

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

A331/01

Unit 1 Modules P1 P2 P3 (Foundation Tier)

WEDNESDAY 11 JUNE 2008

Afternoon
 Time: 40 minutes

Candidates answer on the question paper
Additional materials (enclosed): None

Calculators may be used.
Additional materials (required):
 Pencil
 Ruler (cm/mm)



Candidate
 Forename

Candidate
 Surname

Centre
 Number

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Candidate
 Number

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INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.

FOR EXAMINER'S USE

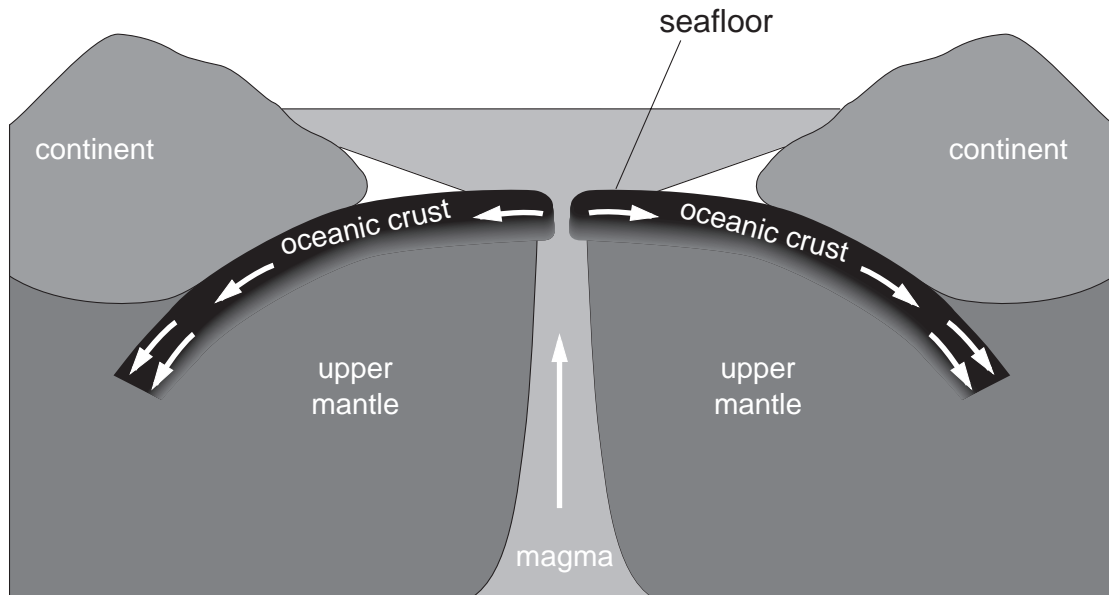
Qu.	Max	Mark
1	7	
2	8	
3	8	
4	5	
5	6	
6	8	
TOTAL	42	

This document consists of **15** printed pages and **1** blank page.

Answer **all** the questions.

- 1 This question is about seafloor spreading and Wegener's theory of continental drift.

The diagram shows a section through the seafloor at the middle of the ocean.



- (a) At mid-ocean ridges, magma from the mantle rises through the seafloor.

Here are five steps in this process.

They are in the wrong order.

- A** The mantle melts as it rises.
- B** The mantle under the ridge rises.
- C** Molten magma erupts into the sea.
- D** The new seafloor pushes continents apart.
- E** The molten magma 'freezes' into new seafloor.

Fill in the boxes to show the correct order. The first one has been done for you.

B				
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[3]

(b) Here are some statements. Not all of them are correct.

Which **three** best support the theory of continental drift?

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

Volcanoes are only found under the sea.

The movement of the continents cannot be measured.

Similar fossils are found in South America and in Africa.

The dinosaurs were all killed by a giant tsunami (tidal wave).

Africa and South America have the same pattern of rocks in the crust.

The shapes of continents look as if Africa and South America once fitted together.

[3]

(c) Wegener's theory of continental drift was rejected by other scientists at first.

Seafloor spreading was then discovered.

Scientists then accepted Wegener's theory.

Which of the following statements is the best explanation for why scientists accepted the theory?

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

Wegener had become their friend.

Mid-ocean ridges are caused by volcanoes.

Seafloor spreading can explain how continents might move.

The seafloor between continents stretches as the continents move apart.

[1]

[Total: 7]

2 Read this extract from a newspaper.

Space 'starshade' could provide clues to alien life

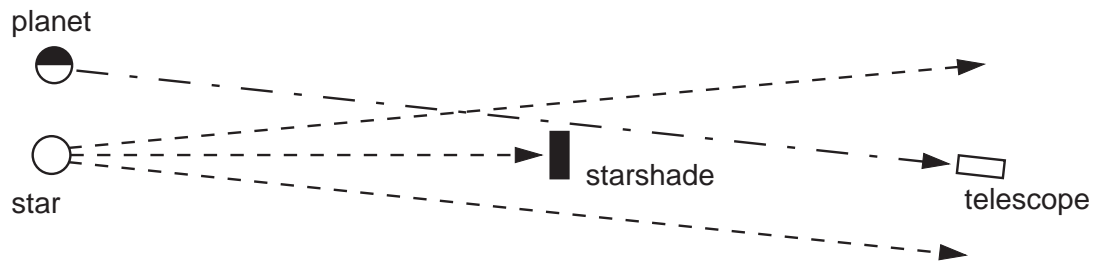
A giant 'starshade' in space could allow astronomers to see Earth-like planets orbiting distant stars.

The starshade and a space telescope would be launched together to orbit about a million miles from Earth.

The starshade could be a simple solution to the problem of a star's light swamping the view of small rocky planets. The starshade would be positioned some 15 000 miles in front of the telescope. It would block the bright light from the star and let the small rocky planets be seen.

Scientists on Earth would fire small thruster rockets on the starshade to move it in front of the stars in which they are interested. Astronomers would then be able to see planets whose reflected light passes the edge of the starshade disc as bright specks.

'We will be able to study Earth-like planets tens of trillions of miles away and chemically analyse their atmospheres for signs of life like methane, oxygen and water,' said Professor Webster Cash, who thought of the idea.



from the Daily Mail, 6 July 2006

(a) Read the following statements.

Put a tick (✓) in the box next to each of the **two** correct statements.

The starshade will block out the light from the star.

The starshade will have thruster rockets attached to it.

This telescope and the starshade will be very close together.

The starshade and space telescope will be launched separately.

The space telescope will be able to clearly see life on distant planets.

[2]

(b) Most telescopes are on the Earth's surface.

This telescope and starshade will be put in orbit around the Earth.

Which of these statements is a correct reason for doing this?

Put a tick (✓) in the box next to each of the **two** correct statements.

Light pollution will not affect the telescope if it is in space.

It is too expensive to put the telescope and starshade on Earth.

The telescope and starshade would take up too much room on the Earth's surface.

The Earth's atmosphere will not reduce the quality of the image if the telescope is in orbit.

[2]

(c) This is what two scientists say about this project.

Professor Hilton

This is an exciting and important project. It will be well worth the large amount of money spent on it.

If we find oxygen in the atmospheres of distant planets it will mean there's life there.

Don't forget that research done in developing new technology always has useful applications here on Earth.



Dr Churchill

This will cost a lot of money, and I don't see any value in it.

If we do find life on a distant planet, what difference will that make to us here on Earth? We'll never be able to go and visit them.

The money would be better spent on fighting disease and reducing global warming.



Which scientist makes each of the following claims?

Put a tick (✓) in **each** correct box.

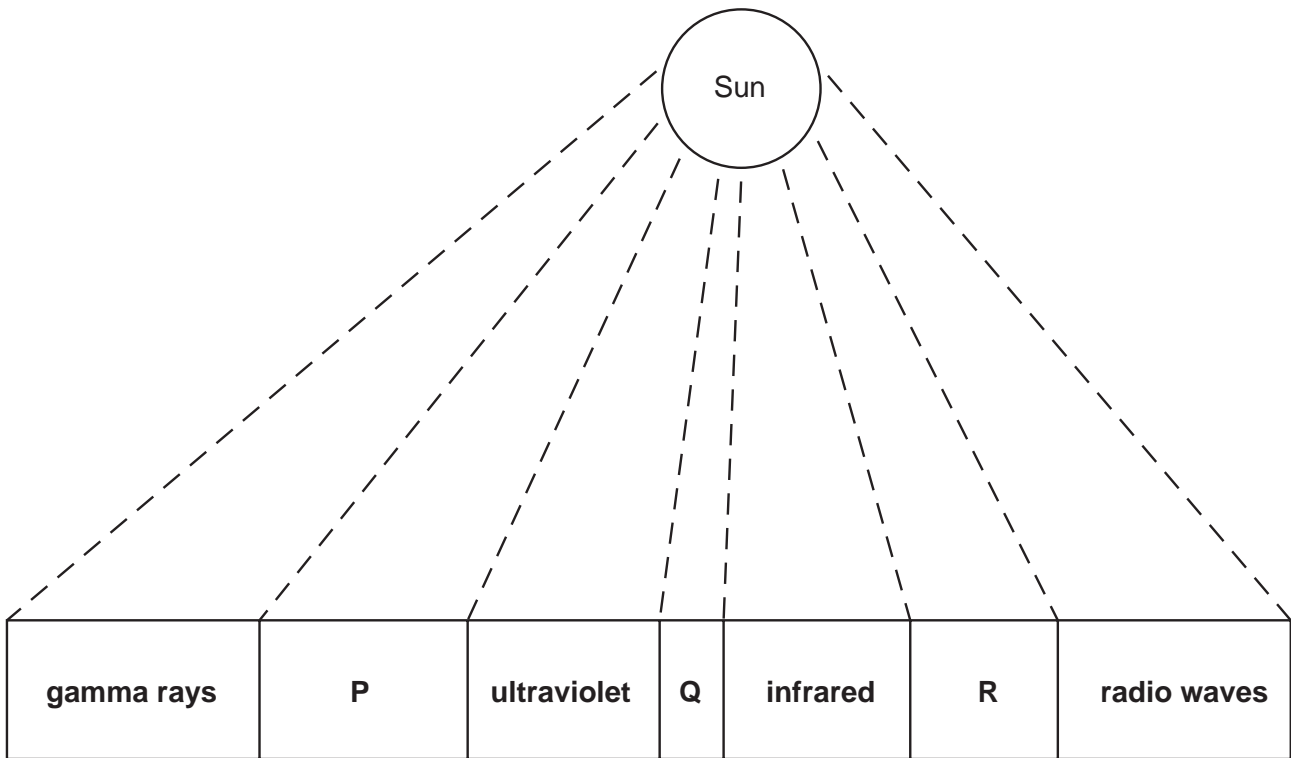
Each claim may have one tick, two ticks or no tick at all.

	Prof. Hilton	Dr Churchill
The project is worth doing.		
The project will be expensive.		
There must be life on distant planets.		
Space research benefits people on Earth.		

[4]

[Total: 8]

3 The diagram shows the spectrum of radiation given out by the Sun.



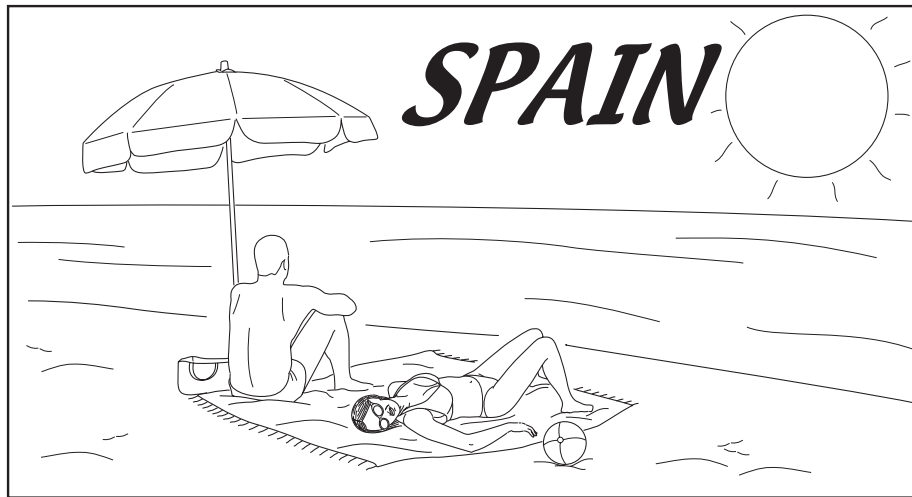
(a) Some regions of this spectrum are labelled with letters instead of their names.

Write the letters **P**, **Q** and **R** in the correct boxes below.

light	<input type="checkbox"/>
X-rays	<input type="checkbox"/>
microwaves	<input type="checkbox"/>

[2]

(b)



A group of friends are going to sunny Spain for a summer holiday. They are talking about sunbathing and the risks from ultraviolet radiation.

Alex
I always use plenty of sun lotion and wear a tee-shirt. A little ultraviolet is good for you - it gives you vitamin D!

Beth
I've been to Spain often. I never burn in the sun. I'm not likely to suffer any damage from ultraviolet.

Carys
I stay indoors reading between 11a.m. and 3p.m., when the sun is hottest. I get just enough sun to go nice and brown.

Derek
My brother had skin cancer, but he used to sunbathe a lot. I have never done that. I'll just go about as I normally do.

- (i) Which **two** people are taking action to reduce the risks from exposure to ultraviolet?
Put ticks (✓) in the **two** correct boxes.

Alex	<input type="checkbox"/>
Beth	<input type="checkbox"/>
Carys	<input type="checkbox"/>
Derek	<input type="checkbox"/>

(ii) Who is talking about the **dangers** from exposure to ultraviolet?

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

- Alex
- Beth
- Carys
- Derek

[2]

(iii) Who is talking about the **benefits** from exposure to ultraviolet?

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

- Alex
- Beth
- Carys
- Derek

[2]

[Total: 8]

4 Terahertz radiation is a part of the electromagnetic spectrum.

Here are some properties of terahertz radiation.

- It is invisible.
- It is not ionising.
- It can penetrate many materials.

(a) Finish these sentences about terahertz radiation.

Choose words from this list. Each word may be used once, more than once or not at all.

ionising **penetrating** **ultraviolet** **visible**

Dentists can detect decay deep inside a tooth with terahertz radiation because it is

.....

It is much safer to use than X-rays because terahertz radiation is **not**

[2]

(b) Terahertz radiation is an invisible radiation which cannot break up molecules.

In which region of the electromagnetic spectrum should it be placed?

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

- | | |
|-------------|--|
| light | |
| infrared | |
| ultraviolet | |

[1]

(c) When photons of terahertz radiation are absorbed by a material, it heats up.

The amount of heating depends on **two** properties of the photons.

Put a tick (✓) in the box next to each of the **two** correct properties.

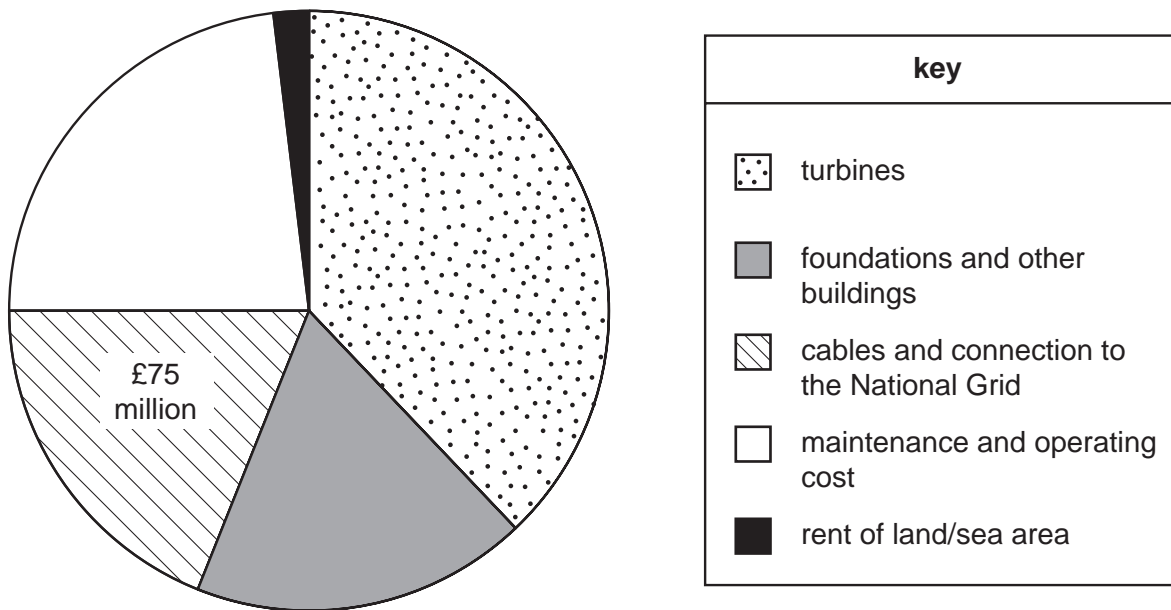
- | | |
|--------------------------------|--|
| the shape of each photon | |
| the energy in each photon | |
| the number of photons arriving | |
| the temperature of each photon | |

[2]

[Total: 5]

5 Many wind farms are being planned to generate electricity for Britain.

The pie chart below shows the costs of setting up and operating a wind farm due to different factors.



(a) The total cost of the wind farm is £400 million.

(i) Which one of the following is the best estimate of the cost of the **turbines**?

Put a ring around the best estimate.

- £40 million £75 million £150 million £200 million

[1]

(ii) Which one of the other factors costs £90 million?

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

rent of land/sea area

foundations and other buildings

maintenance and operating costs

cables and connection to the National Grid

[1]

(b) Sonya and Trevor are worried about plans for a large wind farm in their area.

Sonya
 Our area is very beautiful. Rows of noisy, ugly wind turbines will spoil it for the local people and will stop tourists from coming here. We need the tourists to come here and spend money in our shops.



Trevor
 Evidence from Scotland seems to show that many birds are killed by flying into wind turbines, so I'm worried about migrating birds. And it's not always windy here, so the turbines won't always work.



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

	Sonya	Trevor	neither Sonya nor Trevor
Who thinks the wind farm will make the area unattractive?			
Who thinks the wind farm is bad for wildlife?			
Who talks about economic cost?			
Who talks about efficiency?			

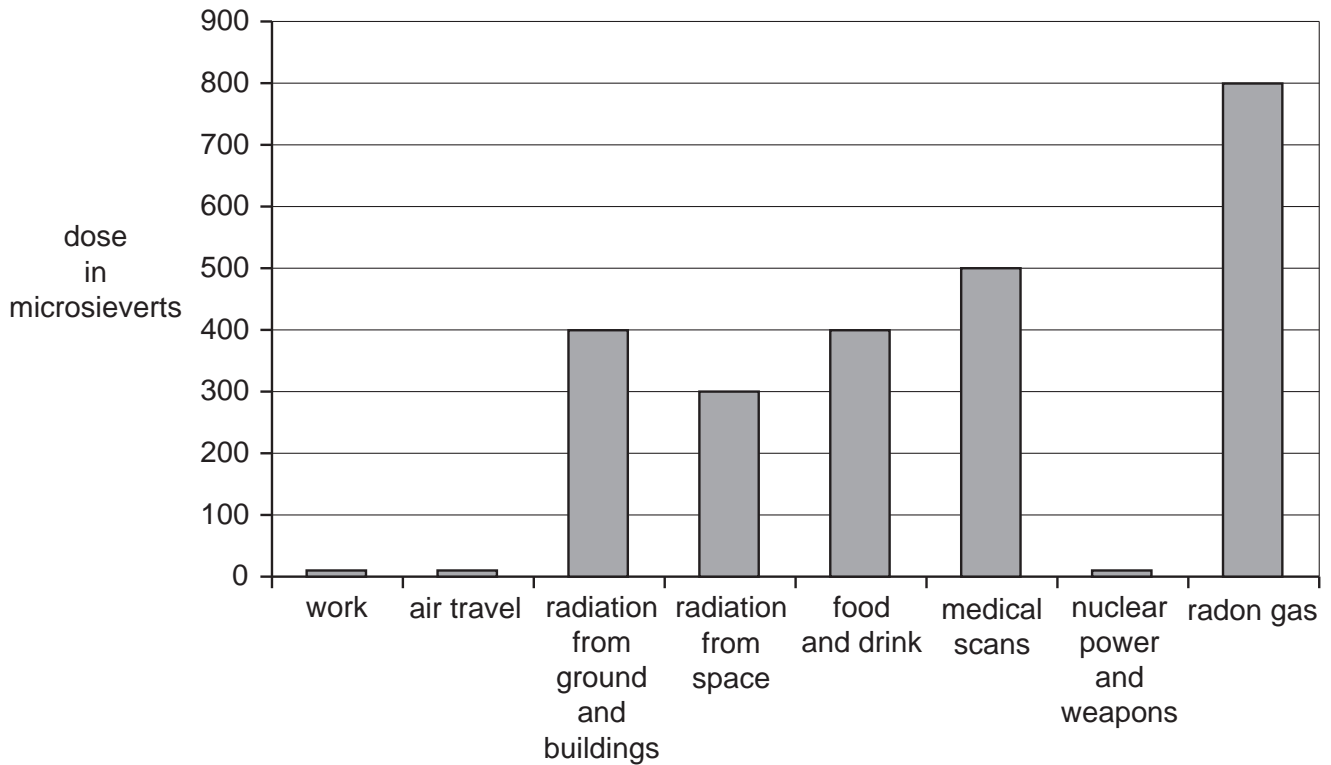
[4]

[Total: 6]

Question 6 starts on page 14

PLEASE DO NOT WRITE ON THIS PAGE

6 The bar chart shows the typical yearly radiation dose for a person in Britain from different sources.



(a) What radiation dose would a typical person get from the ground, buildings and medical scans?

Put a **ring** around the correct answer. All values are in microsieverts.

- 300 400 500 800 900**

[1]

(b) The total for all sources is 2430 microsieverts.

Which of the following statements is a correct conclusion **from the bar chart**?

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

Not everyone will have medical scans.

Radon gas provides more than half the total dose.

The fraction of dose received from nuclear power stations is tiny.

The dose from radon gas will be different in different parts of Britain.

The dose from food and drink is less than a quarter of the total dose.

[2]

(c) (i) Radon gas provides the largest percentage of the total dose.

What percentage of the total dose comes from radon gas?

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

- 22% 33% 67% 80%

[1]

(ii) Radon gas can get trapped inside houses.

It is harmful if you inhale it.

Here are three possible actions you could take.

- A wear a radiation badge to monitor the dose you receive
- B have a regular check-up with a medical radiation specialist
- C open the windows every day to blow away most of the radon gas

Which **one** action will reduce the risk from breathing in radon?

answer [1]

(iii) The following statements describe how radon can cause cancer.

They are in the wrong order.

- A Living cells become cancerous.
- B People breathe in the radon gas.
- C Radon gas is given out by the rocks.
- D Inside the body, radon gives out alpha radiation.
- E Alpha radiation damages living cells in the body.

Fill in the boxes to show the right order. The first one has been done for you.

C				
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[3]

[Total: 8]

END OF QUESTION PAPER

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Q.2 Daily Mail, 6 July 2006

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