

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

**A212/02**

Unit 2: Modules B2 C2 P2 (Higher Tier)

**Thursday 24 June 2010  
Afternoon**

**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	
--------------------	--	-------------------	--

Centre Number						Candidate Number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**MODIFIED LANGUAGE**

**INSTRUCTIONS TO CANDIDATES**

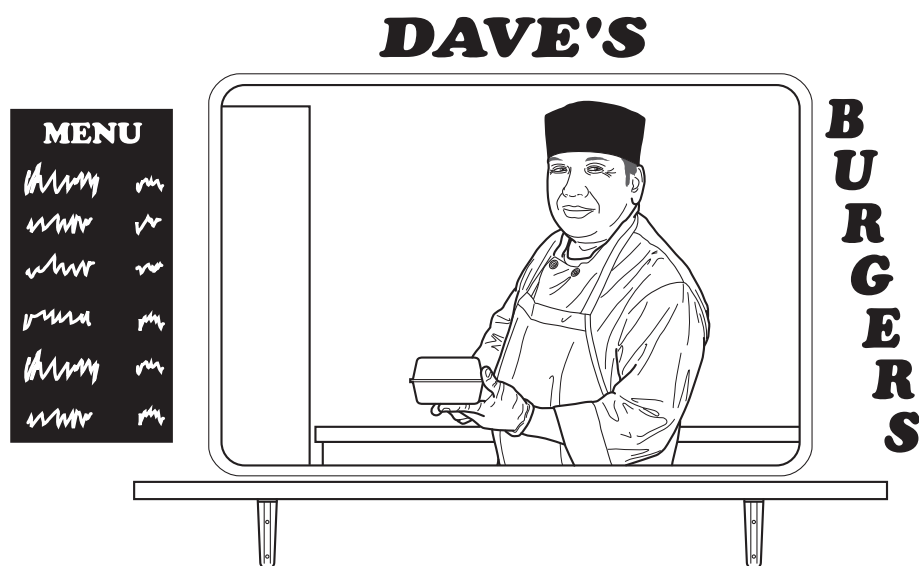
- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

**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



Dave sells hot burgers. He packs them in boxes.

He chooses the material for the boxes.

Look at the properties of different materials shown in the table below.

material	cost	density	melting point in °C	strength
low density poly(ethene) (LDPE)	low	low	80	low
high density poly(ethene) (HDPE)	high	medium	180	high
polystyrene	medium	very low	240	low

(a) Dave chooses polystyrene for his burger boxes.

Which statements explain why Dave chooses polystyrene?

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

Polystyrene is better than LDPE because it is cheaper and it will not be melted by the burgers.

Polystyrene is better than LDPE because it is less dense and will not be melted by the burgers.

Polystyrene is better than HDPE because it is cheaper and less dense.

Polystyrene is better than HDPE because it is weaker and has a lower melting point.

[1]

(b) Both LDPE and HDPE are made from poly(ethene) but their density and melting point are different.

Which of these statements explain why the density and melting point are different?

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

- The molecules in HDPE are farther apart than in LDPE.
- Stronger forces are needed to break HDPE out of its solid structure than LDPE.
- Stronger forces are needed to break the molecules in HDPE than LDPE.
- The molecules are more tangled in LDPE than HDPE.
- HDPE has higher crystallinity than LDPE.

[2]

(c) Dave is told to use cardboard boxes.

Cardboard is more sustainable than polystyrene.

Explain why cardboard is more sustainable than polystyrene.

You should consider production **and** disposal of the materials in your answer.

.....

.....

.....

.....

.....

.....

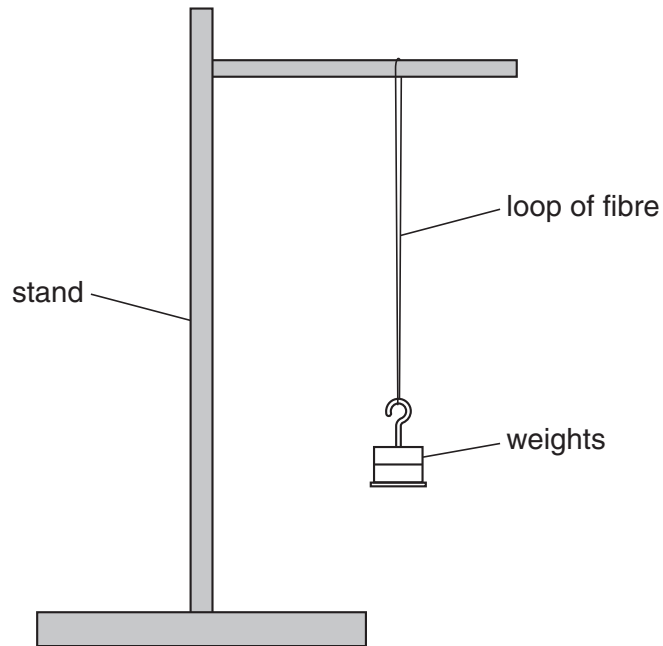
.....

..... [3]

[Total: 6]

2 Mary and George are measuring the strength of different fibres.

A fibre is looped onto a support as shown in the diagram.



Weights are hung from the fibre until it breaks.

They repeat the test 5 times for each type of fibre.

(a) The length of each fibre is 30 cm.

Suggest **one** other factor that should be controlled to make this test fair.

Explain why it should be controlled.

.....

.....

.....

..... [2]

(b) Here are Mary's results for cotton.

test number	1	2	3	4	5
weight to break fibre in N	0.60	1.45	0.90	1.35	0.70

George also investigates cotton.

Here are his results.

test number	1	2	3	4	5
weight to break fibre in N	0.95	0.80	0.90	1.00	0.85

They decide to use George's results to work out the true value of the strength of the fibre.

Explain why it is correct to use George's results rather than Mary's.

.....

.....

.....

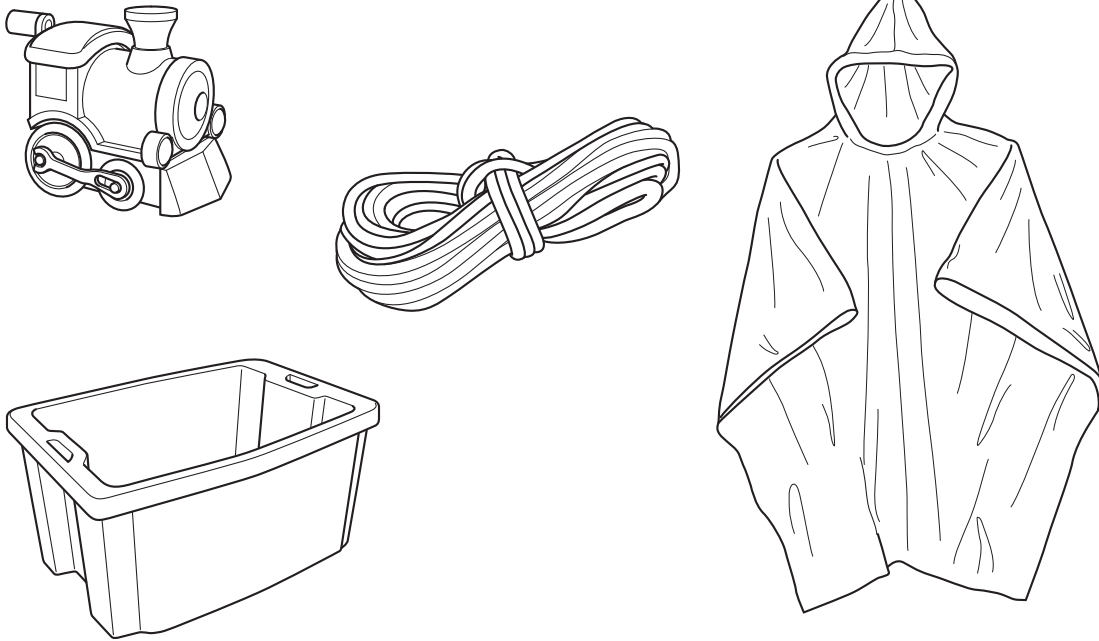
..... [2]

(c) Use **George's** results to calculate the mean value of the weight required to break the cotton thread.

answer ..... N [1]

[Total: 5]

- 3 Poly(propene) is a polymer used to make many different products such as toys, boxes, ropes and clothes.



- (a) The results of Life Cycle Assessments (LCA) for these poly(propene) products are **different**.

Which features of the LCA will be **different**?

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

the energy needed to make poly(propene) from crude oil

the energy needed to make the product from poly(propene)

the sustainability of crude oil

the useful lifetime of the product

the environmental impact of disposing of poly(propene)

[2]

(b) When poly(propene) is made into ropes and clothes a plasticizer is added.

The plasticizer increases the flexibility of the poly(propene).

Draw **one** straight line to make a sentence linking the correct **effect** of using a plasticizer to the correct **outcome** of this effect.

**effect**

Plasticizer breaks the polymer molecules ...

Plasticizer decreases the forces between polymer chains ...

Plasticizer increases the forces between polymer molecules ...

Plasticizer increases the forces inside polymer molecules ...

**outcome**

... so less energy is needed for the molecules to slide past each other.

... so more energy is needed for the molecules to slide past each other.

... so the polymer molecules are smaller.

... so the polymer molecules are branched.

[1]

[Total: 3]

**BLANK PAGE**

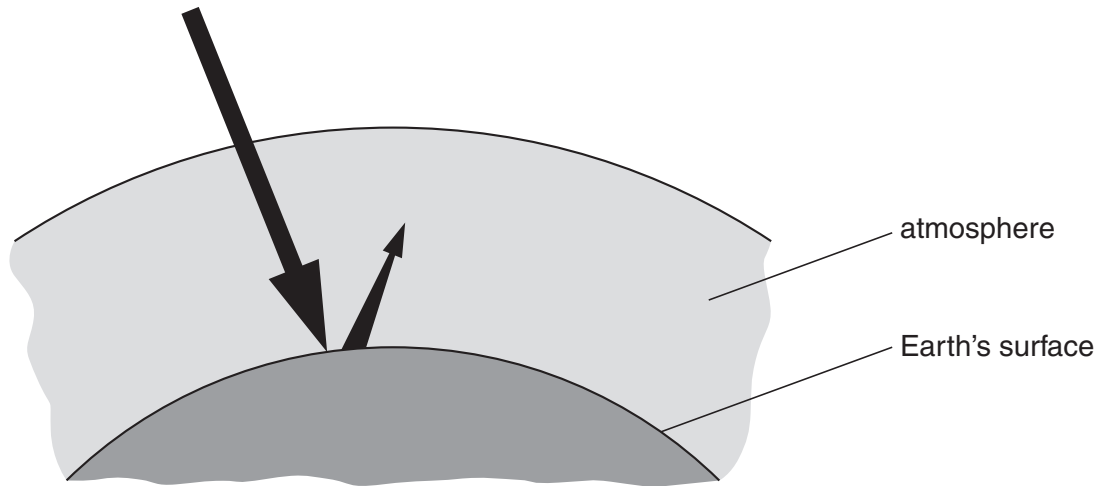
**PLEASE DO NOT WRITE ON THIS PAGE**



4 This question is about global warming.

Most scientists agree that carbon dioxide produced by human activities is making the atmosphere warmer. This is due to the greenhouse effect.

(a) The diagram shows how the greenhouse effect works.



(i) The following statements explain the process in the diagram.

They are in the wrong order.

- A** The atmosphere becomes warmer.
- B** The energy is absorbed by the Earth.
- C** The Earth is heated by the radiation.
- D** The warm Earth gives off lower-energy radiation.
- E** High energy radiation from the Sun reaches the Earth.
- F** The infrared radiation is absorbed by greenhouse gases in the atmosphere.

Fill in the boxes to show the correct order.

The first one has been done for you.

<b>E</b>					
----------	--	--	--	--	--

[2]

- (b) Natural gas has become very expensive to use as a fuel in power stations. It is cheaper to burn coal.

Burning coal produces more carbon dioxide than any other way of generating power.

One way to solve this problem is called carbon capture and storage. All the carbon dioxide produced will be collected and stored deep underground. The carbon dioxide will dissolve in water in porous rocks.

These people are discussing global warming.

**John**  
I saw on television that global warming could be quite natural, and it has nothing to do with carbon dioxide at all.

**Kate**  
The level of carbon dioxide has been rising over the last 150 years, and so has the temperature of the atmosphere. There just has to be a link. We must use carbon capture.

**Nora**  
There's no point in making changes to our power stations when India and China are burning so much coal. It will make no difference at all.

**Mike**  
Carbon dioxide is definitely a greenhouse gas – it absorbs infrared. We should reduce the amount of carbon dioxide in the atmosphere.

(i) Who mentions a **correlation**?

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

John

Kate

Nora

Mike

[1]

(ii) Who mentions a **cause**?

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

John

Kate

Nora

Mike

[1]

[Total: 4]

12  
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

5 Many people enjoy holidays in sunny countries, where the ultraviolet radiation can be intense.

(a) The amount of ultraviolet reaching parts of the Earth's surface is more now than it was fifty years ago. This is because the ozone layer has become thinner as a result of human activity.

Which two statements, taken together, can explain why the ozone layer has become thinner?

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

Natural chemicals in the atmosphere react with ozone.

Ozone absorbs ultraviolet radiation.

Pollutant chemicals in the atmosphere react with ozone.

Ultraviolet radiation breaks up ozone molecules.

Some chemical changes of ozone are not reversible.

The ozone protects living things by absorbing ultraviolet.

[2]

(b) People on holiday in sunny countries know that ultraviolet can damage their skin.

Explain why people will sunbathe, even though they know that it can damage their skin.

.....

.....

.....

.....

[2]

[Total: 4]

- 6 (a) The chart below shows the electromagnetic spectrum. Some of the regions of the spectrum have been labelled **A**, **B**, **C**, **D**, **E** and **F**.

<b>A</b>	<b>microwaves</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>
----------	-------------------	----------	----------	----------	----------	----------

Use the letters **A**, **B**, **C**, **D**, **E** and **F** to answer these questions.

Each letter may be used once, more than once, or not at all.

- (i) Which part of the spectrum contains X-rays?

answer ..... [1]

- (ii) Which parts of the spectrum are ionising radiations?

answer ..... [1]

- (iii) Write down two parts of the spectrum, apart from microwaves, that are used for transmitting information.

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

(b) Barry has hurt his hand, and has it X-rayed.

The X-ray photograph shows that his bones are not damaged.



When X-rays reach a photographic film, they produce chemical changes which make the film black, so denser tissues appear lighter.

Which of the following statements about the X-ray are true?

Put a tick (✓) in the box next to each **true** statement.

Bone absorbs X-rays more effectively than muscle.

Bone reflects X-rays more effectively than muscle.

Bone transmits X-rays more effectively than muscle.

High intensity X-rays are shown by a light colour in the photograph.

Light parts of the film received fewer X-ray photons than dark parts of the film.

[2]

[Total: 5]

7 This question is about the disease measles.

(a) Measles is caused by a type of microorganism.

Measles cannot be treated using antibiotics.

Write down the type of microorganism that causes measles.

answer ..... [1]

(b) People with measles have a high temperature, a rash and generally feel unwell.

Complete the sentences describing how microorganisms can make a person ill.

You should use **one** word in each sentence.

A microorganism gets past the body's natural barriers such as .....

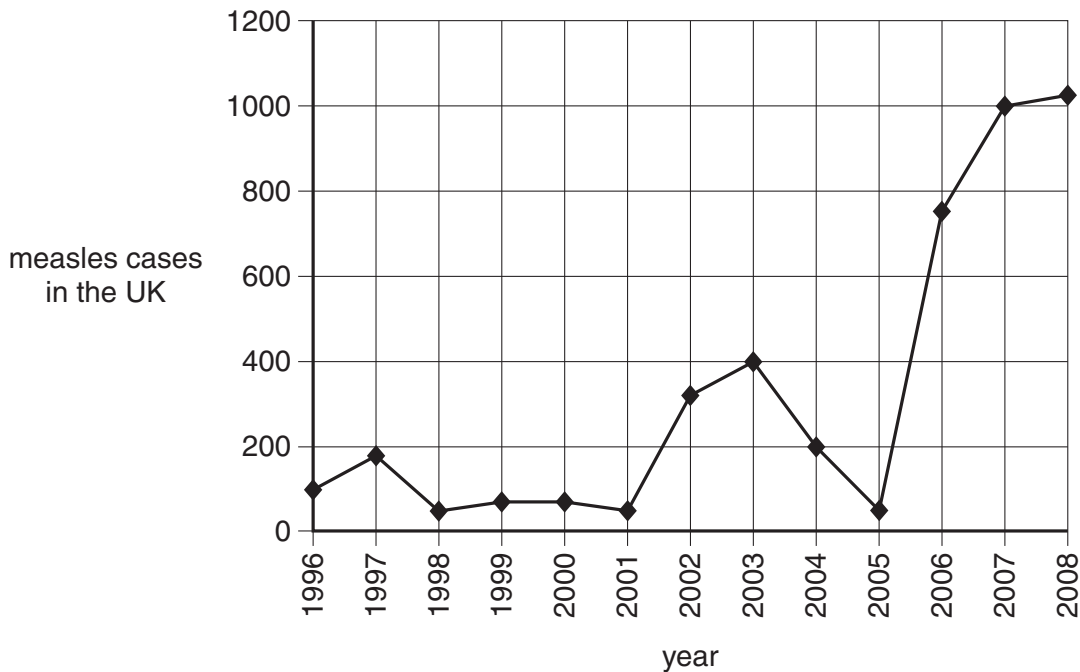
Once in the body the microorganism reproduces .....

Microorganisms damage cells by producing .....

The damage to cells causes ..... of the disease.

[3]

(c) The graph shows the number of cases of measles in the UK from 1996 to 2008.





(i) Put ticks (✓) in the boxes to indicate which of the statements about the data in the graph are **true** and which are **false**.

<b>statement</b>	<b>true</b>	<b>false</b>
The number of measles cases rises and falls every three years.	<input type="checkbox"/>	<input type="checkbox"/>
There were about 10 times more cases of measles in 2008 than 1996.	<input type="checkbox"/>	<input type="checkbox"/>
The number of cases halved between 2003 and 2004.	<input type="checkbox"/>	<input type="checkbox"/>

[2]

(ii) Read this article about measles.

Measles is an infectious disease.

About one in every fifteen children with measles becomes seriously ill. They may get chest infections, fits, swelling of the brain and brain damage.

A measles vaccination contains live, weakened microorganisms and can cause side effects. Up to 20% of children vaccinated have side effects such as a mild fever or rash. There is a one in a million chance of inflammation of the brain.

The measles vaccine only works against measles. It does not work against other viruses such as the flu.

Some parents choose not to have their children vaccinated. Between 1998 and 2008 the percentage of children being fully vaccinated against measles fell to 85%. Doctors think a vaccination rate of 95% is necessary to prevent a measles epidemic.

It is necessary to vaccinate this high percentage of children to prevent a measles epidemic.

Explain why.

.....

.....

.....

..... [2]

- (iii) The article includes some facts about vaccination and some information about the benefits and risks of measles vaccination.

Children benefit from vaccination although there are some risks.

Society as a whole benefits from measles vaccination.

Put ticks (✓) in the boxes to show which of the **facts about measles vaccination** show

- **benefits of vaccination for society**
- **risks of vaccination for children**
- **neither.**

<b>facts about measles vaccination</b>	<b>benefits of vaccination for society</b>	<b>risks of vaccination for children</b>	<b>neither</b>
Some vaccinated children will suffer from a mild fever.			
The measles vaccine does not work against the flu virus.			
Some parents choose not to have their children vaccinated.			
Measles epidemics can be prevented if over 95% of children are vaccinated.			

[2]

- (d) There is a 99% probability that a child vaccinated against measles will be immune to the disease for life.

Why does the child become immune?

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

Red blood cells can engulf and digest measles microorganisms.

White blood cells can now make antibodies against measles very quickly.

White blood cells will change very quickly, confusing the measles microorganism.

The body's natural barriers can now stop the measles microorganism from entering.

White blood cells have been stimulated to produce antibodies against measles microorganisms.

[2]

[Total: 12]

8 A recent study investigated the preventative effects of aspirin on human heart disease.

This was a major long-term study.

It used a blind trial.

Explain what a blind trial is and why placebos are rarely used in human trials.

.....

.....

.....

..... [3]

[Total: 3]

**END OF QUESTION PAPER**

**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.