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
January 2011

Additional Applied Science AASC/2H

Unit 2 Science at Work

H

Written Paper

Thursday 13 January 2011 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.

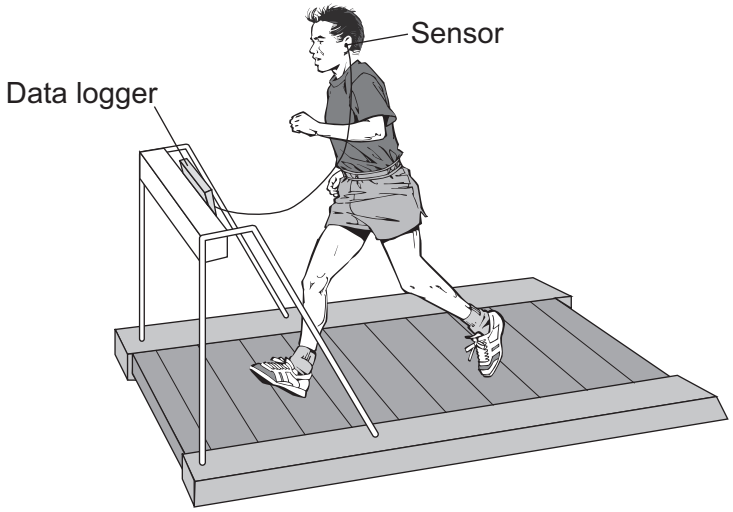
Advice
- In all calculations, show clearly how you work out your answer.

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

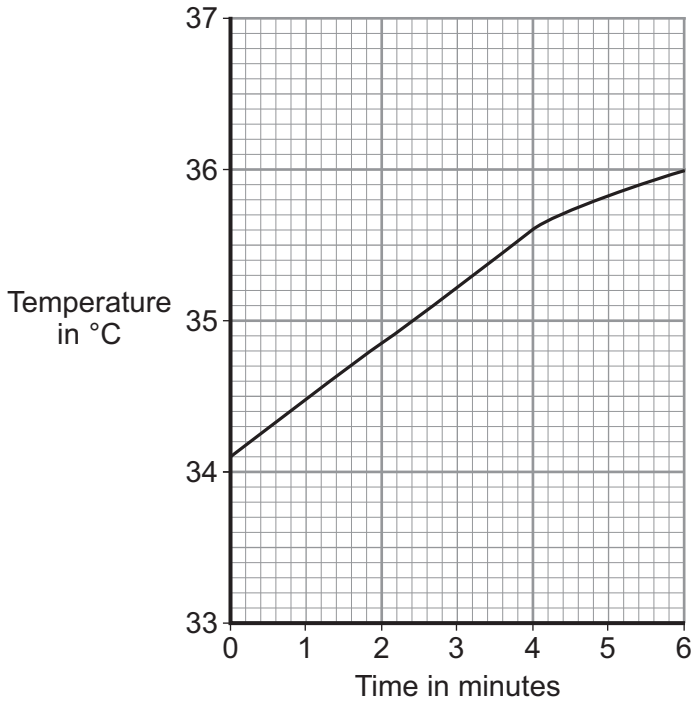
1 A sports physiologist measured the effect of exercise on an athlete's body temperature.

The physiologist attached a temperature sensor to the athlete's earlobe.

The sensor was connected to a data logger, which recorded the athlete's temperature as he exercised for 6 minutes.



The results are shown on the graph.



1 (a) (i) What was the athlete's temperature at the start of the exercise?

..... °C

(1 mark)

1 (a) (ii) By how much did the athlete's temperature rise during the 6 minutes exercise?

..... °C
(1 mark)

1 (a) (iii) Give **two** reasons why using a data logger is a good method of recording body temperature in this experiment?

Reason 1 .....

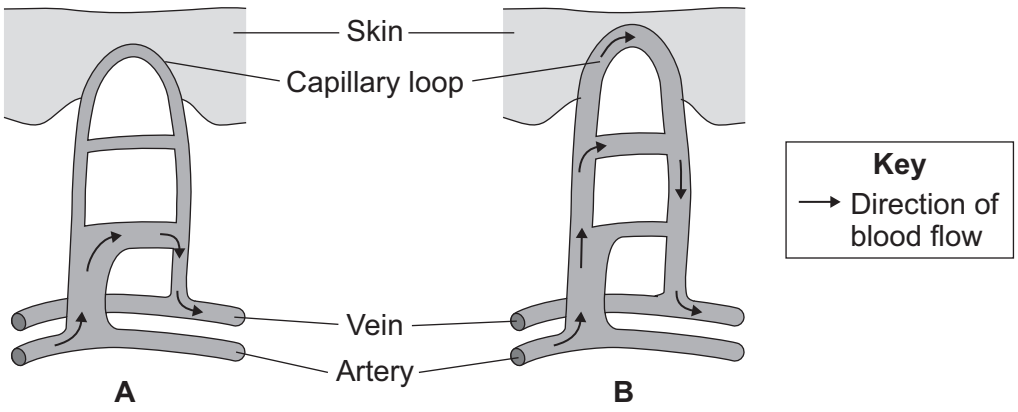
.....

Reason 2 .....

.....
(2 marks)

1 (b) The flow of blood through the body is used to control temperature.

The diagrams show a blood vessel at two different stages during exercise.



Which diagram, **A** or **B**, shows the blood vessel of the athlete after exercise?

Write your answer in the box. ☐

Explain how the change in the blood vessel helps the body to lose heat.

.....

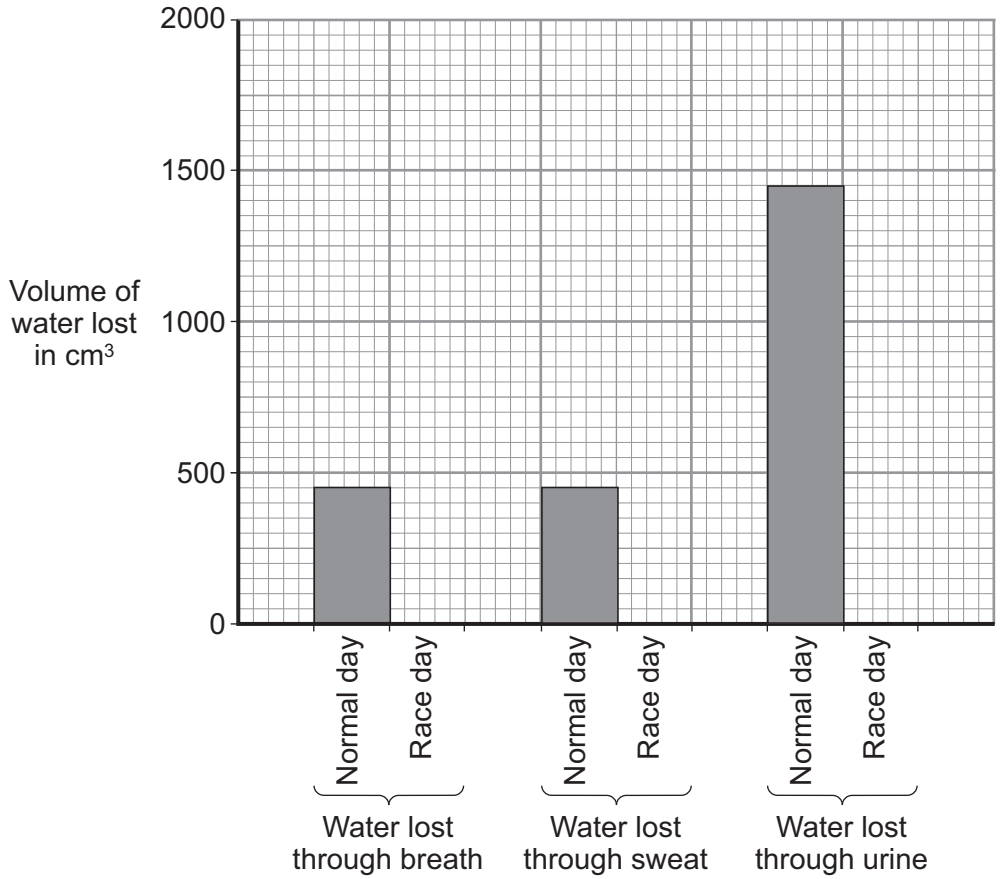
.....

.....

.....
(2 marks)

Question 1 continues on the next page

1 (c) The bar chart shows how much water is lost from the athlete's body on a normal day.



The athlete ran a race.

Draw **three** bars on the bar chart to show how the volume of water lost through breath, sweat and urine might be different on race day.

(3 marks)

9

2 Technicians in forensic laboratories do many chemical tests to identify substances.

2 (a) The table shows the positive results from some tests for a range of substances.

Positive result	Substance
Reacts with acidified potassium dichromate and turns it from orange to green	
Gives a lilac colour in a flame test	
When bubbled through limewater, the limewater turns milky	
When added to sodium hydroxide solution, a blue precipitate forms	

Use words from the box to complete the table.

carbon dioxide	**copper ions**	**ethanol**
glucose	**hydrogen**	**potassium ions**

(4 marks)

2 (b) Sodium chloride is an ionic compound.

2 (b) (i) What is the formula for sodium chloride?

.....

(1 mark)

2 (b) (ii) How are the particles held together in ionic compounds?

.....

.....

.....

(2 marks)

2 (b) (iii) Why do ionic compounds have high melting points?

.....

.....

.....

(2 marks)

9

3 A patient in hospital was told by the hospital dietician that she needed more iron and calcium in her diet.

3 (a) (i) Why does the human body need iron?

.....

(1 mark)

3 (a) (ii) Which vitamin helps the body to absorb iron?

.....

(1 mark)

3 (a) (iii) Why is calcium needed in the diet?

.....

(1 mark)

3 (b) The patient likes to eat fruit and vegetables, so the dietician gave her a chart showing the amount of iron and calcium in some fruit and vegetables.

Fruit / vegetable	**Mineral content of fruit / vegetable in mg per 100 g**	
	Iron	**Calcium**
Apple	0.1	3
Apricot	0.8	20
Avocado	0.7	15
Blackberries	1.0	30
Broccoli	1.5	100
Cabbage	1.0	75
Courgettes	2.4	30
Kiwi	0.3	29
Raspberries	1.5	15
Spinach	1.2	30

3 (b) (i) The patient ate 200 g of raspberries, 100 g of broccoli and 100 g of courgettes.

How much iron would she have consumed?

.....

..... mg
(1 mark)

3 (b) (ii) The Recommended Daily Allowance of iron is 18 mg.

Name a food, **other than** fruit or vegetables, that the patient could eat to significantly increase her intake of iron.

.....
(1 mark)

3 (b) (iii) The patient requires 1300 mg of calcium per day.

How many kilograms of broccoli would the patient need to eat to provide this amount of calcium?

.....

.....

..... kg
(2 marks)

3 (b) (iv) Suggest **one** other food that would supply more calcium per 100 g than broccoli.

.....
(1 mark)

3 (c) Fruit and vegetables are a good source of fibre.

Explain the importance of fibre in the diet.

.....

.....

.....

.....
(2 marks)

10

4 A shopkeeper suspected that a £20 note that he had been given by a customer was forged.

He handed the note to the police, who sent it to a forensic laboratory for analysis.

4 (a) (i) Suggest how a forensic scientist might obtain some of the ink from the £20 note.

.....

.....

.....

(2 marks)

4 (a) (ii) A forensic scientist analysed a sample of the ink from the £20 note using paper chromatography.

Describe how paper chromatography can be used to analyse a sample of ink.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

4 (a) (iii) The £20 note was checked for fingerprints.

Describe a suitable method that could be used to reveal the fingerprints on the £20 note.

.....

.....

.....

.....

(2 marks)

4 (a) (iv) The fingerprints found on the £20 note matched the fingerprints of the customer, who was suspected of forging the note.

Does this mean that the suspect did forge the note?

Explain your answer.

.....

.....

(1 mark)

4 (b) The shopkeeper gave the police the car registration number of the customer who gave him the forged £20 note.

The police used the Driver and Vehicle Licensing Agency (DVLA) database to look up information about the car.

Give **two** pieces of information about the car that the police could obtain from the DVLA database.

1 .....

2 .....

(2 marks)

11

Turn over for the next question

5 During the production of beer, microorganisms respire in the absence of oxygen to change glucose into alcohol (ethanol).

5 (a) (i) What is this type of respiration called?

.....

(1 mark)

5 (a) (ii) Which microorganism is used to produce ethanol in the making of beer?

.....

(1 mark)

5 (a) (iii) Give the chemical formula for each of the following compounds used in making beer.

Glucose .....

Ethanol .....

(2 marks)

5 (b) The following recall notice appeared in a newspaper.

WHESLES BREWERY

PRODUCT RECALL

Whesles Draught Bitter Cans
440 ml Can – Shrink-Wrapped 24 Packs
Batch Code BB4 93Z

Whesles Brewery regrets to announce that a small number of 440 ml cans of Whesles Draught Bitter may contain some of the cleaning fluid used to clean the inside of beer storage tanks.

This is **not** a public health issue. The product is being withdrawn from sale for quality reasons as the affected product is likely to smell and taste unpleasant. These cans should not be opened and the beer should not be consumed.

The affected 440 ml cans are all being withdrawn from public sale. The public are advised to return any affected stock to the store where they purchased it for a full refund.

All other brewery products and packaging are unaffected.

Whesles Brewery apologises for any inconvenience this may cause.

5 (b) (i) What was the cause of the contamination of the beer?

.....

(1 mark)

5 (b) (ii) Suggest **three** reasons why the brewery emphasised that this contamination was **not** a public health issue.

1 .....

2 .....

3 .....

(3 marks)

5 (b) (iii) Suggest **one** possible advantage to the brewery of this recall.

.....

(1 mark)

9

Turn over ▶

6 Rugby is a strenuous sport.

6 (a) A rugby player's training programme resulted in him increasing his weight even though his body fat reduced by almost 5%.

Suggest what caused this increase in weight.

.....

.....

(1 mark)

6 (b) In a 24 hour period, a person uses 1.3 kcal of energy every hour for every kilogram of body mass.

Playing rugby requires a lot of energy. During a game of rugby an extra 8.5 kcal of energy is required every hour for every kilogram of body mass.

A 97 kg man played a rugby game that lasted for 1.4 hours.

Calculate the total energy that this man would use on the day he played the rugby game.

.....

.....

.....

.....

.....

Total energy for the day = ... kcal

(3 marks)

6 (c) A sports nutritionist gave the rugby player some advice.

"Eat some pasta or cereal 3 hours before the game and drink a high energy sports drink 30 minutes before the game".

Explain why he gave the player this advice.

6 (c) (i) Reason for pasta or cereal:

.....

.....

.....

(2 marks)

6 (c) (ii) Reason for sports drink:

.....

.....

.....

(2 marks)

6 (d) During a rugby game the rugby player bends his arm to throw the ball.

Describe how the muscles in the upper arm bend the arm so it is possible to throw the ball.

You may use a diagram to explain your answer.

.....

.....

.....

.....

(2 marks)

6 (e) During a rugby game, respiration without the use of oxygen can occur in the muscles.

Describe the effect on the muscles of respiring without oxygen.

.....

.....

.....

.....

(2 marks)

12

END OF QUESTIONS

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