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Centre Number						Candidate Number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

A212/02

**TWENTY FIRST CENTURY SCIENCE
SCIENCE A**

Unit 2: Modules B2 C2 P2 (Higher Tier)

THURSDAY 24 JUNE 2010: Afternoon

DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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.**

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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 advised to use cardboard boxes.

Cardboard is more sustainable than polystyrene.

Explain why cardboard is more sustainable than polystyrene.

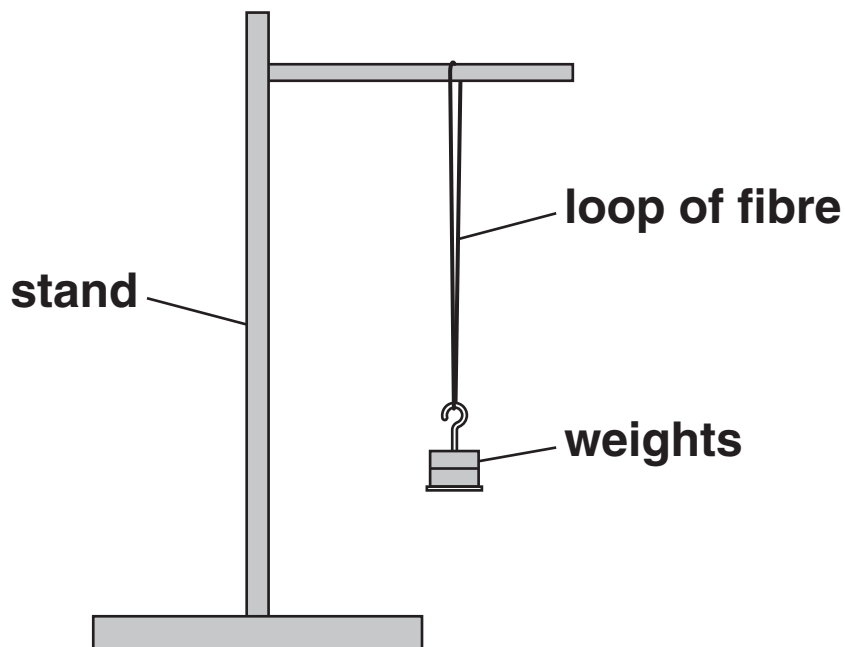
You should consider production AND disposal of the materials in your answer.

[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.

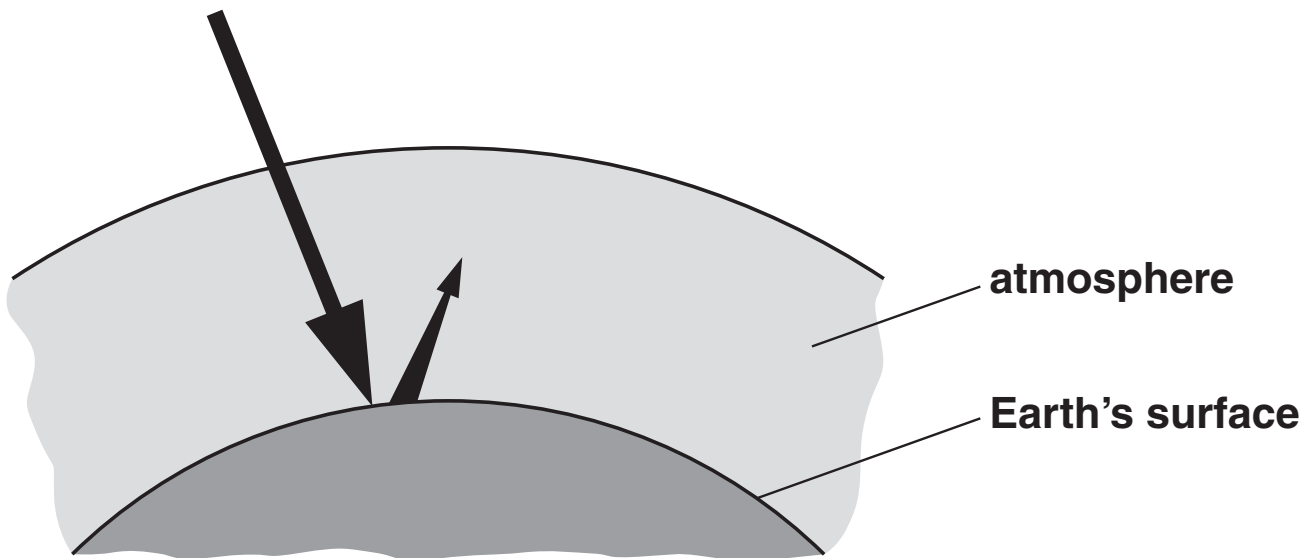
[1]

[Total: 3]

4 This question is about global warming.

Most scientists now 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.

E					
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[2]

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

Unfortunately, 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]

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 harm 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.

A	MICROWAVES	B	C	D	E	F
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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 the bones in Barry's hand as light structures surrounded by darker tissue.

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]

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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 _____ .

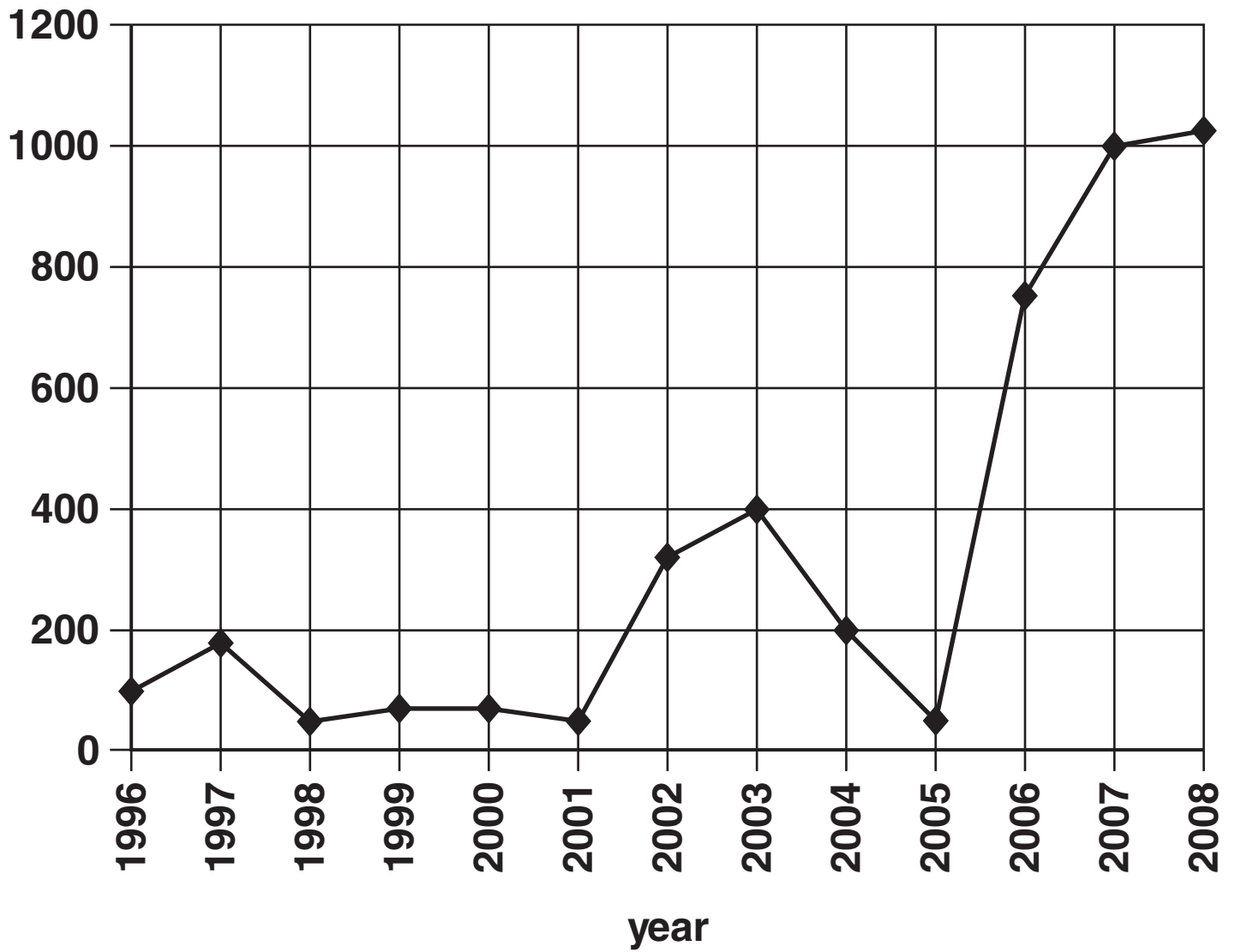
Microorganisms damage cells by producing _____ .

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.

measles cases
in the UK



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

<u>STATEMENT</u>	<u>TRUE</u>	<u>FALSE</u>
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 suffer a mild fever or rash, but 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.

Explain why it is necessary to vaccinate such a high percentage of children in order to prevent a measles epidemic.

[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.

FACTS ABOUT MEASLES VACCINATION	BENEFITS OF VACCINATION FOR SOCIETY	RISKS OF VACCINATION FOR CHILDREN	NEITHER
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



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