

# Specimen Paper

Centre Number						Candidate Number					
Surname											
Other Names											
Candidate Signature											



General Certificate of Secondary Education  
Foundation Tier  
Specimen Paper

## Additional Applied Science

### Unit 1 Science at Work

#### Foundation Tier

# F

**For this paper you must have:**

- a ruler
- the Equations Sheet (enclosed).

You may use a calculator.

**Time allowed**

- 60 minutes

**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 space 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 reminded of the need for good English and clear presentation in your answers.
- Question 6(c)(i) should be answered in continuous prose. In this question you will be marked on your ability to:
  - use good English
  - organise information clearly
  - use specialist vocabulary where appropriate.

**Advice**

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

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

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

**1** Two students are doing a practical investigation.

The diagrams show the ways both students are working.



**Student A**



**Student B**

**1 (a)** Which student, **A** or **B**, is working safely?

Give **four** reasons for your answer.

- 1 .....
- 2 .....
- 3 .....
- 4 .....

(4 marks)

**1 (b)** Why would it be unsafe to use this method to heat petrol?

.....

.....

(1 mark)

5
---

**2** Sports physiologists use information about how our bodies work to help athletes improve their performance.

They need to understand the effects that exercise has on the body.

**2 (a)** Use words from the box to complete the paragraph about exercise.

arteries	veins	aerobic	anaerobic	muscles
----------	-------	---------	-----------	---------

When the athlete is exercising, substances are carried in the blood to the contracting ..... . The substances travel to the muscles through blood vessels called ..... . If the athlete runs very quickly, ..... respiration happens, which makes a waste product called lactic acid.

(3 marks)

**2 (b)** Complete the word equation for aerobic respiration.

Glucose + ..... → water + .....

(2 marks)

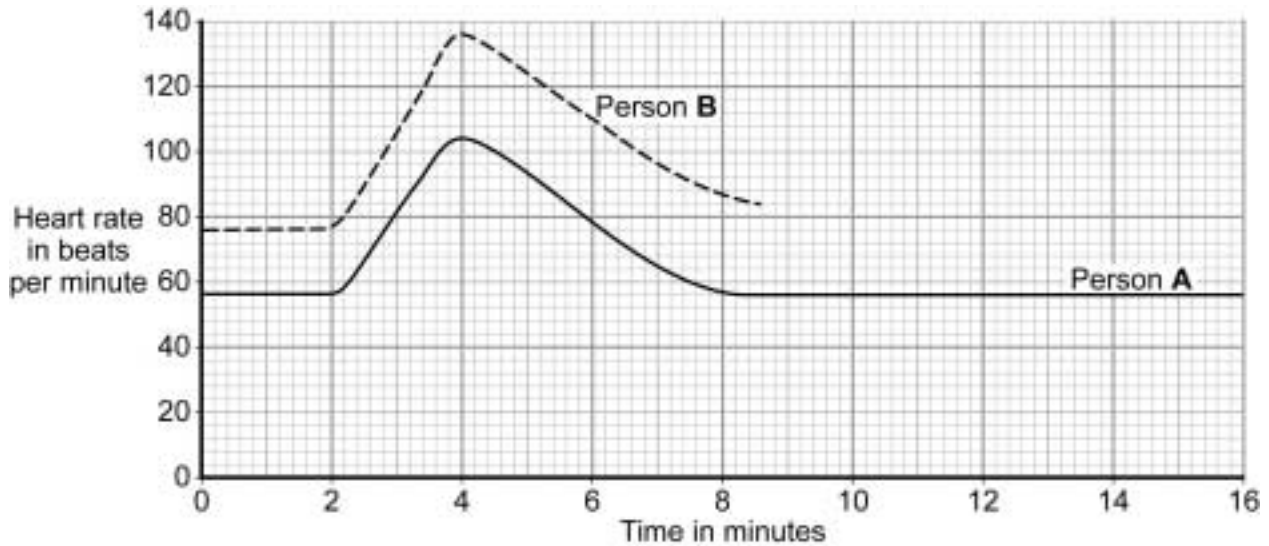
**Question 2 continues on the next page**

**Turn over ►**

**2 (c)** One indicator of fitness is heart rate.

A sports physiologist used a digital monitor to measure the fitness of two people during and after a running exercise.

The readings are shown on the graph.



**2 (c) (i)** Use the graph to explain what is happening to person **A** in the first four minutes of the test.

.....

.....

.....

.....

.....

.....

.....

(3 marks)

**2 (c) (ii)** Use the graph to estimate how long after the start of exercise it took person **B**'s heart rate to return to normal.

.....

(1 mark)

2 (c) (iii) Which person, **A** or **B**, is fitter?

Suggest **two** reasons why.

.....

.....

.....

.....

(2 marks)

11
----

**Turn over for the next question**

**Turn over ►**

**3** An environmental scientist analysed a sample of water from a river that was thought to be contaminated with a metal compound.

**3 (a) (i)** The scientist first tested the water sample for the presence of non-metal ions. The tests and the scientist's observations are shown in the table.

Complete the table by writing in the missing observation and conclusions.

Test	Observation	Conclusion
<b>A</b> Add dilute hydrochloric acid to the sample	..... .....	No carbonate present
<b>B</b> Add dilute hydrochloric acid, followed by dilute barium chloride, to the sample	No precipitate	..... .....
<b>C</b> Add dilute nitric acid, followed by dilute silver nitrate, to the sample	White precipitate forms	..... .....

(3 marks)

**3 (a) (ii)** The scientist then tested the sample for the presence of metal ions.

The scientist's observations are given below.

Test	Observation
Add excess dilute sodium hydroxide to the sample	White precipitate formed, which disappeared on addition of excess sodium hydroxide

What conclusion can you make from the scientist's observation in this test?

.....  
(1 mark)

**3 (b)** Suggest a name for the metal compound contaminating the river.

.....  
(1 mark)

**3 (c)** Dilute hydrochloric acid and sodium hydroxide are common chemicals found in the laboratory.

Which **one** of the hazard labels below would you expect to find on bottles of dilute hydrochloric acid **and** sodium hydroxide?

Tick (✓) **one** box.



(1 mark)

6

Turn over for the next question

Turn over ►

4 Materials scientists choose a material for a particular use depending on the properties of the material.

4 (a) **List A** gives the names of some materials.

**List B** gives some properties of materials.

Draw **one** line from each material in **List A** to the correct property of the material in **List B**.

<b>List A</b>	<b>List B</b>
<b>Material</b>	<b>Property of material</b>
Aluminium	Is a good electrical conductor
Ceramic	Is a composite material
Plywood	Withstands high temperatures
Poly(ethene)	Softens in boiling water
	Is strongly magnetic

(4 marks)

4 (b) Stainless steel alloys are used for making car exhaust systems.

What is the meaning of the term 'alloy'?

.....

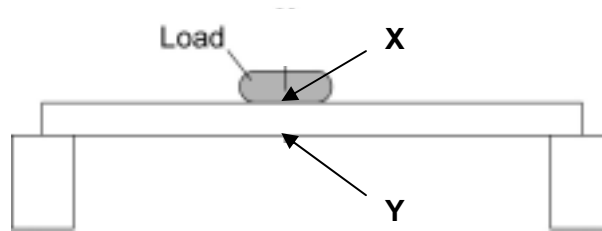
.....

(1 mark)



**4 (c)** Reinforced concrete is used in the construction of buildings.

The diagram shows a beam made of reinforced concrete, supporting a load.



**4 (c) (i)** What type of material is reinforced concrete?

Draw a ring around the correct answer.

**composite**

**ceramic**

**metal**

**polymer**

(1 mark)

**4 (c) (ii)** What forces are acting at points **X** and **Y** on the beam?

Force at **X** .....

Force at **Y** .....

(2 marks)

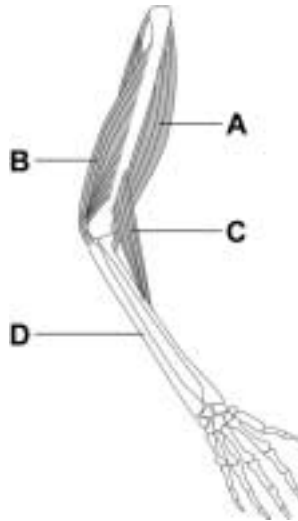
8

**Turn over for the next question**

**Turn over ►**

**5** Physiotherapists need to know about joints so that they can treat skeletal-muscular injuries.

**5 (a)** The diagram shows a human arm.



**5 (a) (i)** Which part of the arm, **A**, **B**, **C** or **D**, is the triceps?

(1 mark)

**5 (a) (ii)** Describe the action of the biceps and triceps in bending the arm.

.....

.....

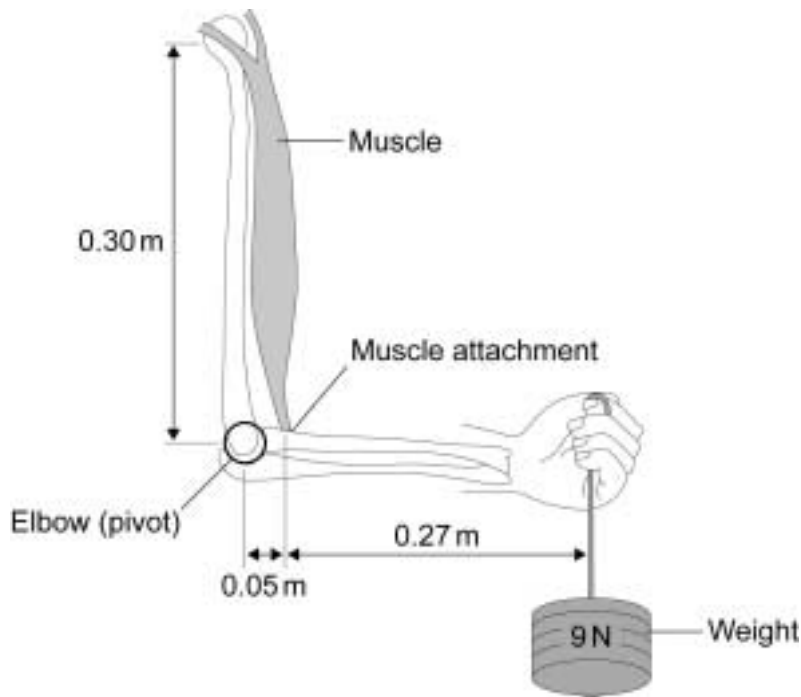
.....

.....

(2 marks)

5 (b) (i) A physiotherapist gives a patient some exercises to do to strengthen her arm muscles.

The diagram shows the bones and one muscle in the patient's arm.



The 9 N weight has a turning effect on the lower arm.

Calculate the moment of the 9 N weight.

Show clearly how you work out your answer.

.....

.....

.....

Moment = ..... Nm  
(2 marks)

5 (b) (ii) Suggest why the muscle must contract with a force greater than 9N to stop the hand moving down.

.....

.....

(1 mark)

Turn over ►

**6** Agricultural scientists research methods of growing crops commercially and safely.

**6 (a)** Name **one** organisation that is responsible for the safety of the food that we eat.

.....  
(1 mark)

**6 (b)** An agricultural scientist suggests that food crops can be produced more economically if fertilisers containing particular minerals are added to the crops.

Name **two** minerals that can be added to food crops to promote healthy growth.

1 .....

2 .....

(2 marks)

**6 (c)** An agricultural scientist investigates two fertilisers, **A** and **B**, to test the hypothesis that **A** is better than **B** in increasing the yield of wheat.

**6 (c) (i)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe an experiment that the agricultural scientist could do to find out which fertiliser would be better for increasing the yield of wheat.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

(6 marks)

6 (c) (ii) How would the agricultural scientist use his results to check the hypothesis?

.....  
.....

(1 mark)

6 (d) Wheat can be used to feed farm animals, such as pigs. Pigs may be kept indoors or outdoors.

The pie charts show how the energy in the food eaten by the pigs kept indoors and by the pigs kept outdoors is used.



Farmers make more profit from keeping pigs indoors than from keeping pigs outdoors.

Use information from the pie charts to suggest why.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

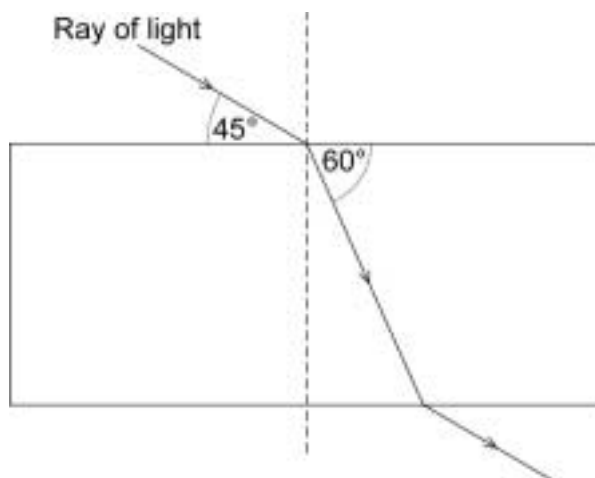
(4 marks)

Turn over for the next question

Turn over ►

7 (a) A glass manufacturer needs to know the refractive index of a specimen of glass.

He can do this by passing a ray of light through a piece of the glass and measuring the angle of incidence and angle of refraction.



7 (a) (i) What is the name of the dotted line shown on the diagram?

.....

(1 mark)

7 (a) (ii) The table shows the refractive indices of different types of glass.

Type of glass	Refractive index
Window glass	1.500–1.520
Headlamp glass	1.400–1.430
Spectacle glass	1.520–1.550

Use the information in the diagram and the table to suggest whether this piece of glass is suitable for headlamps.

.....

.....

.....

.....

.....

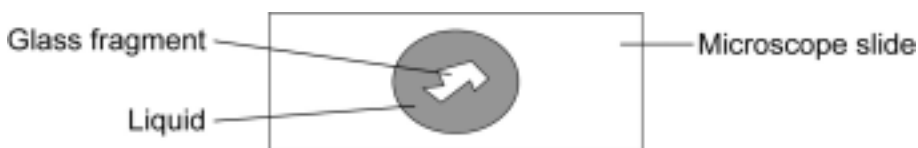
.....

.....  
.....

(4 marks)

**7 (b)** A forensic scientist needs to identify a tiny fragment of glass. The fragment is so small that she cannot use the method described in (a).

The forensic scientist put the glass fragment on a microscope slide and covered it with a few drops of liquid. The liquid was heated and then allowed to cool down.



**7 (b) (i)** As the liquid heats up, the glass fragment seems to disappear and reappear. As the liquid cools, a similar observation is made.

Explain why the glass seems to disappear at one particular temperature.

.....  
.....  
.....  
.....

(2 marks)

**7 (b) (ii)** Why is it better to measure the temperature at which the glass seems to disappear twice?

.....  
.....  
.....  
.....  
.....

(3 marks)

**END OF QUESTIONS**

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**



**GCSE Additional Applied Science Equations sheet****Unit 1**

$$\text{Moment} = \text{force} \times \text{perpendicular distance to pivot}$$

$$\text{BMI} = \frac{\text{mass}}{\text{height}^2}$$

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{Stress} = \frac{\text{force}}{\text{cross-sectional area}}$$

$$\text{Force} = \text{constant} \times \text{extension}$$

$$R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$$

$$\text{Refractive index} = \frac{\sin i}{\sin r}$$