Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

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

General Certificate of Secondary Education
Higher Tier
June 2010

Additional Applied Science AASC/2H

Unit 2 Science at Work

H

Written Paper

Friday 28 May 2010 9.00 am to 10.00 am

For this paper you must have:
- a ruler.

You may use a calculator.

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.

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

Do not write outside the box

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

1 Read about the changes to tennis racquets.

> Tennis racquets used to be made of wood and were heavy (380g). Then aluminium was used to make racquets. This was stronger, lighter and more flexible than wood. The string area of the aluminium racquet was more than 50% larger than that of the wooden racquets.
>
> The lighter weight and greatly increased power of these large racquets was good for the beginner. For powerful players the greater flexibility of the frames distorted the strings and the direction of the ball was unpredictable.
>
> Good players needed a less flexible material for the frame. The best material proved to be a mixture of carbon fibres and a plastic resin to bind them together. This new material is called graphite carbon fibre. The technology for reducing flexibility without adding weight continues to improve. Today the average racquet weighs about 300g.
>
> Unlike wooden racquets, which warped, cracked and dried out with age, graphite carbon fibre racquets can last for many years.

1 (a) (i) Describe how the flexibility of the tennis racquet has changed.

.....

.....

.....

.....

(2 marks)

1 (a) (ii) What type of material is graphite carbon fibre?

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(1 mark)

Do not write outside the box

1 (a) (iii) What are the advantages of using graphite carbon fibre?

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(3 marks)

1 (b) Use the information to work out the percentage reduction in weight of a graphite carbon fibre racquet compared with an original wooden racquet.

Use the equation in the box.

$$\% \text{ Reduction in weight} = \frac{\text{Reduction in weight}}{\text{Original weight}} \times 100$$

Show clearly how you work out your answer.

.....

.....

.....

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..... %

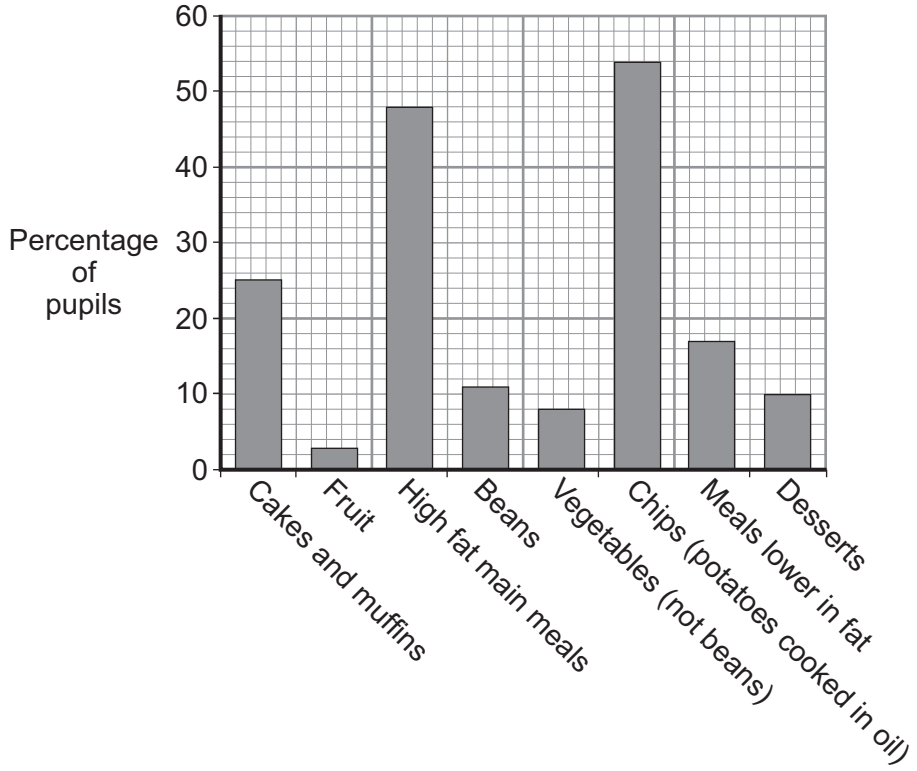
(3 marks)

9

Turn over for the next question

Do not write outside the box

2 A survey was carried out into pupils' school meals.



2 (a) The chart shows the different foods available in school canteens and the percentage of pupils who chose each type of food.

2 (a) (i) What percentage of pupils chose fruit as part of their meal?

..... %

(1 mark)

2 (a) (ii) Which food was chosen by over 50% of the pupils?

.....

(1 mark)

Do not write outside the box

2 (b) The table shows the amount of nutrients in potatoes when served in different ways.

Nutrient (amount per 140 gram serving)	Chips, fried in oil and salted	Baked in their skin and served with butter substitute	Baked in their skin and served with butter
Total fat (in g)	22.8	2.8	4.5
Cholesterol (in mg)	0.0	0.0	11.0
Sodium (in mg)	260.0	101.0	50.0
Total carbohydrate (in g)	33.9	33.9	33.9
Dietary fibre (in g)	3.0	3.1	3.1
Protein (in g)	5.0	4.0	4.0

2 (b) (i) How would you advise the school canteen to serve potatoes to encourage healthy eating?

.....

(1 mark)

2 (b) (ii) Explain the choice you made in 2(b)(i).

.....

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(2 marks)

2 (b) (iii) What could be the risk to your health of eating too many chips?

.....

.....

(1 mark)

Question 2 continues on the next page

Do not write outside the box

2 (c) Give **three** precautions that the canteen staff can take to prevent the spread of micro-organisms onto the food.

1 .....

2 .....

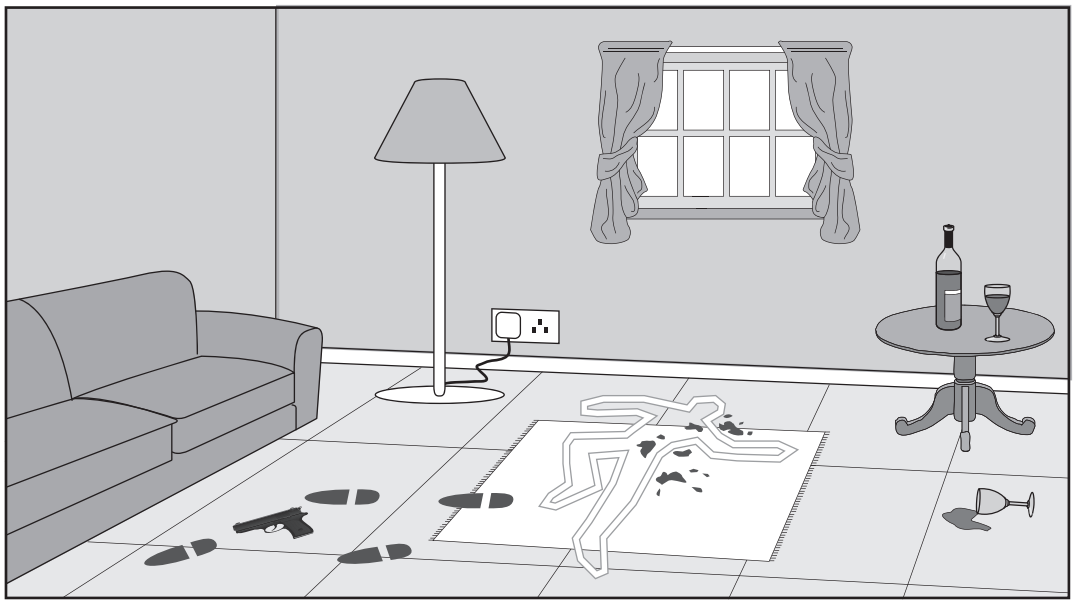
3 .....

(3 marks)

9

Do not write outside the box

3 The picture shows a crime scene.



3 (a) Give **two** ways in which a Scenes of Crime Officer (SOCO) would avoid contaminating evidence at a crime scene.

1 .....

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2 .....

.....

(2 marks)

3 (b) A suspect was arrested.

A sample of white fibres from the rug was collected and compared with some white fibres found on the suspect's jacket.

3 (b) (i) What would the SOCO use to collect the fibres?

.....

(1 mark)

3 (b) (ii) A forensic scientist examines the fibres.

What instrument would the forensic scientist use to examine the fibres from the rug and the fibres from the jacket at the same time?

.....

(1 mark)

Question 3 continues on the next page

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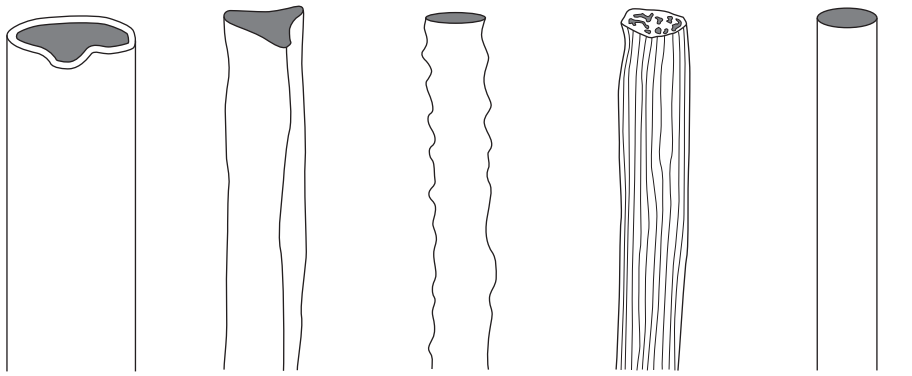
3 (b) (iii) **Diagram 1** shows magnified images of five fibres.

Diagram 1



Name **three** distinctive features of fibres that can be used when matching samples.

1 .....

2 .....

3 .....

(3 marks)

Diagram 2 shows fibres taken from the crime scene.

Diagram 3 shows fibres taken from the suspect's jacket.

Diagram 2

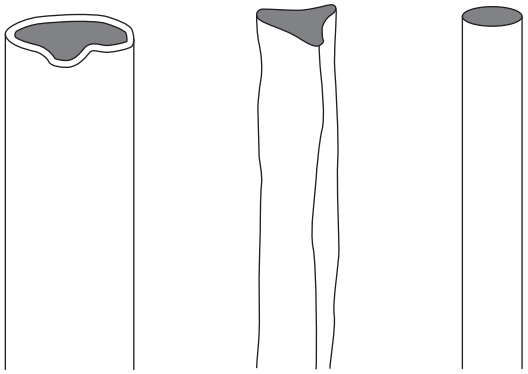
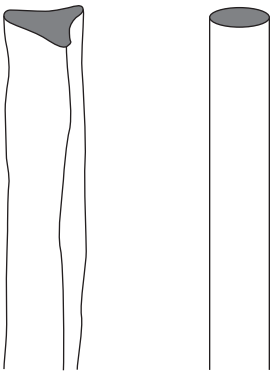


Diagram 3



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3 (b) (iv) What types of fibre were found on the suspect's jacket?

.....

.....

(2 marks)

3 (b) (v) Does the comparison of fibres from the crime scene and the suspect's jacket prove the suspect's presence at the crime scene?

Draw a ring around your answer. **Yes** / **No**

Explain your answer.

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(2 marks)

3 (c) What other evidence could be collected from the crime scene that could link the suspect to the crime?

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(1 mark)

12

Turn over for the next question

Do not write outside the box

4 A student investigated how much suspended matter there was in a particular brand of orange juice. He used three samples of the juice for the investigation.

The table shows the results.

	Mass in grams			
	Sample 1	**Sample 2**	**Sample 3**	**Average**
Orange juice	10.0	10.0	10.0	10.00
Dry, unused filter paper	0.9	0.8	0.8	0.83
Filter paper plus residue	2.6	2.1	2.6	2.43
Residue	1.7	1.3	1.8	

4 (a) (i) Calculate the average mass of residue that the student obtained.

.....

.....

..... grams

(1 mark)

4 (a) (ii) The average mass of the residue was higher than expected.

Which part of the experimental procedure has the student missed out to cause this result?

.....

.....

(1 mark)

4 (b) Vitamin C is found in orange juice.

What is the function of vitamin C in the body?

.....

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(1 mark)

Do not write outside the box

4 (c) To find out the amount of vitamin C in a food, a blue chemical called DCPIP is used. The student also did an investigation to find out if vitamin C is lost from orange juice when it is stored in the refrigerator for 14 days.

He tested four different brands of orange juice. The table shows his results.

Brand	% of vitamin C lost after 14 days	Preservative used in the juice
W	36	None
X	21	Sorbic acid
Y	0	Benzoic acid
Z	0	Sulfur dioxide

4 (c) (i) What conclusions can be made from the results of this experiment?

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(3 marks)

4 (c) (ii) Describe how to use DCPIP to measure the vitamin C content of different brands of orange juice.

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(4 marks)

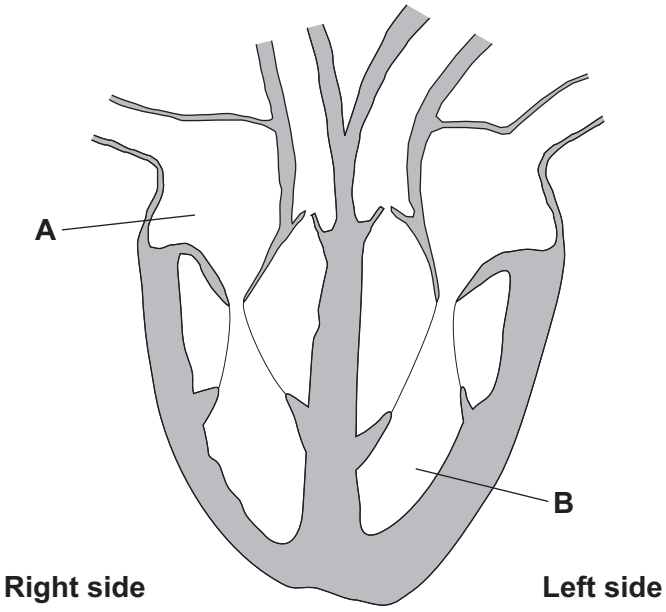
10

Turn over ▶

Do not write outside the box

5 A sports physiologist must have a detailed understanding of the heart system.

The diagram shows the structure of the heart.



5 (a) (i) Draw arrows on the diagram to show how the blood circulates through the heart.

(2 marks)

5 (a) (ii) Name the parts of the heart labelled **A** and **B**.

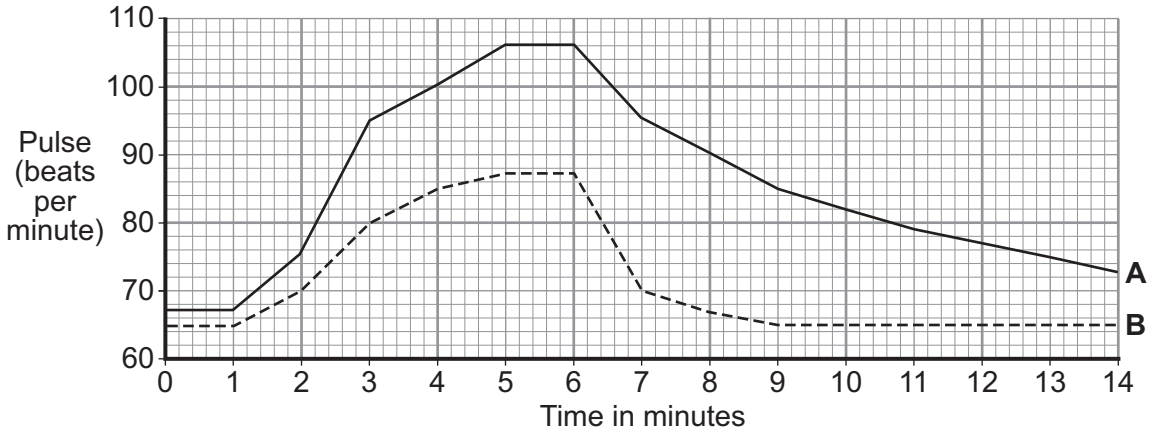
A .....

B .....

(2 marks)

Do not write outside the box

5 (b) An athlete and an office worker monitored their heart rate by taking their pulse before, during and after exercise. The graph shows their results.



5 (b) (i) Why does the heart rate increase during exercise?

.....

.....

(1 mark)

5 (b) (ii) Suggest which line, **A** or **B**, shows the results for the athlete.

Give **three** reasons for your answer.

1 .....

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2 .....

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3 .....

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(3 marks)

5 (c) A good level of fitness (strength, stamina and suppleness) would increase the athlete's chance of success in her sport.

Name **two** other factors that would increase the athlete's chance of success.

1 .....

2 .....

(2 marks)

10

Do not write outside the box

6 Small fragments of glass and some unlabelled jars of powder were found at a crime scene and collected by a Scenes of Crime Officer.

6 (a) (i) Describe the oil immersion method and explain how it is used to find the refractive index of small fragments of glass.

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(4 marks)

6 (a) (ii) How could you make the results of this test more reliable?

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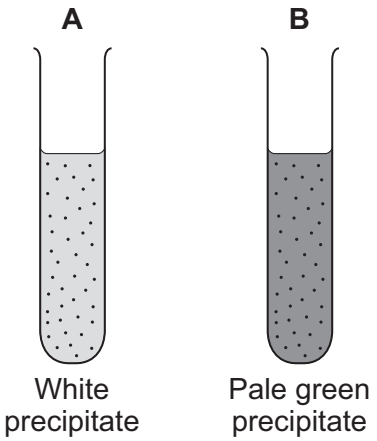
(1 mark)

Do not write outside the box

6 (b) A series of chemical tests was carried out on the samples of powder in the jars. Two of the samples, **A** and **B**, were mixed with water and then with sodium hydroxide solution.

The results are shown below.



6 (b) (i) Name the metal ions present in Sample **B**.

.....

(1 mark)

6 (b) (ii) When more sodium hydroxide solution was added to Sample **A** the precipitate dissolved to give a colourless solution.

Suggest the metal ion present in Sample **A**.

.....

(1 mark)

6 (c) (i) When a sample from another jar was analysed it was found to have the chemical formula $C_6H_{12}O_6$.

Name this compound.

.....

(1 mark)

Question 6 continues on the next page

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6 (c)(ii) $C_6H_{12}O_6$ is a covalent compound.

Most covalent compounds have low melting points.

Explain why.

.....

.....

.....

.....

.....

(2 marks)

10

END OF QUESTIONS

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Question 2 Material taken from www.healthedtrust.com/indicates/schoolmealreport.html

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