UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER			

21ST CENTURY SCIENCE **0608/03**

Paper 3 **May/June 2009**

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 **18** printed pages and **2** blank pages.

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 All cells contain genetic information.

(a) Where in our cells is this genetic information stored?

Put a (ring) around the correct answer.

cell membrane **cytoplasm** **nucleus**

[1]

(b) Complete the following sentences using the correct words from the list below.

alleles **DNA** **genes** **proteins** **recessive**

Genes are sections of very long ………………………… molecules.

They are instructions that describe how to make ………………………… .

Different versions of genes are called ………………………… .

These can either be dominant or ………………………… . [3]

(c) Joe has cystic fibrosis.

This is a genetic condition caused by a recessive allele.

Joe's parents, Henry and Sue, are both carriers of cystic fibrosis.

(i) Complete the genetic diagram below to show the different combinations of these two alleles that any children of Joe's parents could have.

Key F = normal allele f = cystic fibrosis allele		Sue (mother)	
		F	f
Henry (father)	F	………	………
	………	………	………

[2]

(ii) Joe has cystic fibrosis.

What combination of alleles does Joe have? .... [1]

(d) Sue is pregnant again.

Henry and Sue are worried that the new baby may have cystic fibrosis as well.

Their doctor says that the embryo can be tested to see if it has the combination of alleles for cystic fibrosis.

Their friends give their advice on this.

Adelina

You should have the test. If the embryo has the wrong alleles, the pregnancy can be terminated.

Bay

There's no point having the test. It is unnatural to have a pregnancy terminated. You must accept the baby you are given.

Carlos

I'm in favour of the test. If the baby is going to have cystic fibrosis, you can prepare for it beforehand.

Dacia

I'd be worried that the test may damage the baby. I don't think you should be tested.

(i) Who is in favour of Sue having the test?

Write down the **two** correct names.

.... and .... [1]

(ii) People often say that certain actions are never justified because they are unnatural or wrong.

Who says something which supports this view?

Write down the **one** correct name. .... [1]

[Total: 9]

2   Jose's father has heart disease.

Jose knows that heart disease may be inherited.

(a)   Which of the following should Jose do to **reduce** his risk of getting heart disease?

Put ticks (✓) in the boxes next to the **three** correct answers.

cycle to work instead of drive ☐

eat more fresh fruit and vegetables ☐

eat more full fat dairy products ☐

increase alcohol intake ☐

move away from his family ☐

stop smoking cigarettes ☐

[2]

(b)   The graph shows the relationship between the amount of animal fat eaten and the number of deaths from heart disease.

Each point on the graph represents a different country.

animal fat eaten (grams per person per day)
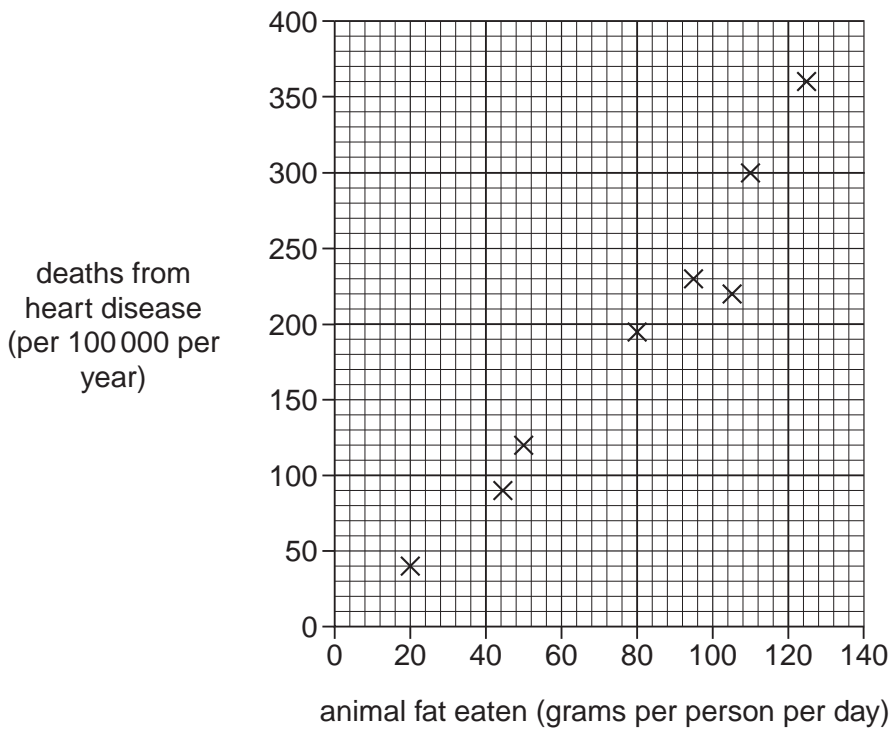
(i)   Draw a straight line of best fit on the graph.   [1]

(ii) In another country, the amount of animal fat eaten is 60 g per person per day.

Use the graph to estimate how many deaths from heart disease occur in this country.

.... per 100 000 per year [1]

(c) Scientists are trying to find a cure for heart disease.

A scientist discovers a new treatment and publishes her results in a journal.

This work has been checked by other people before it is published.

The checking process is called **peer review**.

Which **one** of the following best describes the other people who check the scientist's work?

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

The work is checked by

friends of the scientist ☐

members of the public ☐

other scientists ☐

politicians ☐

[1]

[Total: 5]

3 The Iberian Lynx is a type of wild cat found in Spain.

The table shows how the population of the Iberian Lynx has changed.

year	population of Iberian Lynx
1978	1500
1998	800
2000	600
2002	300
2004	135
2006	120

(a) (i) Describe what happened to the population of Iberian Lynx from 1978 to 2006.

.... [1]

(ii) Calculate the change in the population of Iberian Lynx from 1998 to 2006.

.... [1]

(b) The main prey of the Iberian Lynx is rabbits.

To control rabbit numbers, myxomatosis virus was released in Spain. This virus kills rabbits.

Explain how this may have caused the lynx population to change.

....

....

.... [2]

(c) Much of the lynx's habitat is being cleared so that the land can be used for housing roads.

Suggest what effects this is likely to have on the Iberian Lynx.

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

More lynx will be killed on the roads.

The lynx may become extinct.

The population of the lynx will decrease.

The population of the lynx will increase.

There will be more habitats for the lynx.

[2]

[Total: 6]

8

4 The burning of fuels in motor vehicles releases small particulates of solids into the air. particulates may irritate the lungs and cause problems for those suffering from asthma.

Scientists measure the mass of solid particulates in the air in the centre of three different cities **A**, **B** and **C**. They make these measurements at the same time in each city. Their results are shown in the table.

	solid particulates (micrograms per cubic metre)					
	Monday	Tuesday	Wednesday	Thursday	Friday	mean
city **A**	13	15	11	27	11	12
city **B**	39	36	35	38	37	
city **C**	78	75	74	73	75	75

(a) A measurement of solid particulates **higher** than 50 micrograms per cubic metre is considered harmful to humans.

In which city is the air harmful?

city .... [1]

(b) The scientists decide that taking several measurements in each city gives a better estimate of the mass of solid particulates.

Explain why repeated measurements are likely to give a better estimate.

....

....

.... [2]

(c) The scientists calculate the mean (average) for the set of results for each city.

(i) When calculating the mean for city **A**, they do not use the value for Thursday.

Suggest why they do not use this value.

....

.... [1]

(ii) Work out the mean (average) for the measurements taken in city **B**.

mean (average) = ... micrograms per cubic metre [2]

(d) The table shows the average number of patients per day admitted to hospital b   of an asthma attack.

	city **A**	city **B**	city **C**
number of patients per day	78	105	147

The data suggests a correlation between mass of solid particulates and asthma attacks.

Complete the sentence describing this correlation.

Choose from this list.

decreases   **increases**   **stays the same**

As the mass of solid particulates in the air increases, the number of patients

with asthma attacks ……………………………………………… .   [1]

(e) Solid particulates do not remain in the air for long.

State what happens to them.

....

.... [1]

[Total: 8]

5 Crude oil is a mixture of hydrocarbons.

(a) Which elements are present in hydrocarbons?

Put a (ring) around each of the **two** correct elements.

argon　　　**carbon**　　　**hydrogen**　　　**nitrogen**　　　**oxygen**

[2]

(b) Methane is a hydrocarbon found in crude oil.

When methane burns completely in oxygen, it produces carbon dioxide and water.

Look at this unfinished diagram for the complete burning of methane.
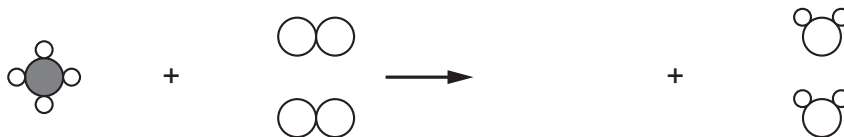
methane

(i) On the diagram, draw a (ring) around **one** molecule of oxygen. [1]

(ii) Which of these needs to be added to finish the diagram?

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

[1]

(c) Some of the hydrocarbons from crude oil are used to make polymers.

    (i) What is the name of this process?

        Put a (ring) around the correct answer.

distillation   **oxidation**   **photosynthesis**   **polymerisation**   **transpiration**

[1]

    (ii) Describe what happens during the process.

        ....

        ....

        .... [2]

[Total: 7]

6 Most processed foods contain chemicals that are added during processing.

(a) Different additives are used for different reasons.

Draw a line from each **additive** to the correct **reason** for adding it to food.

additive		reason

| antioxidant | | mix together ingredients that would normally separate |

| emulsifier | | make the food taste better |

| flavouring | | prevent the growth of harmful microbes |

| preservative | | prevent fats and oils going off |

[3]

(b) Some additives are harmful if their concentration in food is too high.

How do scientific advisory committees in countries around the world make sure that additives do not cause harm?

....

....

.... [2]

[Total: 5]

13

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7 This question is about galaxies.

Until the 1920s, scientists did not know what galaxies are.

(a) Write down what galaxies are.

....

....

.... [2]

(b) The astronomer Edwin Hubble first measured the speeds of distant galaxies.

He found evidence for how the Universe began.

(i) Describe what Hubble found about the movement of distant galaxies.

....

.... [1]

(ii) Scientists have used Hubble's discoveries to find the age of the Universe.

How old did they estimate it to be?

Put a ⃝ring around the best answer in this list.

6000 years   **6 million years**   **5000 million years**   **14 000 million years**

[1]

(c) Hubble's explanation of the beginning of the Universe was not accepted by scientists at the time.

Suggest why it took some time for this new scientific explanation to be accepted.

....

....

.... [2]

[Total: 6]

**8** Most scientists now agree that global warming is a result of man-made activities.

(a) Global warming is caused by greenhouse gases.

One greenhouse gas is produced by burning fuel.

Name this greenhouse gas.

.... [1]

(b) Look at the graph showing how the Earth's surface temperature has changed since 1850. Values are compared with a recent average, which is an average for the years 1961 – 1990.
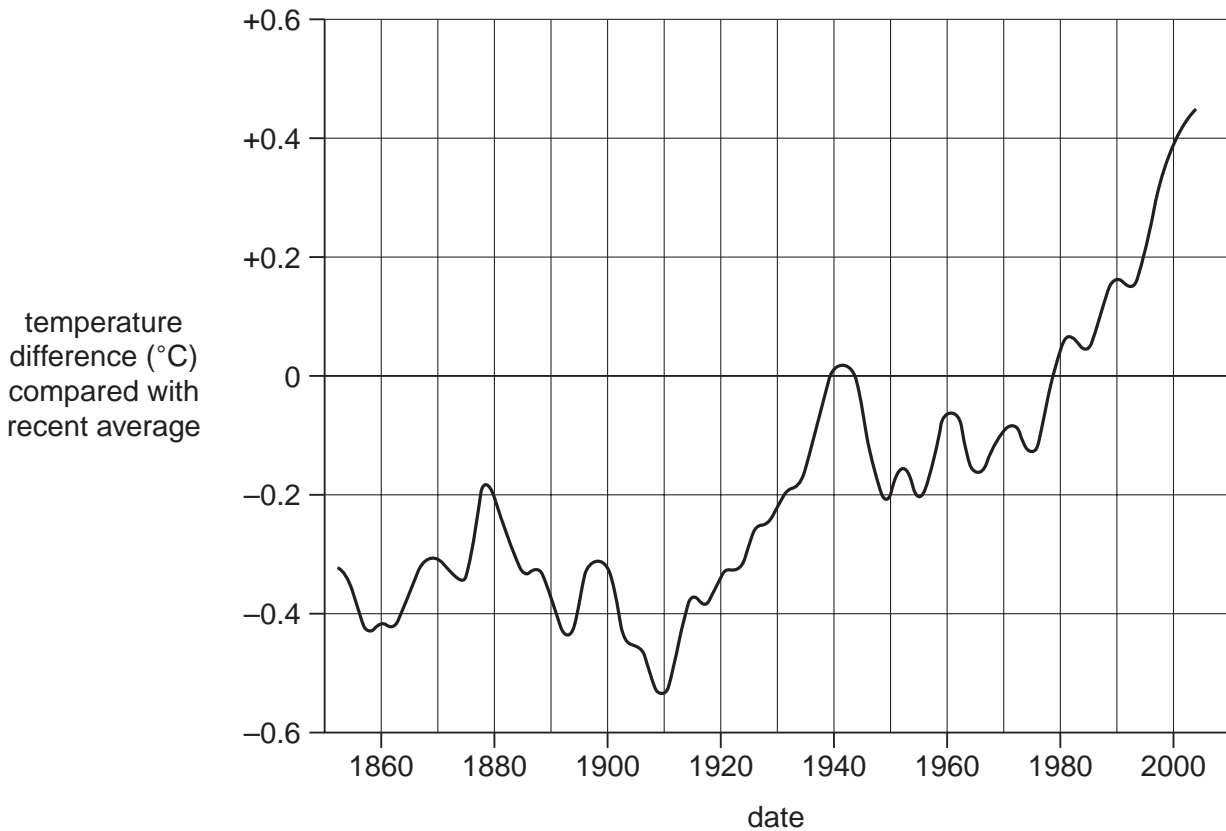
(i) Use the graph to find the date at which the temperature was at its lowest value in the years shown in the graph.
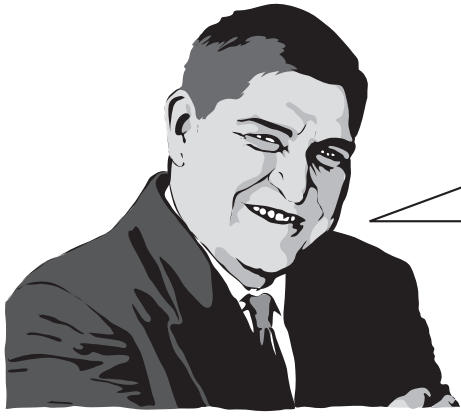
date = ... [1]

(ii) Use the graph to find the date at which the temperature was 0.4 °C above the recent average.

date = ... [1]

(iii) Explain how the graph supports the view that global warming is taking place.

.... [1]

(c) Here are three different scientists' opinions about global warming.

Dr Agassi

The temperature of the Earth is definitely going up. So is the amount of greenhouse gas in the atmosphere.
The global warming must be due to the greenhouse gas.

Dr Burger

I don't think that global warming is definitely taking place. We do not have enough data to be certain. The results only go back 160 years.

Dr Chang

I agree that the temperature of the Earth is increasing, but I don't think it has anything to do with greenhouse gases. It's just chance that they are both increasing.

   (i) Which scientists believe that global warming is taking place?

       Write **each** of their names in the space below.

       .... [1]

  (ii) Which **two** scientists mention ideas of correlation and cause?

       .... and .... [1]

 (iii) Which **one** scientist talks about the difference between correlation and cause?

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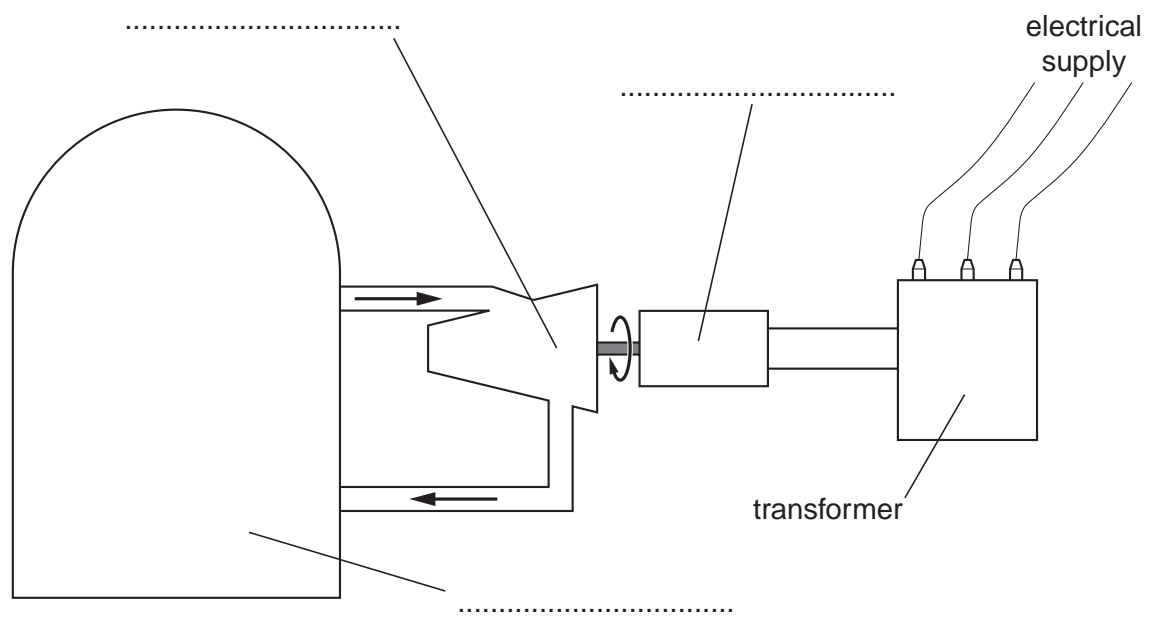
                                                              [Total: 7]

9 This question is about generating electricity by nuclear power.

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

Label the **generator**, **reactor** and **turbine** on the dotted lines provided.

....

....

electrical
supply

transformer

....

[1]

(b) The following energy flow diagram is for a modern nuclear power station generating electricity.

25 MJ
cooling
steam

5 MJ left in
nuclear fuel
after use

50 MJ
in
nuclear
fuel

electrical
energy
output
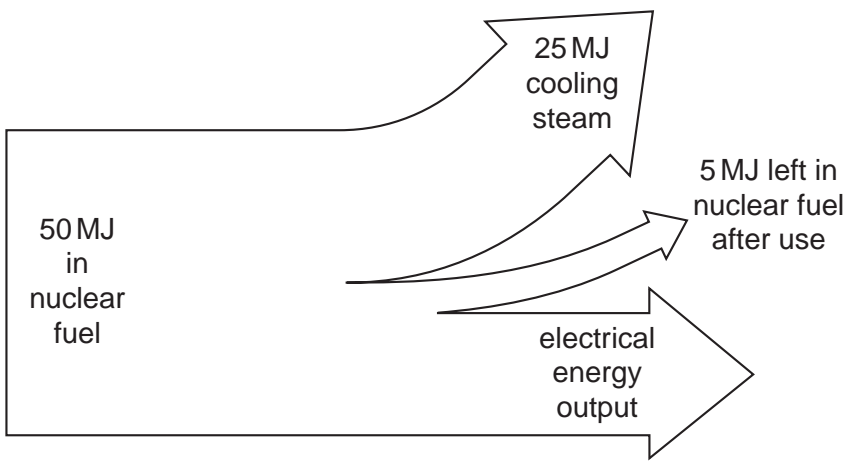
Write down the amount of energy transferred into electrical energy output.

electrical energy output = ... MJ [1]

(c) Workers at nuclear power stations are exposed to ionising radiation. This mea. they have more risk than people who do not work with ionising radiation.

(i) Write down what ionising radiation can do to cells.

....

.... [1]

(ii) Suggest **two** reasons why nuclear power station workers may be prepared to accept the risks of working at a nuclear power station.

1 ....

....

2 ....

.... [2]

(d) Because power station workers are exposed to risk of radiation, the power station managers must make sure that they do not get too large a dose.

Describe **two** ways they could make sure that the workers do not get too large a dose.

1 ....

....

2 ....

.... [2]

[Total: 7]

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