

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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TOTAL	



General Certificate of Secondary Education
Higher Tier
January 2010

Applied Science (Double Award)

APSC/2H

H

Unit 2 Science for the Needs of Society

Thursday 14 January 2010 9.00 am to 10.30 am

For this paper you must have:

- a ruler.

You may use a calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.



J A N 1 0 A P S C 2 H 0 1

Answer **all** questions in the spaces provided.

- 1 (a) The food we eat affects our health.

Certain foods are considered to be healthy and an excess of others is considered to be unhealthy.

- 1 (a) (i) Draw a ring around **one** unhealthy snack.

apple crisps chocolate carrots sweets

(1 mark)

- 1 (a) (ii) Name **one** ingredient in the snack that you have chosen which makes it unhealthy.

..... (1 mark)

- 1 (b) To stay healthy, our body needs to control our blood glucose levels.

Draw a ring around the correct word or phrase to complete each sentence.

- 1 (b) (i) After a meal, the level of glucose in the blood

decreases
increases
stays the same

(1 mark)

- 1 (b) (ii) This makes the

liver
pancreas
stomach

produce insulin.

(1 mark)

- 1 (b) (iii) The insulin causes the glucose to be converted to

glucagon
glycogen
sugar

in the

liver
pancreas
stomach

(2 marks)



1 (c) Insulin belongs to a group of chemical substances known as hormones.

Hormones control many processes in our bodies.

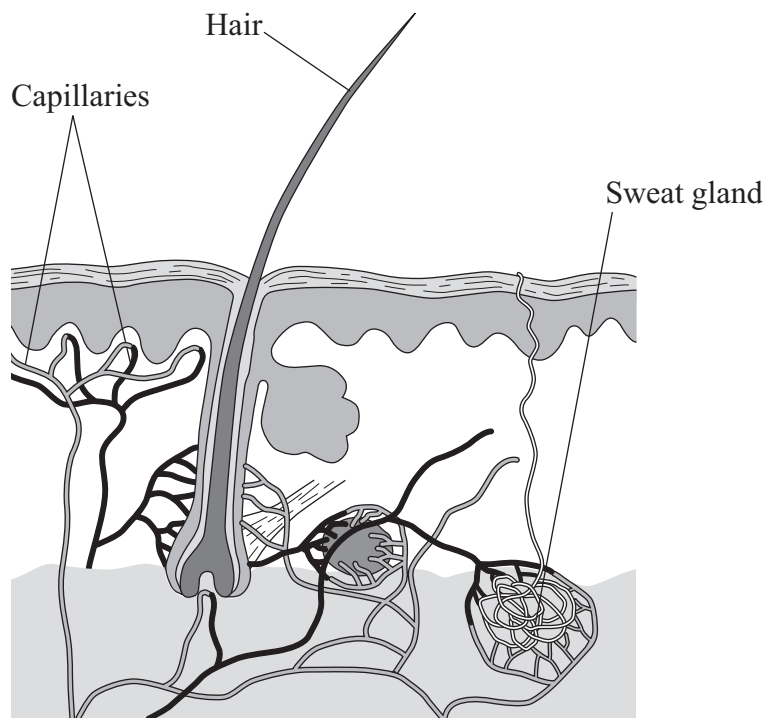
How are hormones transported to their target organs?

.....
.....

(1 mark)

1 (d) Our body also controls our internal temperature.

Use the diagram to describe and explain **one** way in which our skin temperature can be lowered if we are feeling too warm.



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

(2 marks)

9

Turn over ►



- 2 A wide range of materials is used in the building industry.

The physical properties of a material make it suitable for its use.

- 2 (a) Some uses for materials in the building industry are given in **Table 1**. Complete the table by writing the most common type of material next to the example given.

Table 1

Example of material and its use	Type of material
Polyethene gutters	Polymer
Steel-reinforced concrete for foundations	
Copper hot-water cylinder	Metal
Bathroom tiles	
Wooden window frames	Natural

(2 marks)

- 2 (b) Some physical properties of two of the materials in **Table 1** are given in **Table 2**.

Table 2

Material	Melting temperature in °C	Density in g per cm ³	Electrical conductivity	Heat conductivity
A	1083	8.92	Very good	Very good
B	110 to 140	0.95	Poor	Poor

For each material in **Table 2** name the type of material and give the property that makes it suitable for the use given in **Table 1**.

- 2 (b) (i) Material **A**

Type of material

Property

(2 marks)

- 2 (b) (ii) Material **B**

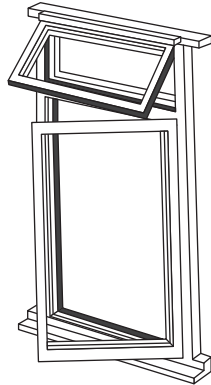
Type of material

Property

(2 marks)



2 (c) Wood is a traditional material used to make window frames, but other materials are often used instead of wood in modern houses.



2 (c) (i) Name a modern material used to make window frames.

.....
(1 mark)

2 (c) (ii) Give **one** advantage of making a window frame from the modern material.

.....
.....
(1 mark)

2 (c) (iii) Give **one** advantage of making a window frame from wood.

.....
.....
(1 mark)

9

Turn over for the next question

Turn over ▶



3 Since 1956 Britain has been building nuclear power stations as an alternative to fossil fuel power stations.

3 (a) Name **one** fossil fuel.....
(1 mark)

3 (b) Nuclear power stations transform nuclear radiation energy to heat energy.

3 (b) (i) Why is nuclear radiation dangerous to humans?
.....
.....
(1 mark)

3 (b) (ii) What is the best material to stop gamma radiation?
.....
(1 mark)

3 (b) (iii) Give **two** uses of gamma radiation.
1
2
(2 marks)



3 (c) There are other alternatives to fossil fuel power stations as energy resources.

3 (c) (i) Which type of energy resource uses the motion of the sea?

.....
(1 mark)

3 (c) (ii) Complete the table by writing a disadvantage of each of the energy resources.

Energy resource	Disadvantage
Solar	
Wind	
Hydroelectric	

(3 marks)

9

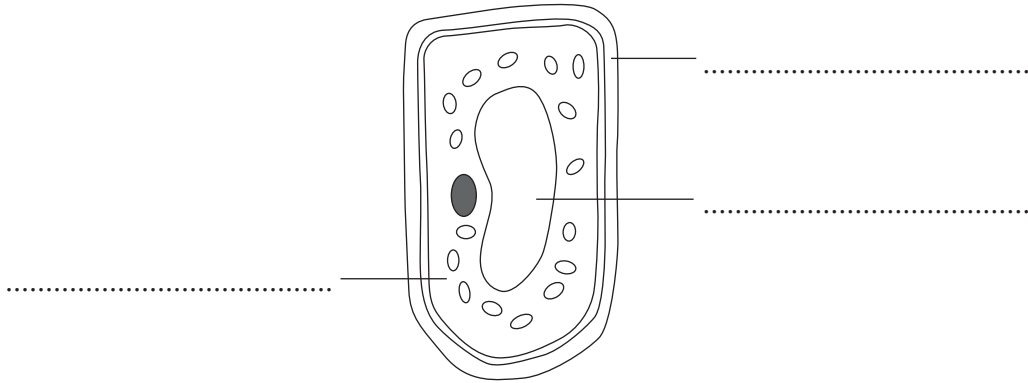
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4 Living organisms are made up of cells that can all do different jobs.

4 (a) (i) This is a diagram of a typical leaf cell from a plant. Complete the missing labels.



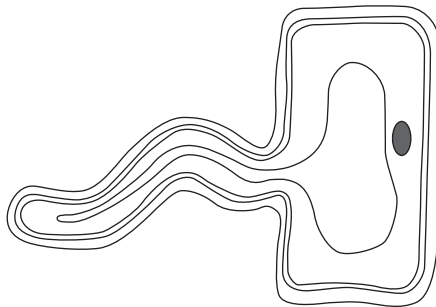
(3 marks)

4 (a) (ii) Name **two** cell components that are found in **both** plant **and** animal cells.

..... and
(2 marks)

4 (b) Specialised plant cells are adapted to do particular jobs.

This is a diagram of a typical root hair cell.



Describe **one** difference between the root hair cell and the leaf cell above.

Explain the reason for the difference.

Difference

Explanation

.....

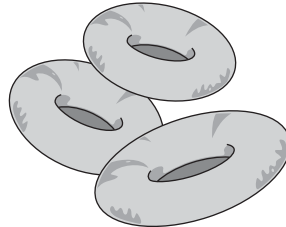
(2 marks)



4 (c) Specialised cells in the human body carry out particular functions.

4 (c) (i) The diagram shows some red blood cells.

Describe **one** special feature of a red blood cell, and explain how this feature helps the cell to carry out its function.



Feature

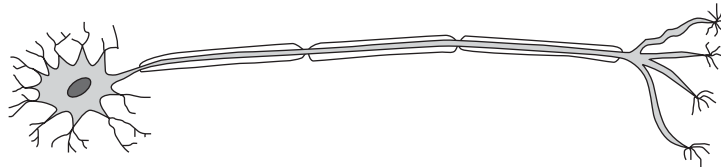
How this feature helps the cell to carry out its function

.....
.....

(2 marks)

4 (c) (ii) The diagram shows a neurone.

Describe **one** special feature of a neurone, and explain how this feature helps the cell to carry out its function.



Feature

How this feature helps the cell to carry out its function

.....
.....

(2 marks)



5 Chemists have discovered that the building blocks of materials are atoms, ions and molecules.

5 (a) Nitrogen has a mass number of 14 and an atomic number of 7.

5 (a) (i) Draw a labelled diagram to show the structure of an atom of nitrogen.

(4 marks)

5 (a) (ii) What is an ion?

.....
.....

(1 mark)

5 (a) (iii) Describe how a nitrogen atom, N, becomes a nitride ion, N^{3-} .

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

(2 marks)

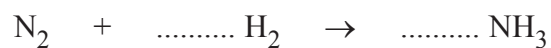


- 5 (a) (iv) What type of bond joins two nitrogen atoms together?

.....
(1 mark)

- 5 (b) Nitrogen molecules combine with hydrogen molecules to form ammonia.

Balance the equation for the reaction between nitrogen and hydrogen to make ammonia, by writing the correct numbers in the spaces.



(1 mark)

- 5 (c) Ammonia reacts with nitric acid to form ammonium nitrate, NH_4NO_3 .

Explain why ammonium nitrate is used to improve plant growth.

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

(2 marks)

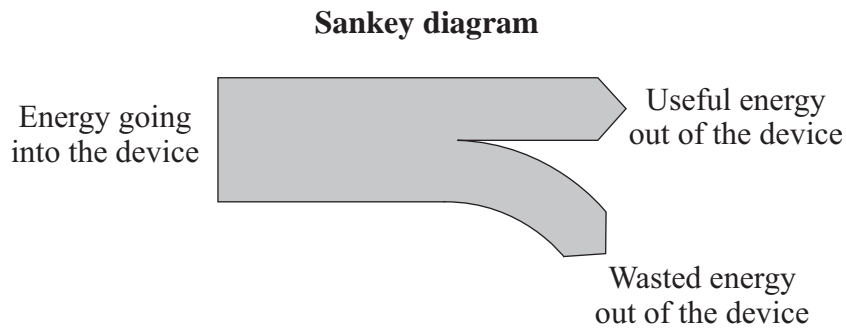
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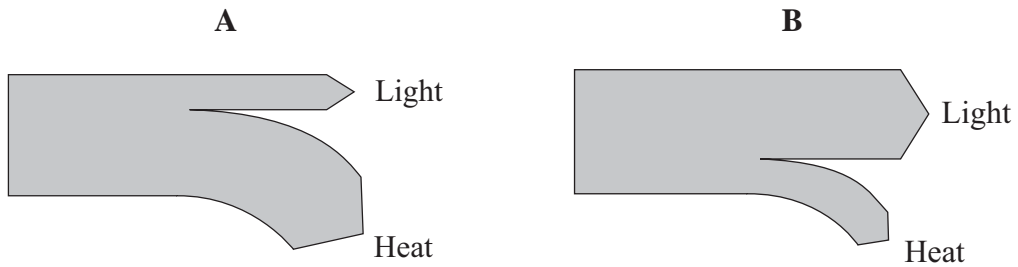
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6 A Sankey diagram shows the energy transfer that occurs in a device.



6 (a) The Sankey diagrams for a normal light bulb and an energy efficient light bulb are given below.



6 (a) (i) Which diagram, **A** or **B**, represents a normal light bulb?
Write your answer in the box.

(1 mark)

6 (a) (ii) Explain your choice.

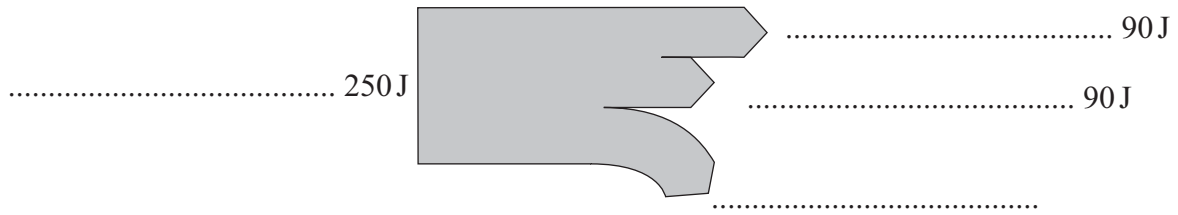
.....

.....

(1 mark)



6 (b) The Sankey diagram for a TV looks like this.



6 (b) (i) Write the **four** types of energy on the lines in the diagram.

(2 marks)

6 (b) (ii) Calculate the efficiency of the TV using the equation in the box.

$$\text{Efficiency} = \frac{\text{useful energy}}{\text{total energy}} \times 100$$

Show your working.

.....

.....

.....

..... Efficiency %
(3 marks)

Question 6 continues on the next page

Turn over ▶



- 6 (c) The table shows how much energy supplied to each device is used and how much is wasted per second.

Device	Energy used (J)	Energy wasted (J)
Computer	290	60
Kettle	600	1400
Hair dryer	1000	500
Microwave oven	800	400

- 6 (c) (i) Which is the least efficient device? Explain your answer.

.....

(2 marks)

- 6 (c) (ii) How much power would the microwave oven use if it was left on for 40 seconds?

Use the equation in the box to work out your answer.

$\text{Total energy supplied to device (J)} = \text{Power (W)} \times \text{time (s)}$
--

Show your working.

.....

Power = W
 (4 marks)



Turn over for the next question

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7 (a) Alcohol and tobacco are two legal drugs used for recreational purposes.

7 (a) (i) Name **one** organ in the human body that is damaged by long-term alcohol use.

.....
(1 mark)

7 (a) (ii) Why should you not drink alcohol before you operate machinery?

.....
.....
(1 mark)

7 (a) (iii) Describe **one** effect of the nicotine in tobacco smoke.

.....
.....
(1 mark)

7 (a) (iv) Describe **one** effect of the carbon monoxide in tobacco smoke.

.....
.....
(1 mark)

7 (b) A UK medical journal published an article comparing the effects of some legal and illegal drugs.

The table shows data on some of the drugs.

Drug	Number of UK users	Number of related UK deaths per year
Heroin	300 000	700
Cocaine	780 000	214
Alcohol	40 000 000	4 000
Amphetamines	430 000	35
Tobacco	10 000 000	114 000



7 (b) (i) Some scientists say that alcohol and tobacco cause more harm than some illegal drugs. Use data from the table to suggest why.

.....
.....
(1 mark)

7 (b) (ii) Suggest why alcohol manufacturers say that the data is misleading.

.....
.....
(1 mark)

7 (c) Other drugs are taken for medical reasons.

7 (c) (i) Name a drug that is commonly prescribed as an antibiotic.

.....
(1 mark)

7 (c) (ii) Paracetamol is taken as a painkiller.

Why might a patient still need to see a doctor, even if the paracetamol works?

.....
.....
(1 mark)

7 (c) (iii) A cold is caused by a virus.

Why will antibiotics **not** treat a cold?

.....
.....
(1 mark)

7 (c) (iv) Explain why doctors have been advised **not** to prescribe antibiotics unless absolutely necessary.

.....
.....
(1 mark)

10

Turn over ►



8 Scientists are worried about the effects of some man-made chemicals on the environment.

Read the article written by an environmental scientist and answer the questions that follow.

Aerosols have damaged the ozone layer

We have released thousands of tonnes of CFCs into the atmosphere. Large quantities of CFCs were used as the propellant gas in aerosol cans. Unfortunately, when CFCs get into the upper atmosphere they help to destroy ozone. CFCs have caused a hole to appear in the ozone layer above Antarctica. This is a major problem because ozone protects us from harmful ultraviolet radiation from the sun. We have developed alternatives to CFCs but these chemicals are powerful greenhouse gases.

8 (a) (i) CCl_2F_2 is an example of a CFC.

One of the elements in a CFC is fluorine.

Name the other **two** elements in a CFC molecule.

1

2

(2 marks)

8 (a) (ii) What is meant by the term *greenhouse gas*?

.....

.....

(1 mark)

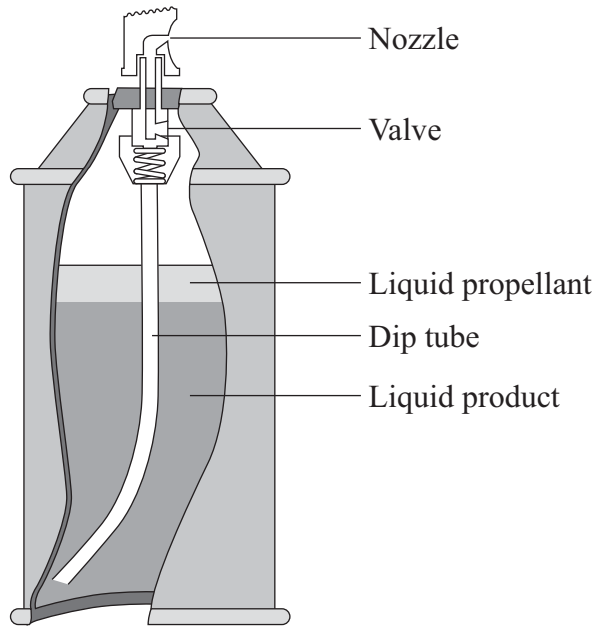
8 (a) (iii) Give the name of an industrial process that releases greenhouse gases.

.....

(1 mark)



8 (b) The diagram shows the design of an aerosol can.



Describe the composition of the mixture that comes out of the can.

.....

.....

.....

.....

(2 marks)

8 (c) Ultraviolet radiation is part of the electromagnetic spectrum produced by the Sun.

8 (c) (i) How does ultraviolet radiation travel to Earth from the Sun?

.....

.....

(1 mark)

8 (c) (ii) Suggest why ultraviolet radiation is more harmful than visible light.

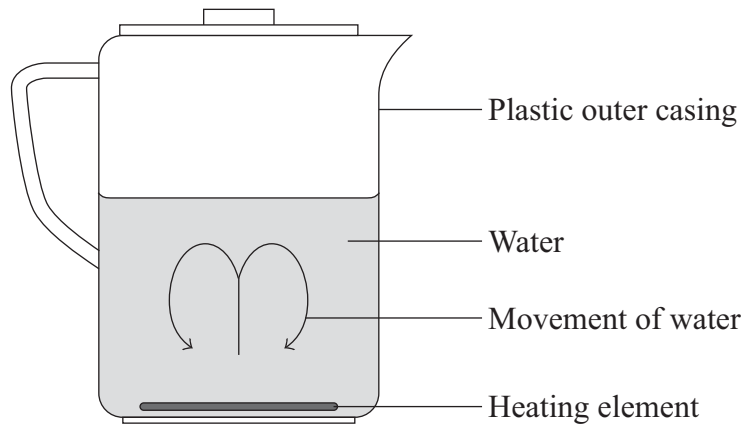
.....

.....

(1 mark)



9 People who make kettles need to understand how heat moves from one place to another.



9 (a) What method of heat transfer occurs through:

9 (a) (i) the heating element; (1 mark)

9 (a) (ii) the water? (1 mark)

9 (b) Describe what happens to the water to make it move as shown in the diagram.

.....
.....
.....
..... (2 marks)

9 (c) (i) What type of material would the manufacturer use to make the heating element of this kettle?

Explain your choice.

.....
.....
.....
..... (2 marks)



9 (c) (ii) The manufacturer decided to make the outer casing of the kettle from plastic.

Give **two** reasons why plastic is a good choice.

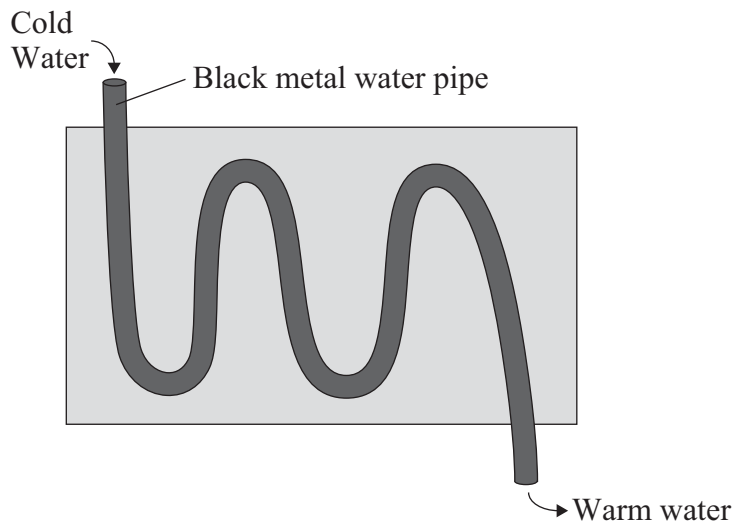
Reason 1

Reason 2

(2 marks)

9 (d) Another way of heating water is to use heat energy from the Sun.

The diagram shows a solar water heater.



9 (d) (i) Suggest what can be put behind the pipe to make sure that more of the available heat is collected (goes into the water).

.....
(1 mark)

9 (d) (ii) Explain how your suggestion works.

.....
.....
(1 mark)

10

END OF QUESTIONS



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