

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

**A331/01**

**PHYSICS A**

Unit 1 Modules P1 P2 P3  
(Foundation Tier)

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)

**Monday 19 January 2009  
Morning**

**Duration: 40 minutes**



Candidate Forename		Candidate Surname	
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Centre Number							Candidate Number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- 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.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**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 **20** pages. Any blank pages are indicated.

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

Answer **all** the questions.

1 Mrs Hood is a radiotherapist in a hospital. A radiotherapist treats people with cancer.

Read the following notes written by Mrs Hood.

Monday 24th November 2008

Today I will be treating David using radiotherapy.  
David has thyroid cancer. He has had surgery to remove the cancerous tumour and this is the follow up treatment.

I will give David some radioactive iodine, which emits beta radiation.

David will have to stay in hospital for a few days after the treatment and will need to take precautions for the safety of the hospital staff and visitors.

I will have to take care when handling the iodine.  
My radiation dose is carefully monitored when I am at work.

(a) The radioactive iodine used in this treatment emits **beta** radiation.

(i) Name the **two** other types of ionising radiation that can be given off by radioactive materials.

answer ..... and ..... [2]

(ii) Complete the following sentence by choosing the most appropriate word from this list.

**lead      paper      steel**

Beta radiation can easily penetrate a sheet of .....

[1]

(b) Why does this treatment mean that David poses a risk to the hospital staff for just a few days afterwards?

Put ticks (✓) in the box next to the **two** best answers.

The radioactivity increases as time goes by.

Waste from David's body will be contaminated with radioactive material.

The iodine in David's body will get less radioactive as time goes by.

The hospital staff may catch a disease from David.

[2]

(c) Exposure to ionising radiation carries an increased risk to a person's health.

Why does David receive this treatment despite the risk?

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

The radiotherapist does not know that the treatment poses a risk to David.

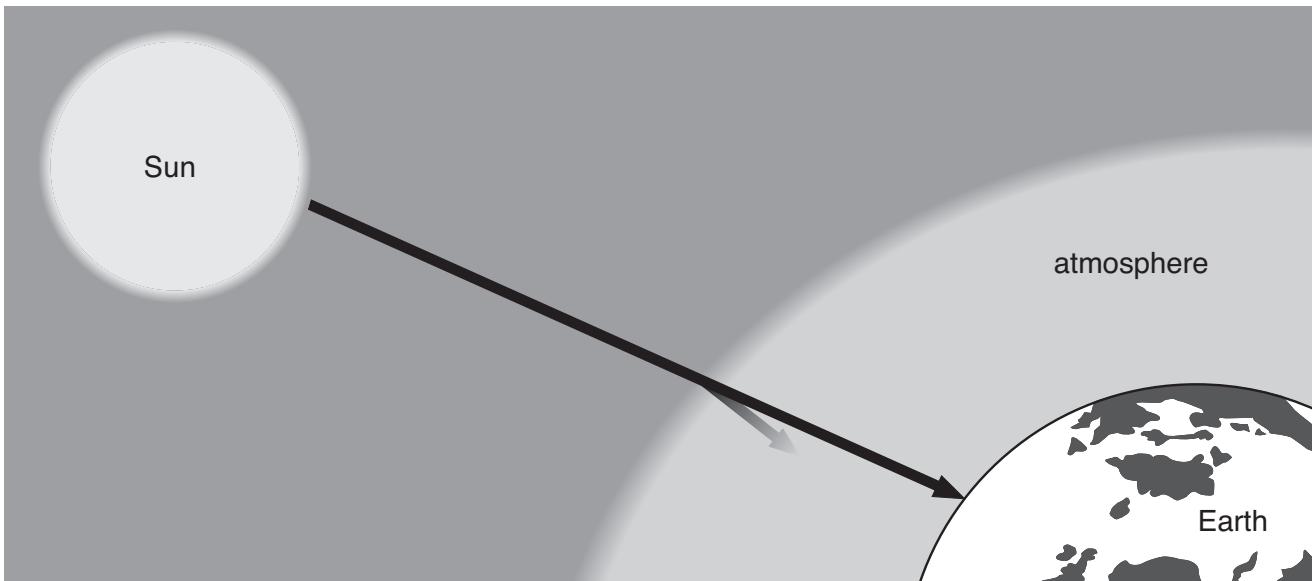
Beta radiation comes from natural sources, so it is relatively harmless.

David is at greater risk from his cancer than from the radiation used.

[1]

[Total: 6]

- 2 (a) The Sun gives off ultraviolet (UV) radiation as part of sunlight.



Which gas found in the Earth's upper atmosphere is good at absorbing UV radiation from the Sun?

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

carbon dioxide

ozone

nitrogen

carbon monoxide

[1]

- (b) Why is it important that a lot of the UV radiation from the Sun is absorbed before it reaches the surface of the Earth?

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

UV radiation interferes with satellite television signals.

UV radiation is used to detect forged banknotes.

UV radiation is harmful to living things.

[1]

(c) Sunlight is needed by plants to provide energy for photosynthesis.

(i) Which gas is **removed** from the atmosphere by photosynthesis?

answer .....  
[1]

(ii) Which gas is **added** to the atmosphere by photosynthesis?

answer .....  
[1]

[Total: 4]

3 This question is about the disposal of nuclear waste.

(a) There are three main types of waste from a nuclear power station.

They are high level, intermediate level and low level waste.

Draw a straight line between each **type of waste** to **how it is first dealt with** by the nuclear industry.

**type of waste**

**how it is first dealt with**

high level waste

seal it in drums and bury it in a special landfill site.

intermediate level waste

chopped up and placed in concrete and stored securely.

low level waste

store underwater until it is less radioactive.

[2]

(b) Some radioactive waste has a very long **half-life**.

What does the term half-life mean?

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

Exposure to radioactive material means  
you live only half as long.

The time taken for the level of radioactivity  
to fall by half.

The amount of radioactive material left  
after half a century.

[1]

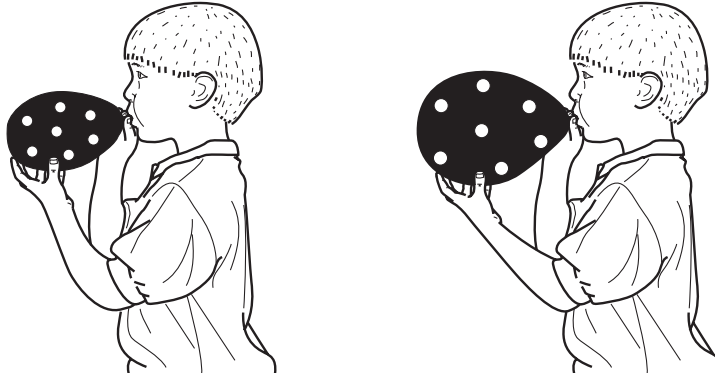
[Total: 3]

7  
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4 Look at the diagram below.

This boy is trying to demonstrate a theory about the Universe by inflating a balloon with dots painted on it.



(a) The dots on the balloon represent galaxies.

What is the best description of a galaxy?

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

- A collection of 8 planets and 1 star.
- A collection of comets and asteroids.
- A collection of dust and hydrogen gas.
- A collection of thousands of millions of stars.

[1]

(b) The dots on the balloon get further apart when the balloon is inflated.

What observation about the Universe does this represent?

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

- The Universe contains a few hundred galaxies.
- The Universe is expanding.
- The Universe never changes.
- The Universe is cooler now than in the past.

[1]



(c) Many scientists think the Universe had a beginning, called the 'big bang'.

What is the current best scientific estimate of the age of the Universe?

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

6 thousand years

4 million years

14 thousand million years

28 million million years

[1]

(d) The 'big bang' theory was developed during the last century.

Like all new scientific theories, it had to undergo **peer review** before it became widely accepted.

What is **peer review**?

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

Journalists look at the theory and write an article.

Other scientists look at the theory and evaluate it.

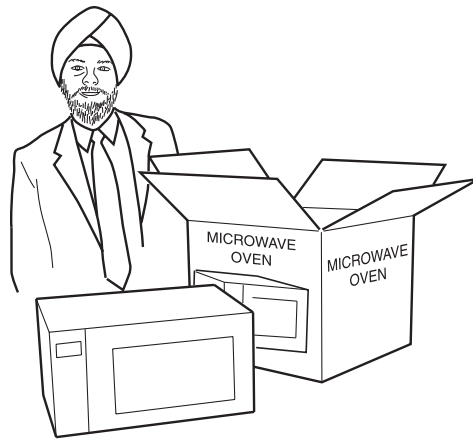
Politicians look at the theory and pass a judgement.

Teachers look at the theory to see if it is good enough.

[1]

[Total: 4]

5 Kiran has bought himself a new microwave oven.



(a) A microwave oven uses microwaves to cook food.

(i) How do microwaves make the food hot?

Complete the following sentences by choosing the most appropriate words from this list.

**absorb      expand      reflect      transmit      vibrate**

Particles in the food ..... the microwaves.

This causes the particles to ....., which makes the food hotter.

[2]

(ii) Which of the following best describes microwaves?

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

Microwaves are non-ionising radiation.

Microwaves are nuclear radiation.

Microwaves are ionising radiation.

[1]

(b) Kiran has heard that exposure to microwaves might be bad for you.

Which of the precautions below will reduce Kiran's exposure to microwaves?

Put ticks (✓) in the box next to the **two** best answers.

The oven will not work unless the door is shut.

There are air vents which should not be blocked.

The door has a screen fitted to it to block microwaves.

People are advised not to dry clothes in the oven.

[2]

[Total: 5]

6 A group of friends are discussing their views on global warming.

**Joe**  
I saw a program on the discovery channel last week. According to a scientist, global warming is not really happening.

**Kevin**  
Some countries will find it harder to produce food crops as it gets warmer. The higher temperatures lead to more droughts.

**Ruth**  
In the winter I feel the cold. I don't use the central heating as much these days. I just put on an extra layer of clothes instead.

**Mark**  
I used to drive to work every day. Now I always cycle instead. I have done my bit.

**Emma**  
Budget airlines are brilliant! I have flown all over the world and saved a fortune. I felt bad seeing those floods on the news, but I work hard and deserve my holidays.

(a) Which **two** people have taken actions that will reduce the amount of carbon dioxide in the atmosphere?

answer ..... and ..... [2]

(b) Which **one** person mentions a **correlation** between a factor and an outcome?

answer ..... [1]

(c) Which **two** people have identified possible consequences of global warming?

answer ..... and ..... [2]

(d) How could you **describe** the decision that Emma has made?

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

She is unaware of any risk, so she goes ahead.

She believes the benefit outweighs the risk.

She is aware of a risk and decides not to go ahead.

She believes the risk outweighs the benefit.

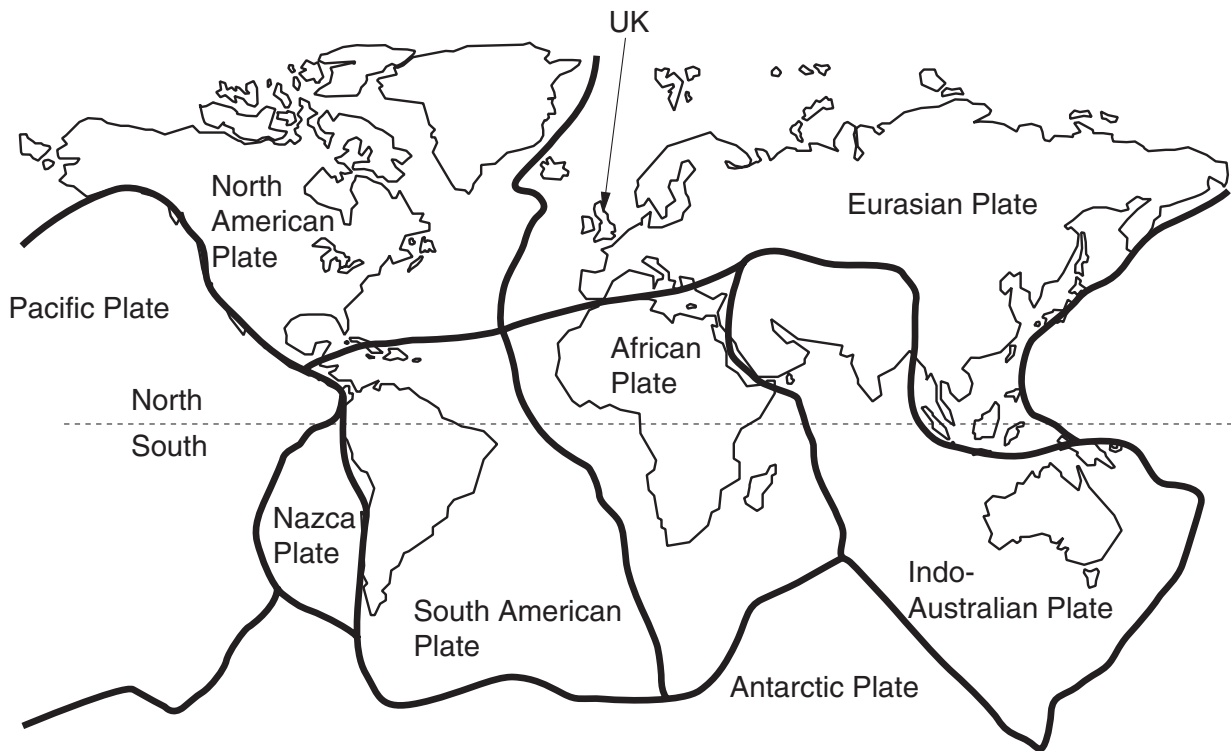
[1]

[Total: 6]

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7 Earthquakes, volcanoes and tsunamis are all naturally occurring events that can result in disaster.



(a) The solid lines on the map show the edges of tectonic plates.

Which **two** statements below explain why the UK does not experience many strong earthquakes?

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

- The UK is surrounded by water.
- The UK is not near the edge of a tectonic plate.
- There are more tectonic plates south of the equator.
- There are better health and safety regulations in the UK.
- Earthquakes usually happen near the edge of a tectonic plate.
- Buildings in the UK are built to withstand the effects of an earthquake.

[2]

(b) Some countries, such as Japan, experience many more earthquakes than the UK.

What can the public authorities in countries such as Japan do to reduce the casualties from earthquakes?

Put a tick (✓) in the boxes next to the **three** best answers.

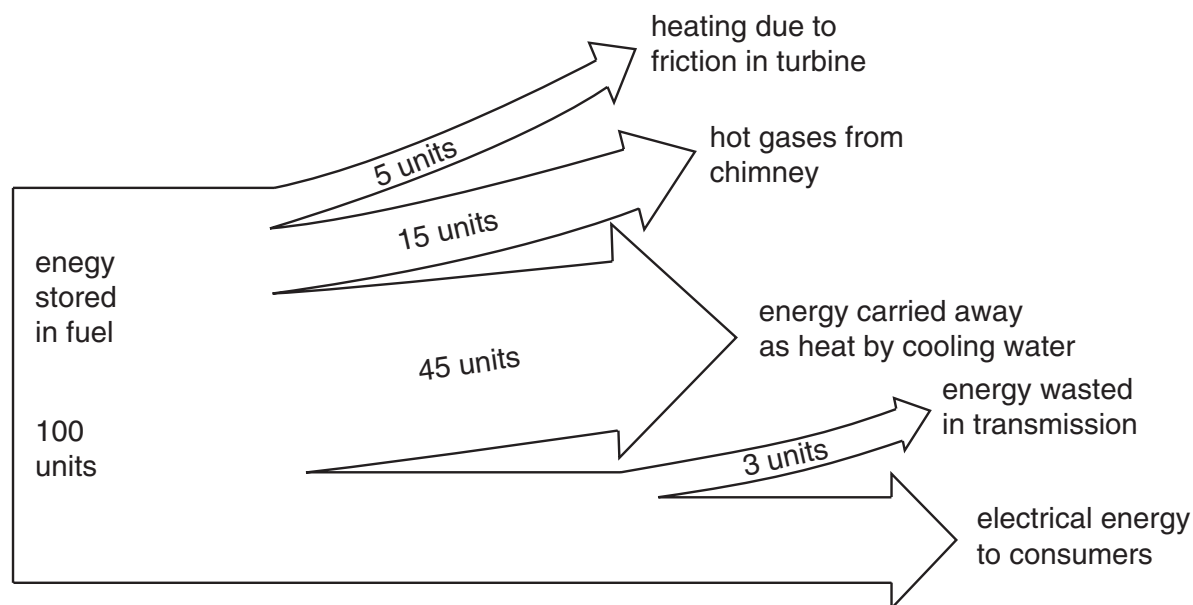
- Stop the tectonic plates from moving.
- Ensure that there is a well-rehearsed emergency plan in place.
- Build more tall buildings in the cities near earthquake zones.
- Encourage new building in areas away from earthquake zones.
- Enforce strict building regulations to prevent buildings from collapsing.
- Put a wall around the cities in earthquake zones to reflect the earthquakes.

[3]

[Total: 5]

## 8 Generating and distributing electricity is not 100% efficient.

Look at this diagram for electricity generation by a fossil fuel power station.



(a) (i) How many units of electrical energy go to consumers?

Put a **ring** around the correct answer in the list below.

**3                    32                    35                    68                    100**

[1]

(ii) 65 units of energy are wasted in the power station.

What is the **efficiency** of the power station?

Put a **ring** around the correct answer in the list below.

**3%                    35%                    45%                    54%                    65%**

[1]

(b) Which element present in the fossil fuel will produce a greenhouse gas when it is burnt?

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

Sulfur	<input type="checkbox"/>
Oxygen	<input type="checkbox"/>
Carbon	<input type="checkbox"/>
Uranium	<input type="checkbox"/>

[1]



(c) It is more efficient to generate heat in your home by burning the fossil fuel in your own boiler.

However, some people still use electricity.

Which of the following are advantages of using electricity?

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

Producing electricity does not harm the environment.

It is easy to transmit energy over long distances.

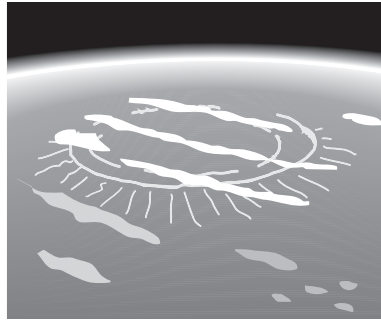
There will be less pollution near to their homes.

There is a limitless supply of fossil fuels.

[2]

[Total: 5]

- 9 This sketch is an artist's impression of a crater in Mexico.



Here is a list of observations;

- There was a mass extinction 65 million years ago, which killed off the dinosaurs.
- There is a very large crater in Mexico that is 65 million years old.
- Craters can be made by asteroids hitting the Earth.
- When an asteroid hits, a metal called iridium is often spread over a long distance.
- A layer of iridium, dated at 65 million years old was found in rocks in Italy.
- Italy is thousands of miles away from the crater in Mexico.

- (a) Some scientists think the mass extinction of the dinosaurs was caused by a large asteroid hitting the Earth.

Which is the **best** reason to **accept** this explanation for the extinction of the dinosaurs?

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

- |  |                          |
|--|--------------------------|
| There have been films made that use this explanation.                        | <input type="checkbox"/> |
| It must have been something big to spread iridium across thousands of miles. | <input type="checkbox"/> |
| This explanation accounts for these observations.                            | <input type="checkbox"/> |
| Iridium is known to be extremely poisonous in high doses.                    | <input type="checkbox"/> |

[1]

- (b) Some other scientists disagree with the explanation given above.

Which is the **best** reason to **reject** this explanation for the extinction of the dinosaurs?

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

- |  |                          |
|--|--------------------------|
| These scientists do not believe that dinosaurs ever existed.         | <input type="checkbox"/> |
| These scientists do not understand the explanation fully.            | <input type="checkbox"/> |
| There are other observations which do not fit with this explanation. | <input type="checkbox"/> |
| The two groups of scientists do not get on with each other.          | <input type="checkbox"/> |

[1]

- (c) Here are some statements related to the information above.

Some of them provide data.

Put ticks (✓) in the boxes next to the **two** data statements.

- |  |                          |
|--|--------------------------|
| Iridium is a metallic element often found near asteroid impacts.       | <input type="checkbox"/> |
| The iridium layer in Italy was caused by an asteroid impact in Mexico. | <input type="checkbox"/> |
| There is a 65 million year old layer of iridium in Italy.              | <input type="checkbox"/> |
| The dinosaurs were probably killed by an asteroid hitting the Earth.   | <input type="checkbox"/> |

[2]

[Total: 4]

**END OF QUESTION PAPER**

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