



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

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TWENTY FIRST CENTURY SCIENCE

0608/03

Paper 3

October/November 2013

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.

Electronic calculators may be used.

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.

This document consists of **16** printed pages.

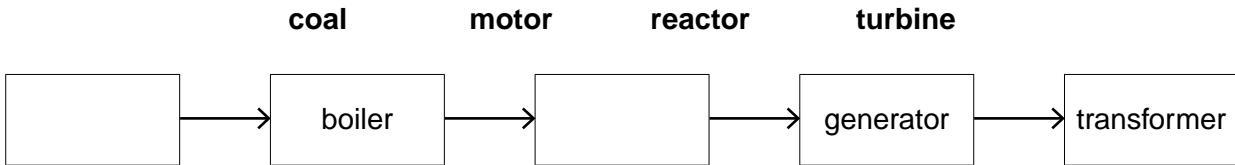


1 This question is about different types of power station.

(a) The block diagram shows the production of electricity in a **nuclear** power station.

Write the two missing names in the empty boxes.

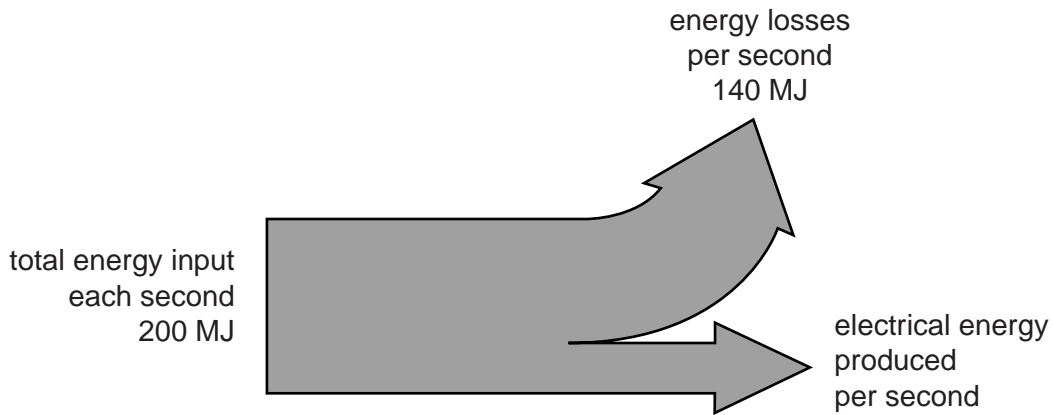
Choose words from this list.



[2]

(b) In a nuclear power station, some energy is lost.

One example is shown in the energy flow (Sankey) diagram below.



(i) Use information from the diagram to find the electrical energy produced per second.

electrical energy produced per second = MJ [1]

(ii) Calculate the efficiency of the power station.

Show your working.

efficiency = % [2]

- (c) In many countries, nuclear power stations are being replaced by power stations using renewable energy sources.

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Use*

Name one such renewable energy source, and state an advantage it has over the use of nuclear power.

renewable energy source

advantage over nuclear power

.....

.....[2]

[Total: 7]

2 This question is about the movement of tectonic plates.

(a) Tectonic plates move because of movements in one of the layers of the Earth.

The Earth has three layers: **core**, **mantle** and **crust**.

Movement of which of these three layers **causes** tectonic plate movement?

.....[1]

(b) (i) Earthquakes often happen where two tectonic plates meet.

Explain why.

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

(ii) Earthquakes can be very damaging and cause much loss of life.

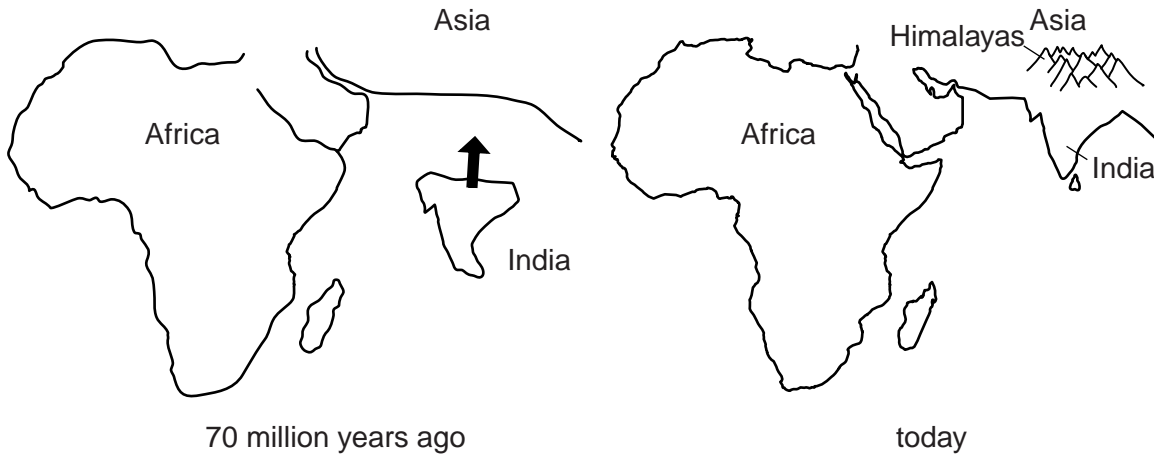
Public authorities in earthquake areas can take actions to reduce the damage caused by earthquakes.

Suggest one action that could be taken to reduce earthquake damage.

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

(c) The diagrams below show how the Indian tectonic plate, which carries the land mass of India, has moved over the last 70 million years.

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Use



- (i) 70 million years ago, the Indian plate was moving at a speed of 20 cm per year.
Calculate how far the Indian plate moved in 100 years.

distance = cm [2]

- (ii) When the Indian plate reached the mainland of Asia, it slowed down to 5 cm per year.

At the same time, the mountains known as the Himalayas were formed.

Explain why these two events happened at the same time.

.....

.....

.....

..... [2]

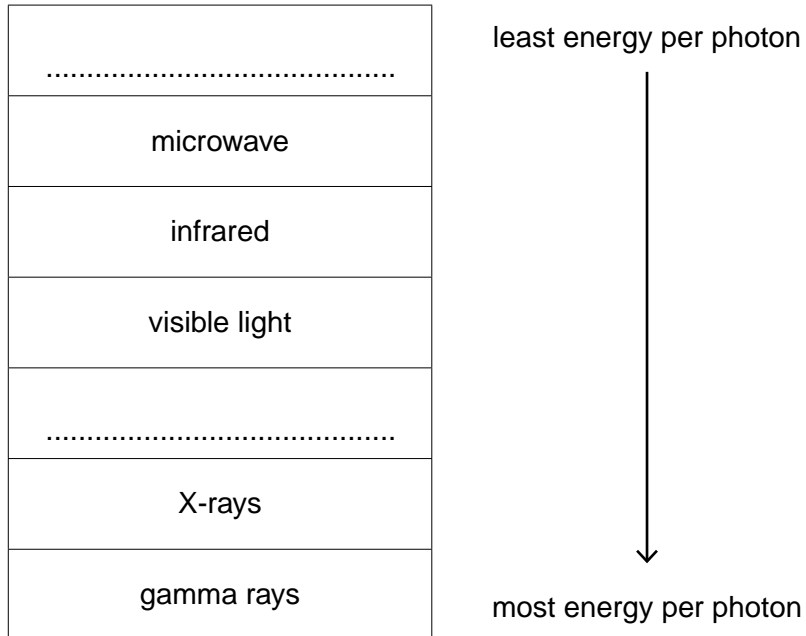
[Total: 7]

3 This question is about the electromagnetic spectrum.

(a) The list below shows the electromagnetic spectrum.

It is arranged in order of the energy in each photon.

Complete the list by filling in the empty boxes.



[2]

(b) The sentences are about the harmful effects of electromagnetic radiation.

Put a **ring** around the correct word to complete each sentence.

When living cells absorb electromagnetic radiation, the radiation can

heat / **light** / **reflect** the cells and damage them.

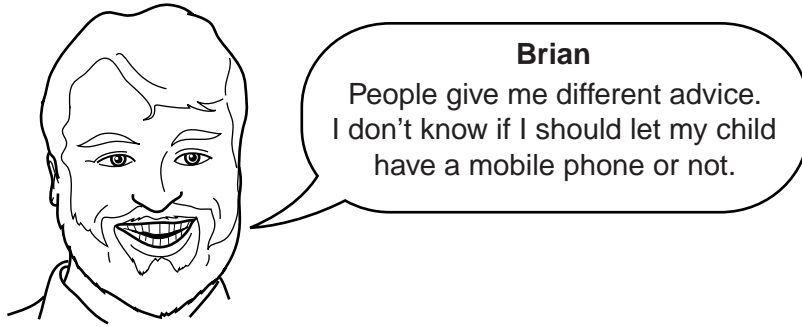
X-rays and gamma rays are particularly dangerous for living cells because they are

light / **ionising** / **microwave** radiations.

[2]

(c) Mobile phones emit microwave radiation.

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Use



Give one reason **for**, and one reason **against**, a child having a mobile phone.

reason for

.....

.....

reason against

.....

..... [2]

[Total: 6]

4 This question is about gases in the air.

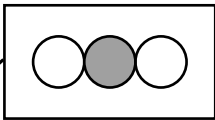
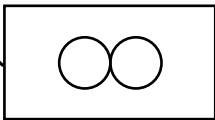
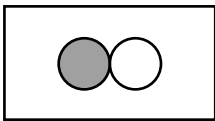
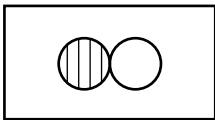
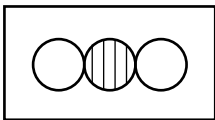
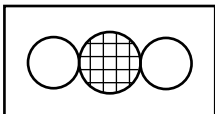
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(a) (i) The diagram shows information about some gases found in air.

Draw a straight line from each **name** to the correct **formula**.

Draw another straight line from each **formula** to the correct **molecule diagram**.

Lines for two of the gases have already been done for you.

name	formula	molecule diagram
carbon dioxide	O_2	
oxygen	CO_2	
carbon monoxide	SO_2	
nitrogen monoxide	CO	
nitrogen dioxide	NO	
sulfur dioxide	NO_2	

[3]

(ii) Give the name of a gas shown in the diagram that is a major cause of acid rain.

.....

[1]

(b) When a hydrocarbon burns in a plentiful supply of air, **complete** burning takes place.

The products are carbon dioxide and water.

When a hydrocarbon burns in a limited supply of air, **incomplete** burning takes place.

The products of this incomplete combustion include two pollutants of air that are **not** produced during complete combustion.

Name these two pollutants.

1

2

[2]

[Total: 6]

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5 Scientists test the effect of adding a new plasticiser to a polymer.

They make batches of the polymer with different percentages (%) of plasticiser.

They measure how far samples of each batch of polymer bend when a force is applied.

(a) The table shows the scientists' results for the polymer containing 2.0% plasticiser.

bend of polymer in mm					
sample 1	sample 2	sample 3	sample 4	sample 5	sample 6
15	17	17	14	15	18

(i) What is the range of results shown in the table?

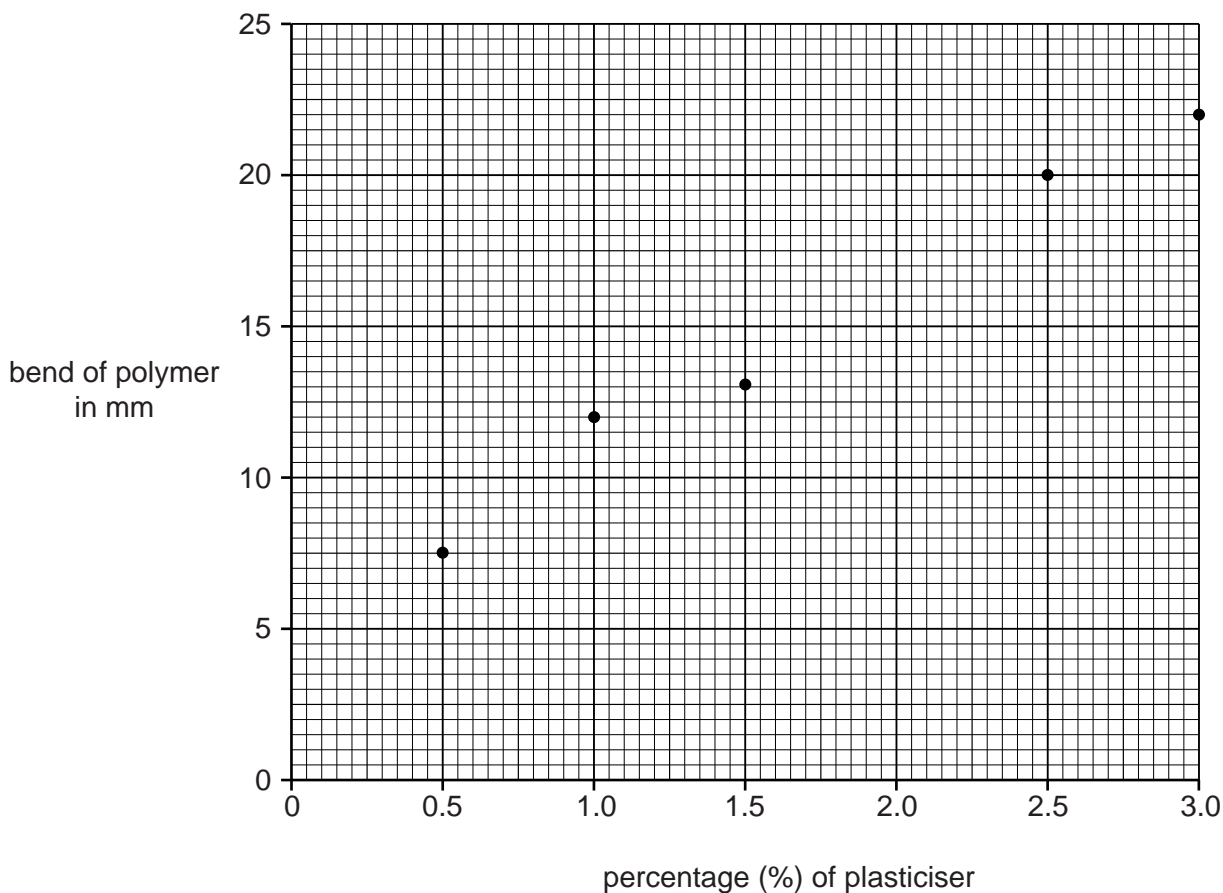
from to

[1]

(ii) Work out the mean (average) to get a best estimate for the bend of the polymer containing 2.0% plasticiser.

best estimate = mm [2]

(b) The graph shows best estimates for the bend of the polymer containing other percentages of plasticiser.



(i) Finish this graph by plotting the best estimate for 2.0% plasticiser. [1]

(ii) Finish this sentence to describe the correlation shown by the graph.
As the percentage of plasticiser the bend [1]

(c) The properties of this polymer could be changed by another modification.
Describe a modification, other than adding plasticiser, and the change it would make to the properties of the polymer.

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

[Total: 7]

6 This question is about chemicals that are added to food.

(a) Finish this table about food additives.

type of food additive	reason for adding to food
flavouring	
	stops oil and water from separating
preservative	

[3]

(b) Aspartame is an artificial sweetener used to replace sugar in food.

Suggest one advantage and one disadvantage of adding aspartame instead of sugar to sweeten food.

advantage

.....

disadvantage

..... [2]

(c) In some countries food is eaten near to where it is produced.

In other countries food is transported long distances.

Suggest **two** reasons for this difference.

.....

.....

.....

.....

..... [2]

[Total: 7]

7 The many complex species of living things on Earth are believed to have evolved from very simple living things.

(a) Complete the sentence.

Life on Earth began about million years ago. [1]

(b) Darwin published his theory of natural selection in 1859.

At the time, many people disagreed with his theory.

Since then, new data have been found to support his theory.

Draw a straight line from each **reason** why people disagreed with Darwin to the **new data** which now supports his theory.

reason

new data

The Earth was not thought to be old enough.

More fossils were discovered.

Darwin couldn't explain how variation occurred.

Mendel published his ideas about inheritance.

Darwin couldn't explain how characteristics were passed on.

The structure of DNA was discovered.

There was not much evidence that species changed over time.

The solar system was found to be about 5 thousand million years old.

[2]

(c) Scientists can compare the genes of different organisms.

For example, about 85% of mouse genes are the same as human genes.

Suggest and explain what percentage of chimpanzee genes are likely to be the same as human genes.

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

[Total: 5]

8 (a) Complete the following sentences.

Use words from this list.

alleles DNA embryo nucleus proteins

Genes are sections of very long molecules of that make up chromosomes.

Chromosomes are found in the of a cell.

Genes are instructions for a cell that describe how to make [3]

(b) Chromosomes in body cells are found in pairs.

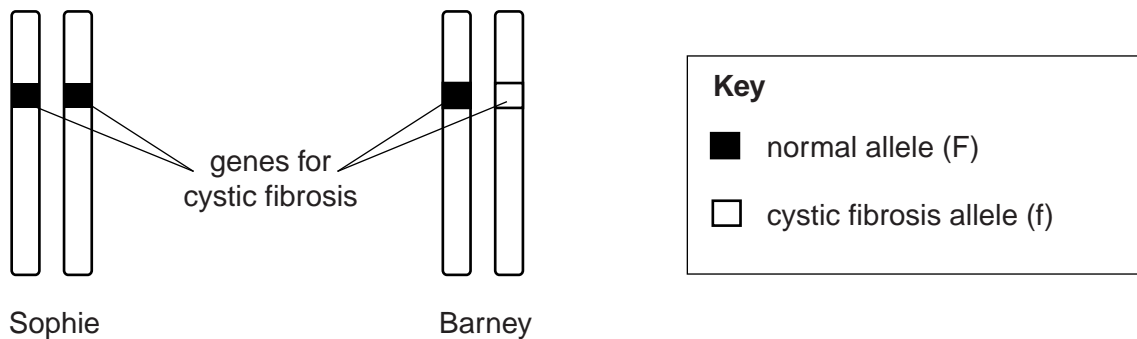
Write down where each chromosome in a pair comes from.

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

(c) The diagram shows the genes for cystic fibrosis on two pairs of chromosomes.

Cystic fibrosis is caused by a recessive allele.

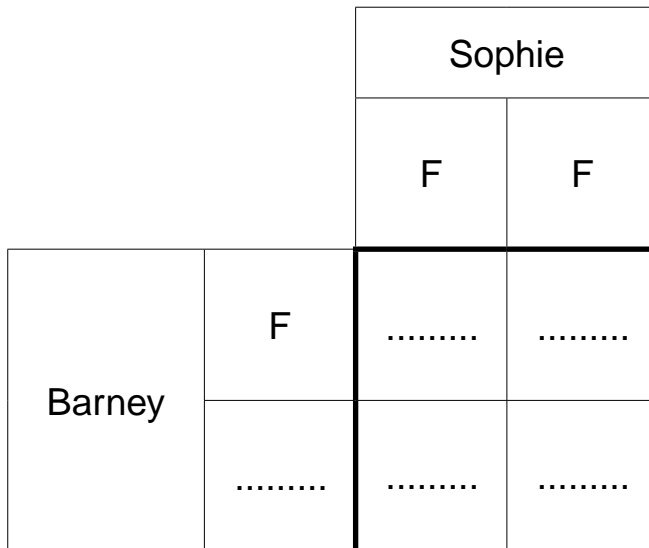
These pairs of chromosomes are found in the body cells of Sophie and Barney.



- (i) Sophie and Barney are expecting a baby.

Complete the genetic diagram to show the possible combinations of alleles that their baby could have.

Use F to represent the normal allele and f to represent the cystic fibrosis allele.



[2]

- (ii) Calculate the probability of Sophie and Barney's baby being a carrier of cystic fibrosis.

probability = [1]

- (iii) Sophie wants to have their foetus tested to see if it will suffer from cystic fibrosis.

Her doctor says that the test is unnecessary.

Use your genetic diagram in (c)(i) to suggest why.

.....
 [1]

- (iv) Some people believe that foetuses should **never** be tested for alleles which cause genetic disease, whatever the circumstances.

Suggest two reasons why they believe this.

1

2 [2]

[Total: 10]

9 A virus is an example of a microorganism. Microorganisms can cause disease.

(a) Describe two ways in which microorganisms can cause the symptoms of disease.

- 1
- 2 [2]

(b) Sarah has chickenpox. Chickenpox is a disease caused by a virus.

(i) Sarah's white cells may destroy the chickenpox virus by engulfing it.

They may also produce specific molecules to help destroy the virus.

Write down the name of these molecules.

..... [1]

(ii) Sarah's brother had chickenpox a year ago.

Explain why Sarah's brother is unlikely to catch chickenpox from Sarah.

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

[Total: 5]

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