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Thursday 26 January 2012 – Morning

**GCSE TWENTY FIRST CENTURY SCIENCE
SCIENCE A**

A212/02 Unit 2: Modules B2 C2 P2 (Higher Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

Duration: 40 minutes

OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- Do **not** write in the bar codes.

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.

Answer **all** the questions.

- 1 Polyethene and polypropene are plastics that are made from crude oil.

This table gives some properties of polyethene and polypropene.

property	polyethene	polypropene
density in g/cm ³	0.92	0.95
melting point in °C	90	220
stiffness in GPa	0.2	2.5
strength when squashed in MPa	20	40
stretch before breaking in %	2000	1000
cost	cheaper	more expensive

- (a) The following three sentences explain the choice of polyethene or polypropene to make different products.

Complete these sentences using the correct property words from the table.

You may use each property once, more than once, or not at all.

Polypropene is chosen to make a garden chair because of its

and its, but a disadvantage of using polypropene for a garden chair is its

Polypropene is used to make a bowl to hold boiling water because of its

..... and its

Polyethene is used to make film to wrap food because of its

its and its

[3]

(b) The company uses polypropene to make the garden chairs.
Polypropene is a polymer that is made from crude oil.

(i) Crude oil is a mixture of many chemicals.
The molecules of these chemicals have some similarities and some differences.
Describe one **similarity** and one **difference** between the molecules in these chemicals.

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

(ii) Crude oil is refined to make propene molecules.
What happens when propene molecules are turned into polypropene?

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

(c) Plastics can be disposed of by recycling, incineration, or dumping in landfill sites.

Why does the incineration and recycling of plastics lower the environmental impact of disposal of these products compared to dumping in landfill sites?

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

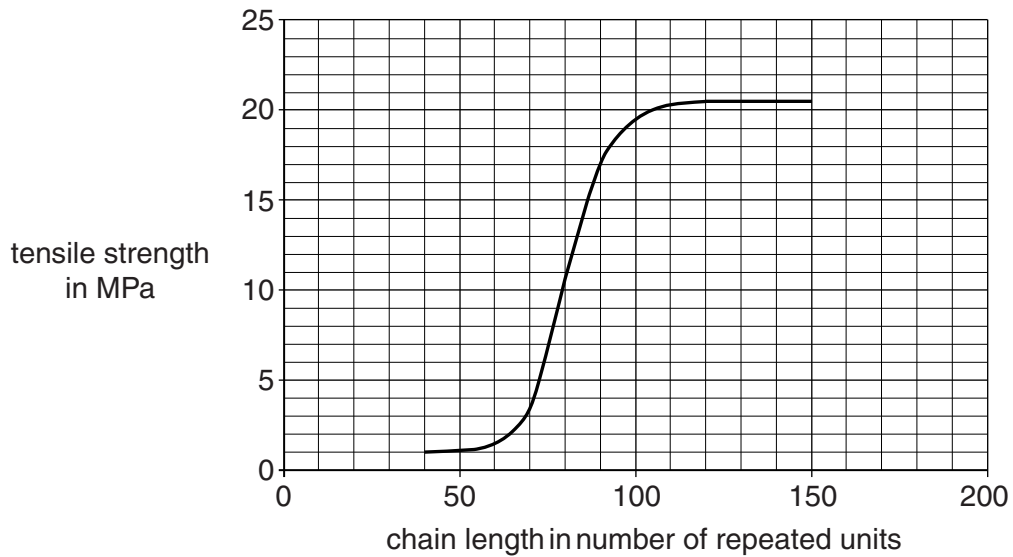
- Recycling plastics into new products uses energy.
- Energy released from incinerating plastics is used to generate electricity.
- Carbon dioxide is made when plastics burn.
- Fuel is used when transporting plastics.
- Plastics take up a lot of space in landfill sites.

[2]

[Total: 9]

- 2 Polyethene molecules can be made with different chain lengths. The chain length shows how many repeated units of ethene there are in a molecule of polyethene.

The graph shows how the strength of polyethene changes with chain length.



- (a) Here are four statements about the graph.

Which of the statements are **true** and which are **false**?

Put a tick (✓) in the correct box for each statement.

	true	false
The strength of polyethene made with 100 repeated units is 10 times that made with 50.	<input type="checkbox"/>	<input type="checkbox"/>
The maximum strength is 20.5 MPa.	<input type="checkbox"/>	<input type="checkbox"/>
Polyethene made with 100 repeated units has the same strength as that made with 150.	<input type="checkbox"/>	<input type="checkbox"/>
The minimum number of repeated units for maximum tensile strength is 120.	<input type="checkbox"/>	<input type="checkbox"/>

[3]

(b) Why does increasing the chain length of a polymer increase its strength?

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

Longer chains are held further apart than shorter ones.

The atoms are held together more strongly in long chains.

Longer chains need more energy to separate them.

There are larger forces inside the longer chains.

There are larger forces between the longer chains.

[2]

[Total: 5]

- 3 A UK Government report in 2005 recommended that young children should not be given mobile phones.

Read what these people say about the Government report.

Amy
Children have thin skulls, and their brains are still developing. They're more likely to be harmed by the microwaves. It's not worth taking any chances with their health.

Betty
Mobile phones are not powerful enough to damage the brain.

Clive
Young people use mobile phones much more than adults. If there is any danger from mobile phones, it'll be worse for them.

David
Mobile phones are very useful. Suppose a child needs to contact a parent urgently?

Erica
I've used my mobile phone for years and I'm OK. Children should be allowed to use mobile phones as much as they like.

- (a) Who talks about a factor that gives a greater risk to children than to adults?

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

Amy

Betty

Clive

David

Erica

(b) Who gives a scientific reason which suggests that mobile phones are safe for children?

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

Amy

Betty

Clive

David

Erica

[1]

(c) Who gives a reason for accepting the possible risk from mobile phones?

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

Amy

Betty

Clive

David

Erica

[1]

[Total: 4]

- 4 There is a strong correlation between global temperatures and carbon dioxide concentration in the atmosphere.

The scientific explanation for this correlation is called the greenhouse effect.

- (a) Explain the greenhouse effect.

You should refer to energy given out by the Sun and by the Earth.

.....

.....

.....

.....

..... [3]

- (b) If the mean global temperature continues to rise, there could be serious consequences.

Which of the following serious events could be caused by continued global warming?

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

- | | |
|-------------------------------------|--------------------------|
| drop in the sea level | <input type="checkbox"/> |
| floods in some areas | <input type="checkbox"/> |
| inability to grow some crops | <input type="checkbox"/> |
| less water vapour in the atmosphere | <input type="checkbox"/> |
| some areas would become colder | <input type="checkbox"/> |

[1]

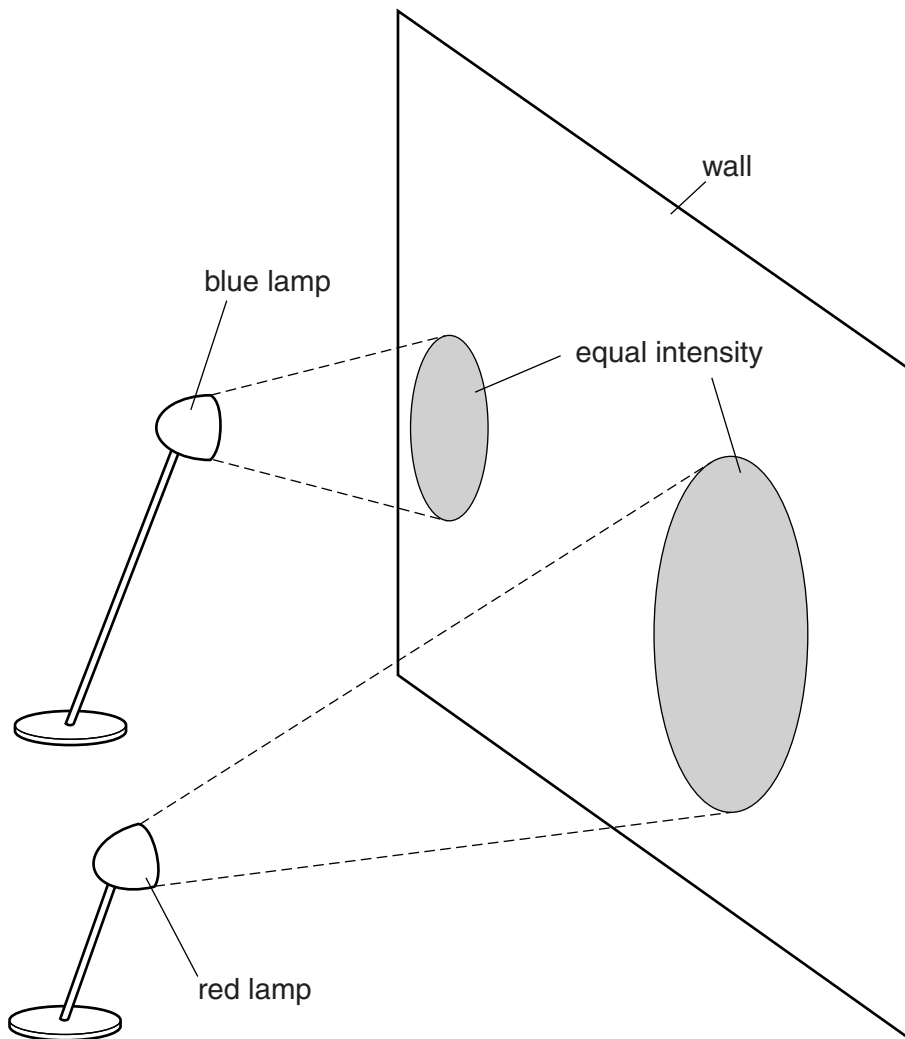
[Total: 4]

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- 5 (a) A red lamp and a blue lamp light up a wall with the **same intensity**.

The red lamp is further from the wall than the blue lamp.



Which of the following statements are true?

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

A photon of red light has less energy than a photon of blue light.

Intensity depends only on how many photons each lamp gives out each second.

The blue lamp gives out more energy per second than the red lamp.

The red lamp emits more photons per second than the blue lamp.

The red lamp is switched on for longer than the blue lamp.

[2]

(b) Some parts of the electromagnetic spectrum are referred to as ionising radiations. This is linked to properties of the photons concerned.

Name these electromagnetic radiations, and explain how they cause ionisation.

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

(c) Ionising radiation is dangerous to living things.

Write down two examples of how exposure to ionising radiation can affect living cells.

1
2 [2]

[Total: 6]

6 (a) A 13-year-long study of 40 000 people in the Netherlands has been done.

The study was published in a scientific journal. It concluded that drinking several cups of tea or coffee a day appears to protect against heart disease compared to drinking water.

(i) Suggest what aspects of this study make it reliable.

.....
 [2]

(ii) What would be needed to show that drinking tea and coffee actually gives protection against heart disease?

..... [1]

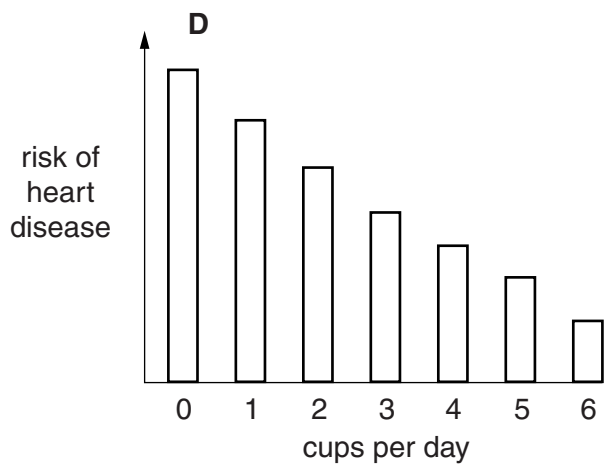
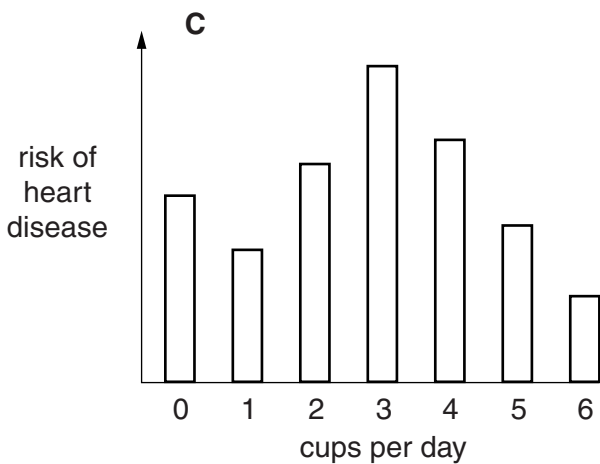
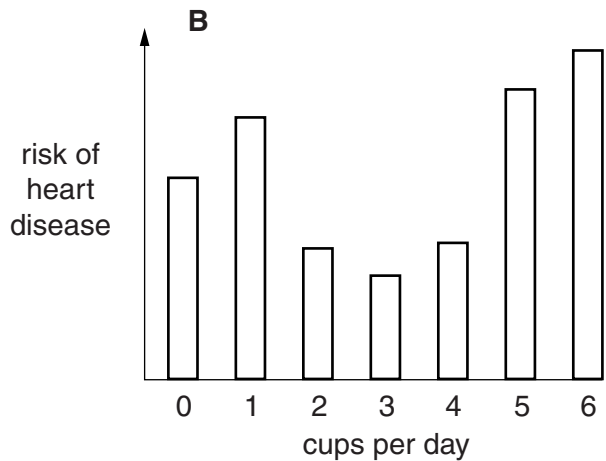
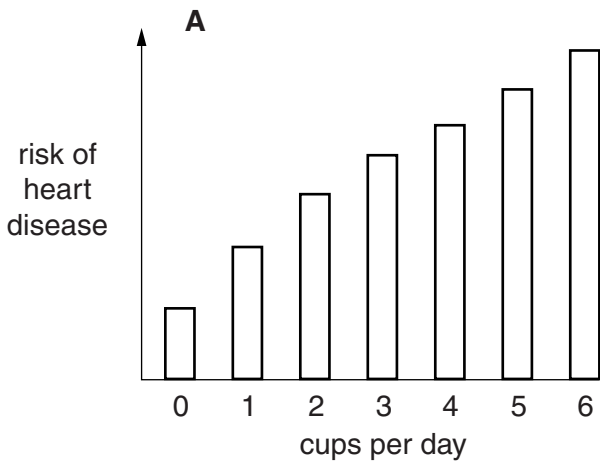
(b) The scientists think that tea and coffee contain **two** different types of substance connected to heart disease.

Substance 1 **protects** against heart disease.

Substance 2 **increases** the risk of heart disease.

The scientists think that the benefits of substance 1 only outweigh the increased risk due to substance 2 when a person drinks between **two and four** cups a day.

Here are four graphs, **A, B, C** and **D**.



Write down the letter, **A, B, C** or **D**, of the graph which supports the scientists' conclusion.

answer

[1]

(c) A spokesperson for the British Heart Foundation said, “having a cigarette with your tea or coffee could completely cancel any benefits”.

Suggest three **other** lifestyle factors that could increase someone’s risk of heart disease.

1

2

3

[1]

(d) In the same year as the study into the effect of tea and coffee drinking on heart disease, a British newspaper printed the following headline:

100 year old woman says: “smoking 20 a day for 70 years has kept me young”.

Put a tick (✓) in the box next to the **best** conclusion that can be made from this data.

It makes us less certain of the correlation between smoking and heart disease.

It makes us more certain of the correlation between smoking and heart disease.

One case does not provide convincing evidence against the correlation between smoking and heart disease.

There is no correlation between smoking and heart disease.

[1]

(e) **One** of the following changes in a blood vessel could cause a heart attack.

Draw **one** straight line to join the correct **change in blood vessel** to its correct **consequence for heart muscle**.

change in blood vessel

consequence for heart muscle

a vein leading to the heart muscle is blocked by fat

increased supply of oxygen and glucose

an artery leading away from the heart muscle is blocked by fat

increased supply of carbon dioxide and glucose

a vein carrying blood away from the heart muscle is blocked by fat

decreased supply of oxygen and glucose

an artery carrying blood to the heart muscle is blocked by fat

decreased supply of carbon dioxide and glucose

[1]

[Total: 7]

Turn over

7 Annie has a sore throat and goes to see her doctor.

The doctor says the sore throat is caused by a microorganism.

(a) Put ticks (✓) in the boxes next to the **two best** statements that describe how some microorganisms can make us ill.

Microorganisms...

... can reproduce asexually.

... contain antibodies.

... produce poisons.

... are very small.

... can damage cells.

[1]

(b) Annie's doctor tells her that the sore throat is caused by a virus.

The doctor refuses to give her antibiotics to treat her sore throat.

The doctor explains why to Annie.

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

Antibiotics do not kill viruses.

Using antibiotics unnecessarily increases antibiotic resistance.

Using antibiotics will make the virus resistant.

Antibiotics encourage bacterial growth.

[1]

(c) Annie's sore throat is a mild infection and she will get better.

Some diseases caused by viruses, such as measles, are much more serious.

Here are some statements about measles and vaccination.

1	Measles infections can be fatal.
2	The measles virus is very infectious.
3	The measles vaccine contains live, weakened measles virus.
4	Doctors recommend vaccination at around 12 to 15 months old.
5	The measles virus can only reproduce inside people.
6	The measles vaccine is very effective.

If most people are vaccinated, this will prevent a measles epidemic.

Write down the numbers of the **two** statements which together explain why.

statements and [2]

(d) It is difficult to develop a vaccine against HIV.

Explain why.

.....

.....

.....

.....

.....

..... [3]

[Total: 7]

END OF QUESTION PAPER

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