Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
January 2009

ADDITIONAL APPLIED SCIENCE **AASC/2H**
Unit 2 Science at Work
Higher Tier

H

Thursday 15 January 2009 1.30 pm to 2.30 pm

For this paper you must have:
- 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. 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 maximum mark for this paper is 60.
- The marks for questions are shown in brackets.
- 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.

For Examiner's Use			
Question	Mark	Question	Mark
1		3	
2		4	
		5	
		6	
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

1 The Food Standards Agency recommends that adults should eat no more than 6 g of salt a day.

Three people recorded what they ate one evening.

Person 1: 3 packets of crisps, 2 portions of chips, $\frac{1}{2}$ pizza.

Person 2: 2 packets of crisps, lasagne, 1 portion of chips.

Person 3: 1 packet of crisps, 1 pizza, 2 portions of chips.

The table shows the amount of salt per portion in the food each person ate.

Food (one portion)	Amount of salt (g)
One packet of crisps	0.6
Chips	1.4
$\frac{1}{2}$ Pizza	2.5
Lasagne	1.8

1 (a) (i) Calculate the amount of salt eaten by each person and put your answers in the table.

One has been done for you.

.....

.....

.....

.....

Person	Amount of salt eaten (g)
1	.....
2	4.4
3	.....

(2 marks)

1 (a) (ii) Which person is eating too much salt?

.....

(1 mark)

1 (a) (iii) Many adults eat 12 g or more of salt per day.

Suggest **two** ways in which people could reduce the amount of salt in their diet.

1 .....

.....

2 .....

.....

(2 marks)

1 (a) (iv) Name **one** of the health risks caused by eating too much salt.

.....

(1 mark)

1 (b) (i) Salt is an ionic compound. Describe the structure of an ionic compound.

.....

.....

.....

.....

(2 marks)

1 (b) (ii) What is the melting point of salt (sodium chloride)?

Draw a ring around the correct answer.

–40 °C **0 °C** **40 °C** **801 °C**

(1 mark)

9

2 A forensic scientist tested some substances that were collected from the scene of a crime.

2 (a) (i) The forensic scientist used a precipitation reaction.

What is a precipitation reaction?

.....

.....

(1 mark)

2 (a) (ii) The forensic scientist mixed a solution of one of the substances with sodium hydroxide. A pale blue precipitate formed.

What metal was present in the solution?

.....

(1 mark)

2 (b) (i) The forensic scientist carried out tests on another of the substances.

Complete the table.

Test	Result	Substance
Add dilute nitric acid	....	Carbonate
Flame test	Brick red flame	.....

(2 marks)

2 (b) (ii) Name the substance that was being tested in (b)(i).

.....

(1 mark)

2 (b) (iii) The forensic scientist did a flame test.

Describe how the scientist would do a flame test.

.....

.....

.....

.....

.....

.....

(3 marks)

2 (b) (iv) Give **one** precaution the forensic scientist should take to make sure that the results of the chemical tests are reliable.

.....

.....

(1 mark)

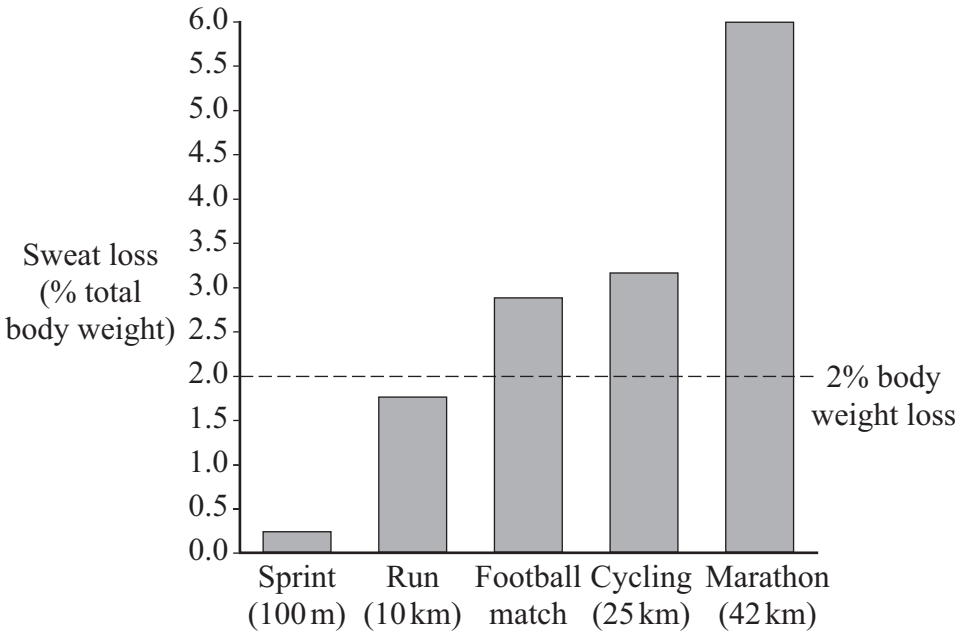
9

Turn over for the next question

3 Sports physiologists study the amount of fluid that athletes need during exercise to optimise their performance.

Losing as little as 2% of body weight as sweat can reduce performance.

The graph shows the percentages of body weight lost through sweat for different activities.



3 (a) (i) In which sport on the graph is an athlete likely to lose most weight through sweat?

.....

(1 mark)

3 (a) (ii) Suggest **two** reasons why this sport would cause the greatest loss in sweat.

1 .....

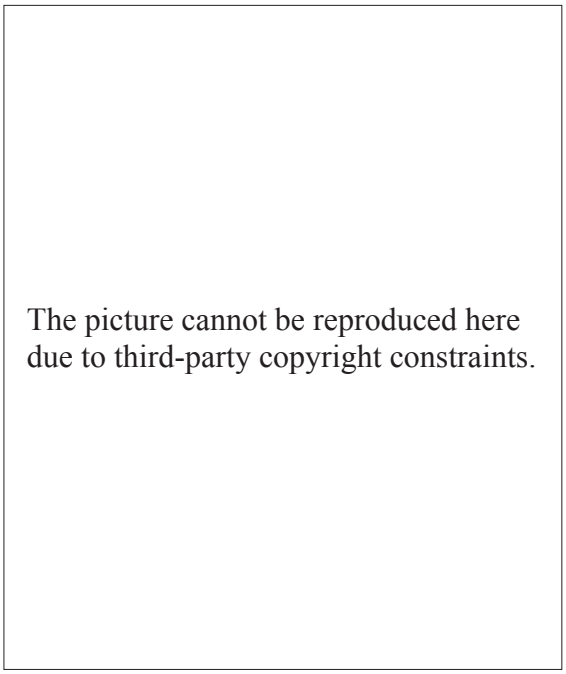
.....

2 .....

.....

(2 marks)

3 (b) A sports physiologist advised a marathon runner to drink isotonic sports drinks during a race.



3 (b) (i) What are the **three** main ingredients of an isotonic sports drink?

1 .....

2 .....

3 ..... *(3 marks)*

3 (b) (ii) The marathon runner's shirt is made from a polymer.

Give an example of a polymer fibre.

.....

(1 mark)

3 (b) (iii) Give **three** properties of a polymer that make it suitable for a running shirt.

1 .....

2 .....

3 .....

(3 marks)

10

Turn over ▶

4 Qualitative analysis is an important part of the work of a forensic scientist.

4 (a) What is qualitative analysis?

.....

(1 mark)

4 (b) A forensic scientist analysed a note found at the scene of a crime to find out if it was written by the victim.

There were traces of blood on the note.

The forensic scientist analysed the ink from the note and ink from a pen found on the victim, using thin layer chromatography.

4 (b) (i) Describe how the ink can be analysed using thin layer chromatography.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

4 (b) (ii) How can thin layer chromatography be used to compare the ink on the note with the ink in the victim's pen?

.....

.....

.....

.....

(2 marks)

4 (b) (iii) Explain why thin layer chromatography might be used instead of paper chromatography.

.....

.....

(1 mark)

4 (c) What other **two** pieces of information might be obtained from the note that could be used to find out who wrote it?

1 .....

.....

2 .....

.....

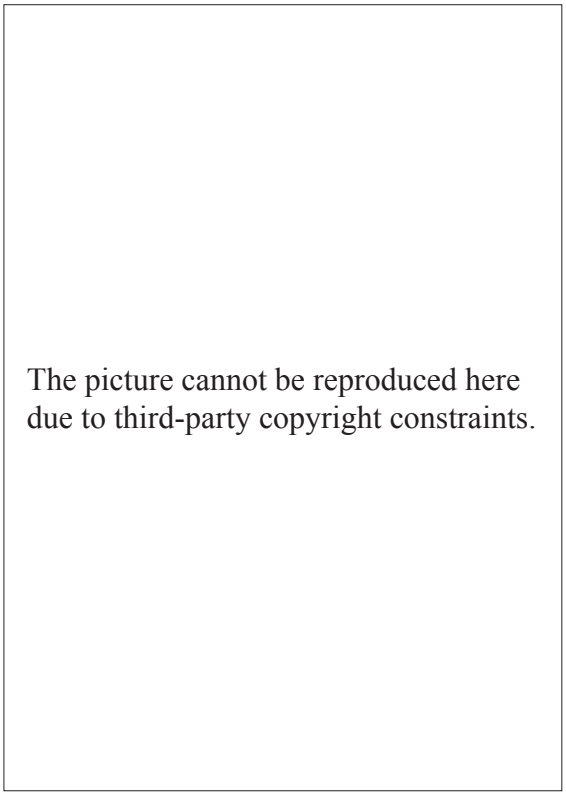
(2 marks)

10

Turn over for the next question

5 Swimwear manufacturers have produced body suits to try to improve the speed of swimmers.

The photograph shows a swimmer wearing a body suit.



5 (a) (i) What is the force that will act on the swimmer to slow him down in the water?

.....

(1 mark)

5 (a) (ii) Suggest how swimwear manufacturers could design the new body suit to overcome this problem.

.....

.....

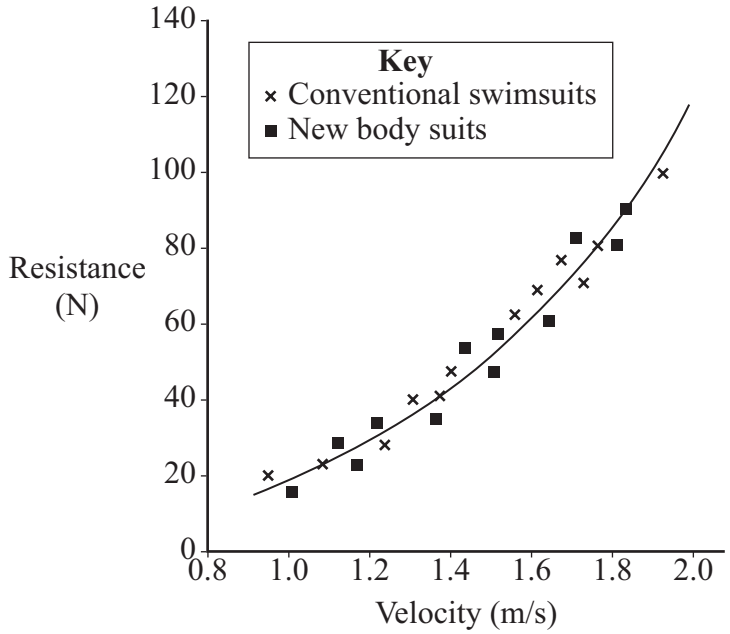
.....

.....

(2 marks)

5 (b) To test the effectiveness of the new body suits 12 swimmers swam 250 m in conventional swimsuits and 250 m in the new body suits. The effect of velocity on the resistance to movement was recorded. The results are shown on the graph.

The results are shown on the graph.



What **two** pieces of information can be obtained from the graph?

1 .....

2 .....

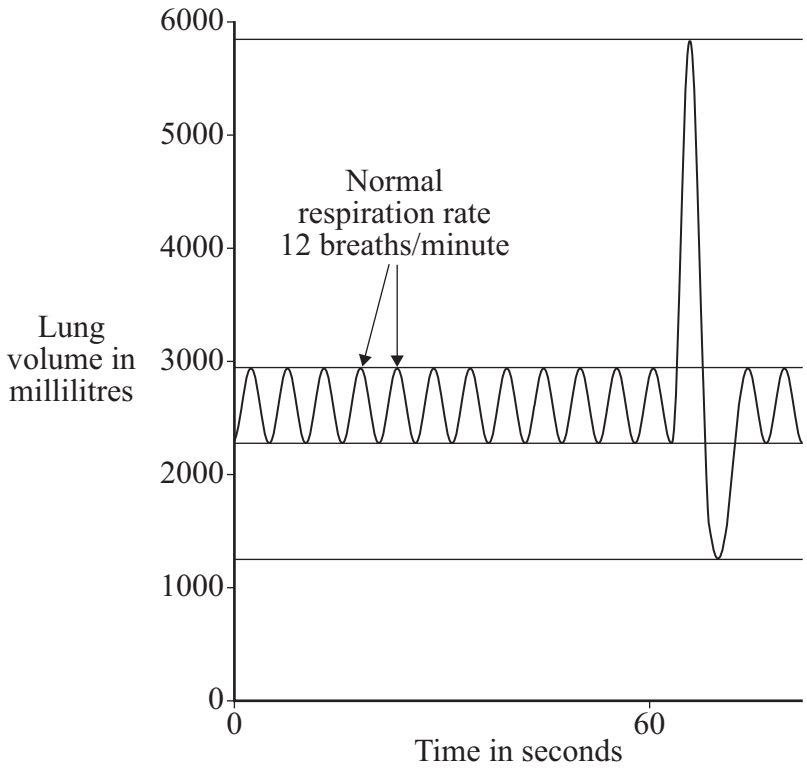
(2 marks)

Question 5 continues on the next page

5 (c) A sports physiologist advised a swimmer on how to improve her fitness.

The physiologist measured the vital capacity and the tidal volume of the swimmer's lungs.

5 (c) (i) On the graph, label the tidal volume and the vital capacity. *(2 marks)*



5 (c) (ii) What is the swimmer's vital capacity?

.....

(1 mark)

5 (c) (iii) Name the equipment that would be used to record tidal volume and vital capacity.

.....

(1 mark)

5 (d) During a race the swimmer may respire both aerobically and anaerobically.

5 (d) (i) Give **two** ways in which aerobic and anaerobic respiration are similar.

1 .....

.....

2 .....

.....

(2 marks)

5 (d) (ii) How is aerobic respiration different from anaerobic respiration?

.....

.....

(1 mark)

12

Turn over for the next question

6 An agricultural student investigated the growth of *Brassica rapa,* a fast growing crop.

The table shows the scientist's results.

Number of plants per pot	Average height of plant (mm)
1	22.5
2	19.5
4	15
8	10
16	6.5

6 (a) (i) Summarise the results of the investigation.

.....

.....

.....

.....

(2 marks)

6 (a) (ii) Suggest **two** reasons for these results.

1 .....

.....

2 .....

.....

(2 marks)

6 (b) (i) Apart from irrigation (watering), what **other** method could an intensive farmer use to increase the yield of his crop?

.....

.....

(1 mark)

6 (b) (ii) Describe the effect that the method you have chosen could have on the environment.

.....

.....

.....

.....

(2 marks)

Question 6 continues on the next page

6 (c) Organic farmers use natural predators to control pests and to increase crop yield. Ladybirds are used to control aphids, which are a serious pest on crops.

Read the following article about ladybirds.

The Harlequin ladybird was introduced into the USA from Asia 25 years ago as a form of pest control. It is found in a variety of habitats. The first one was spotted in the UK in 2004. It is now the dominant species in south-east England. A scientific spokesman said: "The future for native ladybirds is not looking good."

The photographs show the Harlequin ladybird and our native ladybird.

The photographs cannot be reproduced here due to third-party copyright constraints.

Harlequin ladybird	Native ladybird
Actual size: 6–8 mm	Actual size: 4–6 mm
Three generations a year	Two generations a year

Suggest and explain why the Harlequin ladybird is more dominant than our native ladybird in south-east England.

.....

.....

.....

.....

.....

.....

(3 marks)

10

END OF QUESTIONS

ACKNOWEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Question 3 Photograph: © PA Photos
Question 5 Photograph: © PA Photos
Question 6 Photographs: Berenspot ladybird, Photolibrary Group Limited; Harlequin ladybird, Photolibrary Group Limited.