OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION
APPLIED SCIENCE: DOUBLE AWARD

J649
B482/02

Unit 2: Science for the needs of society
(Higher Tier)

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)

Thursday 15 January 2009
Afternoon

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- 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.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

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 **60**.
- The marks allocated and the spaces provided are a good indication of the length of answers required.
- This document consists of **16** pages. Any blank pages are indicated.

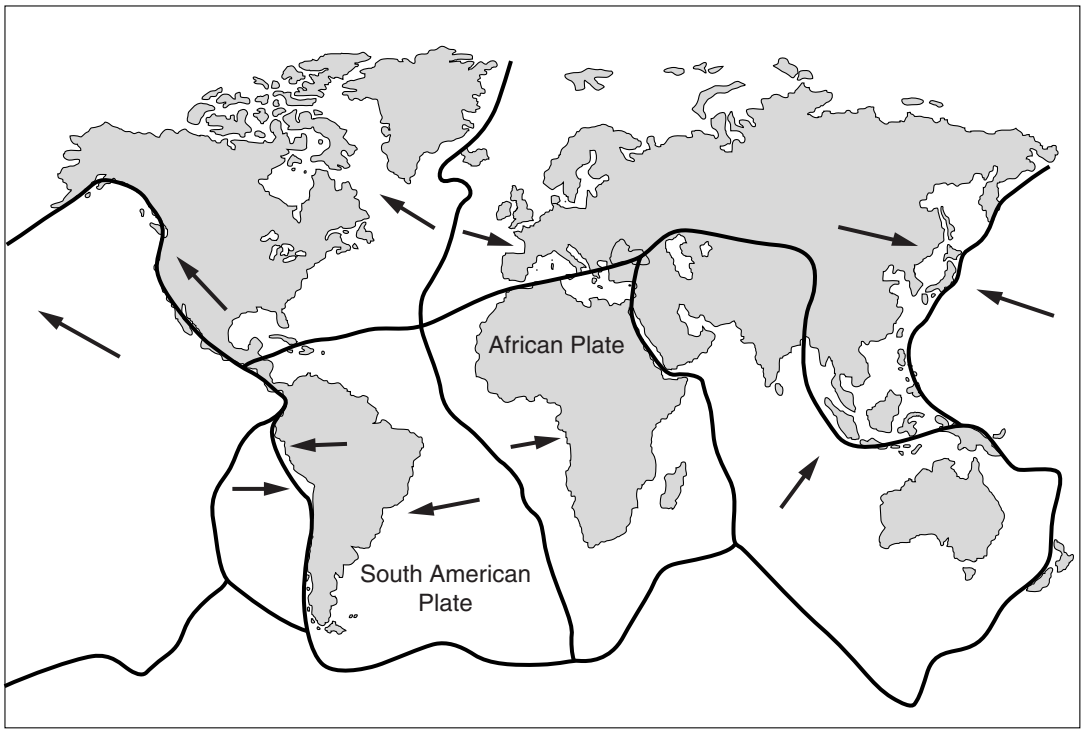
FOR EXAMINER'S USE		
Qu.	**Max.**	**Mark**
1	**10**	
2	**10**	
3	**9**	
4	**13**	
5	**9**	
6	**9**	
TOTAL	**60**	

Answer **all** the questions.

1 Scientists study the Earth to try and predict earthquakes.

They know that the surface of the Earth is made up of plates. The plates move.

The arrows on the map show which direction each plate is moving.



(a) What are these type of plates called?

Put a (ring) around your answer.

ceramic **geographic** **magnetic** **oceanic** **tectonic**

[1]

(b) Scientists believe many earthquakes are caused by the movement of the plates.

(i) Put an **X** on the map to show a likely place for an earthquake caused by movement of the plates. **[1]**

(ii) To make predictions about earthquakes scientists measure the movement of the plates.

Describe how scientists measure the movement of plates.

.....

.....

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

(c) Scientists made the following observations at three different plate boundaries

A plates moving apart

B plates moving along in same direction

C plates moving past each other in opposite directions

(i) At which place are new rocks likely to form?

Choose from **A**, **B** or **C**.

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

(ii) Which place is least likely to have had a big earthquake?

Choose from **A**, **B** or **C**.

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

(d) The movement of the plates causes other changes in the Earth as well as earthquakes.

(i) Put a tick (✓) in the boxes next to the **two** correct changes.

mountain formation	☐
drought	☐
volcanoes	☐
melting icecaps	☐
mountain erosion	☐

[2]

(ii) South America and Africa are moving apart.

Explain why.

.....

.....

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

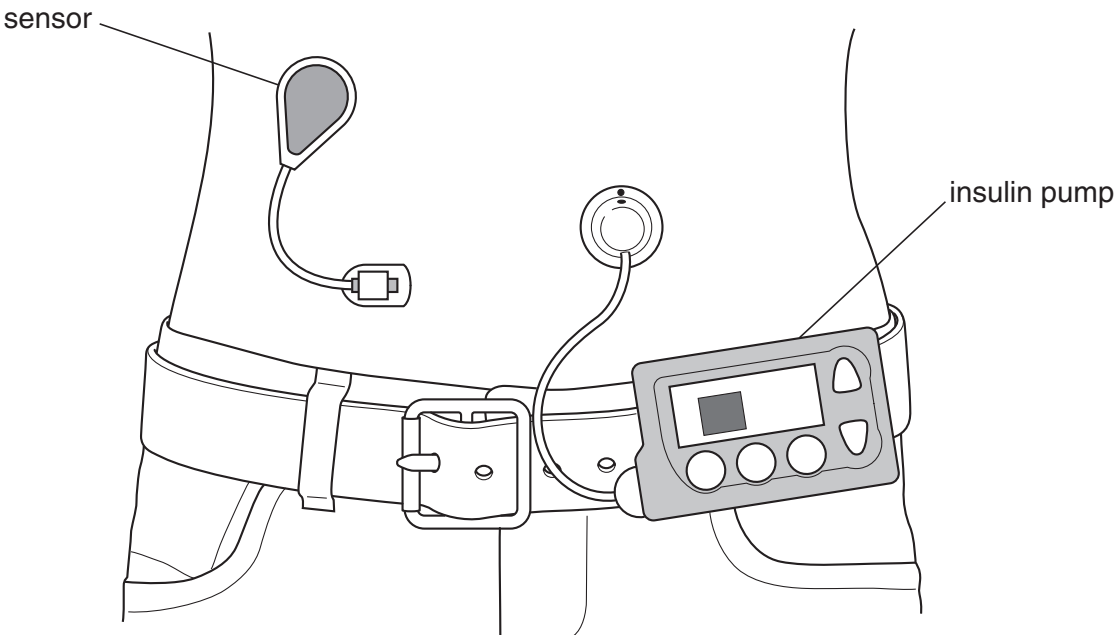
[Total: 10]

2 People with diabetes do not produce enough insulin.

A new device has been developed for people with type 1 diabetes.

The device works in three stages.

1. A sensor tests a drop of blood.
2. A mini-computer works out how much insulin the body needs.
3. The correct dose of insulin is pumped into the blood.



(a) The sensor tests the blood so that the correct dose of insulin can be worked out.

(i) What substance does the sensor test the blood for?

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

(ii) Explain why it is necessary for people with diabetes to test their blood for this substance.

.....

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

(iii) Many people with diabetes have blood test kits to test their own blood.

They can also inject themselves with doses of insulin.

Give **two** reasons that these people may think that the new device is better.

.....

.....

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

(b) (i) The new device does the job of an organ in the human body.

Which organ?

Put a (ring) around the correct answer.

heart **kidney** **liver** **pancreas**

[1]

(ii) Insulin is transported around the body in the blood.

Which part of the blood transports insulin?

Put a (ring) around the correct answer.

plasma **platelets** **red blood cells** **white blood cells**

[1]

(iii) The changes that insulin causes in the body happen more slowly than those that are caused by the nervous system.

Why is this?

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

Nerve impulses are carried by red blood cells. ☐

Insulin is carried in the blood. ☐

Nerve impulses pass through the spinal cord. ☐

Blood travels more slowly than nerve impulses. ☐

The brain does not control nerve impulses. ☐

[2]

(c) Some types of diabetes can be controlled without taking insulin.

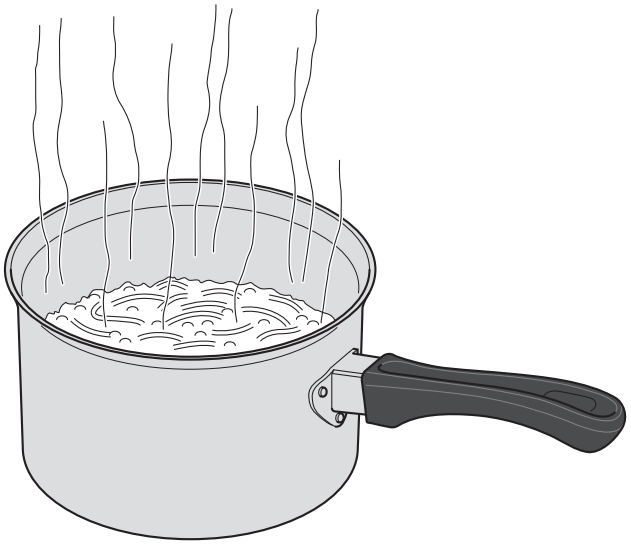
Explain how.

.....

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

[Total: 10]

3 Helen is using a saucepan to cook some spaghetti.



The saucepan is made of metal and plastic.

(a) The handle is made of a thermosetting plastic.

Write down **two** properties of a thermosetting plastic which makes it useful as a saucepan handle.

.....

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

(b) Helen starts by boiling some water.

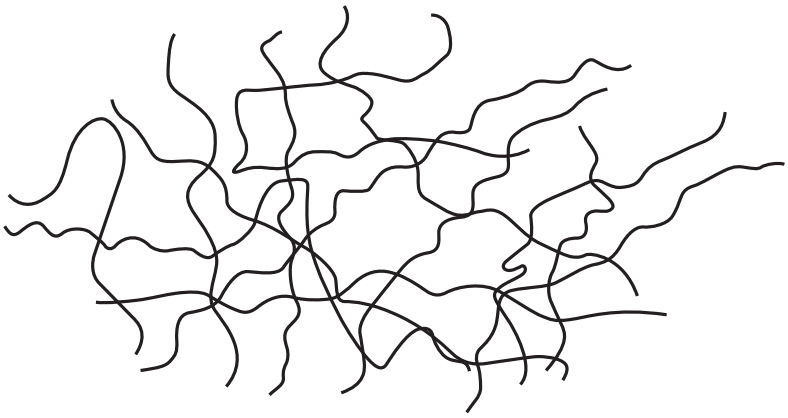
The bonds between the atoms in water molecules are covalent bonds.

Explain what is meant by a **covalent bond**.

.....

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

(c) Helen thinks you can use cooked spaghetti as a model for the structure of polymers.



She says that spaghetti is made of long thin strands.

The strands can easily slide past each other.

(i) What does the spaghetti in Helen's model represent?

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

(ii) Helen's model is a good model for thermoplastic polymers but not for thermosetting polymers.

Explain why.

.....

.....

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

(d) Metals are good conductors of electricity.

Explain how the metallic bonding of a metal makes it a good **electrical** conductor.

Your answer should include:

- a description of metallic bonding
- how this type of bonding makes the metal a good electrical conductor.

.....

.....

.....

.....

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

[Total: 9]

4 The government is thinking about building new nuclear power stations.

(a) Nuclear power stations are used to produce electricity for homes and industry.

At present most electricity is produced by burning fossil fuels.

A major advantage of nuclear power stations is that large amounts of energy are produced from small amounts of fuel.

(i) Suggest another **advantage** of using nuclear fuels.

.....

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

(ii) Many people oppose the idea of using nuclear fuels in power stations.

Suggest two **disadvantages** of using nuclear fuels.

1. .....

.....

2. .....

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

(b) Nuclear fuel is a non-renewable fuel.

Explain what is meant by 'non-renewable'.

.....

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

(c) Electricity is passed from the power stations to homes and industry by the National Grid.

Describe how the National Grid passes electricity to homes and industry.

.....

.....

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

(d) **(i)** Write down the formula connecting power, voltage and current.

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

(ii) A nuclear power station produces 200 000 000 watts.

A voltage used by the National Grid is 400 000 volts.

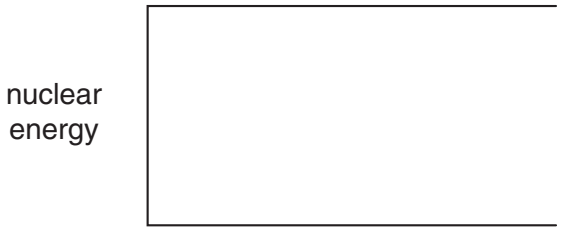
Calculate the current produced at this voltage.

current = ... amps **[2]**

(e) The total energy input from nuclear fuel is 2.5 times greater than the electrical energy output by the power station.

The rest of the energy is lost.

(i) Complete the Sankey diagram to show the energy changes in the nuclear power station.



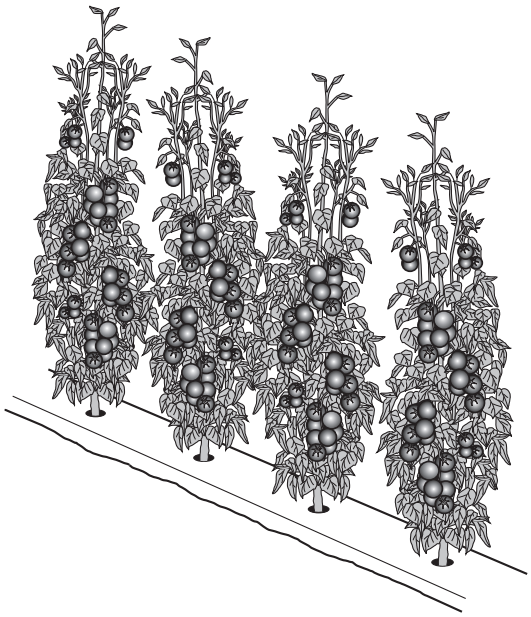
[3]

(ii) What is the efficiency of the power station?

efficiency = ... **[1]**

[Total: 13]

5 Some tomato plants are grown by a system called hydroponics. The plant roots are in water, not soil. Nutrient minerals are added to the water.



(a) Minerals needed for growth are added to the water.

Complete the table below by using words from the list.

magnesium

mercury

nitrate

phosphate

potassium

used for	mineral
making proteins	
making chlorophyll	
growing roots	

[3]

(b) Cell division is involved in plant growth.

(i) What type of cell division takes place in plant growth?

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

(ii) How many cells are produced by each single cell in this type of cell division?

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

(c) Photosynthesis produces glucose that plants need for growth.

Complete the word equation **and** the balanced symbol equation for photosynthesis.

carbon dioxide + water → glucose + ……

…… …… + …… …… → $C_6H_{12}O_6$ + …… ……

[3]

(d) In the plant, glucose is converted into starch for storage.

Why is starch better than glucose for storage?

.....

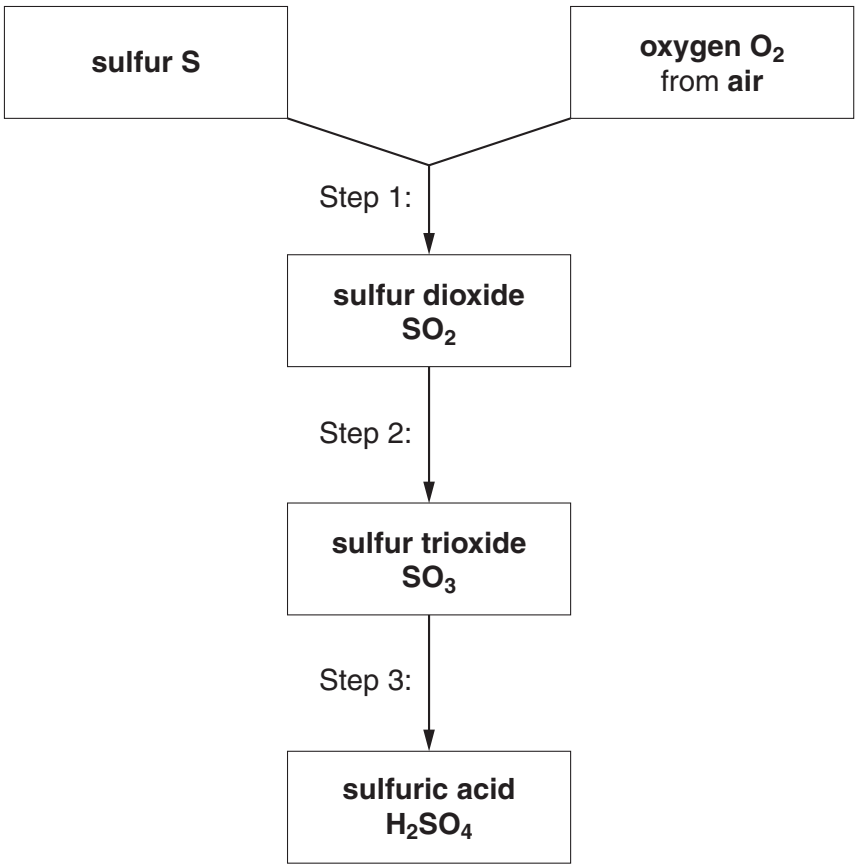
..... **[1]**

[Total: 9]

6 This information comes from a website about sulfuric acid.

Almost 2 million tonnes of sulfuric acid are made in the UK every year. Sulfuric acid is used to make products such as fertilisers, dyes, paints and detergents.

The flow chart shows how sulfuric acid is manufactured.



(a) Use the substances shown in **bold** in the flow chart to answer the following questions.

(i) Write down the names of two substances that are **elements**.

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

(ii) Write down the names of two substances that are **compounds**.

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

(iii) Write down the name of one substance that is a **mixture**.

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

(b) In **step 2**, sulfur trioxide is made from sulfur dioxide.

(i) Complete and balance the equation for step 2 by filling in the gaps.

$$\ldots\ldots\ldots SO_2 + \ldots\ldots\ldots\ldots\ldots \rightarrow 2SO_3$$

[2]

(ii) What type of chemical reaction happens in step 2?

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

(iii) In step 2, the gases are put under pressure to increase their concentration.

Explain the effect this will have on the rate of the reaction.

Use ideas about colliding particles in your answer.

.....

.....

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

(c) Look at the list of products of sulfuric acid given in the information above the flow chart.

Name one sulfuric acid product that is manufactured as a **fine** chemical.

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

[Total: 9]

END OF QUESTION PAPER

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