Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4791/01

S15-4791-01

ADDITIONAL APPLIED SCIENCE

UNIT 1: Science at Work in Applied Contexts
FOUNDATION TIER

P.M. TUESDAY, 12 May 2015

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**9**	
3.	**8**	
4.	**12**	
5.	**11**	
6.	**12**	
Total	**60**	

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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 **6**(i).

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

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

1. *(a)* Lee entered the names of metals and non-metals with their symbols into the table below. Lee made some errors when he filled in the table.

Lee's Table

Metals		Non-metals	
Element	Symbol	Element	Symbol
carbon	**C**	**aluminium**	**al**
copper	**Co**	**phosphorus**	**PH**

Complete the table below, correcting the errors made by Lee. [5]

Metals		Non-metals	
Element	Symbol	Element	Symbol
.....	.....	.....	.....
.....	.....	.....	.....

(b) The formula for carbon dioxide is CO_2.

The relative atomic mass of carbon is 12. The relative atomic mass of oxygen is 16.

(i) Calculate the relative formula mass of carbon dioxide. [2]

relative formula mass of carbon dioxide = ...

(ii) What is the mass of 1 mole of carbon dioxide? ..... g [1]

8

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Turn over.

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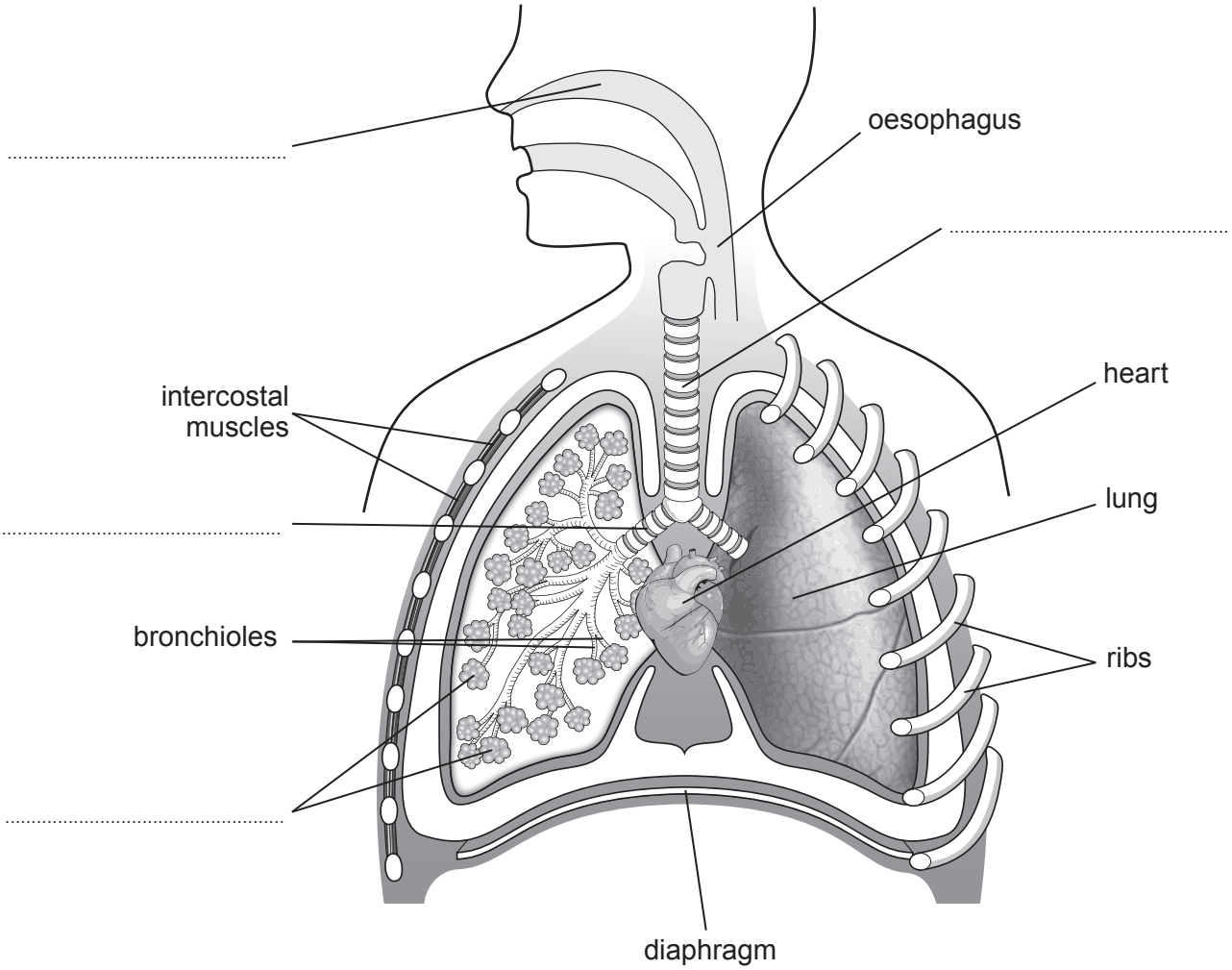
2. Llinos' response to exercise is being monitored by her health care team.

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

Label the missing parts on the diagram below using only words from the box. [4]
*One label in the box is **not** needed in the diagram.*

ventricle	alveoli	nasal cavity	trachea	bronchus



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(b) The air breathed in and out by Llinos was analysed. The analysis is shown below.

Gas	% of gas in air breathed in	% of gas in air breathed out
nitrogen	78	78
oxygen	21	17
carbon dioxide	0.03	4.03
other gases	0.97	0.97

State **two** differences between the air breathed in and air breathed out. [2]

1. .....

2. .....

(c) (i) Complete the following equation. [2]

glucose + oxygen ⟶ ..... + ... + energy

(ii) Name the reaction in the equation above. [1]

.....

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Turn over.

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

Tests for negative ions

Negative ion	Solutions added	Results
carbonate	dilute hydrochloric acid	carbon dioxide gas given off
chloride	dilute nitric acid then silver nitrate	white precipitate
iodide	dilute nitric acid then silver nitrate	yellow precipitate
nitrate	iron(II) sulfate then concentrated sulfuric acid	brown ring forms
sulfate	barium chloride	white precipitate

Test for positive ions

Positive ion	Flame test colour
barium	yellow-green
calcium	brick red
copper	green
lead	blue
lithium	red
potassium	lilac
sodium	yellow

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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
A	Flame test	Lilac coloured flame	Add dilute nitric acid followed by silver nitrate solution	Yellow precipitate
B	Flame test	Red coloured flame	Add dilute hydrochloric acid. Bubble gas given off into limewater.	Fizzing occurs. Gas given off turns limewater milky.
C	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
D	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	Positive ion	Negative ion	Name of compound
A	.....	iodide	.....
B	lithium	.....	.....
C	ammonium	.....	ammonium .....
D	.....	.....	.....

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Turn over.

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4. 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^3)	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 .....

.....

Disadvantage .....

.....

(ii) I Describe how atoms are arranged in aluminium. [1]

.....

.....

II Give **one** reason why this makes aluminium malleable. [1]

.....

.....

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

.....

.....

.....

(ii) Use data from the table to state **three** differences between aluminium and polyester. [3]

1. .....

2. .....

3. .....

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

.....

(iv) The volume of polyester needed to make one type of caravan body is 0.4 m^3.

Calculate the mass of the caravan body.

Use the equation:

mass = density × volume [2]

mass = ... kg

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5. 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]

.....

.....

.....

.....

(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

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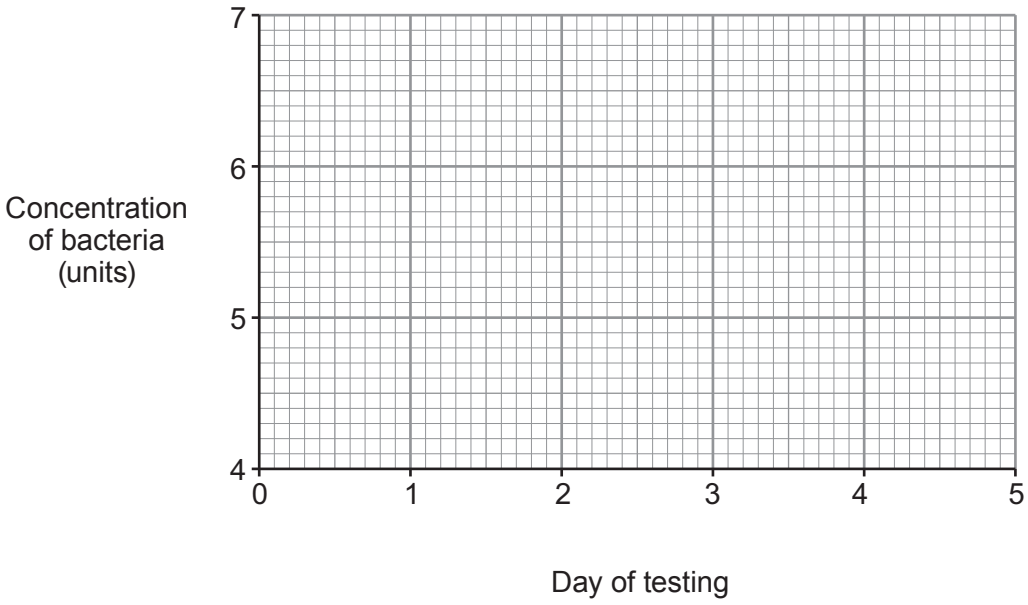
(i) Plot a graph of the data opposite on the grid below and join the plots, point to point. [3]



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

.....

.....

(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]

.....

.....

(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** symptom of food poisoning caused by harmful bacteria. [1]

.....

Turn over.

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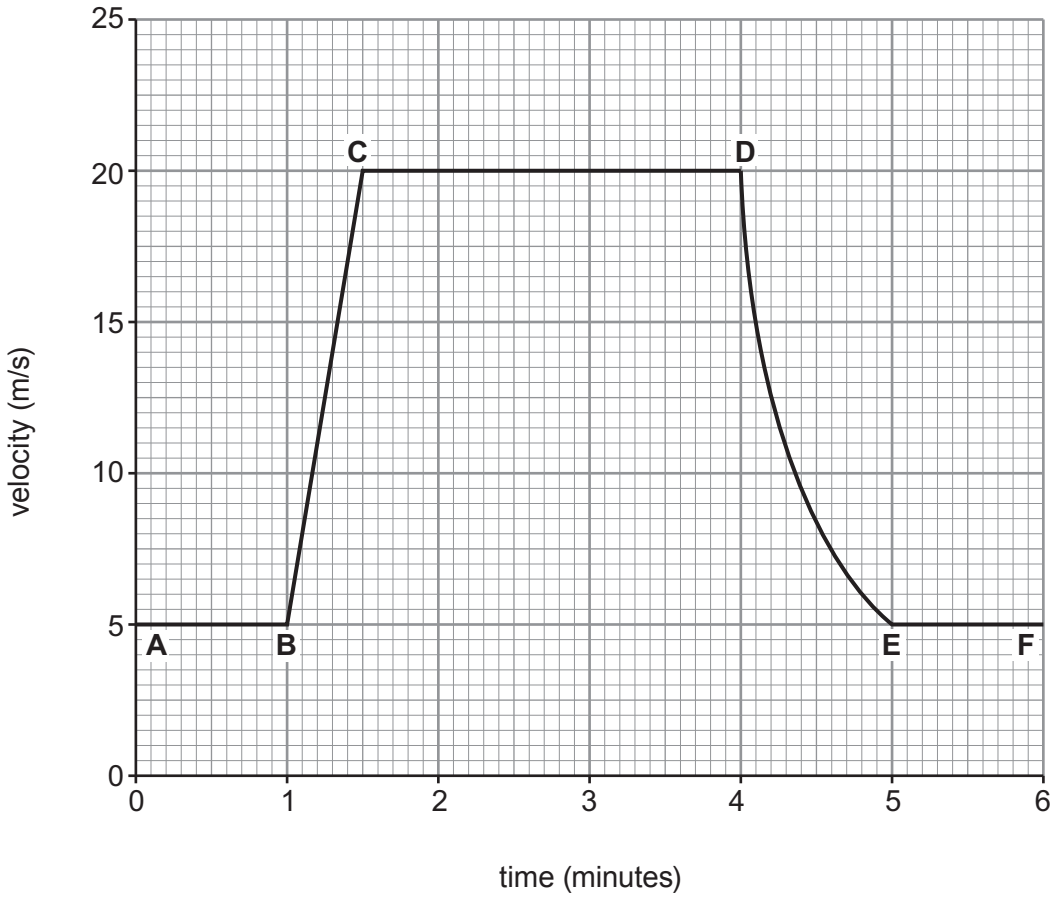
6. The velocity–time graph below shows part of a journey taken by a cyclist.



(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:

distance = velocity × 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^2

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