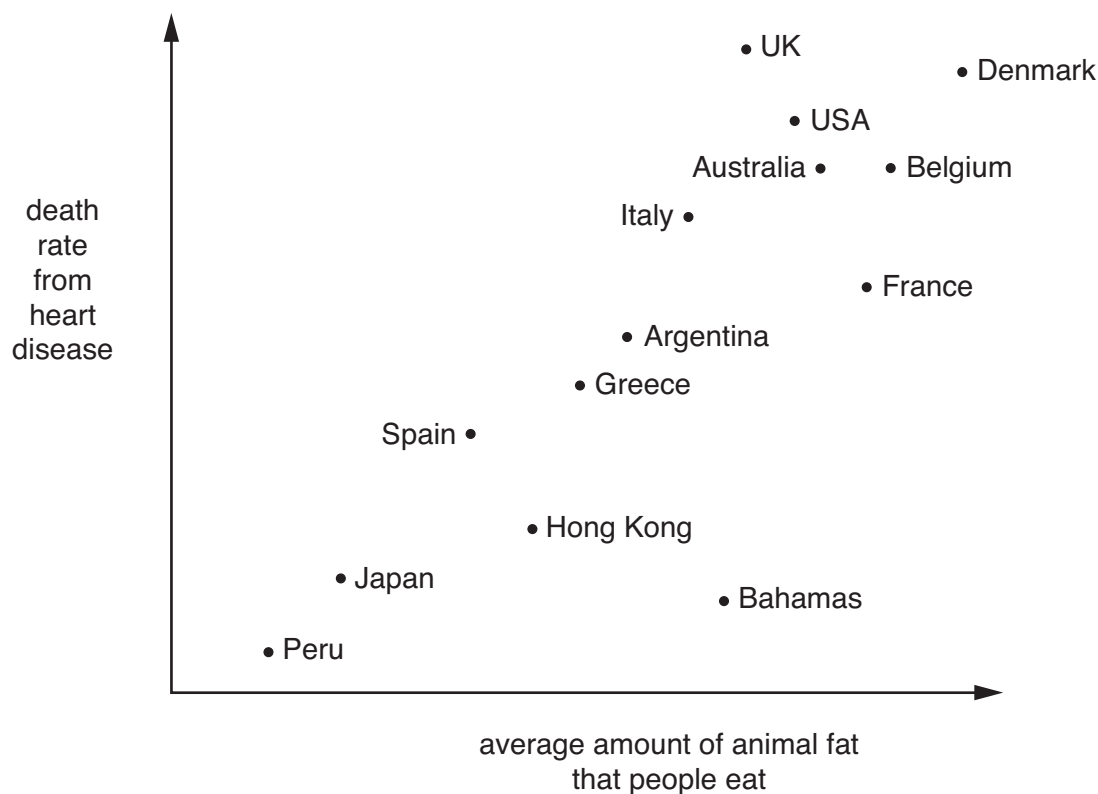
taking regular exercise

☐

[1]

15

(c) The graph shows the relationship between eating animal fat and deaths from heart disease.



(i) Which country has the lowest recorded death rate due to heart disease?

answer ..... [1]

(ii) What correlation does the graph show?

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

People in different countries eat different amounts of animal fat.

☐

The more animal fat that people eat, the greater their chance of dying of heart disease.

☐

The amount of animal fat that people eat has no effect on their chance of dying of heart disease.

☐

The less animal fat that people eat, the greater their chance of dying of heart disease.

☐

[1]

(d) Read about two studies published in scientific journals that link genes to heart disease.

### Heart disease genetic link found

Two teams of scientists have linked a faulty gene with an increased risk of heart disease.

In North America, a study of 23 000 people found that 25% of people had two copies of the faulty gene. These people have a 30 to 40% higher risk of heart disease compared to people who carry no copies.

In Iceland, a study of 17 000 people found that 20% of people had two copies of the faulty gene. These people had a 60% increased risk of heart disease compared to people who carry no copies.

Why do other scientists have confidence in these studies?

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

the results are different

☐

both studies involve large numbers of people

☐

both studies show that genes cause heart disease

☐

scientific journals are always peer reviewed

☐

all scientific work is published in journals

☐

[2]

[Total: 7]



7 (a) Read the information about *C. difficile*.

- 1 The bacterium *C. difficile* is thought to have been responsible for the deaths of 3800 hospital patients in 2004–5.
- 2 *C. difficile* can live in the intestine, causing diarrhoea.
- 3 *C. difficile* is an example of a “super bug”.
- 4 “Super bugs” are resistant to antibiotics.

Write down the number of the sentence that includes a **symptom** of *C. difficile* infection.

sentence number..... [1]

(b) Here are some sentences that describe how “super bugs” such as *C. difficile* can make people ill, even if they take an antibiotic.

They are in the wrong order.

- A *C. difficile* bacteria reproduce rapidly.
- B *C. difficile* bacteria are not killed by the antibiotic.
- C High levels of toxins cause symptoms of the disease.
- D Large numbers of *C. difficile* bacteria produce toxins.

Fill in the boxes to show the right order.  
One has been done for you.

<b>B</b>			
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[2]

18

- (c) The National Health Service (NHS) is trying to reduce the spread of antibiotic resistant bacteria. It makes recommendations to hospitals and patients.

Draw **one** straight line from a **recommendation** that would reduce the spread of antibiotic resistant bacteria, to the **reason** that explains the recommendation.

Draw only **one** line.

recommendation	reason
Buy antibiotics from a supermarket without seeing a doctor first.	Some partly resistant bacteria may otherwise survive.
Stop taking antibiotics as soon as you feel better.	Antibiotics only work against bacteria and viruses.
Always finish a course of antibiotics.	More people would be able to buy antibiotics.
Only take antibiotics for viral infections.	Antibiotics stop the immune system protecting you.

[1]

[Total: 4]

8 Read the headline.

## Measles deaths in Africa fall by 91% between 2000 and 2006

This fall in the number of deaths was achieved by the use of vaccines.

(a) Four students are discussing how vaccines work.

<p><b>Sunil</b> Vaccines kill the microorganisms that cause disease.</p>		<p><b>James</b> Vaccines give people a mild form of the disease.</p>
<p><b>Julian</b> Vaccines cause the immune system to make antibodies against the disease-causing microorganisms.</p>		<p><b>Jane</b> Vaccines give people a small dose of the disease-causing microorganisms.</p>

Which student has given the **best** explanation of how vaccines work?

answer ..... [1]

(b) New vaccines and drugs are carefully tested for safety and effectiveness before being widely used.

Human trials are done as part of this testing.

Draw a straight line from each **type of trial** to the **reason** it is carried out.

type of trial	reason
drug tested on healthy volunteers	test for effectiveness only
drug tested on people with the illness which the drug is designed to treat	test for safety only
	test for both effectiveness and safety

[2]

[Total: 3]

END OF QUESTION PAPER

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