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**Friday 22 June 2012 – Afternoon**

**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**

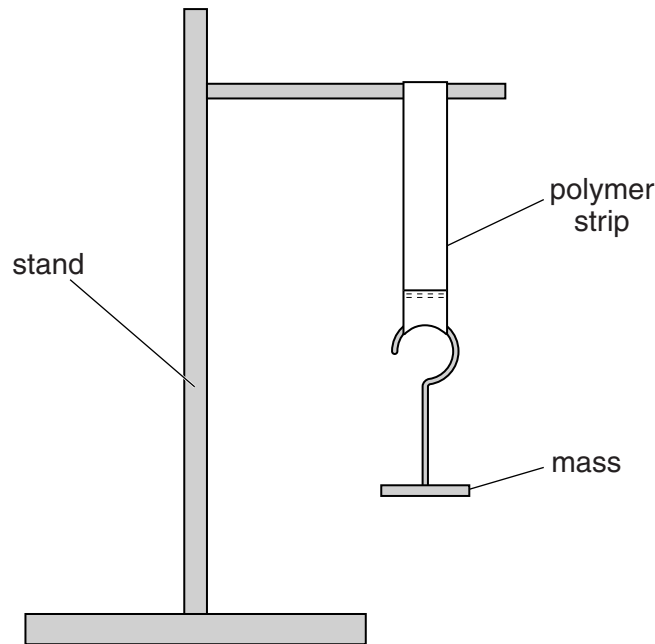
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting 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**

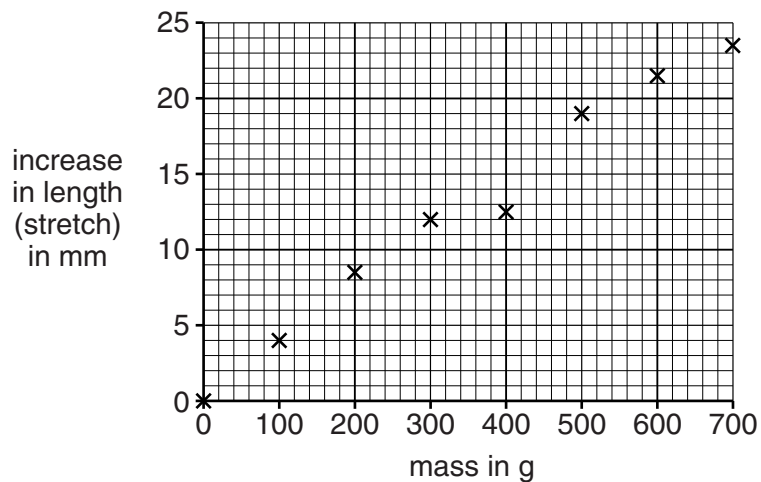
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- This document consists of **16** pages. Any blank pages are indicated.

Answer **all** the questions.

- 1 Rebecca investigates how the length of a polymer strip changes as the mass hanging on it increases.  
 She hangs a 100 g mass on the end of a polymer strip, as shown in the diagram.  
 She measures the increase in length (stretch) of the polymer strip.  
 She adds another 100 g mass and measures the stretch again.  
 She repeats this until the total mass is 700 g.



Look at the graph of Rebecca's results.



- (a) One of the points on the graph is an outlier.  
 What is the increase in length for the outlier?

..... mm  
**[1]**

3

(b) Why do you think it is an outlier?  
Suggest what Rebecca can do about this outlier.

.....

.....

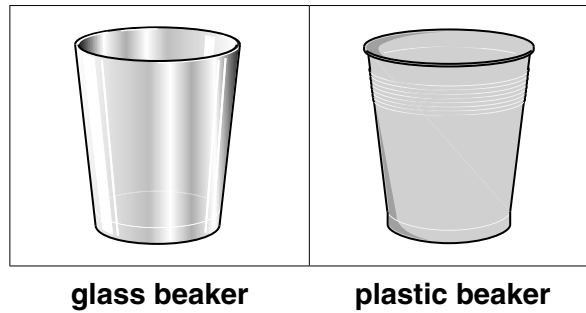
.....

.....

..... [2]

[Total: 3]

2 This question is about glass and plastic beakers used for drinks.



The table shows the energy used, and the greenhouse gases made, at different stages of the life cycle for a glass beaker and a plastic beaker.

	Glass		Plastic	
	Energy used in MJ	Greenhouse gases made in g of CO <sub>2</sub>	Energy used in MJ	Greenhouse gases made in g of CO <sub>2</sub>
<b>Extracting the raw materials</b>	4.0	1.5	4.9	1.8
<b>Manufacturing the beakers from the raw materials</b>	0.4	0.1	0.5	0.2
<b>Transporting the beakers to the shops</b>	3.0	2.1	1.2	0.8
<b>Recycling the beakers</b>	4.5	1.5	1.8	0.5

(a) (i) Two factors that have an impact on the environment are

- the energy used
- the greenhouse gases made.

The following statements are about the environmental impact of these **two** factors. Use **only** data from the table to decide if the statements are **true** or **false**.

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

	True	False
The environmental impact of extracting the raw materials and making the beakers is smaller for glass than for plastic.	<input type="checkbox"/>	<input type="checkbox"/>
The environmental impact of recycling the beakers is smaller for glass than for plastic.	<input type="checkbox"/>	<input type="checkbox"/>
The environmental impact of the glass beakers is smaller than that of the plastic beakers over all four stages.	<input type="checkbox"/>	<input type="checkbox"/>

[2]

(ii) If the beakers are not recycled then they are dumped into a landfill site.

Recycling uses **more** energy than dumping into a landfill site.

Recycling makes **more** pollution than dumping into a landfill site.

Explain why many people think that it is better to recycle the beakers than to dump them into a landfill site.

.....

.....

.....

.....

..... [2]

(b) We can get rid of plastic beakers by burning them in an incinerator.

The heat energy is used to generate electricity.

Why do many people prefer burning to dumping in landfill?

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

- Methane made in landfill sites can be burned.
- Less fossil fuel needs to be burned.
- Much less space is used.
- Land is needed for the incinerator.
- Burning does not make harmful gases.

[2]

[Total: 6]

3 A company makes boxes from polypropene.

(a) What is the name of the process that makes polypropene from small molecules?

..... [1]

(b) Customers have complained that the boxes are too brittle and break easily.

Polymers can be changed to alter their properties.

Which of these changes could make the boxes **less** brittle?

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

Increase the crystallinity of the polypropene.

Decrease the length of the molecules of polypropene.

Add a plasticizer to the polypropene.

Decrease the strength of the bonds between molecules of polypropene.

Increase the strength of the bonds between carbon atoms in each molecule of polypropene.

[2]

(c) Two samples of a polymer, **A** and **B**, have different melting points.

Sample **A** has a **lower** melting point than sample **B**.

Which two sentences, when taken together, explain why?

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

Sample **A** has smaller forces between its molecules.

Sample **A** has larger forces between its molecules.

Sample **A** has larger forces between carbon atoms in its molecules.

Sample **A** has more cross-links.

More energy is needed to break up the molecules.

More energy is needed for the molecules to move from their positions in the solid structure.

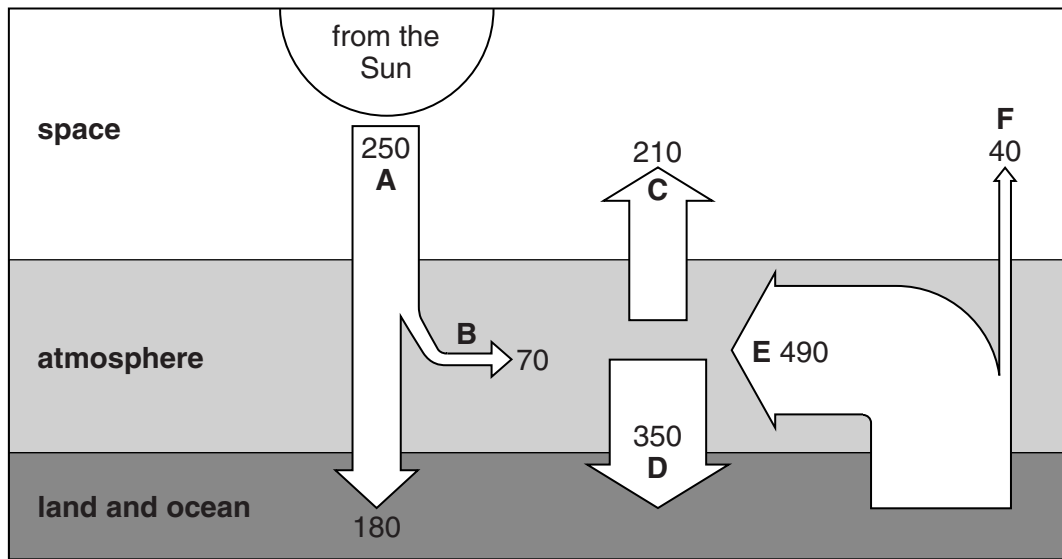
Less energy is needed for the molecules to move from their positions in the solid structure.

Cross-linking reduces the energy needed to move polymer chains apart.

[2]

[Total: 5]

4 The diagram shows energy transfers related to global warming.



The numbers on the diagram represent the amount of energy transferred in joules per  $\text{m}^2$  per second, averaged over 24 hours. For example, the average energy from the Sun (A) reaching the top of the Earth's atmosphere is 250 joules per  $\text{m}^2$  per second.

(a) (i) What is the total energy, in joules per  $\text{m}^2$  per second, emitted into space?

Put a **ring** around the correct answer.

40      70      210      250      490

[1]

(ii) What is the total energy, in joules per  $\text{m}^2$  per second, reaching the land and ocean?

Put a **ring** around the correct answer.

40      180      350      490      530

[1]

(b) If the concentration of greenhouse gases in the atmosphere increases, some of the energy transfer values will change causing the atmosphere to warm up.

(i) The atmosphere warms up but the energy from the Sun stays the same.

This is because **two** of A, B, C, D, E and F have increased.

Which **two**?

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

(ii) Which **one** of A, B, C, D, E and F is unaffected by the concentration of greenhouse gases?

answer ..... [1]

[Total: 4]



5 Read this article.

**Everybody likes sunny weather!**

Sunlight is a source of natural light and energy. It is good for our general health and makes us feel good.

Although sunbathing may be enjoyable it is important to remember that too much exposure to sunlight is a health hazard. The ultraviolet (UV) radiation in sunlight can harm the skin.

Sunburn often affects skiers, climbers and trekkers in the mountains. The higher you go, the stronger the Sun's UV rays are.

The Sun's rays can also pass through water. When swimming, people can underestimate their exposure to sunlight because of the cooling effect of the water.

(a) Explain why sunlight can be harmful, and why people who know this still expose themselves to sunlight.

.....  
.....  
.....  
.....  
..... [3]

(b) Suggest **two** ways in which mountain climbers could reduce their risk from sunlight.

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

[Total: 4]

6 Some of the following statements about electromagnetic radiation are true, and some are false.

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

Infrared is an ionising radiation.

The frequency of the radiation is the number of photons emitted per second.

Microwaves are reflected from metal surfaces.

X-ray photons have enough energy to remove electrons from atoms.

If a red light and a blue light have the same energy, the red light emits more photons.

The energy of two ultraviolet photons is the same as the energy of one photon of visible light.

Radio waves and microwaves of the same intensity will deliver the same amount of energy to an absorber each second.

[3]

[Total: 3]

7 This question is about gases in the atmosphere.

(a) The following statements about ozone are all true.

Put ticks (✓) in the boxes next to the **two** statements which, when taken together, explain how ozone in the atmosphere protects living organisms.

Ozone is a greenhouse gas.

Ozone is produced by car engines.

Ozone forms a layer high in the atmosphere.

The ozone molecule consists of three oxygen atoms.

Ozone is converted into ordinary oxygen when it absorbs ultraviolet radiation.

[2]

(b) Some gases in the atmosphere are greenhouse gases.

Carbon dioxide and ozone are greenhouse gases.

Name one **other** major greenhouse gas in the Earth's atmosphere.

gas ..... [1]

[Total: 3]

- 8 (a) During drug trials, new drugs or placebos are given to patients to find out if the drugs are effective.

Sometimes neither patient nor doctor knows if the patient has been given the drug or the placebo.

What name is given to this type of trial?

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

- blind trial
- placebo trial
- double-blind trial
- double placebo trial
- open trial

[1]

- (b) Susan is suffering from an incurable disease.

A new drug is developed. It shows some effect in treating this disease in a very early trial.

Susan's doctor suggests that she takes part in this trial.

He tells Susan that in this trial she will definitely be given the new drug and not a placebo.

Suggest why placebos are not used in this trial.

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

[Total: 3]

9 This question is about heart disease.

(a) Complete these sentences about the heart.

The heart needs its own blood supply to provide ..... for the muscle cells and remove ..... from the muscle cells.

A build up of ..... in the arteries supplying the heart muscle can cause a heart attack. [2]

(b) Jane visits her doctor.

She is advised to make changes to her lifestyle to reduce the risk of a heart attack.

Put a tick (✓) in the correct box for each row to show if the lifestyle factor increases or decreases the risk.

Lifestyle factor	Increases risk	Decreases risk
excessive alcohol intake		
regular exercise		
diet high in saturated fat		
smoking		
stress		

[1]

(c) Edie has a heart attack.

The heart attack comes at the end of a series of changes which happen in her heart.

Some possible changes are given below.

The changes are in the wrong order. Some are incorrect.

Choose the **six** correct statements and put the letters in the correct order in the boxes below.

- A The heart cells die.
- B A blood clot forms on the fat.
- C Fat builds up inside the heart.
- D The clot blocks the blood vessel.
- E The coronary blood flow is stopped.
- F Fat builds up in the coronary arteries.
- G New veins grow around the blockage.
- H Heart muscle is starved of oxygen and glucose.

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[2]

(d) Here are four statements about smoking and cancer.

Put a tick (✓) in the correct column to show whether each statement shows a **correlation** or a **cause**.

Statement	Correlation	Cause
Tests on smokers who have died of lung cancer often show that their lungs are black.		
More smokers than non-smokers develop lung cancer.		
Chemicals in cigarette smoke damage cells in the lungs.		
Some data have shown that changes in air pollution from car exhausts follow a similar pattern to the number of deaths from lung cancer.		

[1]

[Total: 6]

10 Vaccinations protect the body from certain diseases.

(a) Fred is vaccinated against tetanus when he is a baby.

When Fred is 13 years old, he needs to be vaccinated against tetanus again.

Suggest why Fred needs more than one vaccination against tetanus.

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

(b) Why is it necessary to vaccinate a high percentage of the population?

Here are the answers four people give to this question.

<p><b>Amrit</b> If more people are vaccinated, it will help to prevent an epidemic.</p>		<p><b>Bryan</b> If more people are vaccinated, they are more likely to catch the disease.</p>	
<p><b>Connie</b> If fewer people are vaccinated there will be fewer disease-causing microorganisms to infect other people.</p>		<p><b>Debbie</b> If more people are vaccinated, fewer people will suffer side effects from the vaccination.</p>	

Who gives the correct answer? ..... [1]

[Total: 2]

11 (a) Leanne’s immune system defends her body against invading microorganisms.

Her body does this by destroying the microorganisms.

Which parts of Leanne’s immune system are involved in this process?

Put **rings** around the **two** correct answers.

- |                    |                        |                   |                          |
|--------------------|------------------------|-------------------|--------------------------|
| <b>antibiotics</b> | <b>antigens</b>        | <b>antibodies</b> | <b>penicillin</b>        |
| <b>platelets</b>   | <b>red blood cells</b> | <b>vaccines</b>   | <b>white blood cells</b> |
- [1]

(b) Leanne’s body is invaded by the same type of microorganism for a second time.

This time her body reacts much faster and she recovers more quickly.

Explain why.

.....

.....

..... [2]

[Total: 3]

**END OF QUESTION PAPER**



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