Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A211/02

TWENTY FIRST CENTURY SCIENCE SCIENCE A

Unit 1: Modules B1 C1 P1 (Higher Tier)

FRIDAY 21 MAY 2010: Morning
DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

DC (SM/SW) MEP60374 30277/1

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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).**

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.**

Answer ALL the questions.

1 Read the article.

> **CAN TESTING GENES PREDICT THE FUTURE?**
>
> **Recently, scientists have reported finding key genes involved in diabetes, heart disease, dementia, obesity, bowel cancer and breast cancer.**

(a) Which of the following is the best description of a GENE?

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

A gene is …

… an instruction for making a nucleus. ☐

… an instruction for making DNA. ☐

… an instruction for making a protein. ☐

… an instruction for making a fat. ☐

[1]

The article continues.

Now it is possible to pay for companies to test a person's genes.

The tests claim to predict the probability of a person getting certain disorders.

The companies claim that the tests are accurate and reliable.

Other scientists claim that the tests are a waste of money.

They say the results may cause unnecessary worry.

The Government will look at questions such as who should be allowed to sell these genetic tests, who should pay and who should be allowed to have the results of the tests.

(b) Some questions about genetic tests can be answered by using a SCIENTIFIC APPROACH, but others can not.

Put ticks (✓) in the boxes next to the TWO questions that can be answered using a scientific approach.

	CAN BE ANSWERED USING A SCIENTIFIC APPROACH
Are the tests accurate and reliable?	☐
Have all the genes that might be involved in a disorder been identified?	☐
Should everybody be allowed to have the results of the tests?	☐
Should the Government pay for the tests?	☐

[1]

(c) Colin decides to have a genetic test.

Explain why Colin might want to keep the results of the test to himself.

_____

_____

_____

_____ **[2]**

[Total: 4]

2 Huntington's disorder and cystic fibrosis are both genetic disorders.

(a) Put ticks (✓) in the boxes to indicate which of the SYMPTOMS are those of Huntington's disorder and which are those of cystic fibrosis.

SYMPTOM	HUNTINGTON'S DISORDER	CYSTIC FIBROSIS
breathlessness		
digestion problems		
forgetfulness		
twitching muscles		

[1]

(b) 1 in 25 people in the UK are carriers of cystic fibrosis (CF).

These carriers do not have CF but their children can have CF.

Explain why.

_____

_____

_____

_____

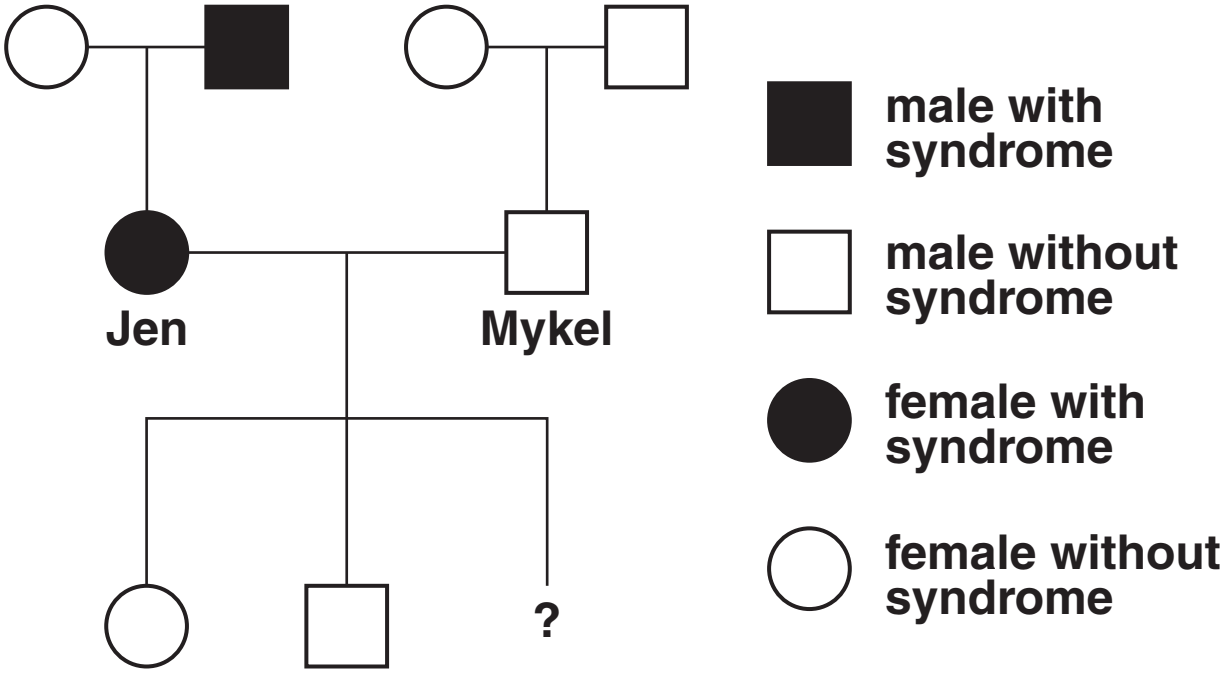
_____ **[3]**

(c) Townes-Brocks syndrome is a genetic disorder.

People with this disorder have a variety of symptoms including heart and kidney problems.

The Townes-Brocks allele is dominant.

Look at the family tree.



(i) Jen and Mykel want to have another child.

What is the probability that this child will inherit Townes-Brocks syndrome?

probability = _____ [1]

(ii) What alleles must Jen and Mykel have?

Use the letters T and t to represent the alleles.

Jen's alleles _____ [1]

Mykel's alleles _____ [1]

[Total: 6]

3 Josh and Ryan are twin brothers.
They have the same mother and father.

They are NON-IDENTICAL twins.

(a) Josh and Ryan are similar but not identical.

Put a tick (✓) in the correct box to show whether each statement provides an explanation for Josh and Ryan being SIMILAR or provides an explanation for Josh and Ryan being DIFFERENT.

	SIMILAR	DIFFERENT
They inherited their alleles from the same parents.	☐	☐
Every sex cell has a unique combination of alleles.	☐	☐
The boys have the same genes but different alleles.	☐	☐

[1]

(b) Some twins are identical.

Identical twins are an example of naturally-occurring clones.

Josh and Ryan are NON-IDENTICAL twins.

Put a tick (✓) in the correct box to indicate whether each statement is TRUE or FALSE.

	TRUE	FALSE
Clones can be produced by asexual reproduction.	☐	☐
Josh and Ryan have identical genes to their parents.	☐	☐
Josh and Ryan are genetically identical to each other.	☐	☐
Differences between clones can be caused by the environment.	☐	☐

[1]

(c) Human embryos can be made by artificial cloning.

These embryos can be used to supply human embryonic stem cells.

These cells can be used to treat some types of illness.

This is called therapeutic cloning.

(i) Complete the sentence about embryonic stem cells.

It may be possible to use these cloned cells to replace damaged adult cells, such as nerve cells, because embryonic stem cells are _____ . **[1]**

(ii) How are cloned embryos made in therapeutic cloning?

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

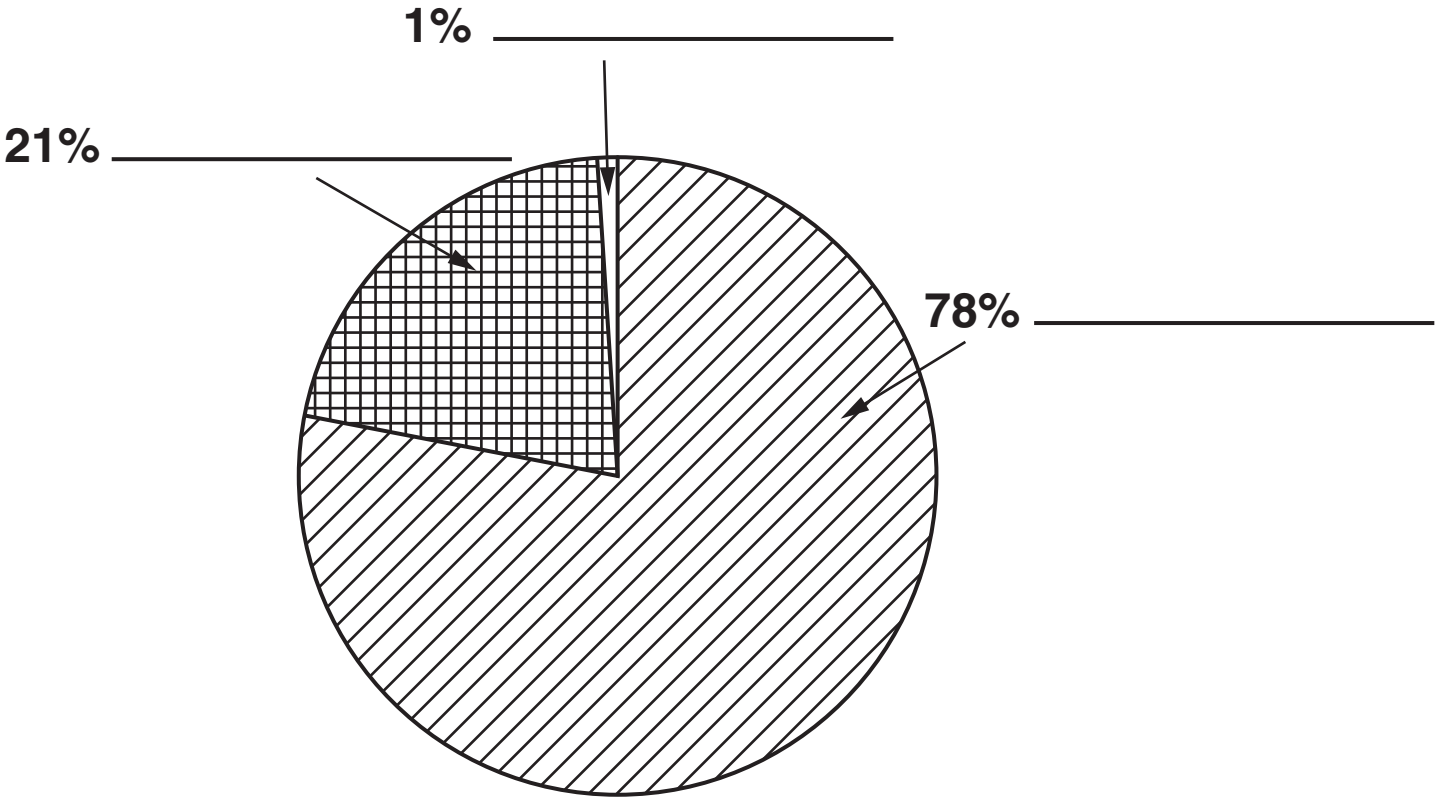
Replace the nucleus of a fertilised egg cell with the nucleus from an adult cell.	☐
Replace the nucleus of a fertilised egg cell with the nucleus from an embryonic cell.	☐
Replace the nucleus of an unfertilised egg cell with the nucleus from an adult cell.	☐
Replace the nucleus of an unfertilised egg cell with the nucleus from an embryonic cell.	☐

[1]

[Total: 4]

4 (a) The pie chart shows the three main gases in the air.

Label the pie chart with the names of the gases.



[2]

(b) (i) Burning fuels pollutes the air.

Most fuels are compounds of hydrogen and carbon.

What is the name for compounds containing only hydrogen and carbon?

answer _____ [1]

(ii) **Particulate carbon, carbon dioxide, carbon monoxide and nitrogen oxides are pollutants made when fuels burn.**

Draw a <u>SINGLE</u> straight line from <u>EACH POLLUTANT</u> to <u>HOW IT IS MADE</u>.

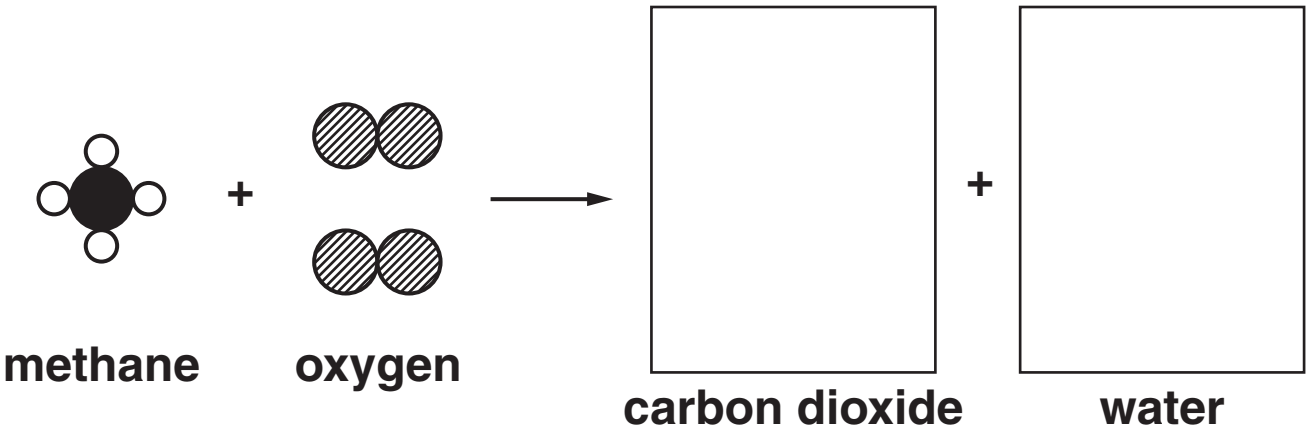
<u>POLLUTANT</u>	**<u>HOW IT IS MADE</u>**
particulate carbon	
	complete combustion of the fuel
carbon dioxide	
	incomplete combustion of the fuel
carbon monoxide	
	reaction of gases from the air at high temperature
nitrogen oxides	

[2]

(c) Methane is a fuel.

Methane burns to make carbon dioxide and water.

Complete the diagram to show this chemical reaction.



[3]

[Total: 8]

5 Read this newspaper article.

CLEAR SKIES FOR BEIJING OLYMPICS

China wanted to reduce air pollution in Beijing for the Olympic Games.

Two million cars (half the total number) were banned from the roads. 100 factories and some coal-burning power stations were shut down.

Beijing's massive experiment with controlling pollution gave scientists an opportunity to investigate pollution.

After the factory closures and traffic restrictions began, air pollution levels fell.

Weather conditions made a difference too.

(a) Scientists collected data on air quality in Beijing before and after the start of the Olympic Games.

Why did scientists collect these air quality data?

Put ticks (✓) in the boxes next to the <u>TWO</u> best scientific reasons.

So they could …

… prove that athletes and spectators were not harmed by poor air quality. ☐

… use data to make explanations. ☐

… detect changes in air pollution. ☐

… find out how many people ride bicycles. ☐

… show air pollution is caused only by traffic. ☐

[2]

(b) Some weather conditions reduce the amount of air pollution.

Suggest and <u>EXPLAIN</u> one weather condition that can reduce air pollution.

_____

_____

_____

_____ **[1]**

(b) The chart on page 19 opposite shows measurements of particulates in the air for the 15 days before the Olympic Games started and the 15 days of the Games themselves.

Here are three statements about the data. Each statement is either true or false.

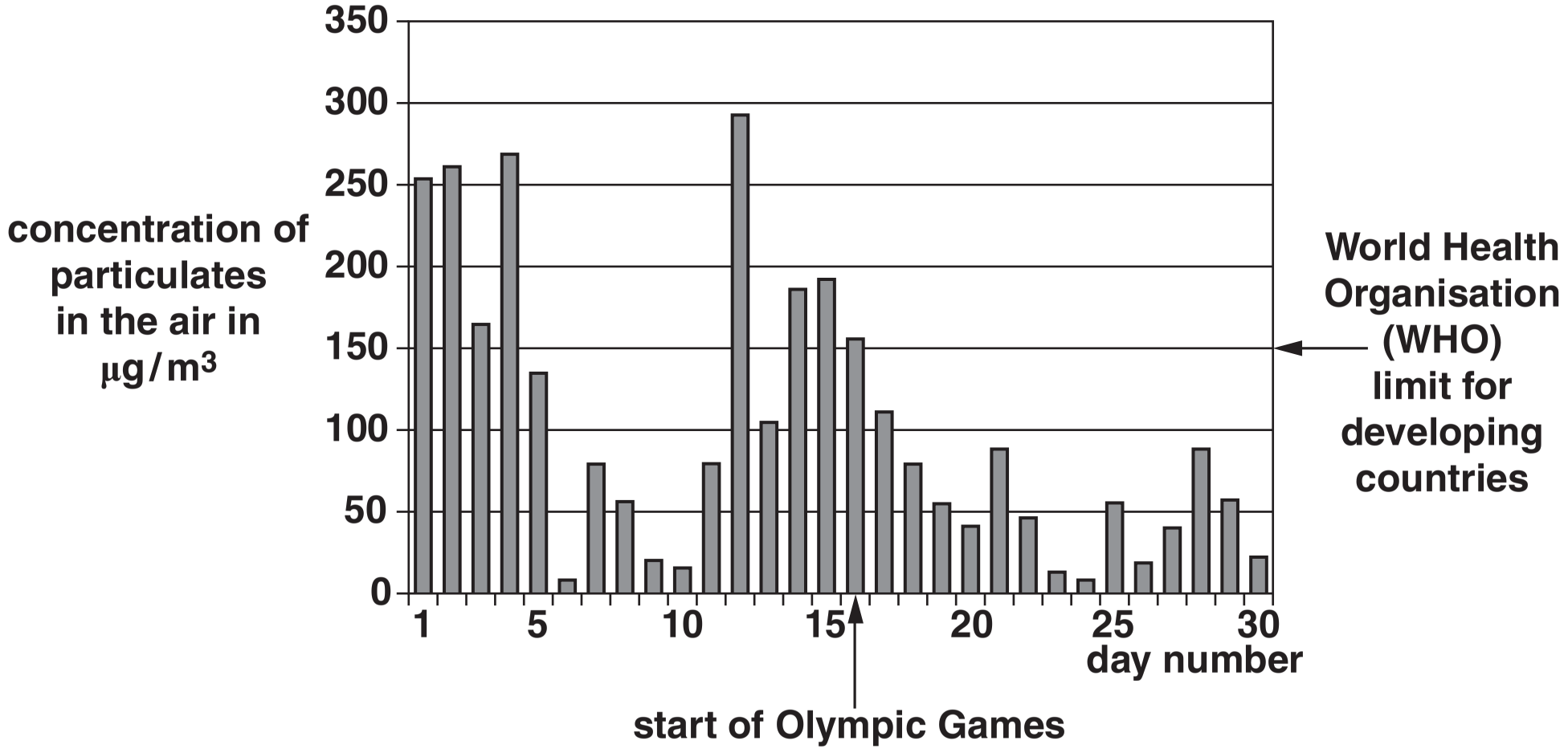
Put a tick (✓) in the correct box to show whether each statement is TRUE or FALSE.

	TRUE	FALSE
Concentrations of particulates go down steadily over the 30 days.	☐	☐
Concentrations of particulates exceeded the WHO limit on 8 days.	☐	☐
The maximum measurement was over twice the WHO limit for developing countries.	☐	☐

[1]

mean concentration of particulates for 15 days before the Games started = 141 μg/m³

mean concentration of particulates for 15 days after the Games started = 51 μg/m³



(ii) Scientists want to know if there is a real difference between the particulate data before the Games and after the Games began.

Use the data and chart provided to show how scientists decide whether there is a real difference.

_____

_____

_____

_____ **[2]**

[Total: 6]

6 There was a massive explosion in northern Russia in 1908. A very large area of forest was destroyed. It was thought that this was probably due to an asteroid or comet about 50 metres in diameter.

(a) Asteroids and comets are similar in their movement around the Sun, but the table shows three differences between them.

	MADE OF	STRUCTURE	HARDNESS
asteroids	rock or metal	dense solid	hard
comets	ice and dust	loosely bound	soft

When scientists investigated the area that was damaged, they found no material evidence of any sort in the ground and no trace of any impact crater.

Use the information above to explain why scientists decided that the object was probably a comet.

_____

_____

_____

_____ **[2]**

(b) Small asteroids often hit the Earth, but cause little damage.

(i) Explain how the impact of a <u>LARGE</u> asteroid could affect the whole world.

_____

_____

_____

_____ **[2]**

(ii) Although the <u>CONSEQUENCES</u> of a large asteroid colliding with the Earth would be very serious, the actual <u>RISK</u> of people dying due to a large asteroid strike is not great.

Explain why.

_____

_____ **[1]**

[Total: 5]

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Question 7 begins on page 24

PLEASE DO NOT WRITE ON THIS PAGE

7 Ptolemy was an astronomer who lived nearly 2000 years ago.

His ideas about the Sun, the Moon and the planets were believed for many hundreds of years.

PTOLEMY

Everything in our Solar System – the Sun, the Moon and the planets – all move in orbits around the Earth.

In 1530, Nicolaus Copernicus had different ideas.

COPERNICUS

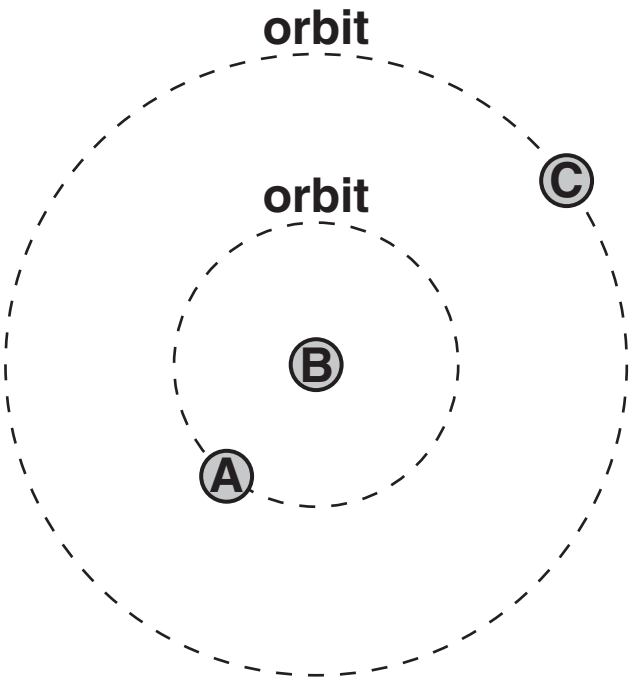
Ptolemy's ideas are wrong. The Earth and the other planets all move in orbits around the Sun.

Both ideas were equally good at predicting the movement of the Sun and the planets.

(a) The diagram on page 25 opposite shows the Sun, the Earth and the planet Mars.

Mars never moves between the Earth and the Sun.

This diagram can fit both Ptolemy's ideas and Copernicus' ideas.



Use words from this list to complete the sentences.

THE EARTH

MARS

THE SUN

(i) Copernicus would say that

A was _____

B was _____

C was _____ .

[1]

(ii) Ptolemy would say that

A was _____

B was _____

C was _____ .

[1]

(b) It took over 100 years for Copernicus' ideas to be accepted.

(i) Put ticks (✓) in the boxes next to the TWO statements that explain why astronomers in 1530 preferred Ptolemy's ideas to Copernicus' ideas.

Ptolemy's ideas had worked well for hundreds of years.	☐
Ptolemy's ideas made better predictions of the movement of planets than Copernicus' ideas.	☐
Copernicus was very good at persuading people that he was right.	☐
Copernicus' ideas were new and different.	☐

[1]

(ii) Copernicus' ideas can account for <u>ALL</u> of the following observations. Ptolemy's ideas can account for <u>SOME</u> of them.

Put a tick (✓) in the box next to each observation that can be accounted for by <u>BOTH</u> Ptolemy and Copernicus.

The Moon goes around the Earth.	☐
Most planets have moons which go around them.	☐
The planet Venus is sometimes between the Earth and the Sun.	☐
Spaceflight calculations are only successful because they assume the Sun is at the centre of the Solar System.	☐

[2]

[Total: 5]

8 A strong earthquake hit the central American country of Costa Rica in January 2009.

(a) Earthquakes are common in Costa Rica because it is on the boundary of two tectonic plates.

Read the following facts about Costa Rica.

Put ticks (✓) in the boxes next to the TWO facts that could be the result of Costa Rica being on the boundary of two tectonic plates.

Costa Rica has active volcanoes.	☐
A mountain chain runs along Costa Rica.	☐
Hurricanes are very common near Costa Rica.	☐
Costa Rica is near the equator.	☐
Costa Rica is where South America and North America join.	☐

[2]

(b) A country like Costa Rica can take action to reduce the damage from earthquakes.

Some actions will REDUCE DAMAGE TO PROPERTY, some will REDUCE DEATHS AND INJURIES and some will REDUCE BOTH.

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

ACTION	REDUCE DAMAGE TO PROPERTY	REDUCE DEATHS AND INJURIES	REDUCE BOTH
Devise and enforce better building regulations.	☐	☐	☐
Educate people so they know what to do during an earthquake.	☐	☐	☐
Prepare emergency plans ready for earthquakes.	☐	☐	☐
Improve predictions about when earthquakes will occur.	☐	☐	☐

[2]

[Total: 4]

END OF QUESTION PAPER

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