

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

4791/02



S15-4791-02

**ADDITIONAL APPLIED SCIENCE**  
**UNIT 1: Science at Work in Applied Contexts**  
**HIGHER TIER**

P.M. TUESDAY, 12 May 2015

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	12	
2.	12	
3.	16	
4.	8	
5.	12	
<b>Total</b>	<b>60</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you may require a calculator and a ruler.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question **2(i)** and **5(a)(ii)**.

You are reminded to show all your workings. Credit is given for correct workings even when the final answer given is incorrect.

*Answer all the questions in the spaces provided.*

1. A food manufacturer claims that probiotic yoghurt, containing live bacteria, will provide health benefits when eaten.

- (a) Describe the stages in the production of yoghurt. [3]

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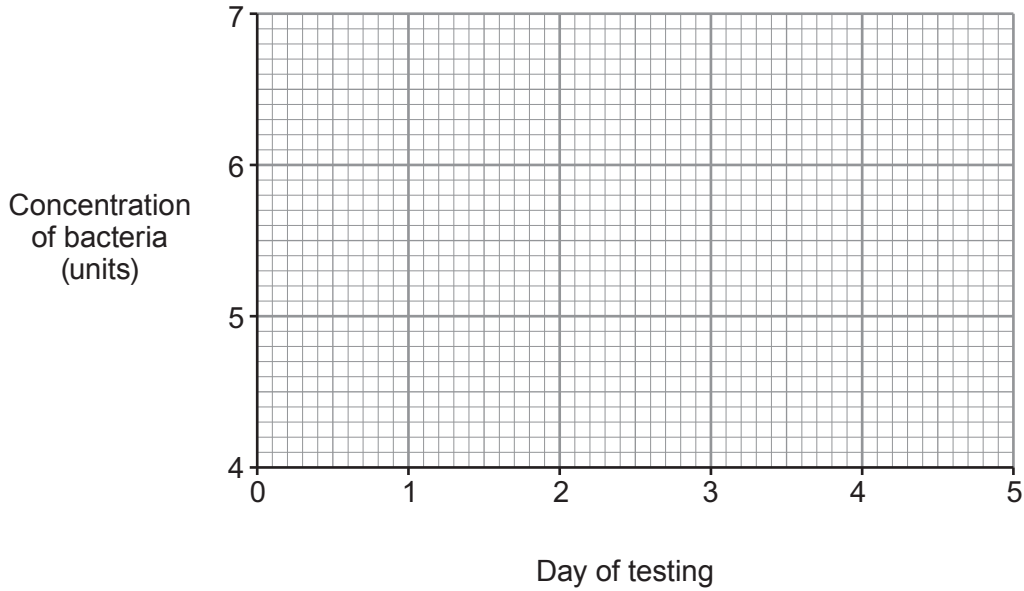
- (b) Some people claim that bacteria will not survive in the stomach. The food manufacturer claims that the bacteria will survive and their numbers will increase.

An independent scientist investigates the claim. She produces a model of the stomach and adds live bacteria found in the yoghurt. The bacteria concentration is measured daily for 5 days. The results are shown below.

Day of testing	Concentration of bacteria (units)
1	5.0
2	6.4
3	4.8
4	5.6
5	4.8

(i) Plot a graph of the data on the grid below.

[4]



(ii) Do the results agree with the claim that the bacteria will **not** survive in the stomach? Give **one** reason for your answer. [1]

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(iii) Do the results agree with the manufacturer's claim that the number of bacteria in the stomach will increase? Give **one** reason for your answer. [1]

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(c) (i) It is important that harmful bacteria do not get into the probiotic yoghurt during production.

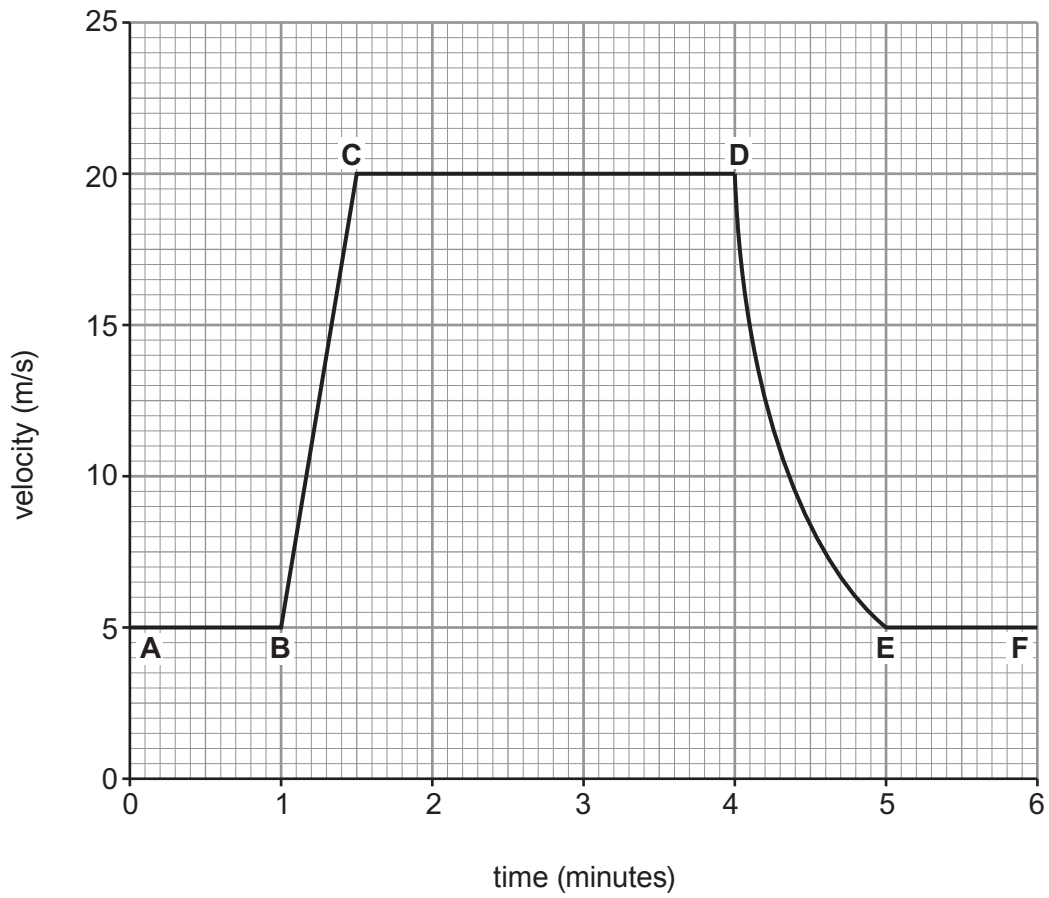
State **two** methods of making sure this will not happen. [2]

1. ....
2. ....

(ii) Name **one** type of harmful bacteria that causes food poisoning. [1]

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2. The velocity–time graph below shows part of a journey taken by a cyclist.



- (i) **Describe** the motion of the cyclist using data from the graph. [6 QWC]

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(ii) Calculate the distance travelled by the cyclist between **C** and **D** on the graph. [3]

Use the equation:

$$\text{distance} = \text{velocity} \times \text{time}$$

distance travelled = ..... m

(iii) Calculate the acceleration of the cyclist between **B** and **C**. [3]

Use the equation:

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

acceleration = ..... m/s<sup>2</sup>

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3. Caravan manufacturers are continually researching different ways of making caravans. The table shows information about some of the materials used to make the body of caravans.

Material	Density (kg/m <sup>3</sup> )	Stiffness (GPa)	Melting point (°C)	Tensile strength (MPa)	Brittle
aluminium	2700	69	660	90	No
steel	7800	210	1357	1200	No
polyester	1900	150	121	250	Yes

(a) At one time, caravan bodies were made from aluminium.

- (i) Use the table to state **one** advantage and **one** disadvantage of making caravan bodies from aluminium instead of steel. [2]

Advantage .....

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Disadvantage .....

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- (ii) Explain in terms of the arrangement of atoms, why aluminium is malleable. [2]

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- (b) (i) The polyester used in some modern caravans is a new polymer. Describe the structure of a polyester in terms of molecules. [2]

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- (ii) Using data from the table, explain why polyester is a more suitable material than aluminium for caravan bodies. [4]

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- (iii) State **one** disadvantage of polyester caravan bodies. [1]

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- (iv) The volume of polyester needed to make one type of caravan body is 0.4 m<sup>3</sup>. Calculate the mass of the caravan body. [3]

Use the equation:

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

mass = ..... kg

- (c) The wheels on modern caravans are made from an alloy which is not malleable. Explain how the structure of the alloy is different from aluminium. [2]

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4. The tables below show tests that can be carried out by a technician.

#### Tests for negative ions

Negative ion	Symbol	Solutions added	Results
carbonate	$\text{CO}_3^{2-}$	dilute hydrochloric acid	carbon dioxide gas given off
chloride	$\text{Cl}^-$	dilute nitric acid then silver nitrate	white precipitate
iodide	$\text{I}^-$	dilute nitric acid then silver nitrate	yellow precipitate
nitrate	$\text{NO}_3^-$	iron(II) sulfate then concentrated sulfuric acid	brown ring forms
sulfate	$\text{SO}_4^{2-}$	barium chloride	white precipitate

#### Test for positive ions

Positive ion	Symbol	Flame test colour
barium	$\text{Ba}^{2+}$	yellow-green
calcium	$\text{Ca}^{2+}$	brick red
copper	$\text{Cu}^{2+}$	green
lead	$\text{Pb}^{2+}$	blue
lithium	$\text{Li}^+$	red
potassium	$\text{K}^+$	lilac
sodium	$\text{Na}^+$	yellow
ammonium	$\text{NH}_4^+$	no colour



The table below shows the tests carried out by the technician on four compounds, **A**, **B**, **C** and **D**, and the results of those tests.

Compound	Test used to identify the positive ion		Test used to identify the negative ion	
	Test using the solid form of compound	Result	Test using a solution of compound	Result
<b>A</b>	Flame test	Lilac coloured flame	Add dilute nitric acid followed by silver nitrate solution	Yellow precipitate
<b>B</b>	Flame test	Red coloured flame	Add dilute hydrochloric acid. Bubble gas given off into limewater.	Fizzing occurs. Gas given off turns limewater milky.
<b>C</b>	Add sodium hydroxide solution and warm mixture. Test gas given off with damp litmus paper.	Pungent smelling gas given off which turns damp red litmus paper blue	Add barium chloride solution	White precipitate
<b>D</b>	Flame test	Yellow coloured flame	Add dilute nitric acid followed by silver nitrate solution	White precipitate

Use the information to complete the table below.

[8]

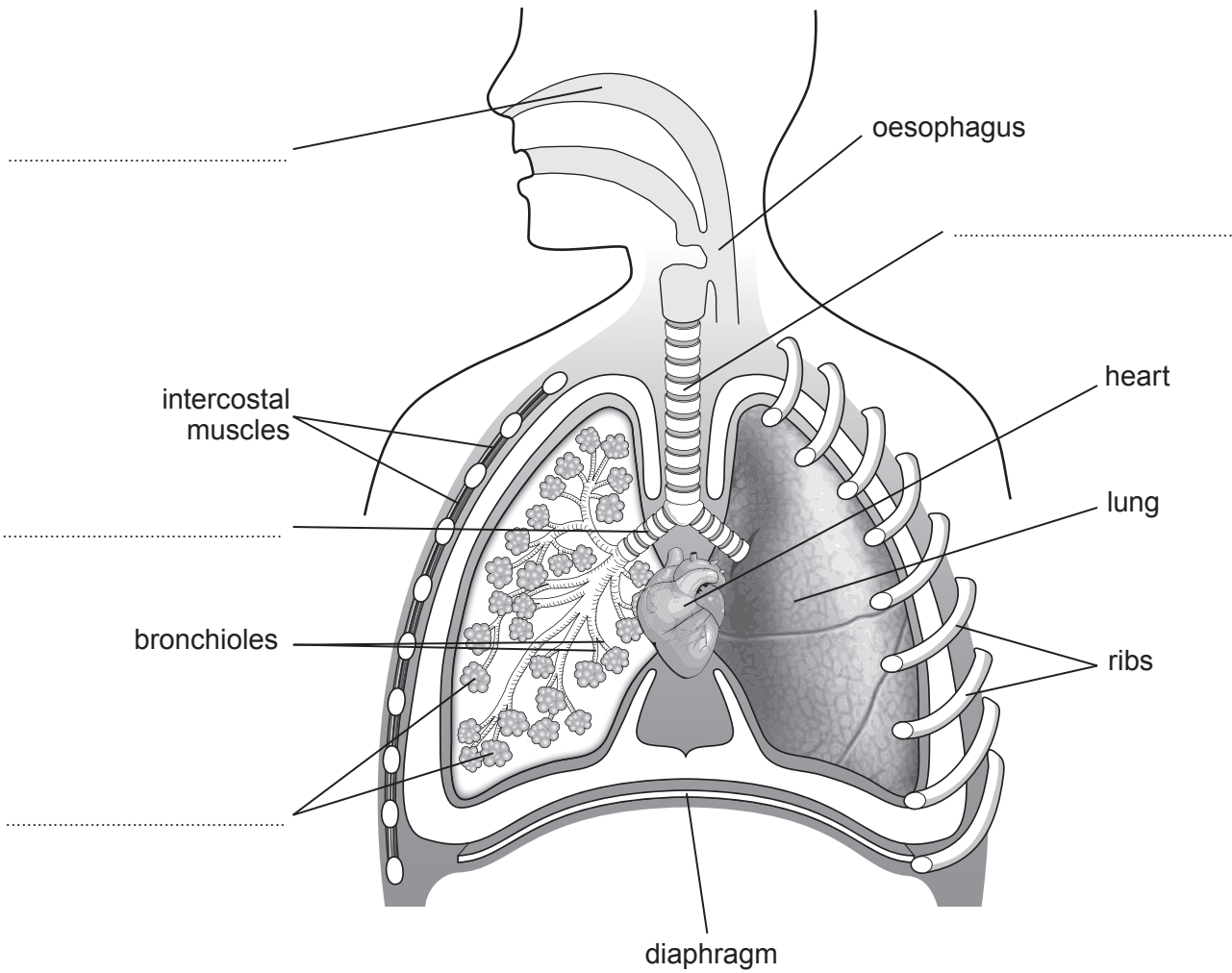
Compound	Name of compound	Chemical formula
<b>A</b>	.....	.....
<b>B</b>	.....	.....
<b>C</b>	ammonium .....	.....
<b>D</b>	.....	.....

5. Llinos' response to exercise is being monitored by her health care team.

(a) The team needs to know about the respiratory system.

(i) **Label** the missing parts on the diagram below.

[4]





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(b) Llinos' breathing was monitored before and during exercise.

(i) State **one** short-term effect of exercise on breathing. [1]

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(ii) State **one** long-term effect of exercise on breathing. [1]

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**END OF PAPER**

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