UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

TWENTY FIRST CENTURY SCIENCE　　　　　　　　　　　　　**0608/03**

Paper 3　　　　　　　　　　　　　　　　　　　**October/November 2012**

　　　　　　　　　　　　　　　　　　　　　　　1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

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

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

2

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3

1   Chromosomes are found in the nucleus of every human body cell.

(a) Read the following sentences about human chromosomes.

In the box next to each sentence, write a **T** if the sentence is true and an **F** if the sentence is false.

	T or **F**
there are 23 pairs of chromosomes in the nucleus of every human body cell	
each chromosome in a pair always has the same alleles	
there are 23 chromosomes in the nucleus of every human body cell	
the nucleus of each female body cell has two X chromosomes	

[2]

(b) Jack and Jill work for the same employer.

He asks them to undergo a genetic test for alleles that cause genetic diseases.

(i)   Jack's father is a carrier of sickle cell anaemia.

Suggest one reason why Jack is willing to undergo the genetic test.

....

.... [1]

(ii) Jill does **not** want to undergo the test.

She does not think anyone working for the employer should undergo genetic testing.

Suggest **two** reasons why Jill might feel like this.

1 ....

2 .... [2]

[Total: 5]

2 **(a)** Complete these sentences about the heart.

Use words from the list.

**arteries   blood   muscle   nitrogen   oxygen   veins**

The heart .... cells need their own blood supply so that the cells get

enough .... and glucose to carry out respiration.

The blood vessels that supply blood to the heart cells are called the

coronary ....   [2]

(b) The graph shows the mean body mass of a population over a ten year period.

It also shows the percentage of the same population who were affected by heart disease during the same ten year period.
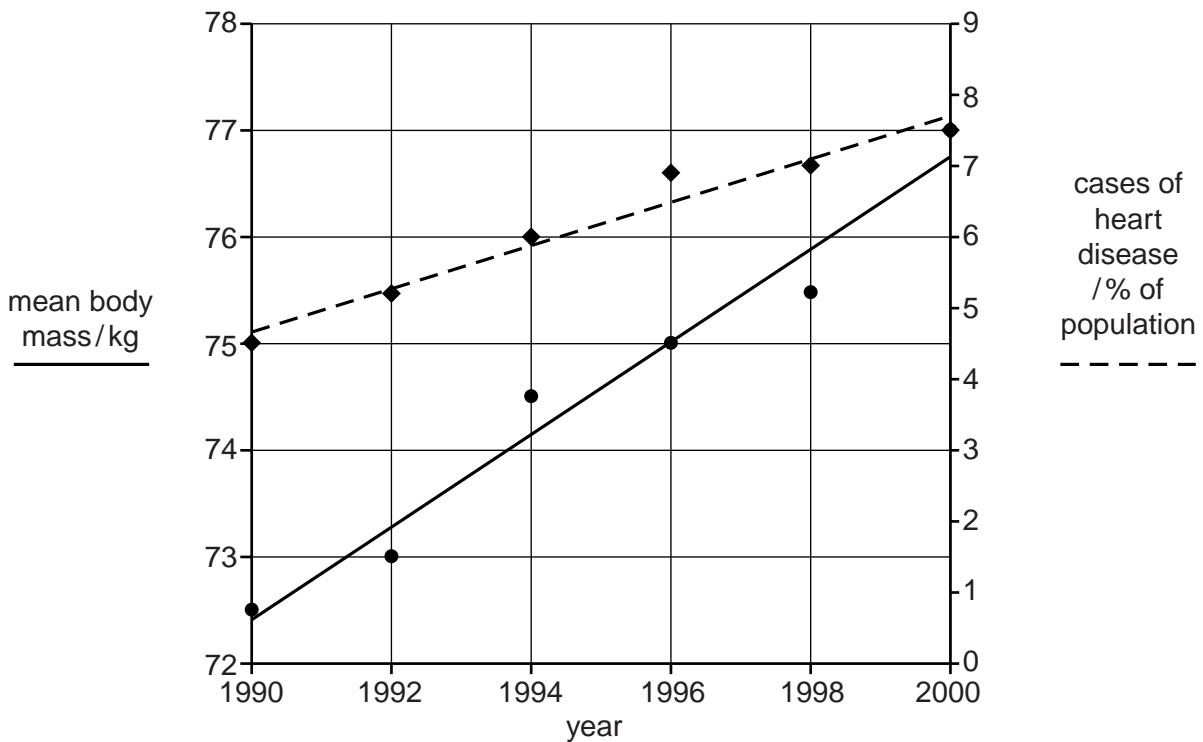
(i) Use the graph to write down

the mean body mass of the population in 1996 = ... kg,

the cases of heart disease in 1994 = ... % of population.
[2]

(ii) Describe the trend in mean body mass over the ten year period.

.... [1]

(iii) Describe the correlation between body mass and heart disease shown............ graph.

....

....

.... [1]

(iv) Suggest a lifestyle factor that is likely to show the same correlation with heart disease.

....[1]

[Total: 7]

3 **(a)** In 1859, Charles Darwin proposed his theory of evolution. He suggested that the different species of living things on Earth all developed gradually over time from simple living things.

Suggest **two** reasons why many people refused to accept his theory.

....

....

.... [2]

(b) Earthworms are small organisms found living in soil.

Arsenic is a poisonous element.

In the early 19th century, some arsenic mines were dug in the south of England.

Over time, the amount of arsenic in the soil near to the mines increased. This arsenic killed most of the earthworms living in the soil.

However, a small number of live earthworms were found in the soil. These earthworms were not killed by the arsenic.

(i) This is an example of a process suggested by Charles Darwin.

Complete the name of this process.

evolution by ....   [1]

(ii) Read the statements and then place them in the boxes below in the correct order to show how this process may have occurred.

The first one has been done for you.

      A   The worms in the area show variation.

      B   These worms are more likely to breed and pass their genes onto their offspring.

      C   Some worms are not killed by the arsenic so they survive.

      D   Some of the next generation of worms also survive.

      E   The amount of arsenic in the soil increases.

A				

[3]

(c) New species can be created by the process of **selective breeding**.

Describe how this process is carried out.

....

....

.... [2]

[Total: 8]

4   Scientists investigate the acidity of rain water in two locations.

Location **A** is near a coal-burning power station.

Location **B** is in countryside far from the nearest city.

The scientists collect several samples of rain water at each location. They measure the pH of each sample.

Their results are shown in the table.

	pH of rain water						
	sample 1	sample 2	sample 3	sample 4	sample 5	sample 6	best estimate
location **A**	5.7	5.6	5.5	5.6	5.8	5.4	
location **B**	7.2	4.0	7.0	6.9	7.1	7.3	7.1

(a) (i) The scientists did not use the value for sample 2 when working out their best estimate of the pH of rain water from location **B**.

Suggest why they did not use this value.

.... [1]

(ii) Work out the mean for the pH of rain water from location **A**. This is the best estimate.

Show your working.

mean (best estimate) = ...
[2]

(b) Coal contains small amounts of sulfur compounds.

The scientists think that the acidity of rain water at location **A** is caused by pollution from the coal-burning power station.

(i) Explain how the burning of coal in the power station could cause acidity in rain water.

....

....

.... [2]

(ii) The acidity in the rain water may have been caused by a different pollutant from another source.

Name this pollutant and give its most common source.

name ....

source ....   [2]

[Total: 7]

5 Crude oil is a mixture of many different compounds.

(a) (i) What property of crude oil shows that it is a mixture?

....

.... [1]
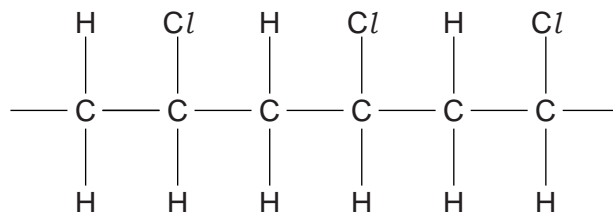
(ii) Most of the compounds in crude oil are hydrocarbons.

How are the molecules of these compounds different from each other?

....

.... [1]

(iii) The diagram shows a small section of the polymer PVC.

$$\begin{array}{cccccc}
\text{H} & \text{C}l & \text{H} & \text{C}l & \text{H} & \text{C}l \\
| & | & | & | & | & | \\
\text{C} - \text{C} - \text{C} - \text{C} - \text{C} - \text{C} \\
| & | & | & | & | & | \\
\text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H}
\end{array}$$

PVC polymer is not a hydrocarbon.

How does the diagram show this?

.... [1]

(b) A plasticiser can be added to PVC. This changes its properties.

(i) Describe one change in a property of PVC that results from the addition of a plasticiser.

....

.... [1]

(ii) Complete these sentences to describe how the addition of a plasticiser changes the properties of PVC.

Use words from the list.

between   easier   harder   increases   inside   reduces

The molecules of plasticiser get .... the polymer chains.

This .... the forces between the chains.

The chains are then .... to separate.   [2]

[Total: 6]

6 Farmers grow crops in their soil and then harvest them.

(a) If the same crop is grown on the same ground, the yield decreases each year.

Explain the reason for this decrease in yield.

....

....

....

.... [2]

(b) To maintain crop yield, synthetic fertilisers can be added to the soil.

(i) Explain why using synthetic fertilisers is **not** sustainable.

....

....

....

.... [2]

(ii) Explain how crop yield can be maintained by more sustainable methods.

....

....

....

.... [2]

(iii) Suggest another problem that may cause a decrease in crop yield.

.... [1]
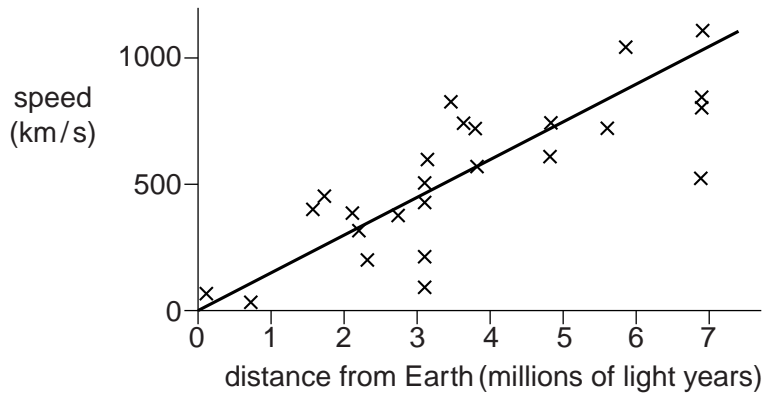
[Total: 7]

7 This question is about galaxies.

(a) At one time, astronomers thought galaxies were clouds of dust and gas somewhere the Milky Way, but they were wrong.

Write down what a galaxy is.

....

.... [2]

(b) The astronomer Edwin Hubble studied the movement of distant galaxies.

This graph shows Hubble's results.

(i) Describe the relationship shown in this graph.

....

.... [2]

(ii) Hubble's data were not very accurate.

State the feature of the graph which shows that the data were not accurate.

....

.... [1]

(iii) More accurate measurement of galaxies show that the Universe started at one point thousands of millions of years ago in a 'Big Bang'.
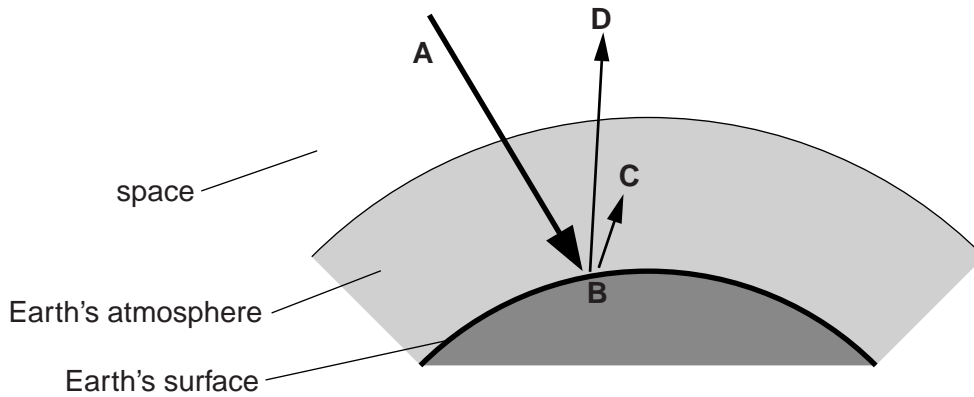
Approximately how long ago was the Big Bang?

.... thousand million years ago. [1]

[Total: 6]

8 This question is about radiation from the Sun reaching the Earth.

(a) The diagram shows what happens to some of this radiation. The diagram can be used to explain the greenhouse effect.

Use the words from this list to complete the sentences below.

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

absorbed   emitted   reacted   transmitted

Radiation from the Sun, **A**, is .... by the Earth at **B** and makes the Earth warmer.

Radiation is .... by the warm Earth.

Some of this radiation is .... by the atmosphere at **C**.

[2]

(b) Most scientists agree that global warming is due to the greenhouse effect.

(i) Give **one** reason why global warming has increased over the past two hundred years.

....

.... [1]

(ii) Write down **one** possible consequence of continued global warming.

....

.... [1]

(c) A different radiation from the Sun, ultraviolet radiation, is absorbed by the ozone the atmosphere.

Some man-made chemicals used in refrigerators and aerosol sprays escaped into the atmosphere and partly destroyed the ozone layer.

(i) Explain why the ozone layer is important.

....

.... [2]

(ii) The use of these chemicals was banned, and the amount of ozone has gradually returned to normal.

Suggest one group of people who might **not** be happy with the ban.

.... [1]

[Total: 7]

9 This question is about nuclear power.

(a) The block diagram shows a nuclear power station.

Complete the labels on the dotted lines provided.

Choose words from this list.

furnace

generator

motor

nuclear reactor

turbine

.... electrical supply

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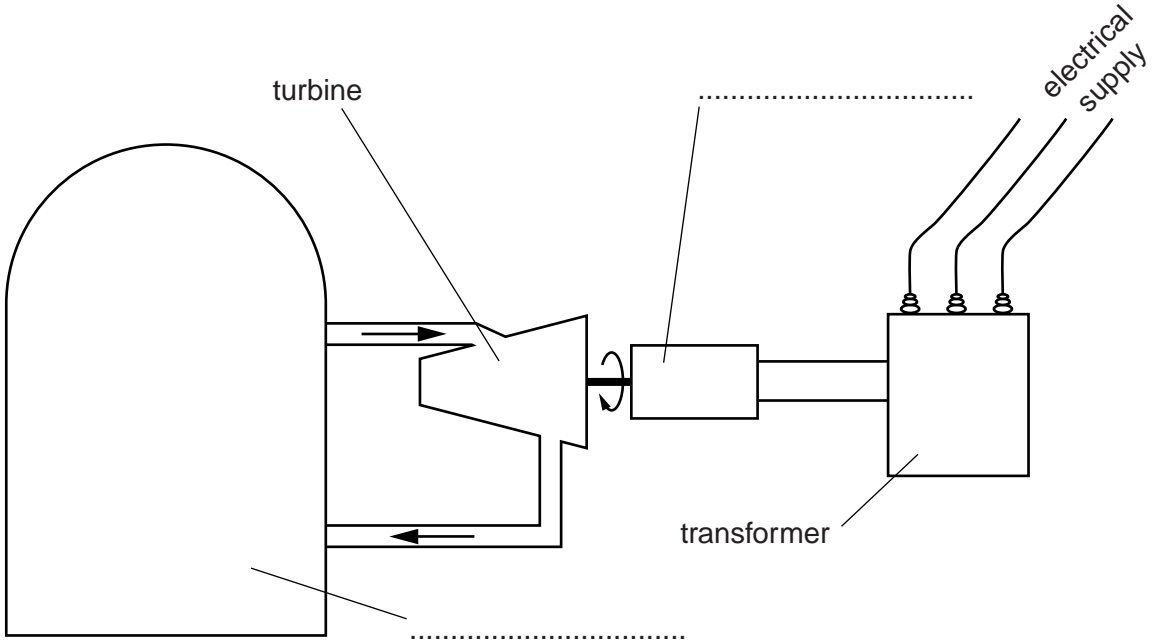
.... [2]

(b) Many countries use both nuclear power stations and power stations which burn carbon fuels such as coal.

Both methods have environmental disadvantages.

Give one disadvantage for each type of power station.

disadvantage for nuclear power station ....

....

....

disadvantage for coal-burning power station ....

....

.... [2]

(c) The table below shows the energy produced by two different types of power stations.

type of power station	energy released from 1 kg of fuel / MJ	electrical energy generated by 1 kg of fuel / MJ
coal-burning	36	12
nuclear	3 600 000	1 000 000

(i) Use the data to explain why the supply of fuel to a coal-burning power station has different problems from the supply of fuel to a nuclear power station.

....

.... [1]

(ii) Use the equation below to calculate the efficiency of the **coal-burning** power station in terms of the conversion of the energy released from the fuel (input) to the electrical energy generated (output).

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}} \times 100\%$$

efficiency = ... %

[2]

[Total: 7]