

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
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11	
12	
TOTAL	



General Certificate of Secondary Education  
Higher Tier  
June 2013

# Additional Science 1

# AS1HP

Unit 5

# H

Tuesday 14 May 2013 9.00 am to 10.30 am

**For this paper you must have:**

- a ruler
- a calculator
- the Chemistry Data Sheet and Physics Equations Sheet Booklet (enclosed).

**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. Do not write outside the box around each page or on blank pages.
- 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.
- Question 4(b) should be answered in continuous prose.  
In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

**Advice**

- In all calculations, show clearly how you work out your answer.



J U N 1 3 A S 1 H P 0 1

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

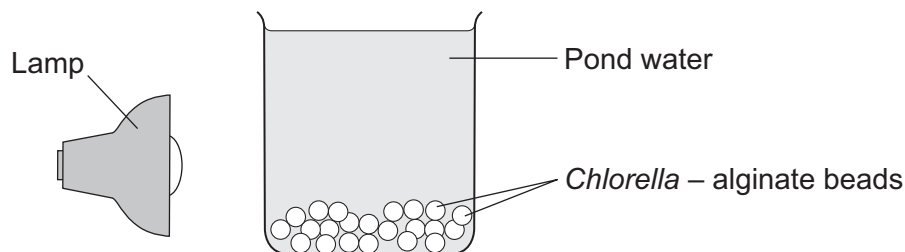
### Biology Questions

- 1 Students investigated the effect of light intensity on the rate of photosynthesis by an alga called *Chlorella*.

The students:

- used *Chlorella* to make alginate beads
- put *Chlorella*-alginate beads into each of five beakers of pond water
- put lamps at different distances from each beaker.

The diagram shows how the investigation was set up.



- 1 (a) The students needed to control variables in their investigation to make the investigation fair.

Give **one** control variable the students should have used in the investigation.

.....  
(1 mark)

- 1 (b) The students switched on the lamps.

Soon afterwards, the *Chlorella*-alginate beads floated to the surface of the water.

Each floating bead had tiny bubbles around it.

Which gas was in the bubbles?

Draw a ring around the correct answer.

**carbon dioxide**

**nitrogen**

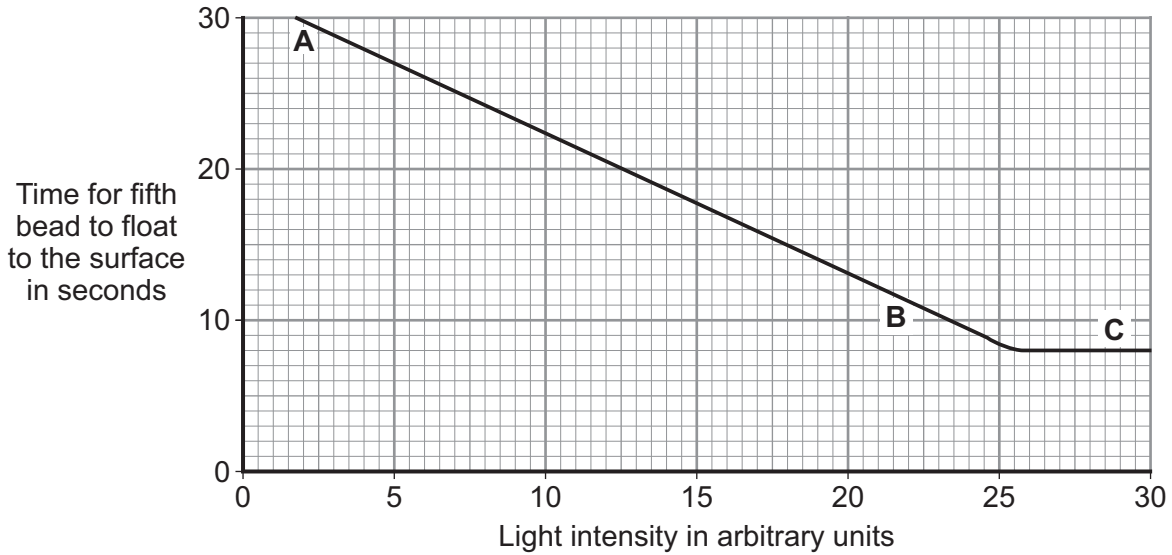
**oxygen**

(1 mark)



1 (c) The students measured the light intensity for each beaker. For each light intensity, the students recorded the time taken for the fifth bead to float to the surface of the water.

The graph shows the results.



The results were used to measure the rate of photosynthesis.

1 (c) (i) Between points A and B on the graph the time for the fifth bead to float to the surface of the water decreases.

Explain why.

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(3 marks)

1 (c) (ii) At point C, increasing light intensity does not increase the rate of photosynthesis.

Give one reason why.

.....

.....

(1 mark)

Question 1 continues on the next page

Turn over ►



1 (d) Scientists are planning to build laboratories on the moon.  
The people who work in the laboratories will need food.

Scientists are investigating using algae such as *Chlorella* as food.

1 (d) (i) Suggest **one** advantage and **one** disadvantage of using algae such as *Chlorella*, and **not** vegetables, as food.

Advantage .....

.....

.....

Disadvantage .....

.....

.....

(2 marks)

1 (d) (ii) Give **one** other advantage of keeping algae such as *Chlorella* in laboratories on the moon.

Do **not** include food in your answer.

.....

.....

(1 mark)

9



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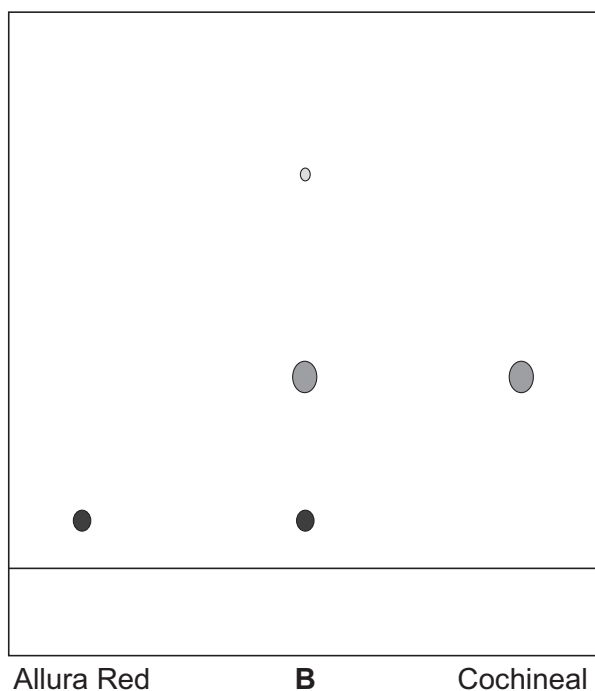
**Chemistry Questions**

**2** A company making sweets uses different colour additives in different countries. In some countries the company uses Allura Red to colour sweets red.

Some European countries recommend children do **not** eat Allura Red. In Europe the company uses Cochineal instead of Allura Red to colour sweets red.

A different red food colouring, **B**, was compared with Cochineal and Allura Red using paper chromatography.

The diagram shows the results.



**2 (a) (i)** How can you tell from the diagram that the three food colourings are **not** the same?

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(2 marks)



**2 (a) (ii)** The red food colouring, **B**, is **not** suitable for use in sweets sold in European countries.  
Suggest **one** reason why.

.....  
.....

(1 mark)

**2 (b)** Give **two** reasons why food scientists use instrumental methods instead of paper chromatography to analyse food colourings.

1 .....

2 .....

(2 marks)

5

**Turn over for the next question**

**Turn over ►**



3 Herbs and spices can be treated with radiation to kill bacteria. Radiation from the isotope  ${}_{27}^{60}\text{Co}$  is used to treat the herbs and spices. This means the herbs and spices can be stored for a long time.

3 (a) The most common isotope of cobalt is  ${}_{27}^{59}\text{Co}$

Complete the table.

	${}_{27}^{59}\text{Co}$	${}_{27}^{60}\text{Co}$
Number of protons		
Number of neutrons		
Mass number		

(3 marks)

3 (b) The European Union does **not** allow the sale of most foods treated with radiation from  ${}_{27}^{60}\text{Co}$

In America, food is allowed to be treated with radiation from  ${}_{27}^{60}\text{Co}$

In America, food treated with radiation from  ${}_{27}^{60}\text{Co}$  must be labelled with the symbol shown below.



Suggest an explanation why a symbol is used on the labels of food treated with radiation.

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(2 marks)





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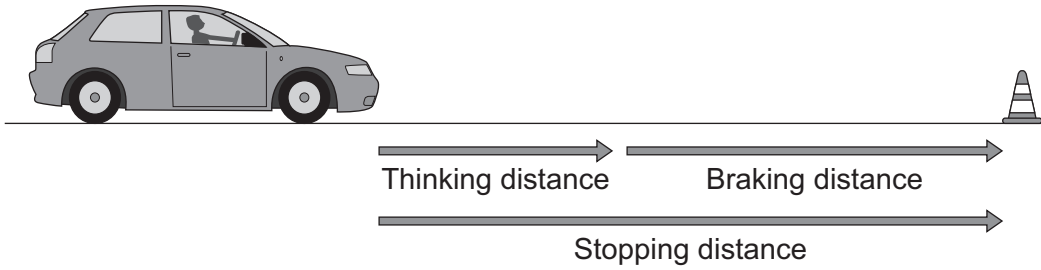
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**Physics Questions**

**4 (a)** A driver on a motorway sees a hazard ahead and brakes to stop.

The stopping distance of the car is the thinking distance added to the braking distance.



**4 (a) (i)** What is meant by:

thinking distance .....

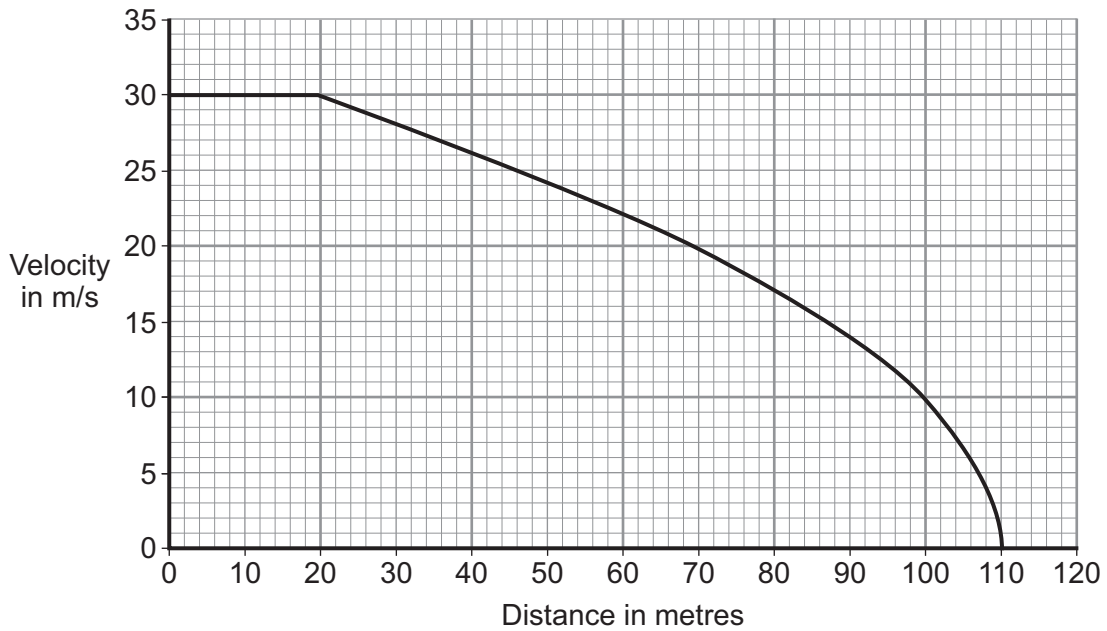
.....

braking distance .....

.....

(2 marks)

**4 (a) (ii)** The graph shows how the velocity of the car changes during the stopping distance.





### Biology Questions

5 Some molecules can move into and out of cells across the cell membrane.

5 (a) Dissolved substances move into and out of cells.

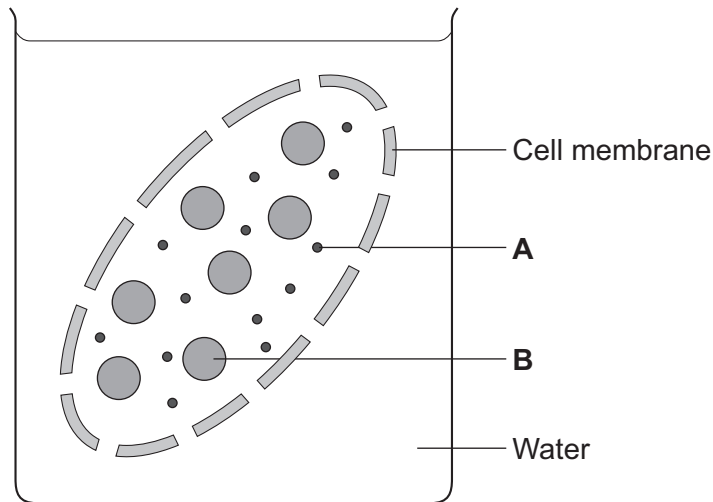
Name this process.

.....  
(1 mark)

5 (b) **Diagram 1** shows a model of a cell surrounded by water.  
The model cell contains a solution of two molecules, **A** and **B**.

In the diagram, the circles represent molecules of **A** and **B**.  
The cell membrane contains small holes that allow molecules to pass through.

**Diagram 1**



5 (b) (i) Describe what will happen to the number of molecules of **A** and of **B** in the cell **and** in the water, in the next few hours.

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(3 marks)



5 (b) (ii) Explain the reasons for your answer to part (b)(i).

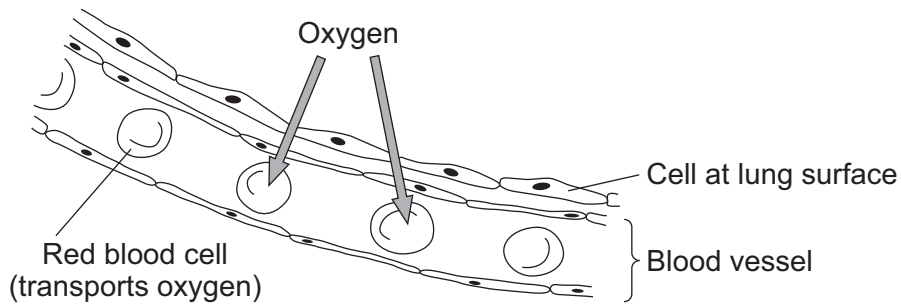
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(2 marks)

5 (c) Oxygen can pass through membranes into cells.  
Oxygen passes from the lungs into the blood.

Diagram 2 shows a blood vessel and cells at the surface of the lung.

Diagram 2



5 (c) (i) Why do cells need oxygen?

.....  
(1 mark)

5 (c) (ii) Blood moves along the blood vessel all the time.

In terms of oxygen passing into the blood from the lungs, why is the movement of blood important?

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(2 marks)

Turn over ►



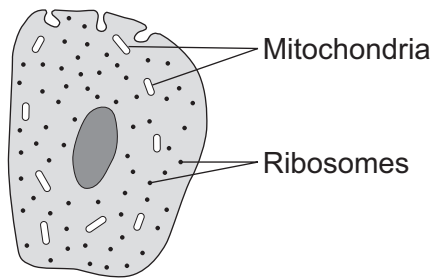
**6** In some parts of cells enzymes control chemical reactions.  
Respiration involves chemical reactions.

**6 (a)** Suggest **one** advantage of having different reactions in different parts of the cell and **not** all in one part of the cell.

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.....

(1 mark)

**6 (b)** Ribosomes and mitochondria are involved in chemical reactions in cells.



Ribosomes and mitochondria work together.

**6 (b) (i)** What is the function of ribosomes?

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(1 mark)

**6 (b) (ii)** Explain why ribosomes rely on the activity of mitochondria.

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(3 marks)

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7 Students used quadrats to sample the distribution of plants in a field.

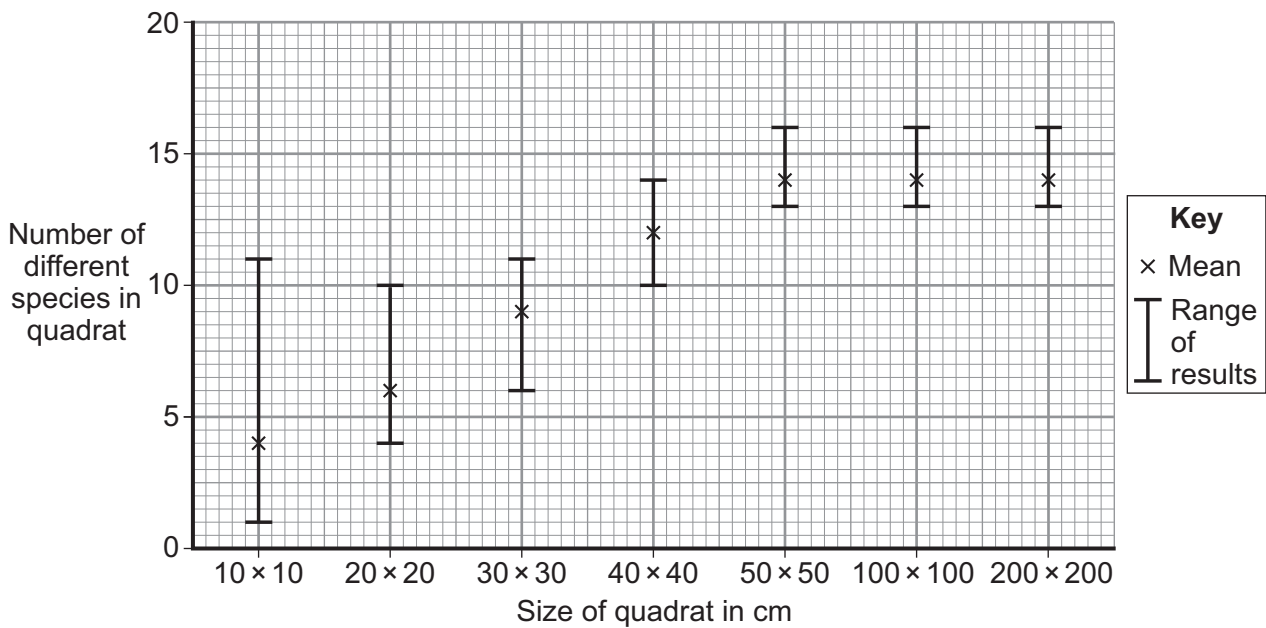
7 (a) Why should the students place the quadrats randomly in the field?

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(1 mark)

7 (b) The students wanted to find the best size of quadrat to use. The students used quadrats of different sizes. For each quadrat the students recorded the number of different species in the quadrat.

The graph shows the mean and the range of results of using ten quadrats of each size.



7 (b) (i) Describe the relationship between the size of the quadrat and the range of results.

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(2 marks)





7 (b) (ii) Which size quadrat should the students use to investigate the plants in the field?

Explain your answer.

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(2 marks)

7 (c) The students used a quadrat to sample the plants in a different field along a *transect*.

7 (c) (i) What is a *transect*?

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(1 mark)

7 (c) (ii) The students found different plant species at different points along the transect.

Suggest **one** physical factor that might affect which plant species grow in different parts of the field.

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(1 mark)

7

Turn over for the next question

Turn over ►



**Chemistry Questions**

**8** 'Laughing gas' is used to relieve pain during childbirth.

Laughing gas is nitrous oxide.

The chemical formula of nitrous oxide is  $\text{N}_2\text{O}$

**8 (a) (i)** Calculate the relative formula mass of nitrous oxide.

Relative atomic masses ( $A_r$ ): N=14, O=16

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(2 marks)

**8 (a) (ii)** Calculate the percentage of nitrogen in nitrous oxide.

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(2 marks)

**8 (b)** What is the mass of one mole of nitrous oxide?

.....

(1 mark)

<b>5</b>



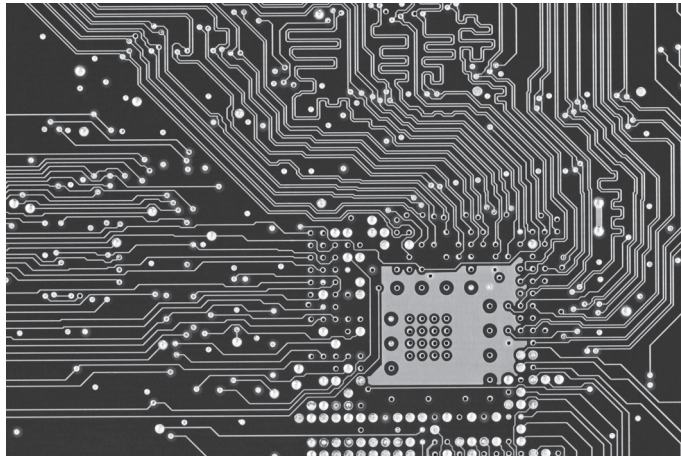
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**9** Gold is used in circuit boards.



**9 (a) (i)** Gold is a metal.

Describe the structure of gold and explain how gold conducts electricity.

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*(4 marks)*

**9 (a) (ii)** Explain how the structure of gold allows it to be pulled into a thin wire.

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*(2 marks)*



9 (b) The table shows information about five metals.

Metal	Cost in £ per kg	Melting point in °C	Relative electrical conductivity
Aluminium	1.4	660	59
Copper	6	1084	100
Gold	36000	1064	65
Silver	707	961	106
Zinc	1.3	420	28

Copper is used for household electrical wiring.

Use information from the table to explain why.

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(2 marks)

8
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Turn over for the next question

Turn over ►



- 10** A Bunsen burner burns natural gas. Natural gas is mainly methane.



- 10 (a)** Name and describe the bonding in methane ( $\text{CH}_4$ )

To gain full marks you must include details of the electronic structure of the atoms involved in the bonding.

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(5 marks)



**10 (b)** Explain, in terms of forces, why methane is a gas at room temperature.

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(2 marks)

7

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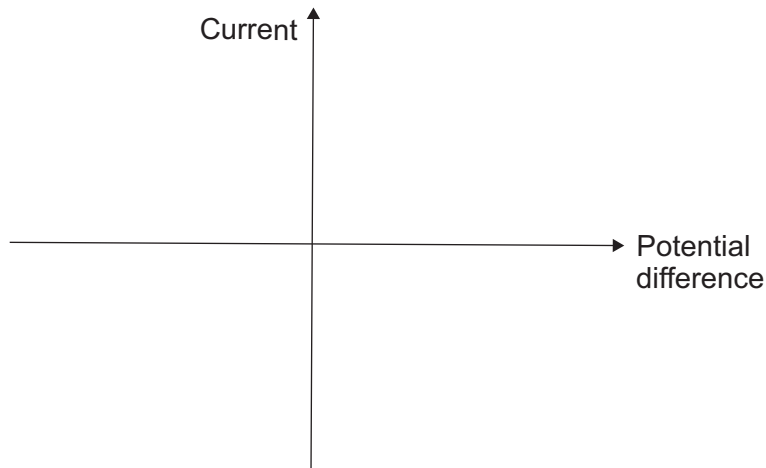
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**Physics Questions**

- 11** This question is about electrical circuits.
- 11 (a)** Current-potential difference graphs are used to show how the current through a component varies with the potential difference across it.
- 11 (a) (i)** On the axes sketch a current-potential difference graph for a resistor.



(2 marks)

- 11 (a) (ii)** What assumption have you made about the resistor when drawing this graph?

.....

(1 mark)

**Question 11 continues on the next page**

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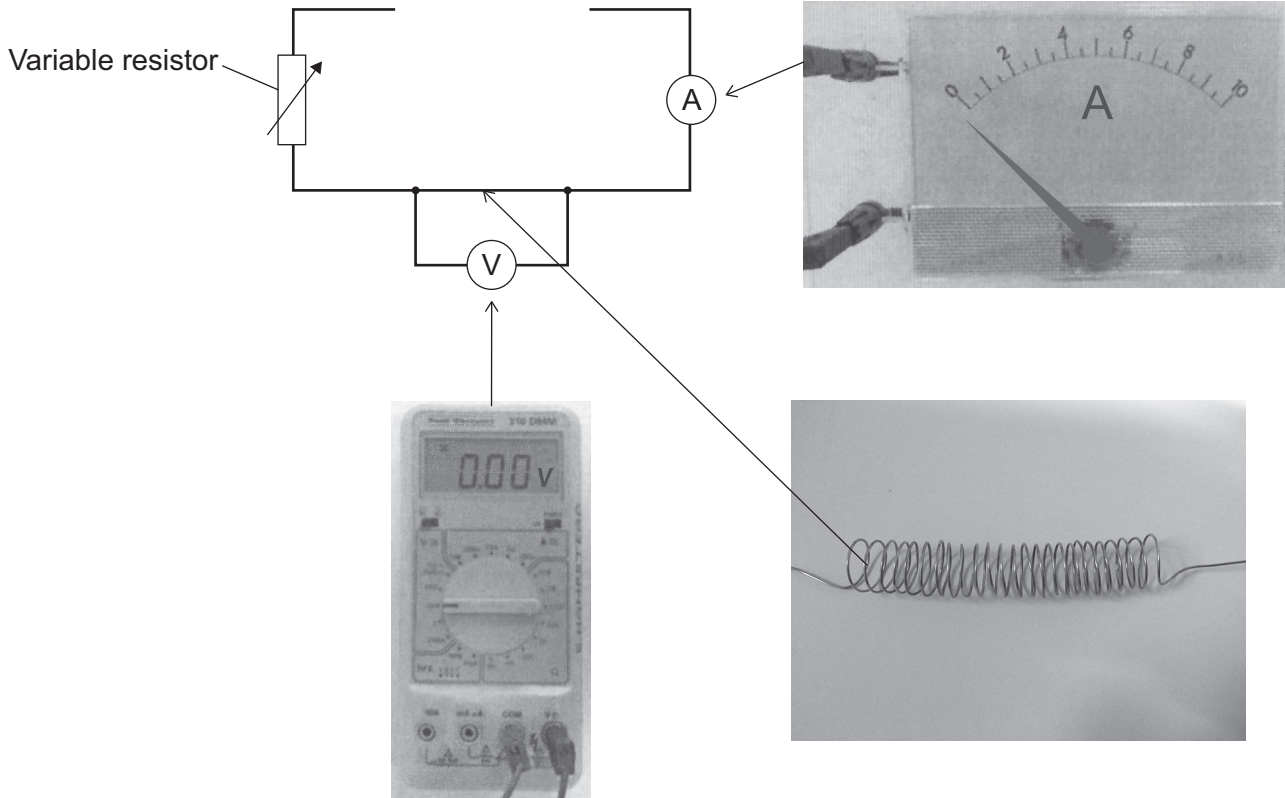
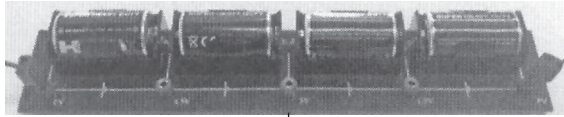


- 11 (b)** A student investigates how the current in a sample of wire varies with the potential difference across the wire.

These are photographs of some of the electrical components **before** the investigation starts.

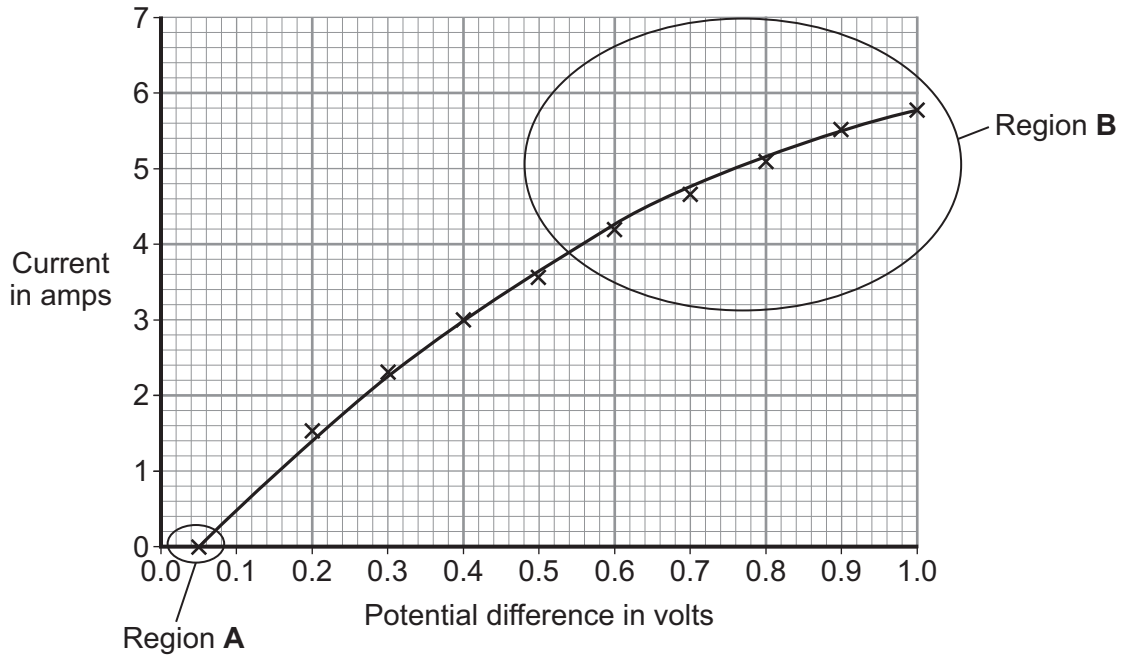
- 11 (b) (i)** The circuit diagram shown is **not** complete.  
Complete the circuit diagram below for the battery shown.

(1 mark)



**11 (b) (ii)** The student uses the variable resistor to change the potential difference across the wire. At each value of potential difference the student takes one reading from the voltmeter and one reading from the ammeter.

The readings are used to plot a current-potential difference graph.



Describe and give a reason for:

the result in Region A .....

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

the shape of the graph in Region B. ....

.....  
 .....  
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(4 marks)

**11 (b) (iii)** Suggest **two** ways the student could improve the investigation.

1 .....

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 .....  
 2 .....

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(2 marks)

10
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Turn over ►



**12** The International Space Station (ISS) is a scientific research laboratory in space.  
The photograph shows a rocket carrying supplies for the ISS ready for take-off.



**12 (a)** Complete the sentences.

The resultant force on the rocket before take-off is .....

After take-off the resultant force on the rocket causes the rocket to move

and ..... in the direction of the resultant force.

(2 marks)

**12 (b)** At take-off the resultant force on the rocket is 6 000 kN and the initial acceleration of the rocket is  $12 \text{ m/s}^2$ .

Calculate the mass of the rocket at take-off.

Use the correct equation from the Physics Equations Sheet.

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.....

Mass = ..... kg  
(3 marks)



**12 (c)** As the rocket moves through the atmosphere it burns fuel.

Explain the effect this will have on the acceleration of the rocket.

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(2 marks)

**12 (d)** As the rocket approaches the ISS its velocity decreases.

When the rocket is 50 m away from the ISS its velocity is 0.05 m/s.

When the rocket is 25 m away from the ISS its velocity is 0.02 m/s.

The mean mass of the rocket during the approach is 15 000 kg.

Calculate the change in momentum of the rocket as it moves from 50 m away to 25 m away from the ISS.

Give the unit.

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

Change in momentum = .....

(3 marks)

10

**END OF QUESTIONS**



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