

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**  
**APPLIED SCIENCE: DOUBLE AWARD**

Unit 2: Science for the needs of society  
 HIGHER TIER

**FRIDAY 18 JANUARY 2008**

Afternoon  
 Time: 1 hour

Candidates answer on the question paper  
**Additional materials (enclosed):** None

**Additional materials (required):**  
 Pencil  
 Ruler (cm/mm)  
 Calculator



\* C O P / T 4 5 3 2 6 \*

Candidate Forename

Candidate Surname

Centre Number

Candidate Number

**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question 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 for your answers are a good indication of the length of answers required.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	8	
2	10	
3	11	
4	10	
5	8	
6	13	
<b>TOTAL</b>	<b>60</b>	

This document consists of **14** printed pages and **2** blank pages.

Answer **all** the questions.

- 1 An advert for a new type of non-drip ice lolly says that the lolly does not drip when it melts.



The ice lolly is made from a gel made from locust bean gum (a solid) and sugar solution.

- (a) Which of the following words best describes a gel?

Put a **ring** around the correct answer.

**element**      **composite**      **compound**      **mixture**

[1]

- (b) (i) Complete the table to show the structure of the gel in the non-drip ice lolly.

Choose from these words.

**gas**      **liquid**      **solid**      **solvent**      **sugar**

	<b>continuous phase</b>	<b>dispersed phase</b>
gel		

[2]

- (ii) Ice cream is made by freezing a colloid with the following structure.

<b>continuous phase</b>	<b>dispersed phase</b>
liquid	gas

What is the name for this type of colloid?

Put a **ring** around the correct answer.

**aerosol**      **foam**      **sol**      **suspension**

[1]

(c) The ice lolly contains sugar solution.

What does the word **solution** mean?

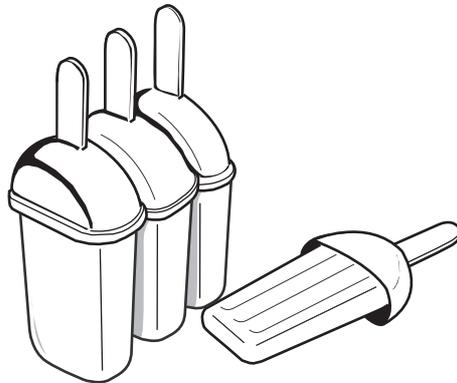
.....  
..... [1]

(d) The company that makes the lollies wants to make a new version that would be suitable for diabetics.

How could the ingredients in the lolly be changed to make it more suitable for diabetics?

..... [1]

(e) The gel lollies are made by freezing the gel in moulds made from poly(ethene).



(i) One reason for using poly(ethene) to make ice lolly moulds is that it is easily shaped.

State **one other** property that makes poly(ethene) a good material for making ice lolly moulds.

..... [1]

(ii) Suggest a reason why poly(ethene) is **not** suitable to use as a container for **hot** foods.

..... [1]

[Total: 8]

2 John has received a report about the cost of home improvements and how they could save him money.

The home improvements all result in less energy being used.

improvement	cost (£)	annual saving (£)	payback time (years)
double glaze all windows	4000.00	69.34	20+
fit low energy light bulbs	100.00	35.79	3
put a thermostat on the hot water tank	114.00	19.95	6
install thick layers of fibreglass in loft	274.00	17.32	16
fit draught proofing	20.00	13.26	2

(a) (i) Give **two** improvements that involve insulation.

1. ....
2. .... [1]

(ii) Explain what is meant by insulation.

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

(b) Energy can be transferred by conduction, convection and radiation.

The layers of fibreglass in the loft reduce energy transfer by conduction and convection.

Complete the following sentences.

Choose words from the list.

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

- gases      foam      heat      liquids      solids**

Conduction transfers heat through .....

The spaces in the fibreglass are filled with ..... which reduces conduction.

Above the fibreglass, heat is transferred by convection currents in ..... [3]

(c) (i) Explain what is meant by the final column 'payback time'.

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

(ii) Another way for John to reduce his costs is to fit a timer to the heater in his hot water tank.

This would cost £115.50 to fit.

It would give John a saving of £10.50 each year.

Calculate the payback time.

You must show your working.

payback time = ..... years [2]

(d) After looking at the information in the table, John decides not to double glaze his windows.

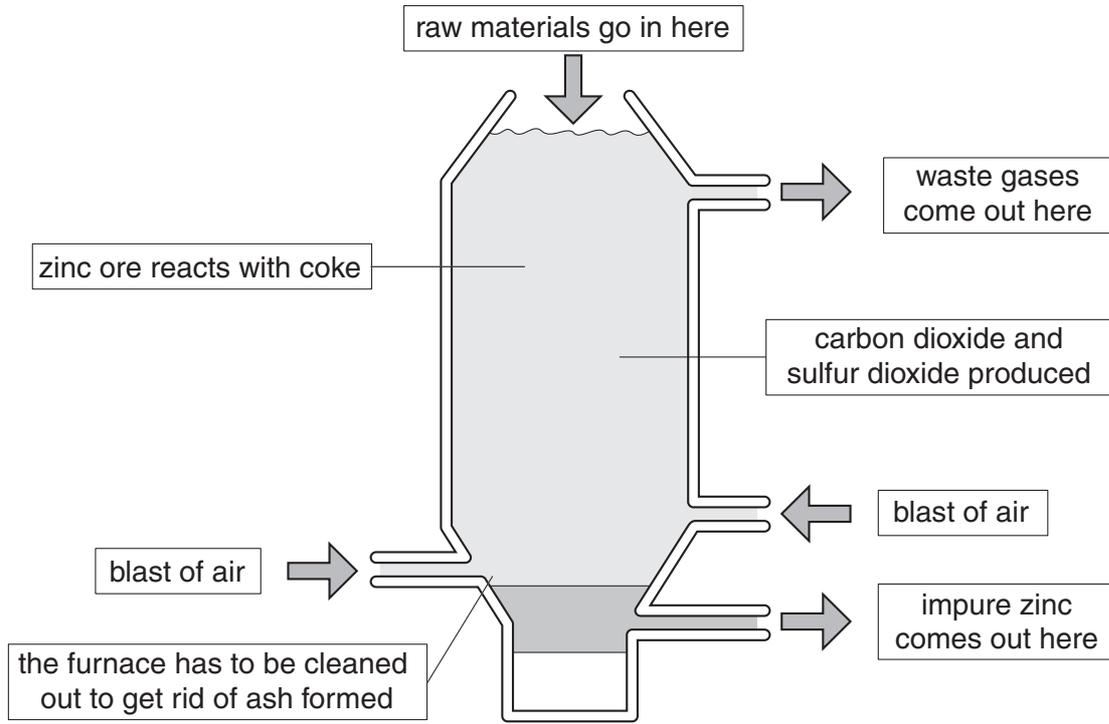
Suggest **two** reasons why John did **not** double glaze his windows.

reason 1 .....  
.....  
reason 2 .....  
..... [2]

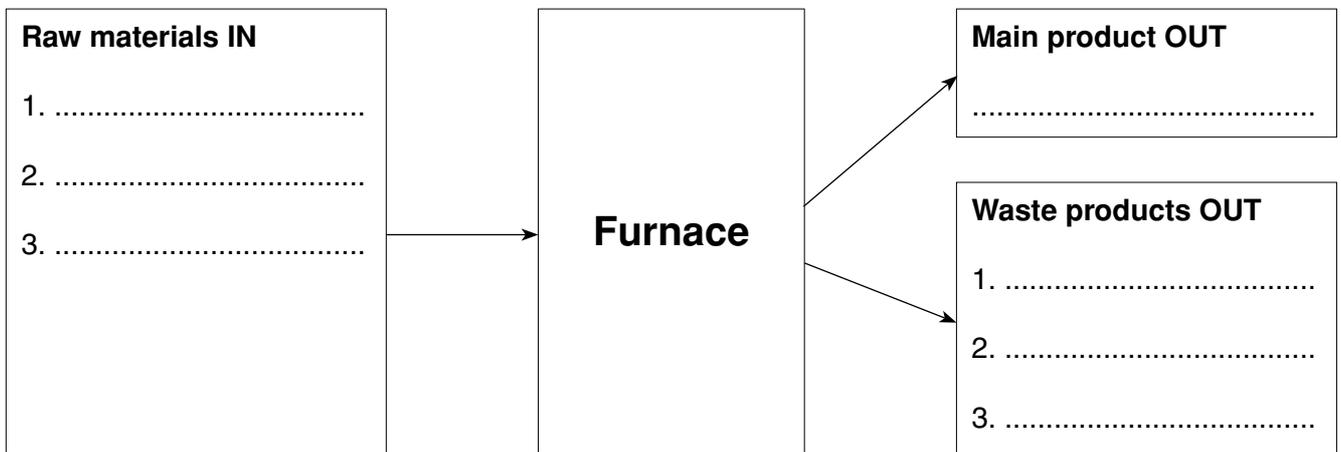
[Total: 10]

3 Some coins contain zinc.

Zinc ore is mixed with coke and heated in a furnace to make zinc.



(a) Complete the flow chart.

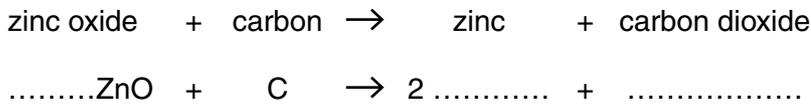


[4]

(b) The reaction in the furnace happens in several stages.

One reaction makes zinc from zinc oxide and carbon (from the coke).

This equation shows the reaction.



Complete and balance the equation by filling in the gaps. [2]

(c) Some coins are made from an alloy of zinc and copper

coin	metal	relative size of atom	percentage of metal in coin
	copper	10	80
	zinc	8	20

(i) Put a tick (✓) in the correct box to show which diagram shows the atoms in this coin.

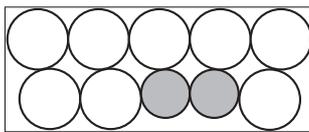


Diagram 1

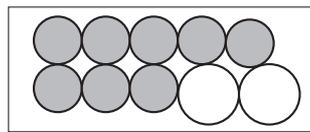


Diagram 2

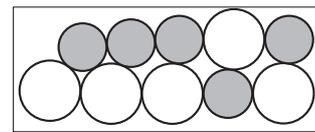


Diagram 3

[1]

(ii) Explain your reasoning.

.....  
 .....

[1]

(iii) The coins are made from an alloy because they need to be very hard.

Why do coins need to be hard?

..... [1]

(iv) Explain how the arrangement of the particles in the alloy makes it harder than either pure zinc or pure copper.

.....  
 .....  
 .....

[2]

[Total: 11]

4 Amy works for the Department for Environment, Food and Rural Affairs (Defra).

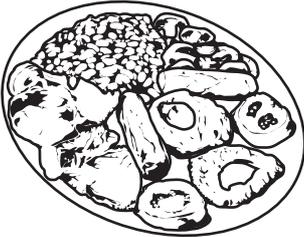
She is giving a presentation on farming methods.

(a) These are her slides for the presentation.

For each slide she will be talking about the differences between intensive and organic farming. For each slide write some notes on what she could say.

One has been done for you.

slide 1



production of food

We need to produce more food.

Intensive farming is more productive than organic farming.



cost

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



effects on the environment

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



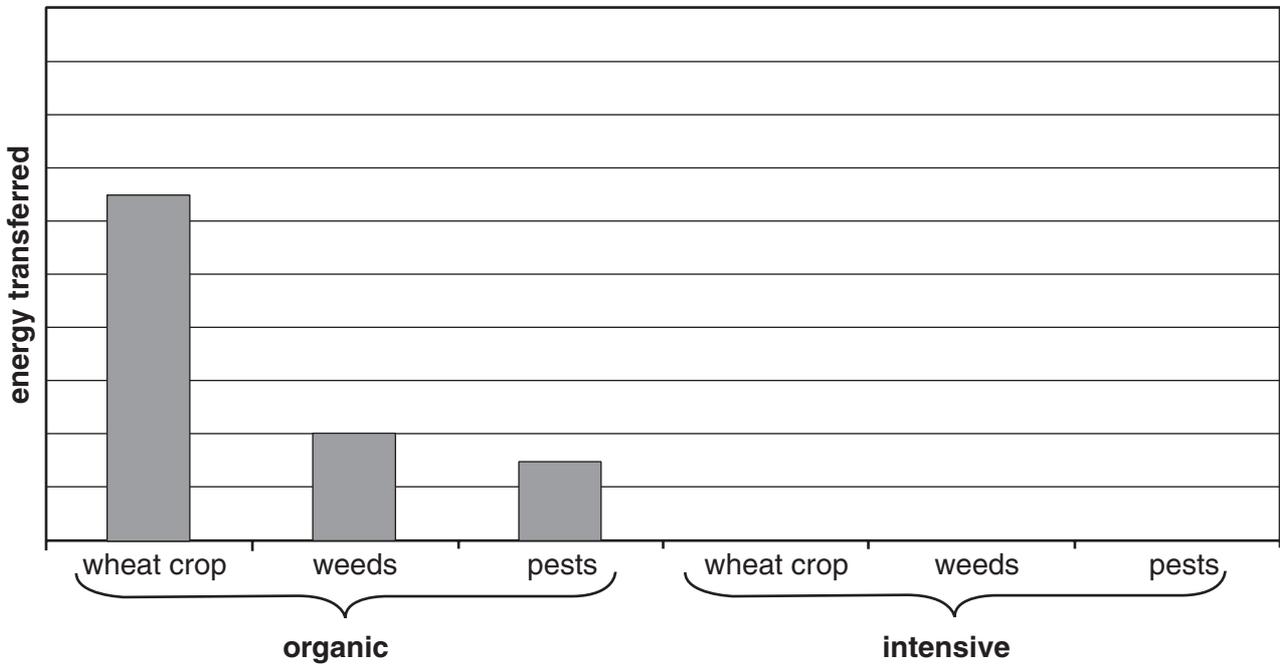
animal welfare

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

(b) Amy has a bar chart to illustrate how energy is transferred in a field of wheat for both types of farming.

The bars for the organic farm are shown.

Draw the bars to show how it might look for the intensive farm.



[2]

(c) Amy ends her presentation with a warning.

“Sometimes innovations used for intensive farming can cause unexpected harm.”

Describe how Amy could use **either** DDT **or** BSE as her example.

.....

.....

..... [2]

[Total: 10]

- 5 (a) In the past there were many theories to explain the features of the Earth's surface.

One theory stated that the Earth was cooling and shrinking.

This shrinking caused the thin solid crust of the Earth to wrinkle up.

Which of the following pieces of evidence support this theory?

Put a tick (✓) in the **three** correct boxes.

Mountains can be formed when the Earth's crust folds up.

Fossils of the same freshwater crocodile species have been found in South America and South Africa.

The same sequences of rock types can be found in South America and Africa.

Many earthquakes are caused by the rocks pushing against each other.

The centre of the Earth is hotter than the surface of the Earth.

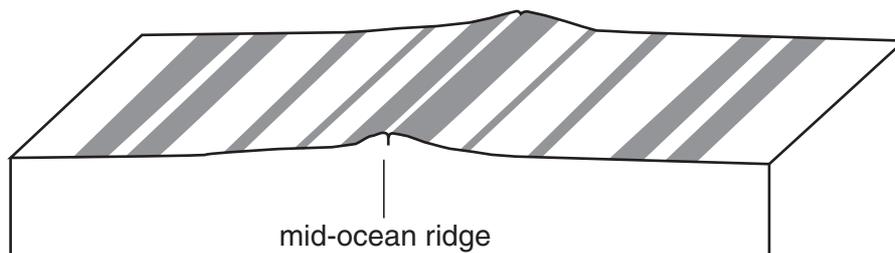
The coast of South America fits like a jigsaw with the coast of Africa.

[3]

- (b) Another early theory was Wegener's theory of continental drift.

In the 1960s, new evidence was found to support this theory.

The diagram shows two plates moving apart as new rocks are formed at the mid-ocean ridge.



- (i) On the diagram, put an **X** where you would expect to find the youngest rocks.

[1]

(ii) The rocks of the ocean floor show patterns of magnetism.

The patterns are shown in the diagram.

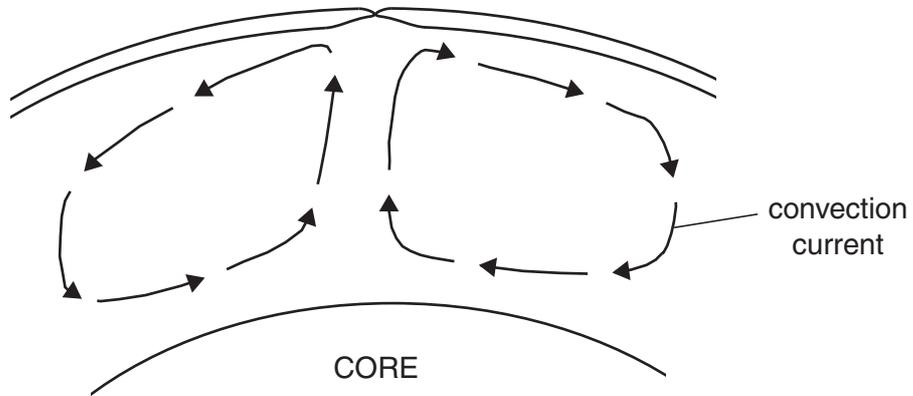
The patterns provide evidence for the theory of moving tectonic plates.

How does the pattern in the rocks support the idea of movement of the tectonic plates?

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

(c) One problem with Wegener's theory was that he could not explain how the continents moved.

A modern theory suggests that the plates are pushed apart by convection currents.



The convection currents transfer heat from the core to the surface.

Use ideas about particles and density to explain how convection currents happen.

.....  
.....  
..... [3]

[Total: 8]

6 Sue is a researcher for a Member of Parliament (MP).

The MP is very worried about the spread of MRSA in hospitals.

MRSA is resistant to many antibiotics.

Sue has been asked to produce a report on the disease.

(a) Complete the following two sentences.

(i) Antibiotics are used to treat some diseases caused by ..... [1]

(ii) Antibiotics are not effective in treating infectious diseases caused by ..... [1]

(iii) Sometimes a course of antibiotics is given when they do not affect the microorganisms causing the disease.

Which of the following gives the **best** reason for this?

Put a tick (✓) in the correct box.

to stimulate the production of antibodies

because it might affect the disease microorganisms

to treat secondary infections

to heal any cuts in the skin

because drugs alter the patient's mood

[1]

(b) Sue discovers that scientists think MRSA developed its resistance to antibiotics by **natural selection**.

Explain how MRSA might have developed its resistance to antibiotics.

.....

.....

.....

..... [3]

(c) People with an MRSA infection can suffer from a very high temperature and from liquid in the lungs.

(i) Describe how the human body normally controls its temperature.

Your answer should include:

- how the body temperature is monitored
- an example of a temperature control mechanism and its effect.

.....  
.....  
.....  
..... [3]

(ii) The human body's mechanism for controlling body temperature is an example of homeostasis.

What is meant by homeostasis?

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

(iii) When there is too much liquid in the lungs, less gaseous exchange takes place.

This results in an increase in the breathing rate.

Explain how the change in breathing rate is brought about.

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

[Total: 13]

**END OF QUESTION PAPER**

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