Surname		Other Names	
Centre Number			Candidate Number				
Candidate Signature									

For Examiner's Use

General Certificate of Secondary Education
June 2009

ADDITIONAL APPLIED SCIENCE **AASC/2F**
Unit 2 Science at Work
Foundation Tier

F

Thursday 4 June 2009 9.00 am to 10.00 am

For this paper you must have:
- a ruler
- 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.

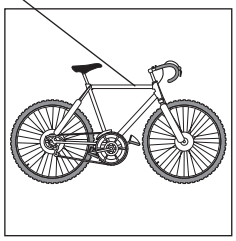
For Examiner's Use			
Question	Mark	Question	Mark
1		5	
2		6	
3			
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

1 Materials scientists research and develop the materials and designs for sports equipment.

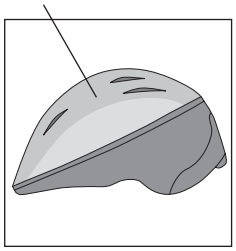
1 (a) (i) Draw a line linking each piece of sports equipment to a suitable property.
You may use each property only once or not at all.

Lightweight frame



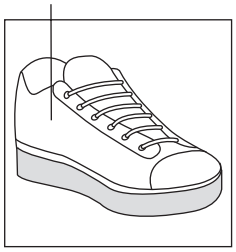
bicycle

Lined with foam



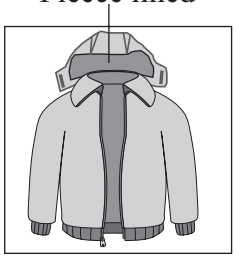
cycle helmet

Soft material



training shoe

Fleece lined



ski jacket

large surface area for cooling

thermal insulation to help maintain body temperature

flexible for comfort

shock absorbance to prevent head injury

low density for increased speed

(4 marks)

1 (a) (ii) Complete the table to give a suitable material for each piece of equipment.

Equipment	Material
The lightweight bicycle frame	
The outside of the cycle helmet	
The upper of the training shoe	

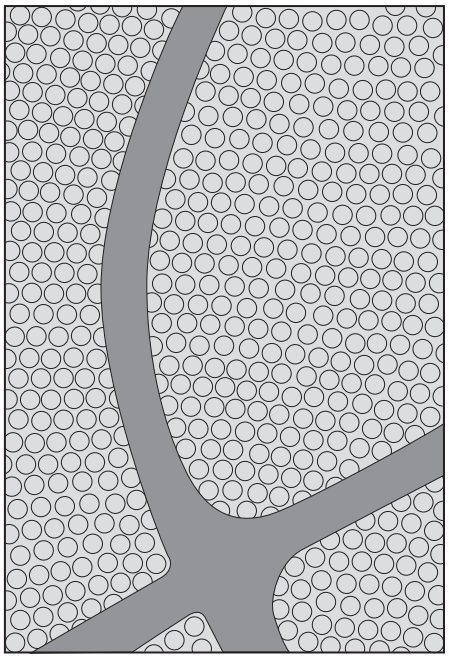
(3 marks)

Question 1 continues on the next page

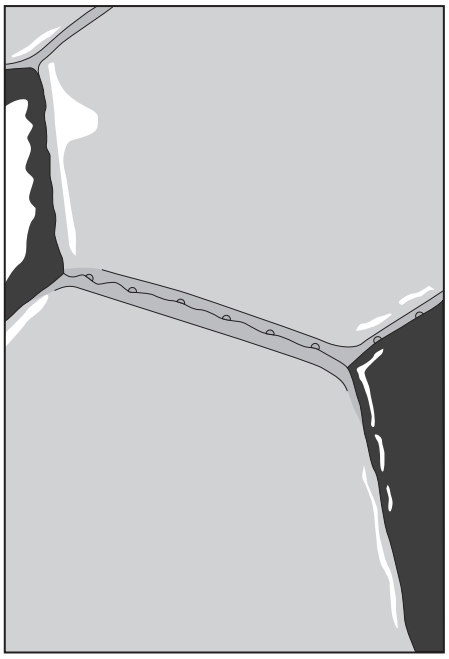
1 (b) When scientists are designing sports equipment, they have to consider friction.

Look at the pictures which show the magnified surfaces of a basket ball and a football.

Surface of a basketball



Surface of a football



1 (b) (i) How are the surfaces of the two balls different?

.....

.....

(1 mark)

1 (b) (ii) Suggest a reason for the design of the surface of the basketball.

.....

.....

(1 mark)

1 (b) (iii) State **one** disadvantage of friction in sports equipment.

.....

.....

(1 mark)

10

2 Some customers became ill after eating in a restaurant.

They had food poisoning.

2 (a) (i) Draw a ring around the bacteria that could cause food poisoning.

Lactobacillus **Streptococcus** **Salmonella**

(1 mark)

2 (a) (ii) Give **one** symptom of food poisoning.

.....

(1 mark)

2 (a) (iii) Give **two** conditions necessary for bacteria to grow.

1 .....

2 .....

(2 marks)

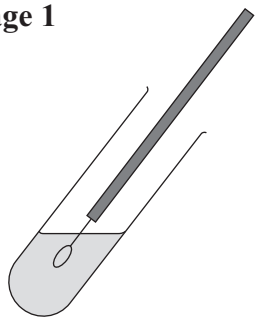
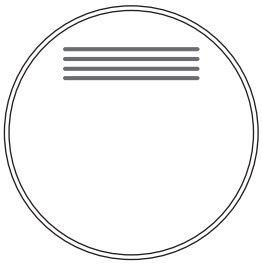
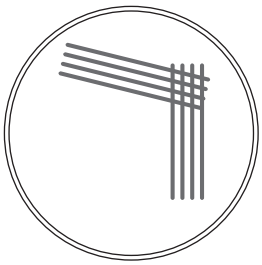
Question 2 continues on the next page

2 (b) (i) A Public Health Scientist was asked to identify the bacteria in the food that the customers had eaten.

He used the streak plate method.

The diagrams show how to make a streak plate.

Describe what is happening at each of the stages **1–3**.

Stage	Description
Stage 1 	....
Stage 2 	....
Stage 3 	....

(3 marks)

2 (b) (ii) What precaution should be taken when using the loop between **Stage 2** and **Stage 3**?

.....

.....

(1 mark)

2 (b) (iii) How does the streak plate method help to identify bacteria?

.....

.....

(1 mark)

2 (c) The Public Health Scientist also collected samples from the restaurant's kitchen. He used an aseptic technique.

Put a tick (✓) in the box next to the aseptic technique which the scientist would use.

Tick **one** box.

A sterile cotton swab was wiped on the work surface. ☐

A cotton bud was wiped on the work surface. ☐

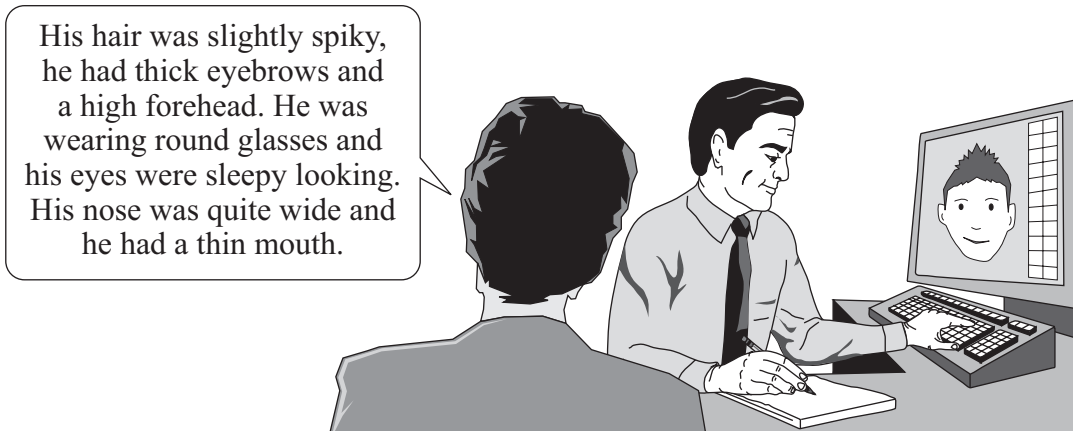
A sterile inoculating loop was wiped on the work surface. ☐

(1 mark)

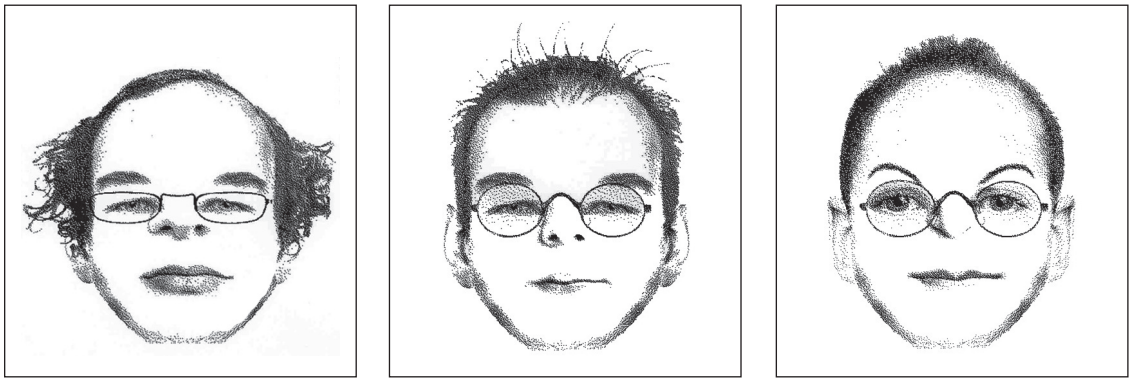
10

Turn over for the next question

3 A man lay injured at a crime scene. A witness gave the description of a person she saw leaving the scene of the crime to a forensic artist.



3 (a) (i) Which identikit picture, **A**, **B** or **C**, matches the witness description?



A **B** **C**

Write your answer in the box. ☐ *(1 mark)*

3 (a) (ii) Distinguishing features help us to tell the difference between one person and another.

Draw a ring around **two** distinguishing features that would be the **most** help in identifying a suspect.

Scar **Hair colour** **Tattoo** **Chin shape** **Eye Colour**

(2 marks)

3 (b) A suspect was arrested. Blood was found on one of his shoes.

A sample of the blood was taken and tested.

3 (b) (i) Why is it important to label the sample of blood?

.....

.....

(1 mark)

3 (b) (ii) Information can be obtained from the blood sample.

Draw a ring around the **two** pieces of information obtained from the blood sample that would be useful in the investigation.

Blood group	**Iron content**	**Red blood cell count**	**Percentage of white blood cells**	**DNA profile**

(2 marks)

3 (b) (iii) The sample of blood from the shoe was found to belong to the victim.

Does this prove that the suspect committed the crime?

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

Explain your answer.

.....

.....

(1 mark)

Question 3 continues on the next page

3 (c) The man arrested was also suspected of dealing in drugs.

Some white powder was found in his pocket and was tested by a technician.

3 (c) (i) Choose words from the box to complete the sentences about the tests on the white powder.

dissolved	**solid**	**solute**	**solvent**	**stirred**	**suspension**

A small amount of solid was added to a ..... and

..... to mix it. The mixture was observed to see whether

the solid ..... or formed a ..... .

(4 marks)

3 (c) (ii) The technician tested for a negative ion by mixing the powder with an acid.

The sample reacted with the acid and dissolved, giving off a gas.

Identify the ion. Draw a ring around the correct answer.

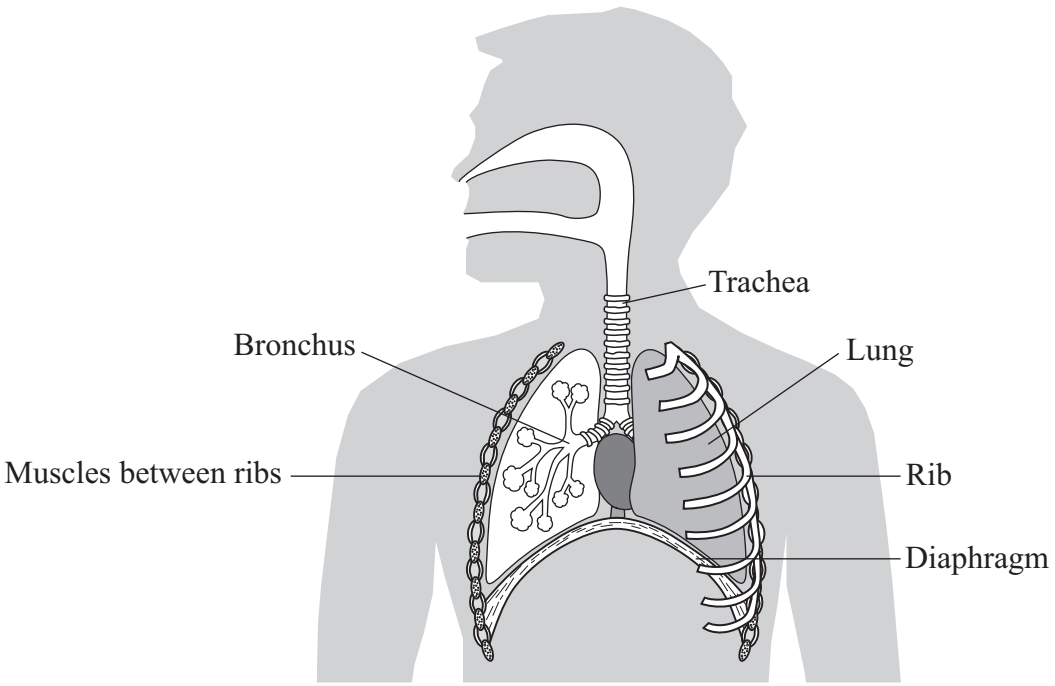
Chloride **Sulfate** **Carbonate**

(1 mark)

12

Turn over for the next question

4 The diagram shows the breathing system.



4 (a) Choose **two** structures from the diagram that are important in the ventilation of the lungs during breathing.

Structure 1 .....

Structure 2 .....

(2 marks)

4 (b) A student did an experiment to find out how exercise affected her breathing rate.

4 (b) (i) Write a method for the experiment.

.....

.....

.....

.....

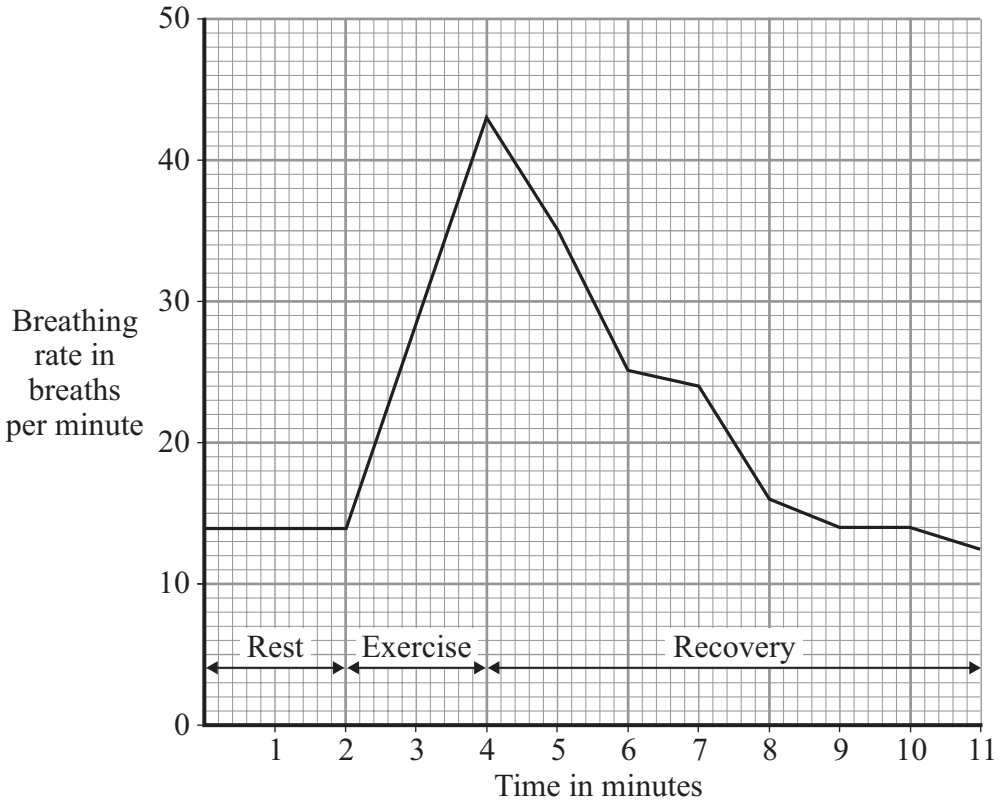
.....

.....

(3 marks)

Turn over ▶

The graph shows how the student's breathing rate changed with exercise.



4 (b) (ii) What was the student's breathing rate 4 minutes after the exercise ended?

.....

(1 mark)

4 (b) (iii) How long did it take the student to recover after the exercise ended?

.....

(1 mark)

4 (c) (i) Draw a ring round the correct word or phrase in each box to complete the sentences.

During exercise the volume of air you breathe in and out

increases
decreases
stays the same

.

During exercise the breathing rate increases to get more

oxygen
carbon dioxide
nitrogen

.

(2 marks)

4 (c) (ii) Draw a ring around the instrument that measures the volume of air which you breathe in and out.

Peak flow meter **Respirometer** **Spirometer**

(1 mark)

10

Turn over for the next question

5 (a) A crisps manufacturer developed a new brand of crisps made out of rice instead of potatoes.

Use the information on the nutrition labels to answer the questions.

Original Potato Crisps

Nutritional information

	per 100g	GDA*
Energy	2249 kJ (540 kcal)	8400 kJ (2000 kcal)
Protein	4.1g	45g
Carbohydrate	49g	230g
of which sugars	1.9g	90g
Fat	36g	70g
of which saturates	10g	20g
Fibre	3.6g	24g
Sodium	0.53g	2.4g

* Guideline Daily Amount for women

NEW RICE CRISPS

Nutritional information

	per 100g	GDA*
Energy	2061 kJ (493 kcal)	8400 kJ (2000 kcal)
Protein	5.3g	45g
Carbohydrate	59g	230g
of which sugars	2.4g	90g
Fat	24g	70g
of which saturates	7g	20g
Fibre	3.0g	24g
Sodium	0.75g	2.4g

* Guideline Daily Amount for women

5 (a) (i) The nutritional information on the packet gives the Guideline Daily Amount of energy for women.

What percentage of the GDA for energy is provided by 100 g of potato crisps?

Show your working. .....

.....

.....

.....

..... %

(2 marks)

5 (a) (ii) Which brand could be marketed as 'naturally lower in fat'?

Explain your answer.

Brand .....

Explanation .....

.....

(1 mark)

5 (b) The British Heart Foundation (BHF) has produced a guide to food labelling to help people to lower the fat, sugar, salt and sodium content in their diets.

Guide to food labelling

Nutrient	Low content (per 100 g of food)	High content (per 100 g of food)
Fat	3.0 g	20.0 g
Saturated fat	1.5 g	5.0 g
Sugars	5.0 g	15.0 g
Salt	0.3 g	1.5 g
Sodium	0.1 g	0.6 g

5 (b) (i) The crisps manufacturer claims that the rice crisps are a healthy snack. Use the BHF guide and the nutritional information on the rice crisps label to give **two** reasons why this claim might not be true.

Reason 1 .....

.....

Reason 2 .....

.....

(2 marks)

5 (b) (ii) Name **two** nutrients in the BHF Guide and say why it is important to control them in the diet.

Nutrient 1 .....

.....

Nutrient 2 .....

.....

(2 marks)

Question 5 continues on the next page

5 (b) (iii) The BHF also recommends eating plenty of foods containing fibre.

Explain the importance of fibre in the diet.

.....

.....

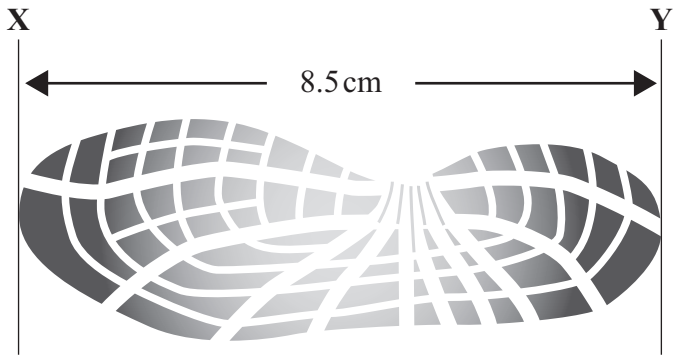
.....

.....

(2 marks)

9

6 The diagram shows a shoeprint found in the soil at the scene of a crime.



Scale 1:3

6 (a) (i) Use the scale on the diagram and the chart, to work out the size of the shoe.

Men's shoe sizes															
Length of shoe (cm)	23.5	24	24.5	25	25.5	26	26.5	27	27.5	28	28.5	29	29.5	30	30.5
Shoe size	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12

Show your working .....

.....

.....

.....

Shoe size ..... *(2 marks)*

Question 6 continues on the next page

6 (a) (ii) Describe how a Scenes of Crime Officer would obtain a cast of the shoeprint.

.....

.....

.....

.....

.....

.....

(3 marks)

6 (a) (iii) Apart from shoe size, what **two** features could a forensic scientist use to match the cast of the shoeprint to the shoes of a suspect?

Feature 1 .....

Feature 2 .....

(2 marks)

6 (b) A database can be used to identify the tread marks of a shoe.

Suggest how the shoeprint could be recorded and used in a database.

.....

.....

.....

.....

(2 marks)

9

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED