Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Examiner's Use

General Certificate of Secondary Education
January 2008

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

H

Friday 18 January 2008 1.30 pm to 2.30 pm

For this paper you must have:
- a ruler.

You may use a calculator.

Time allowed: 1 hour

Instructions
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- 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.

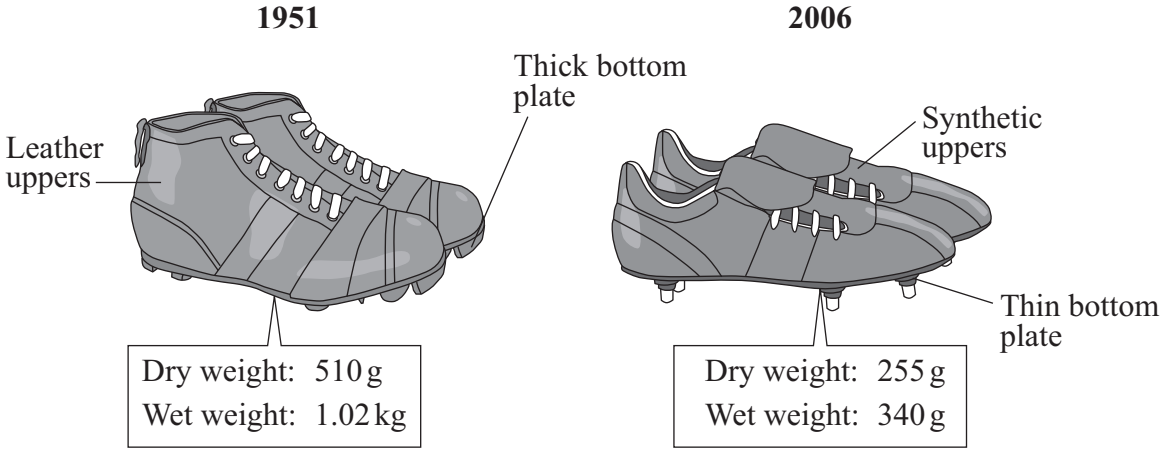
Advice
- In all calculations, show clearly how you work out your answer.

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 A materials scientist researches and develops new designs and materials to make sports shoes.

The diagrams show how football boots have changed over 55 years.



(a) Some differences between the boots are labelled.

Write down **two** other design differences that you can see.

1 .....

2 .....

(2 marks)

(b) Modern boots are now made using synthetic materials in the uppers instead of leather.

Give **three** advantages of using synthetic materials for the uppers.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

(c) The number of footballers who break a bone (metatarsal) in their foot is increasing.

Suggest a feature of the new boots that could be causing this increase.

Explain your choice.

Feature .....

Explanation .....

.....

(2 marks)

(d) The studs at the bottom of the boot can be made from a variety of materials.

Choose a material from the words in the box that could be used to make the studs.

Ceramic	**Composite**	**Metal**	**Polymer**	**Wood**

Give **two** reasons for your choice.

Material .....

Reason 1 .....

.....

Reason 2 .....

.....

(2 marks)

9

Turn over for the next question

2 A Scenes of Crime Officer found three fingerprints, **A**, **B** and **C**, at the scene of a crime.

Fingerprint **A**

Fingerprint **B**

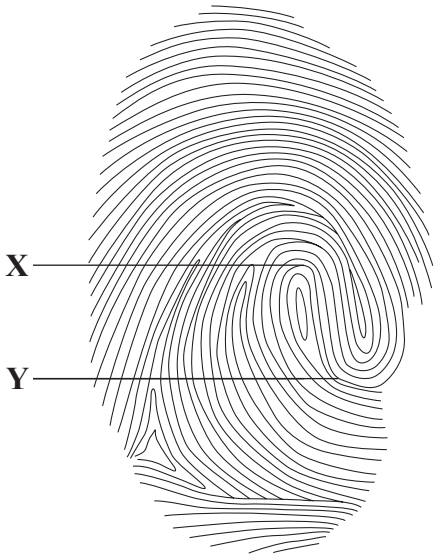
Fingerprint **C**

(a) What is this type of fingerprint pattern called?

.....

(1 mark)

(b) A suspect was arrested and his fingerprints were taken. The diagram shows one of his fingerprints.



(i) Has the suspect been at the scene of the crime?

Explain your answer.

.....

.....

(1 mark)

(ii) Use a ruler to measure the length of the suspect's fingerprint from **X** to **Y** in millimetres.

Length = ... mm
(1 mark)

(iii) The drawing is magnified × 5.

Calculate the distance from **X** to **Y** in the real fingerprint.

.....

Distance from **X** to **Y** = ...
(1 mark)

(c) Describe a method used by a Scenes of Crime Officer to reveal, lift and store fingerprints left at the scene of the crime.

.....

.....

.....

.....

.....

.....
(3 marks)

(d) Explain why fingerprint evidence on its own cannot be used to prove that the suspect committed the crime.

.....

.....

.....

.....
(2 marks)

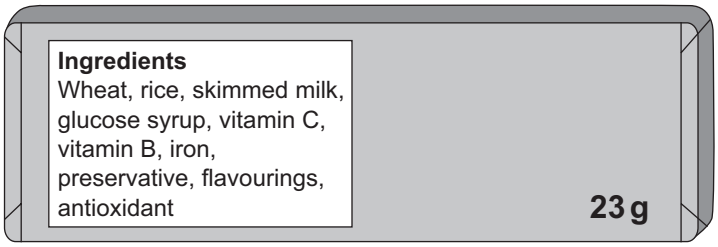
9

Turn over for the next question

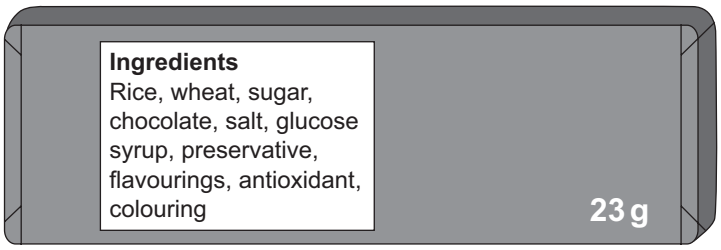
3 Food analysts test the composition of food to make sure that the correct nutritional information is given on the label.

The following information is given on two cereal bars, **P** and **Q**.

Cereal bar **P**



Cereal bar **Q**



(a) Which cereal bar, **P** or **Q**, could be in a 'Healthy Living' range?

Explain your answer.

.....

.....

.....

.....

.....

.....

(3 marks)

(b) Which cereal bar, **P** or **Q**, contains the greater proportion of rice?

Explain your choice.

.....

.....

(1 mark)

(c) Cereal bar **P** contains 393 kcal per 100 g.

A typical bar weighs 23 g.

How many kcal would one bar contain?

.....

..... kcal
(2 marks)

(d) Cereal bar **P** contains vitamins B and C.

What are the functions of these vitamins?

Vitamin B .....

.....

Vitamin C .....

.....
(2 marks)

(e) (i) Give an example of a preservative that may be found in cereal bar **P**.

.....
(1 mark)

(ii) Give an example of a colouring that may be found in cereal bar **Q**.

.....
(1 mark)

(f) The cereal bars also contain fibre.

Why is fibre important in the diet?

.....

.....

.....

.....
(2 marks)

12

4 A sports physiologist needs a good understanding of the body to help a cyclist to improve his fitness.

Photograph of a cyclist undergoing fitness endurance testing is not reproduced here due to third-party copyright restrictions

(a) Describe the changes that occur in the cyclist's body when he is exercising.

.....

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(4 marks)

(b) The sports physiologist advised the cyclist to increase his intake of complex carbohydrates before a race.

Explain how this makes sure that the cyclist has enough energy during the race.

.....

.....

.....

.....

(2 marks)

(c) Glucose is a simple carbohydrate.

(i) Give the chemical formula for glucose.

.....

(1 mark)

(ii) Name the type of chemical bonding in a molecule of glucose.

.....

(1 mark)

(iii) Explain why glucose has a low melting point.

.....

.....

.....

.....

(2 marks)

10

Turn over for the next question

5 Substances left at a crime scene often contain DNA. DNA can be used to identify an individual.

(a) (i) What **two** substances may be left at a crime scene that would contain DNA?

.....

.....

(2 marks)

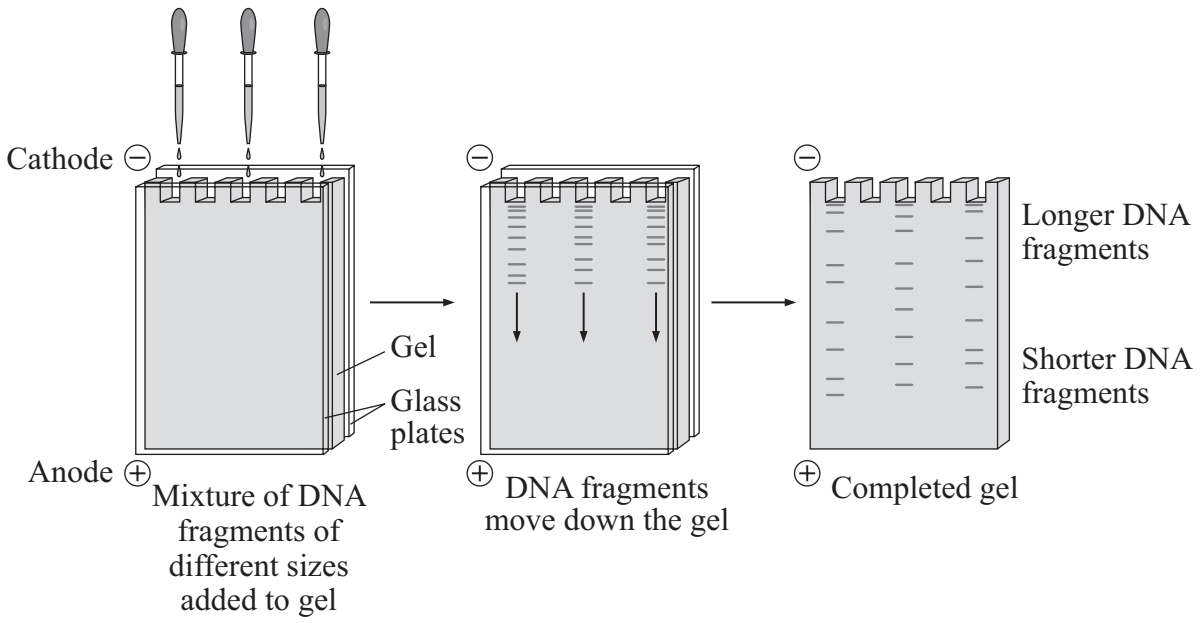
(ii) DNA is found in cells.

What structure in the cell contains the DNA?

.....

(1 mark)

(b) The diagram shows how a DNA profile is produced.



(i) What is the name of this process?

.....

(1 mark)

(ii) Explain how the fragments of DNA separate in the gel.

.....

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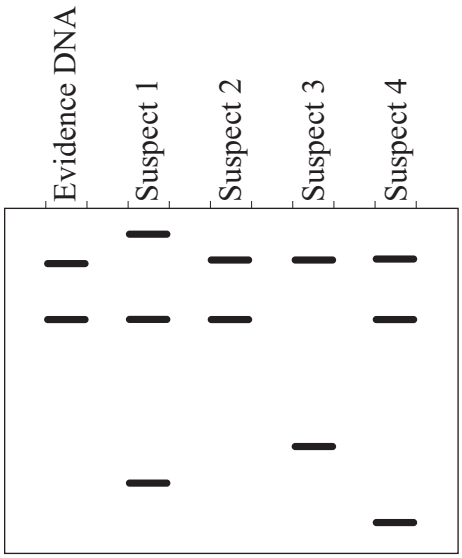
(4 marks)

(c) DNA was collected from a crime scene and its profile compared with the DNA profiles of four suspects.



Which suspect is most likely to have committed the crime?

Explain your answer.

.....

.....

.....

.....

(2 marks)

10

6 Read the news article about the salmonella scare in chocolate in 2006.

SALMONELLA IN CHOCOLATE SCARE

A chocolate company announced that 250 tonnes of chocolate are to be buried. A full product recall followed revelations that the chocolate products may be contaminated with salmonella. Chocolate is made by combining chocolate liquor with cocoa butter, sugar and milk solids or powder at a temperature of 30 °C.

In January 2006, waste material leaked through a faulty pipe at a chocolate factory. The Health Protection Agency (HPA) was informed, but the Food Standards Agency was not informed straight away and the chocolate was allowed to be sold.

The HPA noticed a sudden rise in the number of people contracting *Salmonella montevideo*, a rare strain of the disease. In 2005 there were only 14 cases but in the four months to June 2006 over 53 cases were reported to the HPA. The chocolate was then recalled and laboratory tests showed it to be contaminated with *Salmonella montevideo*.

Under the Food Safety Act 1990, companies must withdraw food from the shops when they have confirmed contamination. They are responsible for informing all the relevant authorities. Businesses that sell unsafe food may have to pay compensation to individuals who can show that they have been injured or have suffered loss as a result.

(a) (i) What type of microorganism is *Salmonella montevideo*?

.....

(1 mark)

(ii) Suggest how the salmonella got into the chocolate.

.....

.....

(1 mark)

(b) Describe a laboratory test that could be carried out to show that the contamination in the chocolate was the same as the one causing illness in people.

.....

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.....

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(4 marks)

(c) Why was the salmonella not killed during the manufacture of the chocolate?

.....

.....

(1 mark)

(d) Evaluate the company's decision not to recall the chocolate straight away.

.....

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.....

.....

.....

(3 marks)

10

END OF QUESTIONS

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