OCR
RECOGNISING ACHIEVEMENT

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
PHYSICS A
Unit 1 Modules P1 P2 P3
HIGHER TIER
MONDAY 25 JUNE 2007

H

A331/02

Morning
Time: 40 minutes

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

CUP/T43364

Candidate Name

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

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

FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**6**	
2	**6**	
3	**3**	
4	**4**	
5	**9**	
6	**6**	
7	**8**	
TOTAL	**42**	

This document consists of **18** printed pages and **2** blank pages.

[Turn over

Answer **all** the questions.

1 Read this article from a newspaper.

Children should not use Mobile Phones

"I don't think we can say mobile phones are totally safe," says Professor Stewart. Scientists have no proof that the electromagnetic radiation emitted by mobile phones is not dangerous.

Professor Stewart says that new evidence suggests there may be possible health risks. He says there is enough uncertainty about mobile phones to adopt a "precautionary approach" - particularly when it comes to children.

If electromagnetic radiation poses a risk, it will affect children more than adults. This is because their skulls are thinner and their brains are still developing.

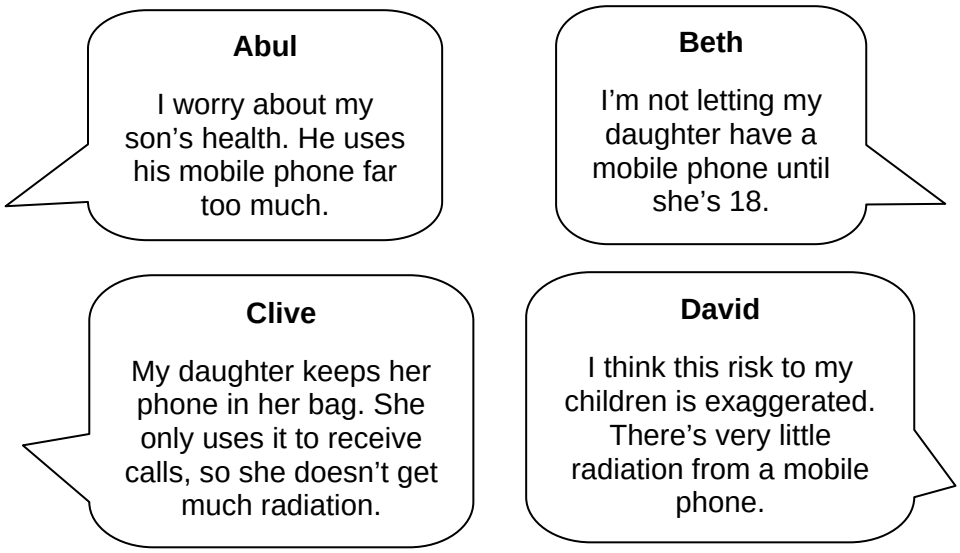
(a) Here are some statements about the risk from mobile phones.

Put ticks (✓) in the boxes next to each of the **four** statements that are mentioned in the article.

Adults are less at risk than children.	☐
Mobile phones are completely safe.	☐
Children have thinner skulls than adults.	☐
The radiation from mobile phones causes cancer.	☐
There may be health risks from the use of mobile phones.	☐
Children's brains are more likely to be affected than adults' brains.	☐

[2]

(b) Four parents have been reading the article. This is what they say.



(i) Put a tick (✓) in the box next to the name of **each** parent who thinks their children are at risk from mobile phones.

Abul ☐

Beth ☐

Clive ☐

David ☐

[2]

(ii) Put a tick (✓) in the box next to the name of **each** parent who explains how they reduce the risk to their children.

Abul ☐

Beth ☐

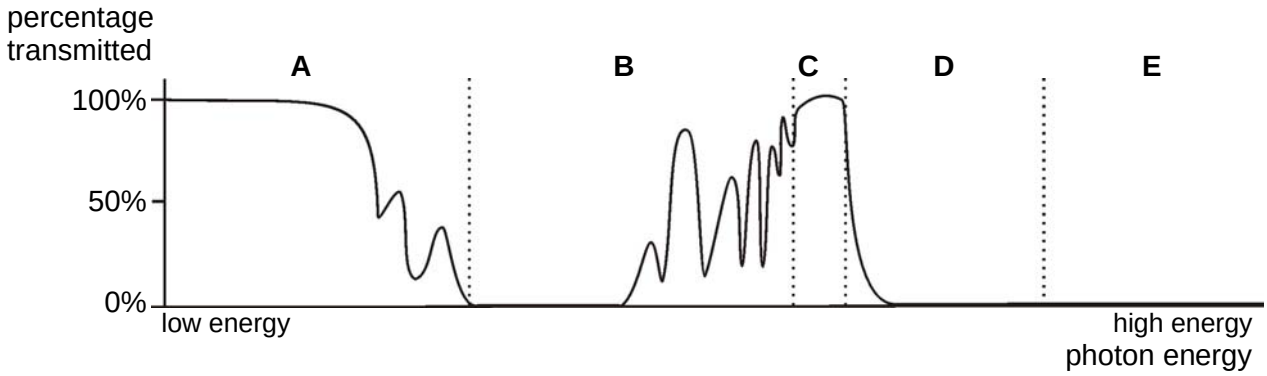
Clive ☐

David ☐

[2]

[Total: 6]

2 **(a)** The diagram shows the fraction of different parts of the electromagnetic spectrum which are transmitted through the Earth's atmosphere.



Here are some statements about these parts of the electromagnetic spectrum.

Use **one** of the letters **A**, **B**, **C**, **D** and **E** to identify the part of the spectrum described.

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

statement	**part of the spectrum**
produces reversible changes in ozone	
provides the energy for photosynthesis	
an ionising radiation absorbed by sun-screens	
used for communication with satellites and space probes	

[4]

(b) It is widely accepted that human activities have produced changes in the atmosphere which are causing global warming.

The statements below are all true.

Which of these statements have provided **evidence** for global warming?

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

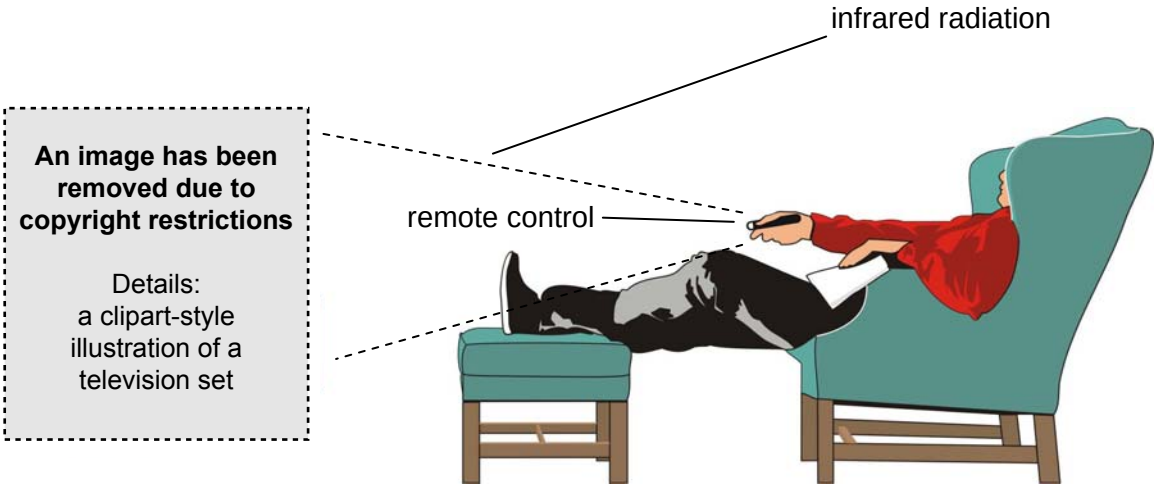
Analysis of tree rings over the past 100 years suggests a gradual increase in temperature.	☐
Burning of forests has increased in the last 100 years.	☐
Computer climate models predict our current climate from old data, and they predict future global warming from current data.	☐
Deep ice from the Antarctic suggests that the weather used to be cooler.	☐
The average temperature in the year 2000 was higher than it was in the year 1900.	☐

[2]

[Total: 6]

3 This question is about beams of infrared radiation.

(a) The remote control for a television gives out infrared radiation.



The remote control will not turn on the television if it is too far away.

Explain why.

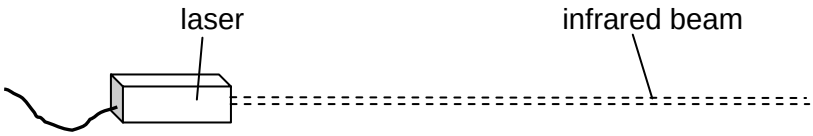
Put ticks (✓) in the **two** correct boxes.

Photons spread out from the remote control.	☐
Infrared radiation can break molecules into bits.	☐
Photons which travel further have less energy.	☐
Infrared photons have less energy than ultraviolet photons.	☐
The infrared intensity depends on the number of photons arriving each second.	☐

[2]

(b) An infrared laser is used to send information.

The beam from the laser is a **parallel beam**.



Which statement is true for the laser beam?

Put a tick (✓) in the correct box.

Photons which travel further from the laser have less energy.	☐
Photons do not spread out from the laser as much as from a remote control.	☐
Infrared photons from a laser have much more energy than infrared photons from a remote control.	☐

[1]

[Total: 3]

4 Four families in the same street worry about radioactive radon gas in their houses.

Five measurements are made of the radioactivity of a volume of air in each house.

The table shows the results.

	radioactivity readings in Bq / m^3					
family	**test 1**	**test 2**	**test 3**	**test 4**	**test 5**	**average of all 5 tests**
Addams	130	140	120	80	130	120
Brown	120	110	130	130	110	120
Clark	100	90	100	80	80	90
Davies	130	120	120	110	140	124

(a) **One** of the readings in the table is an outlier.

Put a (ring) around the outlier.

[1]

(b) Here are some statements about the radon gas levels in these houses.

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

The Clark house has the least amount of radon gas.	☐
The Davies house has significantly more radon gas than the Brown house.	☐
The Brown house and the Davies house have similar amounts of radon gas.	☐
The Adams house and the Brown house have exactly the same amount of radon gas.	☐

[2]

(c) Radon gas can cause lung cancer.

For this reason, the Government recommends a maximum level of 200 Bq/m^3 in any house.

Which **one** of the following is the best description of the risk for these four families?

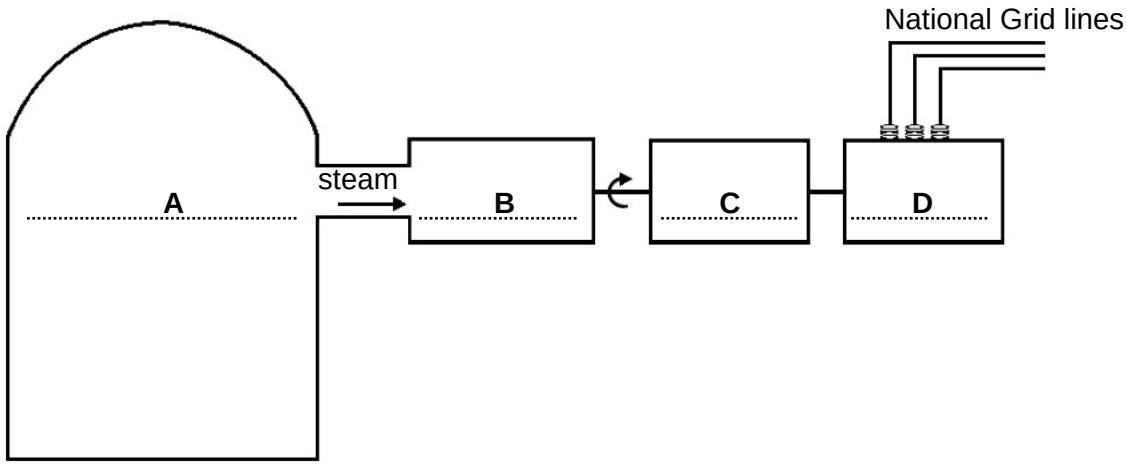
Put a tick (✓) in the box next to the **best** description.

There is a small risk for all these families from lung cancer due to radon gas.	☐
There is an identical risk for all these families from lung cancer due to radon gas.	☐
There is no risk for any of these families from lung cancer due to radon gas.	☐

[1]

[Total: 4]

5 The diagram shows a nuclear power station.



(a) Four places, **A**, **B**, **C** and **D**, have been labelled on the diagram.

Use these letters to complete the table to show where each process takes place.

process	place
Electricity is generated.	
The voltage is changed.	
Nuclear fission takes place.	
Radioactive waste is produced.	
High-pressure steam turns turbines.	

[4]

(b) It is likely that more nuclear power stations will be built in Britain.

Not everyone agrees with this development.

Here are some statements about nuclear power.
Each statement either **supports** nuclear power, **opposes** nuclear power, or **neither** supports nor opposes it.

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

	supports	**opposes**	**neither**
Nuclear power stations do not produce carbon dioxide.			
Nuclear power stations are very expensive to take apart at the end of their lifetimes.			
Nuclear power is produced by changes in radioactive nuclei.			

[3]

(c) Here are some suggested ways of disposing of high-level radioactive waste.

A	send it into space in rockets
B	bury it in deep underground mines
C	bury it under the ocean bed in places where the ocean is deep
D	store it in tanks near the power station until it is no longer radioactive

(i) Which of these methods could release waste if there was an earthquake?

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

A ☐

B ☐

C ☐

D ☐

[1]

(ii) One problem which could occur is that the radioactive waste could leak out after it has been put in its final store.

Which method is **most** likely to result in radioactive material entering the food chain?

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

A ☐

B ☐

C ☐

D ☐

[1]

[Total: 9]

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Question 6 starts on page 14

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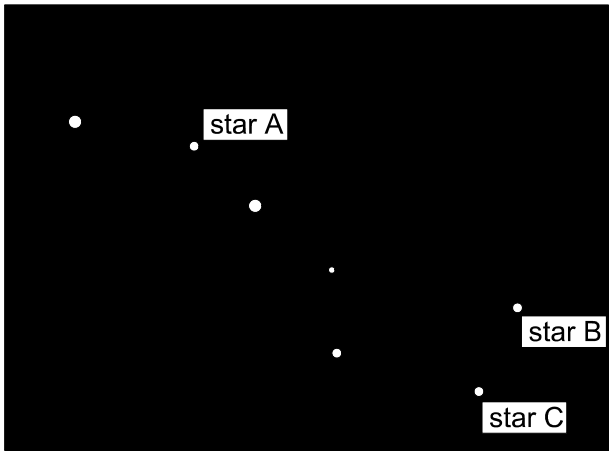
6 The diagram shows the stars in the constellation of the Plough.



(a) Star **A** looks as bright as star **B,** but star **A** is much closer to us than star **B**.

Which statement explains why the stars **A** and **B** look equally bright?

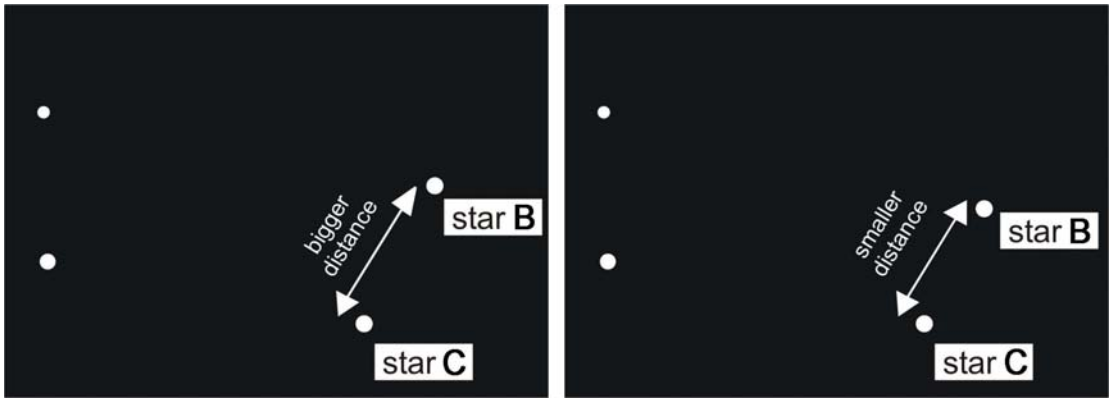
Put a tick (✓) in the correct box.

Star **A** gives out less light than star **B**.	☐
Star **A** gives out more light than star **B**.	☐
Star **A** and star **B** give out the same amount of light.	☐

[1]

(b) The distance between stars **B** and **C** is measured every June and December. They always appear closer together in December.

This is shown in the diagram. The diagram is not to scale.



appearance every June appearance every December

Which **one** of these statements is the **best** explanation for this observation?

Put a tick (✓) in the correct box.

Star **B** moves towards and away from star **C** once every year.	☐
As the Earth moves around its orbit, we get different views of the stars.	☐
The Earth's axis is tilted less in December, so the stars seem closer together.	☐

[1]

(c) If you look at star A through a telescope, it has a fainter star near it.

In ancient times, Arab astronomers claimed that only people with perfect eyesight could see these as two different stars. Nowadays, if the sky is dark enough most people can see this quite easily without a telescope or binoculars.

Here are some suggested explanations for the fact that this ancient eye test now seems easy.

A Star A has become less bright, so it is easier to see a faint star near it.

B Star A and the fainter star have moved further apart since ancient times.

C The fainter star used to be even fainter, so it was hard to see in ancient times.

D In ancient times, the night sky was darker, so it was harder to see the two stars.

E There used to be another faint star nearer star A, but that star is now too faint to see.

(i) Which **one** of these explanations, **A**, **B**, **C**, **D** or **E**, **must** be wrong?

Put a (ring) around the **one wrong** explanation.

A **B** **C** **D** **E**

[1]

(ii) Which of these explanations, **A**, **B**, **C**, **D** or **E**, use the idea that stars change during their life cycles?

Put a (ring) around **each** correct explanation.

A **B** **C** **D** **E**

[3]

[Total: 6]

7 The following steps, **A**, **B**, **C**, **D**, **E** and **F**, show how new scientific theories can develop. They are in the wrong order.

A The old theory is abandoned or modified.

B An old theory has been accepted for some time.

C Some observations do not fit the old theory well.

D Many scientists are not willing to accept the new theory.

E A new theory is thought of to explain these observations.

F New observations, predicted by the new theory, are made.

(a) Fill in the boxes to show the right order.
Two have been done for you.

B					A

[3]

(b) One example of the development of a new theory is Alfred Wegener's theory of the movement of the Earth's continents.

For each of the following statements, write down the letter **A**, **B**, **C**, **D**, **E** or **F**, from the list above, which describes this step in the development of new theories.

statement	**step**
Wegener explains why there are fossils of similar animals on both sides of the Atlantic Ocean.	
Scientists had not observed any movements of the continents.	
Spreading of the sea floor was discovered after Wegener's death.	

[3]

(c) Which of these distances is the best estimate of the distance a seafloor spreads each year?

Put a (ring) around the best estimate.

1 mm **10 cm** **1 m** **100 m**

[1]

(d) Which of these processes are possible **explanations** for seafloor spreading?

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

movement in the mantle	☐
reversals in the Earth's magnetic field	☐
solidification of molten magma at oceanic ridges	☐

[1]

[Total: 8]

END OF QUESTION PAPER

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