

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	



General Certificate of Secondary Education  
Higher Tier  
June 2013

# Additional Applied Science

# AAS1HP

Unit 1 Science at Work

# H

Written Paper

Tuesday 14 May 2013 9.00 am to 10.00 am

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>• a ruler</li> <li>• a calculator</li> <li>• the Equations Sheet (enclosed).</li> </ul>
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### Time allowed

- 1 hour

### 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 60.
- 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 3 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 A S 1 H P 0 1

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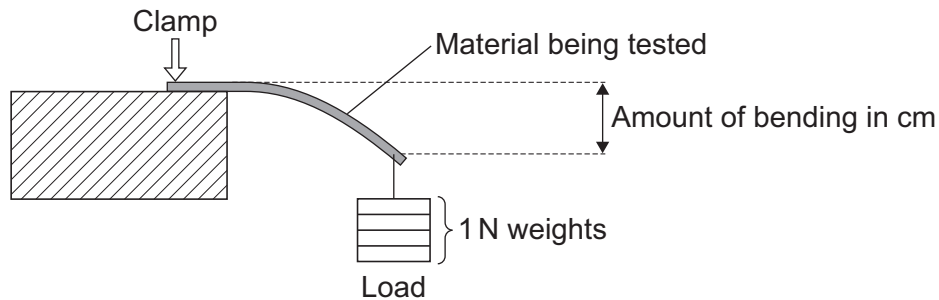
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# AAS1HP

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

**1** A technician tested the stiffness of a material.

The diagram shows the equipment the technician used.



**1 (a)** Part of the material being tested is in compression. On the diagram, label the part in compression with the letter **C**. (1 mark)

**1 (b)** Suggest how the technician would use the weights to test the stiffness of the material.

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(2 marks)

**1 (c)** The technician tested the stiffness of two materials, **J** and **K**.

The results for material **J** are shown in the table.

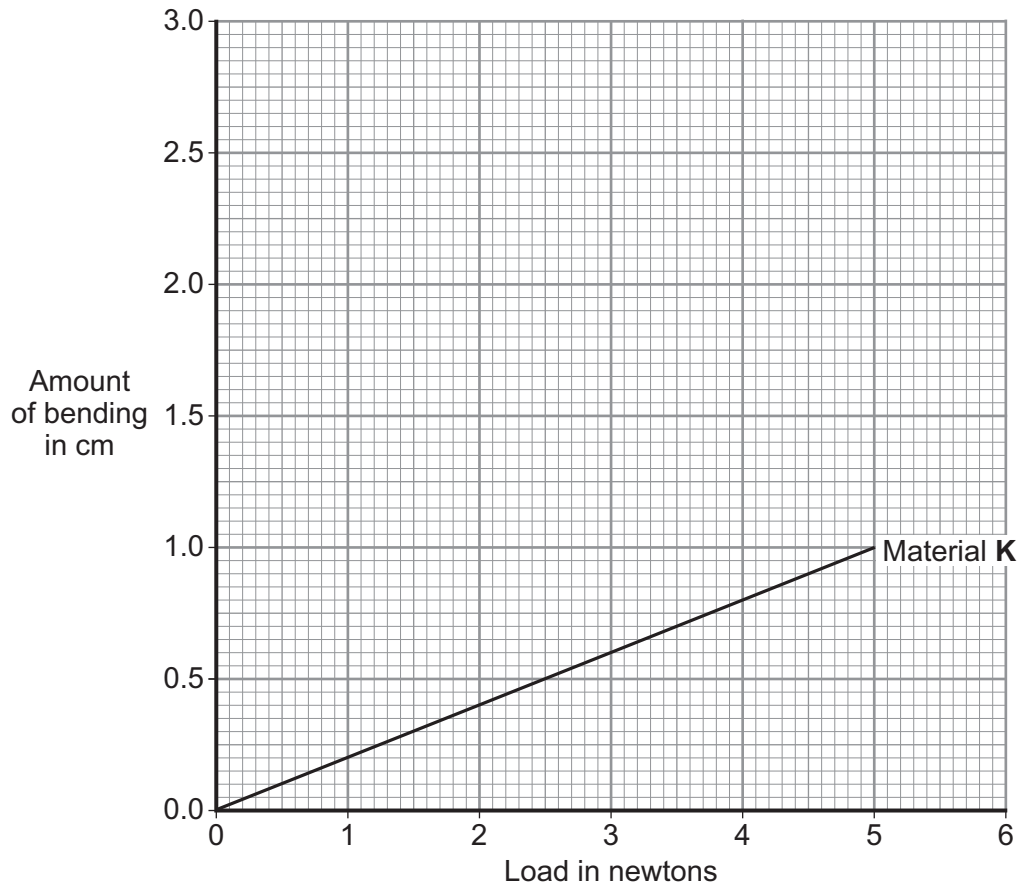
Load in N	Amount of bending in cm
0	0.0
1	0.5
2	1.0
3	1.6
4	2.0
5	2.5



1 (c) (i) The results for material **K** have been plotted on the graph.

On the same axes plot the results for material **J**.

Draw a line of best fit.



(2 marks)

1 (c) (ii) Look at your graph.

Which material is stiffer, **J** or **K**?

Give a reason for your answer.

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.....

(1 mark)

6

Turn over for the next question

Turn over ►



**2** Athletes need to drink more fluids when they are training.

**2 (a) (i)** Which drink in the table, **W**, **X**, **Y** or **Z**, shows the correct list of ingredients for an isotonic sports drink?

Tick (✓) **one** answer.

Drink	Ingredients	Tick (✓)
<b>W</b>	Glucose, water, sugar	
<b>X</b>	Glucose, water, electrolytes	
<b>Y</b>	Sucrose, water, electrolytes	
<b>Z</b>	Sucrose, water, sugar	

(1 mark)

**2 (a) (ii)** What does 'isotonic' mean?

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(2 marks)

**2 (a) (iii)** Athletes drink isotonic drinks when exercising.

Suggest **one** reason why.

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.....

(1 mark)



**2 (b)** A nutritionist measured a man's height and mass.

**2 (b) (i)** The man's height was 1.6 m and his mass 74 kg. Calculate the man's BMI.

Use the Equations Sheet to help you answer the question.

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.....

.....

BMI .....  
(2 marks)

**2 (b) (ii)** The table below shows what the BMI values mean.

BMI	What it means
<18.5	Underweight
18.5–24.9	Ideal weight
25.0–29.9	Overweight
>30.0	Obese

What advice would you give to the man?

Use the information from your calculation and the table to help you.

.....

.....

.....




.....

(2 marks)



- 3 *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The information in the table shows how tennis racquets have changed since 1950.

Wooden racquet, 1950	Aluminium racquet, 1980	Composite racquet, 2010
		
Mass 400 g Head size 420 cm <sup>2</sup>	Mass 280 g Head size 700 cm <sup>2</sup>	Mass 330 g Head size 645 cm <sup>2</sup> Composite may contain: <ul style="list-style-type: none"> <li>• carbon fibre</li> <li>• glass fibre</li> <li>• titanium</li> <li>• ceramics</li> </ul>





**4 (a)** Describe how a forensic scientist would use the oil immersion method to measure the refractive index of a piece of glass.

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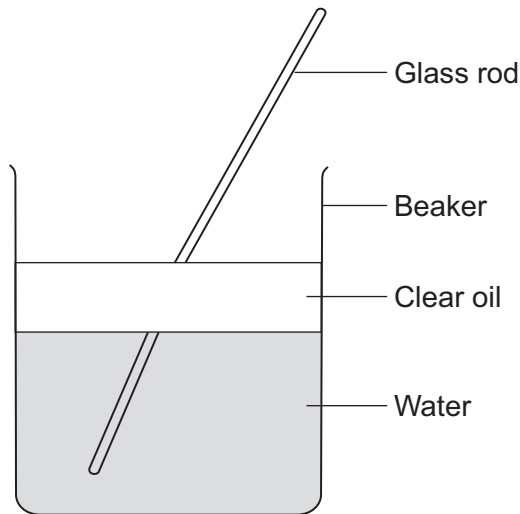
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(4 marks)

**4 (b)** To explain refraction, a teacher sets up the equipment shown in the diagram.



Why does the glass rod seem to disappear in the oil?

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(2 marks)

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**5** Ammonium sulfate is a fertiliser.

**5 (a)** Ammonium sulfate dissolves in water.

Suggest why it is important for a fertiliser to be soluble in water.

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(1 mark)

**5 (b)** A student made some ammonium sulfate.

He mixed ammonia solution with dilute sulfuric acid.

Ammonia reacts with sulfuric acid to make ammonium sulfate.

**5 (b) (i)** Balance the symbol equation for this reaction.



(1 mark)

**5 (b) (ii)** The student predicted he would make 8.0g of ammonium sulfate.

He actually made 7.0g.

Calculate his percentage yield.

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

Percentage yield ..... %

(2 marks)

**5 (b) (iii)** Give **two** possible reasons why the student's actual yield was less than the theoretical yield.

1 .....

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2 .....

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(2 marks)

Turn over ►



**5 (c)** Plants need nitrates, phosphates and potassium for healthy growth.

The table shows the effect of adding some substances to the soil on the yield of a crop.

Substances added (kg per hectare)			Crop yield (tonnes per hectare)
Nitrates	Phosphates	Potassium	
0	0	0	1.70
96	0	0	3.70
0	77	107	2.00
96	77	107	6.60

**5 (c) (i)** Which substance is most important for the growth of the crop?

Use the data in the table to explain your answer.

Substance .....

Explanation .....

.....  
.....

(2 marks)

**5 (c) (ii)** Describe how an organic farmer would add these substances to his soil.

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(1 mark)

**5 (c) (iii)** Each of the substances in the table helps the growth of one part of a plant.

Which part(s) of the plant is helped by each substance?

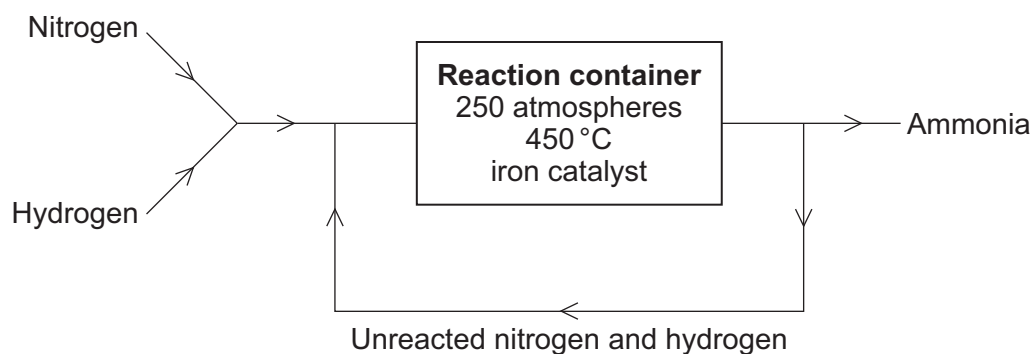
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(3 marks)

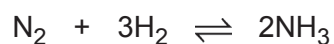


**6** Ammonia is made from nitrogen and hydrogen.

The flow chart shows how ammonia is made using the Haber process.



The equation for the reaction is



**6 (a)** What does the  $\rightleftharpoons$  sign mean?

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(1 mark)

**6 (b)** Some of the nitrogen and hydrogen do not react.

What happens to the unreacted nitrogen and hydrogen?

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.....  
(1 mark)

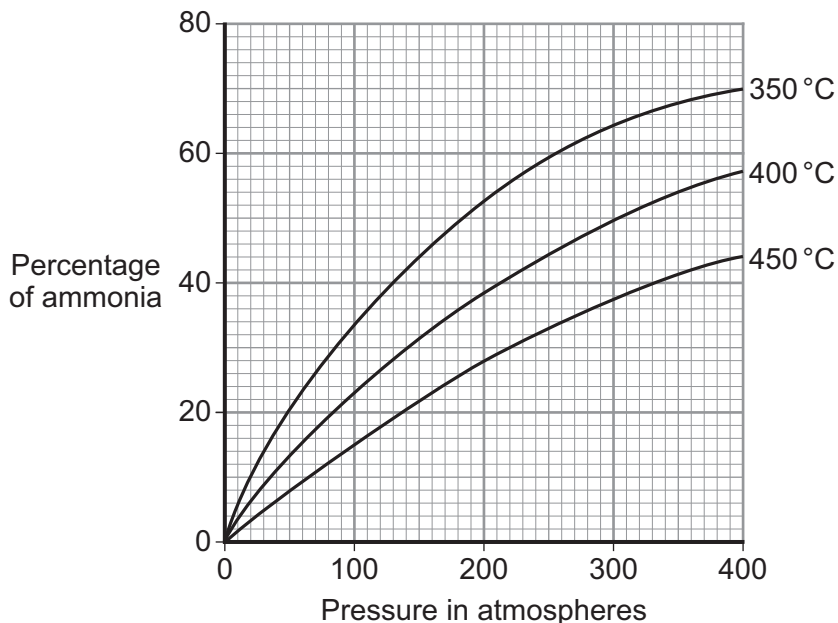
**6 (c)** Why is a catalyst used in the Haber process?

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(1 mark)

Turn over ►



**6 (d)** The graph shows the percentage of ammonia made in the Haber process at different temperatures and pressures.



Use the graph to answer the questions.

**6 (d) (i)** Write down a temperature and pressure which makes 20% of ammonia. Give the units in your answer.

Temperature .....

Pressure .....

(1 mark)

**6 (d) (ii)** What conclusions can you make about the effect of temperature and pressure on the percentage of ammonia produced?

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(2 marks)

6
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**8** Mountain bikes have frames made out of tubes of metal.

The metal used is usually steel, a steel alloy or an aluminium alloy.



The table shows some of the properties of materials used in making bikes.

	<b>Steel</b>	<b>Steel alloy</b>	<b>Aluminium alloy</b>
Density in g/cm <sup>3</sup>	7.85	7.10	2.70
Tensile strength in MN/m <sup>2</sup>	430	760	100
Relative cost	Low	Medium	High

**8 (a)** What is the advantage of using aluminium alloy to make the frame?

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(1 mark)



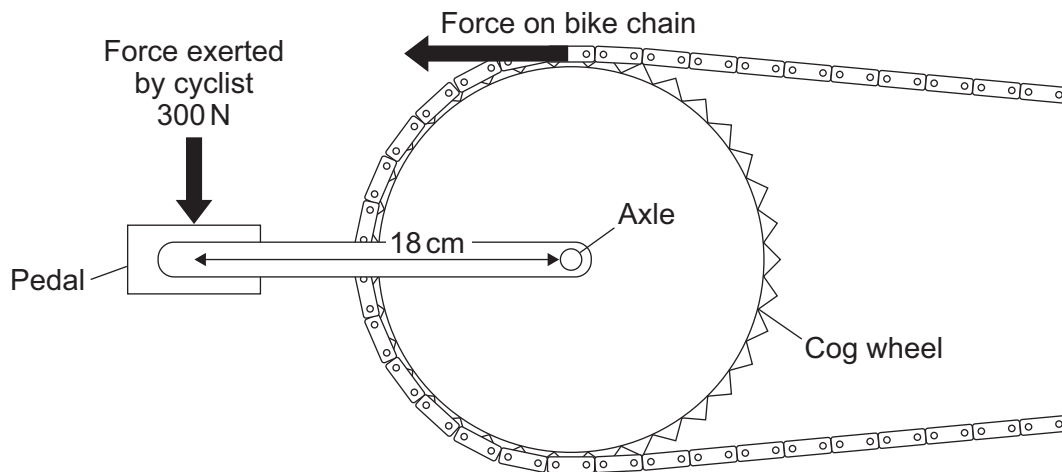
8 (b) A mountain bike manufacturer uses  $500\text{ cm}^3$  of aluminium alloy to make his bike frame.

Calculate the mass of the frame. Use the Equations Sheet to help you work out your answer.

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Mass ..... kg  
(3 marks)

8 (c) The diagram shows the cog wheel, pedal and chain of a mountain bike.



A cyclist pushes down on the pedal with a force of 300 N.

Calculate the moment of the 300 N force around the axle. Use the Equations sheet to help you answer the question.

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Answer ..... Nm  
(2 marks)

6

Turn over ►



