

General Certificate of Secondary Education
APPLIED SCIENCE: DOUBLE AWARD

Science for the needs of society

HIGHER TIER

FRIDAY 19 JANUARY 2007

Candidates answer on the question paper.

Calculators may be used.

Additional materials: Pencil
Ruler (cm/mm)

H **1497**
4882/02

Afternoon

Time: 1 hour 30 minutes



Candidate
Name

Centre
Number

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Candidate
Number

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INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED.**
ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- 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	11	
2	13	
3	12	
4	12	
5	10	
6	12	
TOTAL	70	

This document consists of **18** printed pages and **2** blank pages.

Answer **all** the questions.

1 Jake works in a laboratory where blood tests are done.

To work in the lab, he must be vaccinated against different types of diseases.



(a) Explain how vaccination works.

The following words may help you.

antibody **antigen** **vaccine**

.....

.....

.....

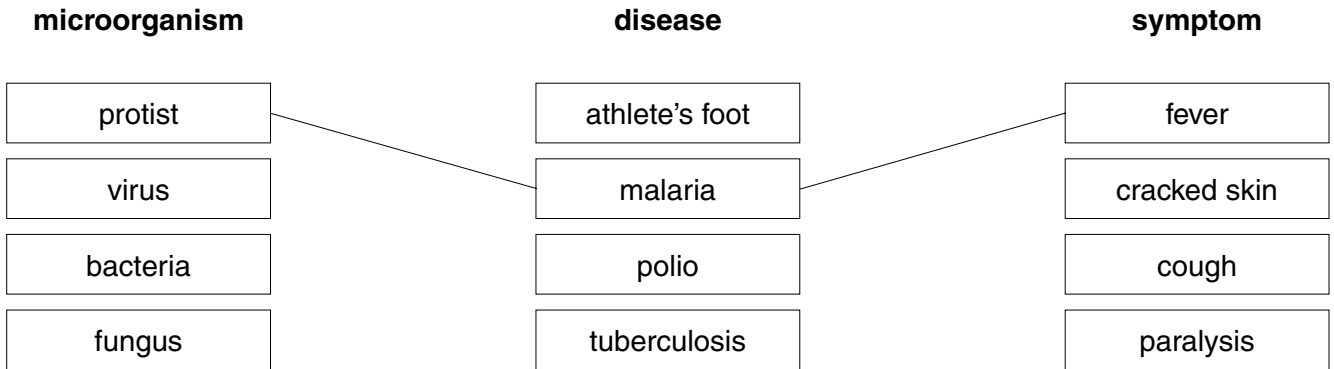
..... [3]

(b) Jake studies the effects of different diseases.

He knows that different diseases are caused by different microorganisms.

Draw a straight line linking the **microorganism** with the correct **disease** and the disease with the correct **symptom**.

One has been done for you.



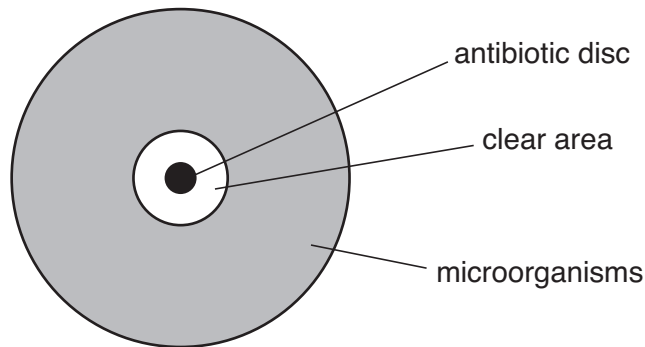
[4]

(c) Jake is carrying out a test in the lab.

He places an antibiotic disc in the centre of agar jelly in a Petri dish.

He then grows some microorganisms on the agar jelly in the dish.

This is what he sees.



Suggest what type of microorganism Jake is growing.

Explain your answer.

.....

.....

..... [2]

(d) Write down **two** simple ways in which Jake could stop the spread of microorganisms in his everyday life.

1.

.....

2.

..... [2]

[Total: 11]

2 Drilling rigs extract oil and gas from under the North Sea.



(a) Oil and gas are fossil fuels.

Which **two** of the following statements best describe fossil fuels?

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

always black in colour

useful source of energy

supplies are limited

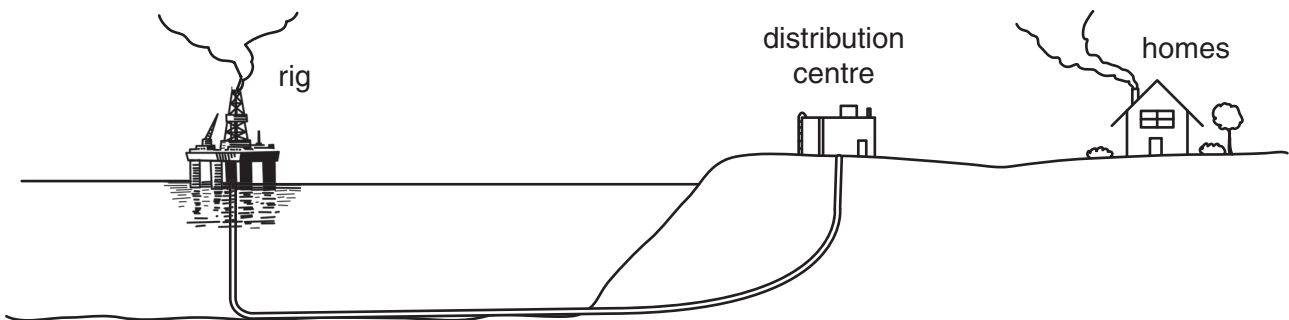
they are all renewable

they do not contribute to global warming

[2]

(b) The gas from the rig is pumped to a distribution centre.

It is then sent to homes, offices and factories.



(i) Is there any change to the chemical energy stored in the gas as it is piped between the rig and the distribution centre?

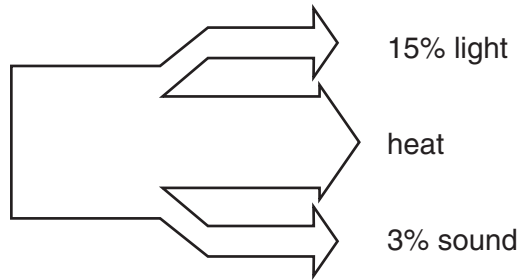
Explain your answer.

.....

..... [2]

(ii) When the gas arrives in people's homes, it is burnt.

The diagram shows what happens to the chemical energy in the gas.



Calculate the percentage (%) of the energy that is used as heat.

Show your working.

.....% [2]

(iii) The energy used to heat the house cannot be used again.

Explain why we cannot keep using this heat energy over and over again.

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

(iv) In what form is most of the energy **lost** from the house?

..... [1]

(c) Modern homes use condensing gas boilers.

They are much more efficient than older types of boiler.

Which **two** of the following statements best describes why these boilers are more efficient?

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

- more chemical energy in the gas is converted to useful heat energy
- the gas contains more chemical energy
- the gas burns at a lower temperature
- the burning gas has a brighter flame
- much less heat energy is lost into the atmosphere

[2]

(d) When fossil fuels are burnt carbon dioxide gas is produced.

This is released into the atmosphere.

Write about what effect this is having on the Earth.

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

(e) As fossil fuels run out more nuclear fuel could be used.

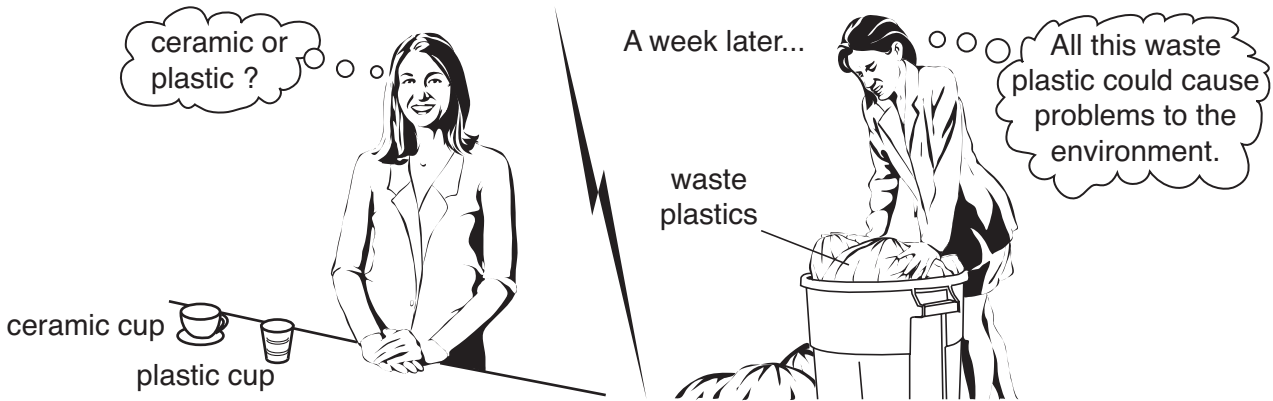
State whether nuclear fuel is a renewable form of energy.

Give a reason.

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

[Total: 13]

- 3 Rose runs a coffee shop. She sells coffee in ceramic cups.
She decides to start to use throw-away plastic cups instead.



- (a) Write down **two advantages**, other than cost, of using plastic coffee cups.

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

- (b) What problems to the environment do waste plastics cause?

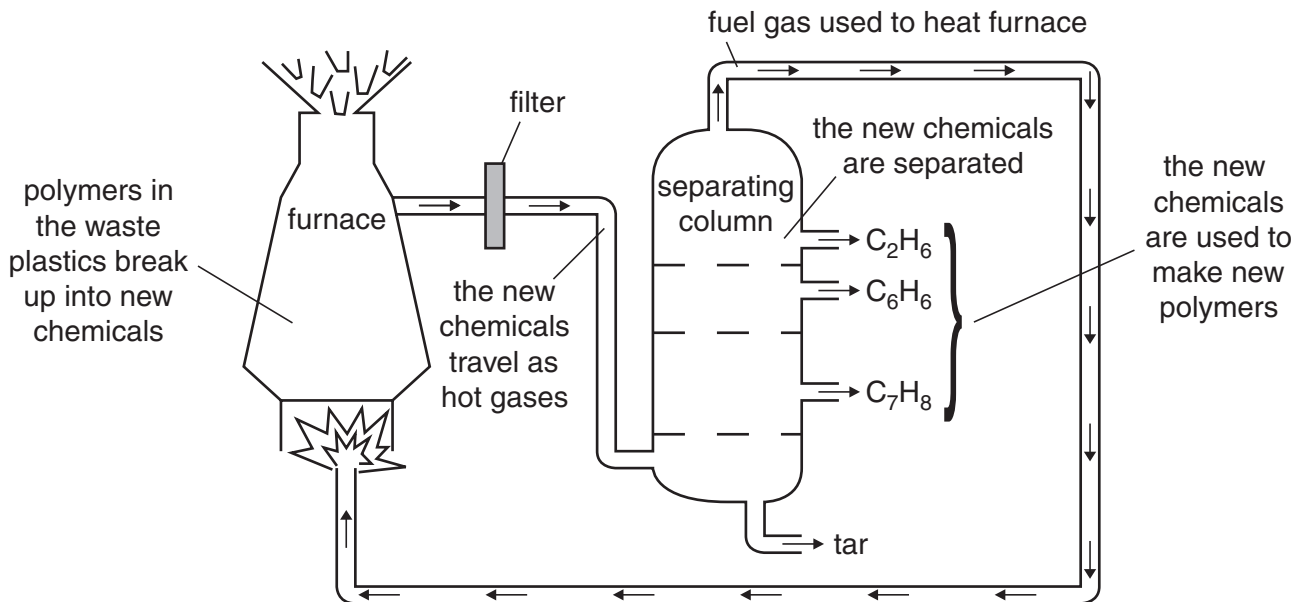
.....
.....
..... [2]

(c) Rose decides to find out what happens to waste plastics.

She finds a website that shows a recycling process for waste plastics.

The process breaks down the polymers in the plastics into new chemicals.

These new chemicals can be used to make new polymers.



(i) Suggest why the gases coming out of the furnace must be filtered.

..... [1]

(ii) What is the name for the process that happens in the separating column?

Put a (ring) around the best answer.

evaporation **fractional distillation** **polymerisation** **reduction** [1]

(iii) Put an **X** on the separating column to show where the temperature is the highest. [1]

(d) What type of chemicals are made by this process?

(i) Put a (ring) around the best answer.

ionic **inorganic** **organic** [1]

(ii) Explain how you can tell.

..... [1]

(e) The process makes fuel gases.

The furnace is heated using fuel gases from the separating column instead of using crude oil.

Using fuel gases makes the process cheaper and is better for the environment.

Explain why.

.....

.....

.....

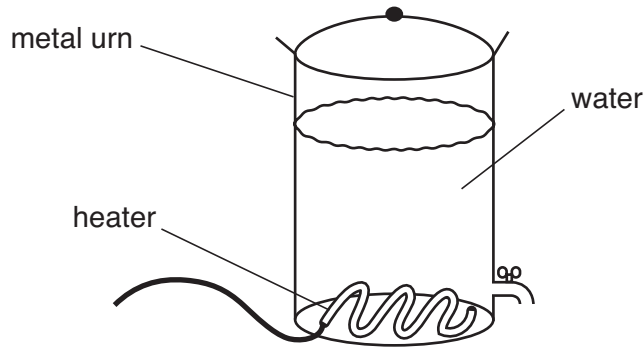
..... [3]

[Total: 12]

11
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4 Liz works in a canteen.
 She uses hot water to make tea and coffee.
 She heats the water in an old metal urn.
 The heater is at the bottom of the urn.



(a) Explain how the energy from the heater warms **all** the water in the urn.

.....

 [2]

(b) The urn is used for 8 hours a day.

The heater in the urn has a power of 2000W.

(i) Calculate the total energy (in kWh) used by the urn per day.

..... kWh [2]

(ii) Calculate the cost of running the urn for 5 days.

(1 kWh of electricity costs 9p)

cost [1]

(c) The heater has a power rating of 2000W. The mains voltage is 230V.

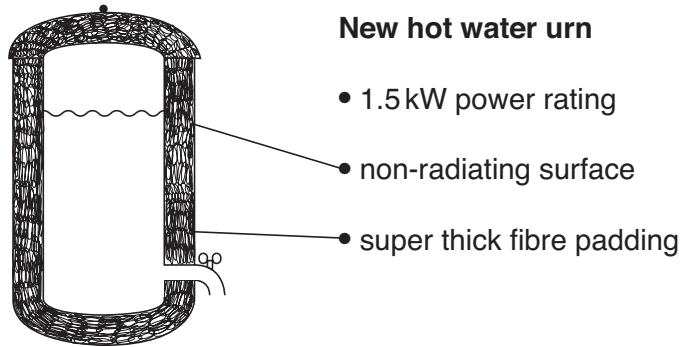
(i) Write down the formula that links power, voltage and current.

[1]

(ii) Calculate the current in the heater when the urn is being used.

current [3]

(d) Liz sees an advert for a new urn.



Explain why this new urn will cost less to run than the old urn.

.....

.....

.....

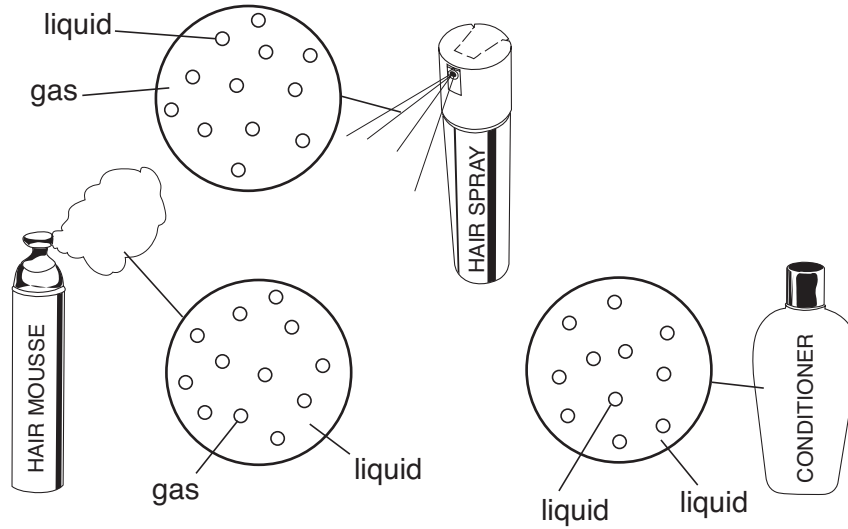
..... [3]

[Total: 12]

5 Julia is training to be a hairdresser.

Julia visits a factory that makes hair products.

These are some of the hair products that the factory makes.



(a) Complete the table to show what each hair product contains.

Use the diagram to help you.

hair product	continuous phase	dispersed phase
conditioner	liquid	liquid
hair mousse		
hair spray		

[2]

(b) Conditioner is a type of mixture called an emulsion.

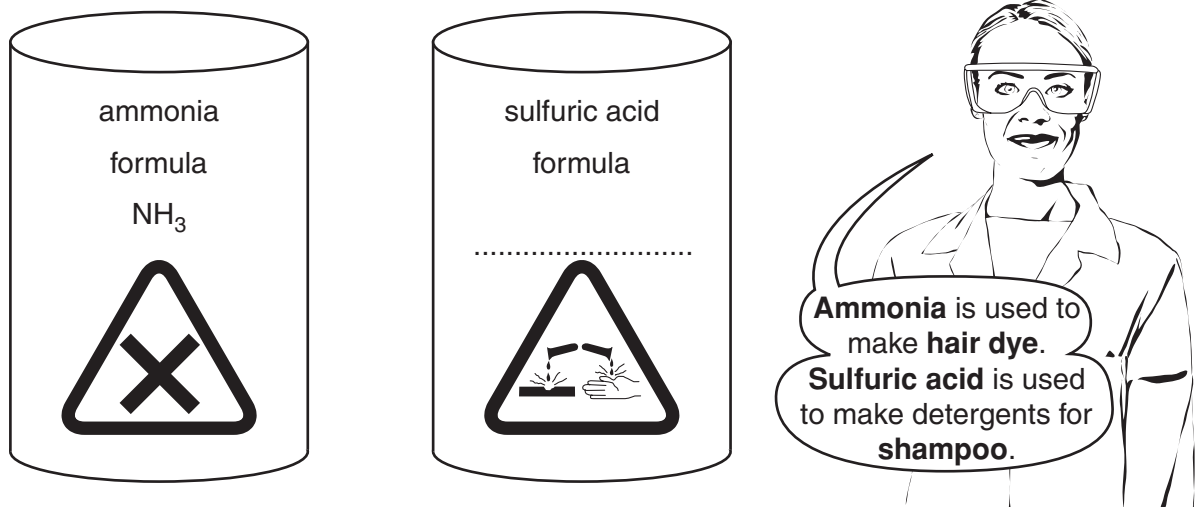
(i) What type of mixture is hair spray?

..... [1]

(ii) What type of mixture is hair mousse?

..... [1]

(c) One of the factory workers shows Julia some of the raw materials that the factory uses.



Fill in the missing **formula** on the container of sulfuric acid. [1]

(d) Ammonia and sulfuric acid are manufactured as **bulk chemicals**.

Hair dye is manufactured as a **fine chemical**.

(i) How are **bulk** chemicals different from **fine** chemicals?

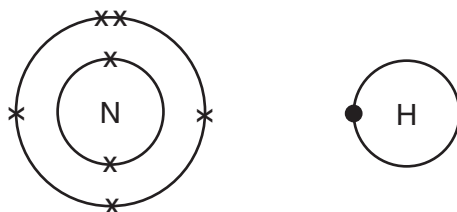
..... [1]

(ii) Give a reason why hair dye is manufactured as a fine chemical.

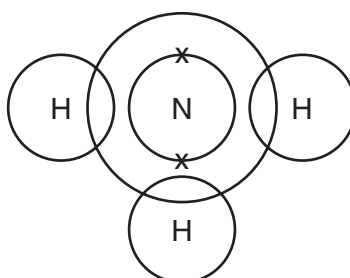
.....
 [1]

- (e) The formula for ammonia is NH_3 .

The diagrams show the arrangement of electrons in a nitrogen and a hydrogen atom.



- (i) Complete the diagram below to show the arrangement of electrons in an ammonia molecule.



[2]

- (ii) What particles, other than electrons, are in each atom of nitrogen?

..... and [1]

[Total: 10]

17
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6 Steve is a farmer.

He grows his crops using intensive farming methods.

(a) Which **two** of the following statements best describe intensive farming?

Put a tick (✓) next to the **two** best answers.

uses more land to grow more crops

uses more labour to harvest the crops

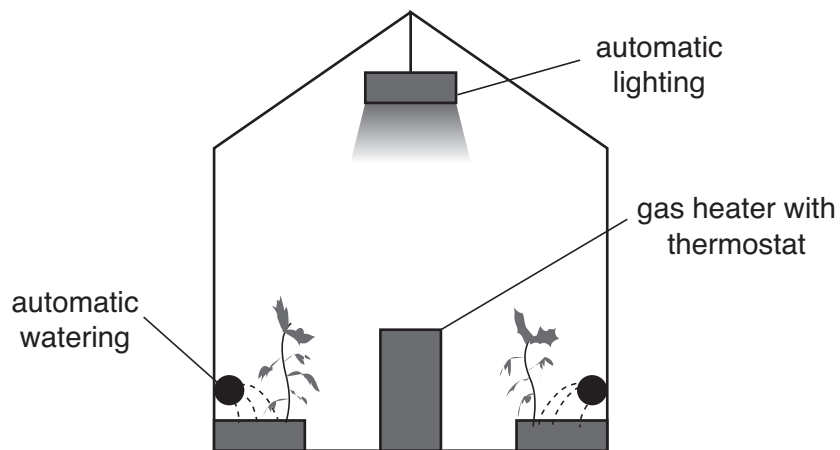
increases crop yield by using more fertiliser

grows crops in controlled conditions

grows different kinds of crop on the same farm

[2]

(b) Steve grows tomatoes in a greenhouse.



Name **one** condition that is controlled in Steve's greenhouse.

Explain why this increases the yield of tomatoes.

.....

.....

.....

..... [3]

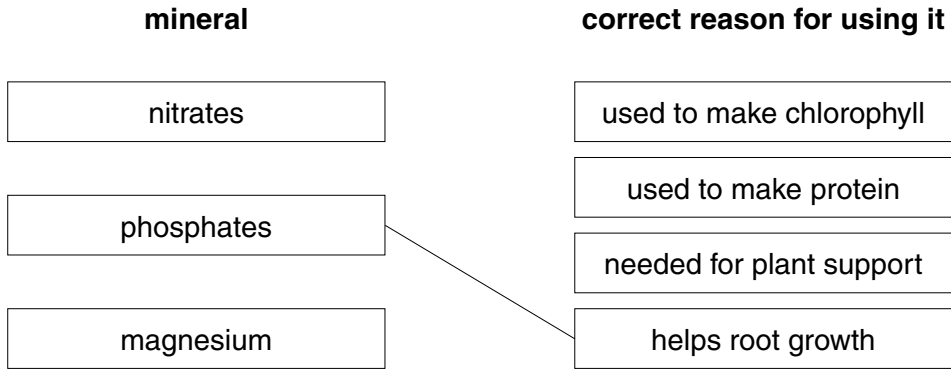
(c) Steve 'feeds' his tomatoes with fertiliser.

His fertiliser contains the following minerals:

nitrates phosphates magnesium

Draw a straight line from each **mineral** to the **correct reason for using it**.

One has been done for you.



[2]

(d) Steve knows that fertilisers are not really 'food' for plants.

Use your knowledge of photosynthesis to explain why Steve is right.

.....

.....

..... [2]

- (e) Steve is thinking about switching to organic farming.

These statements are about organic farming.

Put a tick (✓) in the table to show whether each statement is an advantage or disadvantage.

	advantage tick (✓)	disadvantage tick (✓)
uses less pesticides		
produces less crops		
food may not look as good		
food contains less harmful chemicals		
uses more manpower		
better for wildlife		

[3]

[Total: 12]

END OF QUESTION PAPER