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 2011**

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.

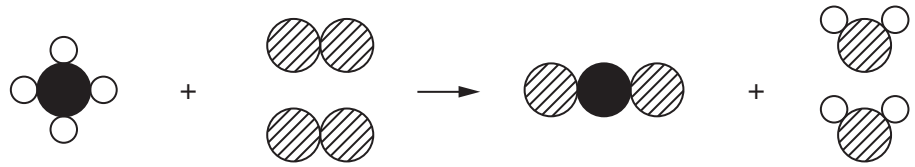
For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total	

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

1 Methane, CH_4, is a fuel. It is burned to release heat energy.

In a plentiful supply of oxygen, O_2, methane burns to produce carbon dioxide, CO_2, and water, H_2O, only.

Look at this diagram showing the burning of one molecule of methane.



methane oxygen carbon dioxide water

(a) Complete this table to show the number of **molecules** in the reactants and products when one molecule of methane burns.

	reactants		**products**	
	methane	oxygen	carbon dioxide	water
number of molecules	1	2		

[2]

(b) Complete this table to show the number of **atoms** of each element in the reactants and products when one molecule of methane burns.

	carbon	hydrogen	oxygen
number of atoms in reactants	1		
number of atoms in products	1		

[2]

(c) When methane burns in a limited supply of air, other products are also formed. These other products cause air pollution.

Name **one** of these other products.

..... [1]

[Total: 5]

2 Most window frames are made from either wood or unplasticised polyvinylchloride (u

Data from a Life Cycle Assessment (LCA) for window frames, of the same size, made fro each of these two materials are shown in the table.

part of LCA	wood	uPVC
energy for production, use and disposal	9150 MJ	9713 MJ
fossil fuel used	5.57 kg	18.23 kg
carbon dioxide produced	457 kg	487 kg
smog chemicals	893	383
air acidification	29.6	37.7
water pollution	67	1.6

(a) For which parts of the LCA is wood a more sustainable material for a window frame than uPVC?

Choose your answers by ticking the correct boxes.

	tick (✓)
energy for production, use and disposal	
fossil fuel used	
carbon dioxide produced	
smog chemicals	
air acidification	
water pollution	

[3]

(b) Complete the sentences about the sustainability of wooden and uPVC window frames.

Use words from this list.

burned **more** **less** **grown** **oil** **wood**

Wood used to make window frames comes from trees. More trees can

be ..... .

uPVC is made from chemicals in crude ..... . This will one day run out.

Wooden window frames are therefore made from a ..... sustainable

(c) uPVC does not contain a plasticiser.

Explain why PVC containing a plasticiser would not be a good material for a window frame.

.....

.....

..... [2]

(d) The main cause of air acidification is the release of acidic gases from burning fossil fuels. Acid rain is formed from these acidic gases.

(i) Give the name and formula of one of the gases that cause acid rain.

name .....

formula ..... [2]

(ii) Describe **one** environmental problem caused by acid rain.

.....

..... [1]

[Total: 10]

3 Country **A** is an industrialised country. Farmers in country **A** use synthetic pesti... prevent insect pests attacking their crops. They spread synthetic fertilisers on their fields...

Country **B** is a developing country. Farmers in country **B** use organic farming methods. They do not use synthetic pesticides or synthetic fertilisers.

(a) (i) Suggest why farmers in country **B** do not use pesticides.

.....

..... [1]

(ii) Describe **one** method that farmers in country **B** may use to protect their crops from insect pests.

.....

..... [1]

(iii) How may farmers in country **B** be affected by the fact that they do not use pesticides?

.....

..... [1]

(b) When crops are grown they take nitrogen compounds from the soil. Farmers put fertiliser on their fields to add nitrogen compounds to the soil.

(i) A farmer grows crops for several years without adding fertiliser to the soil.

Describe what happens to his crops.

.....

..... [1]

(ii) Farmers in country **B** do not use synthetic fertilisers.

Suggest how they add nitrogen compounds to their soil.

.....

..... [1]

[Total: 5]

4 This question is about the movement of the Earth's tectonic plates.

(a) Although Wegener's idea of continental drift was first suggested in 1912, it was mo than 50 years before geologists believed this.

Use words from the list to explain why they did not believe this in 1912.

astronomy **chemistry** **earthquakes** **evidence** **geology** **movement**

It was not possible to detect any ..... of the continents.

There was not enough ..... to support Wegener's ideas.

Scientists did not think Wegener had enough knowledge because he had no training in

..... [3]

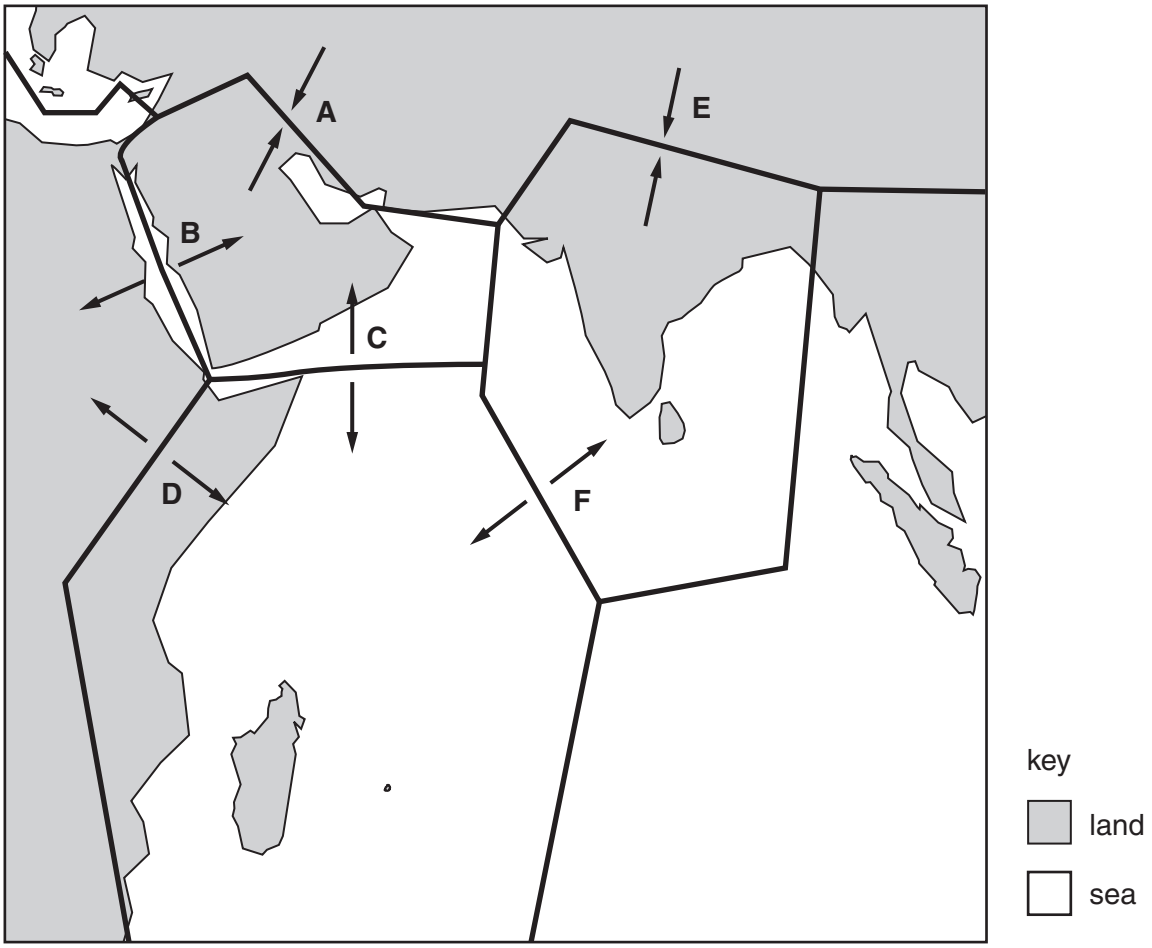
(b) The movement of the tectonic plates is due to movements inside the Earth.

Write down the name of the part of the Earth causing the movement of tectonic plates.

..... [1]

(c) The Earth's tectonic plates in the Indian Ocean region are shown in the diagram.

The pairs of arrows **A**, **B**, **C**, **D**, **E** and **F** show the directions of movement of the plates.



(i) The letters **B** and **C** show places where sea-floor spreading is taking place.

Which other letter, **A**, **D**, **E** or **F**, also shows a place where sea-floor spreading is taking place?

..... [1]

(ii) Which **one** of the movements, **A**, **B**, **C**, **D**, **E** or **F**, is opening a valley on the land?

..... [1]

(iii) Which of the movements **A**, **B**, **C**, **D**, **E** and **F** are building mountains?

Write down **each** of the letters.

..... [1]

[Total: 7]

5 This question is about microwave radiation.

(a) The table shows the electromagnetic spectrum.

(i) Fill in the missing names.

radio waves	.....	infrared	visible light	.....	.....	gamma rays

[2]

(ii) In the table, put a tick (✓) next to the name of each **ionising radiation**. [1]

(b) Some people believe that microwaves from mobile phones may be a health risk, but they still use mobile phones.

Suggest why they use mobile phones, even though there is a risk.

Use ideas of **risk** and **benefit** in your answer.

.....

.....

.....

..... [2]

(c) Microwave ovens are much more powerful than mobile phones, but they are not thought to be dangerous.

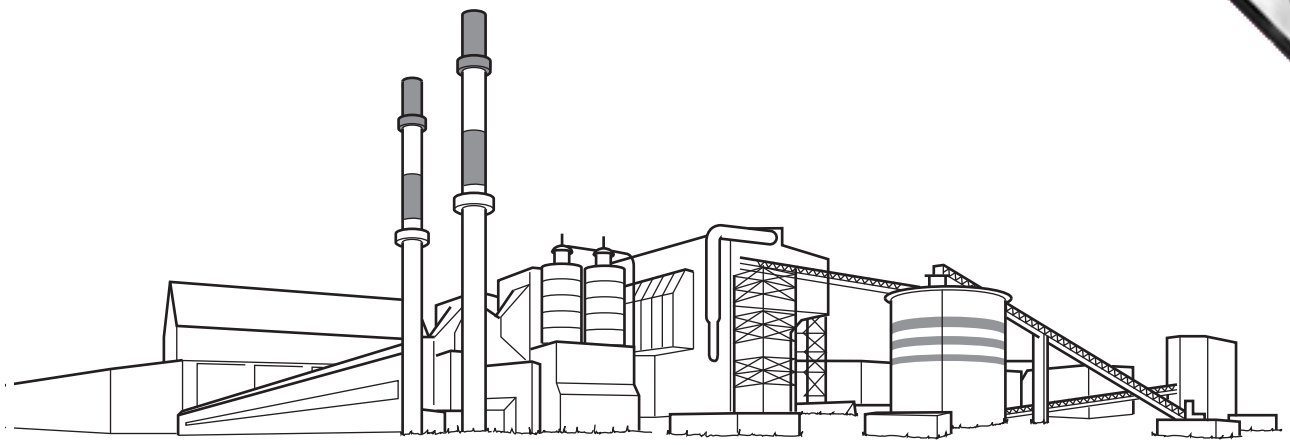
Explain how the construction of microwave ovens protects users from microwave radiation.

.....

..... [1]

[Total: 6]

6 This question is about generating electricity from biomass (waste vegetable matter).



(a) Burning biomass to generate electricity is an example of a renewable energy source.

(i) Give **one** other example of a renewable energy source.

..... [1]

(ii) Burning biomass is renewable because the vegetable matter can be grown as fast as it is burned.

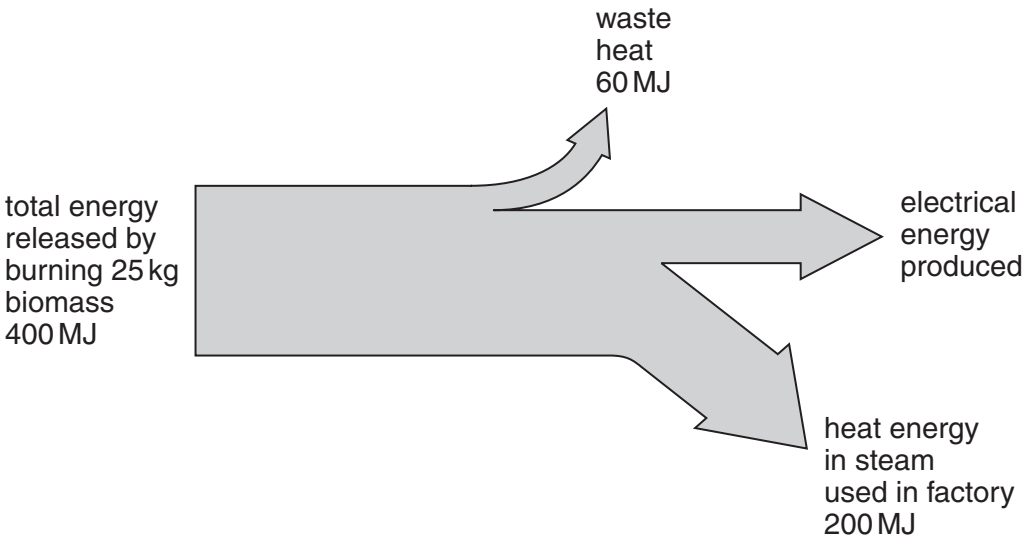
Explain why burning coal is **not** renewable.

.....

..... [1]

(b) The following energy flow diagram shows the energy obtained from burning 2 kg of biomass.

The energy is measured in megajoules (MJ).



(i) How much energy does 25 kg of biomass release?

energy = ... MJ [1]

(ii) How does the diagram show that half of the energy in the biomass is transferred into heat energy in steam?

..... [1]

(iii) Explain how the energy flow diagram shows that 140 MJ of electrical energy were produced.

.....

..... [1]

(iv) Use the equation

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

to calculate the efficiency of production of electrical energy.

Show your working.

efficiency = ...% [2]

[Total: 7]

7 **(a)** Some cells are unspecialised and can develop into many other types of cell.

What name is given to these unspecialised cells?

..... [1]

(b) Complete the sentences, choosing the correct words from the list below.

embryos **harmful** **nerve** **people** **unnatural** **unspecialised**

There is the potential to use ..... cells to treat some illnesses.

It is possible to clone ..... to produce large numbers of unspecialised cells.

Some people think this should never be done because it is ..... .

[3]

(c) Read the sentences in the box.

A	Scientists have discovered that baby teeth are a source of unspecialised cells.
B	Storing your children's baby teeth could help to save their lives in the future.
C	The unspecialised cells are easy and painless to extract.
D	Storing the teeth is very expensive.
E	There is no guarantee unspecialised cells will be able to help cure diseases.
F	Many teeth can be stored for each child.
G	It may not be possible to extract the unspecialised cells if the teeth are damaged.

Which of the sentences, **A**, **B**, **C**, **D**, **E**, **F** and **G**, suggest reasons why

(i) parents may choose to store their children's baby teeth,

..... [1]

(ii) parents may choose **not** to store their children's baby teeth?

..... [1]

(d) Read the following sentences about twins.

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

	T or **F**
identical twins are clones	
identical twins are produced asexually	
identical twins can appear different due to environmental factors	
identical twins occur when the cells of an embryo separate	

[2]

[Total: 8]

8 When Janet had a throat infection caused by bacteria the doctor gave her antibiotics.

Janet is now suffering from influenza, which is caused by a virus.

The doctor will not give her antibiotics for influenza.

(a) Explain why the doctor gave Janet antibiotics for a throat infection but will not give her antibiotics for influenza.

.....

.....

..... [2]

(b) John does not want to catch influenza.

He goes to the doctor for a vaccination to help prevent him catching this disease.

John had an influenza vaccination last year.

(i) Explain why John needs to have a vaccination against influenza this year, even though he had one last year.

.....

..... [1]

(ii) State the name of the chemicals that are produced in the body following a vaccination.

..... [1]

(c) In 2009, there was an outbreak of influenza caused by a new microorganism called H1N1.

This new type of influenza spread quickly around the world.

Scientists developed a vaccine against H1N1 to help stop the spread of the disease.

New vaccines must be tested before they can be used.

Suggest why a new vaccine must be tested.

.....

.....

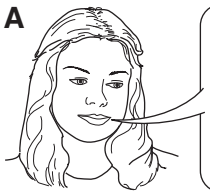
..... [1]

(d) Abi is pregnant. Her doctor recommends that she should have the vacc… against H1N1.

Abi is not sure whether she should have the vaccination or not.

She talks to her friends and asks their opinions.

A

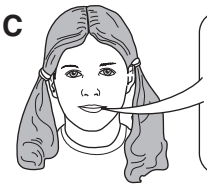


The vaccine has been developed very quickly and has not been tested as thoroughly as other vaccines.

B

When you are pregnant, your immune system is weakened and you are not able to fight off infections as easily.

C

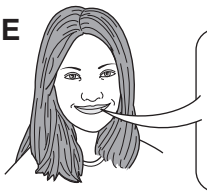


The vaccination protects against H1N1 and does not cause any damage to the baby.

D

It is important for a pregnant woman to make the right decision for both her and her baby.

E



Having the vaccination really hurts and your arm can be very sore for a few days afterwards.

Complete the table by writing the letters **A**, **B**, **C**, **D** and **E** in the correct columns.

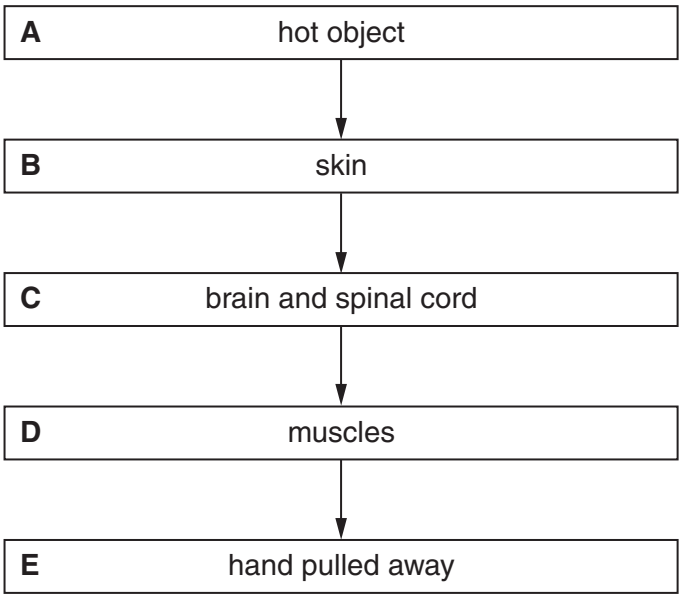
Each letter can be used once only.

friends who give reasons to have the vaccination	friends who give reasons **not** to have the vaccination	friends whose comments do not support either argument

[2]

[Total: 7]

9 Look at the flow diagram. This shows an example of nervous communication.



(a) Which **one** of the boxes, **A**, **B**, **C**, **D** or **E**, represents

(i) the central nervous system, ... [1]

(ii) the stimulus, ... [1]

(iii) the effector cells, ... [1]

(iv) the sensor (receptor) cells? ..... [1]

(b) Communication can be hormonal as well as nervous.

Give **one** example of hormonal communication.

.....

..... [1]

[Total: 5]

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