GCSE

4791/01

ADDITIONAL APPLIED SCIENCE

UNIT 1: Science at Work in Applied Contexts

FOUNDATION TIER

P.M. TUESDAY, 12 May 2015

1 hour plus your additional time allowance

Surname _____

Other Names _____

Centre Number _____

Candidate Number 0 _____

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

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

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.

TABLE 1

METALS		NON-METALS	
Element	Symbol	Element	Symbol
CARBON	C	ALUMINIUM	al
COPPER	Co	PHOSPHORUS	PH

TABLE 2

METALS		NON-METALS	
Element	Symbol	Element	Symbol
_____	_____	_____	_____
_____	_____	_____	_____

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 opposite (Table 1). Lee made some errors when he filled in the table.**

Complete the table opposite (Table 2), correcting the errors made by Lee. [5]

1(b) The formula for carbon dioxide is CO_2.

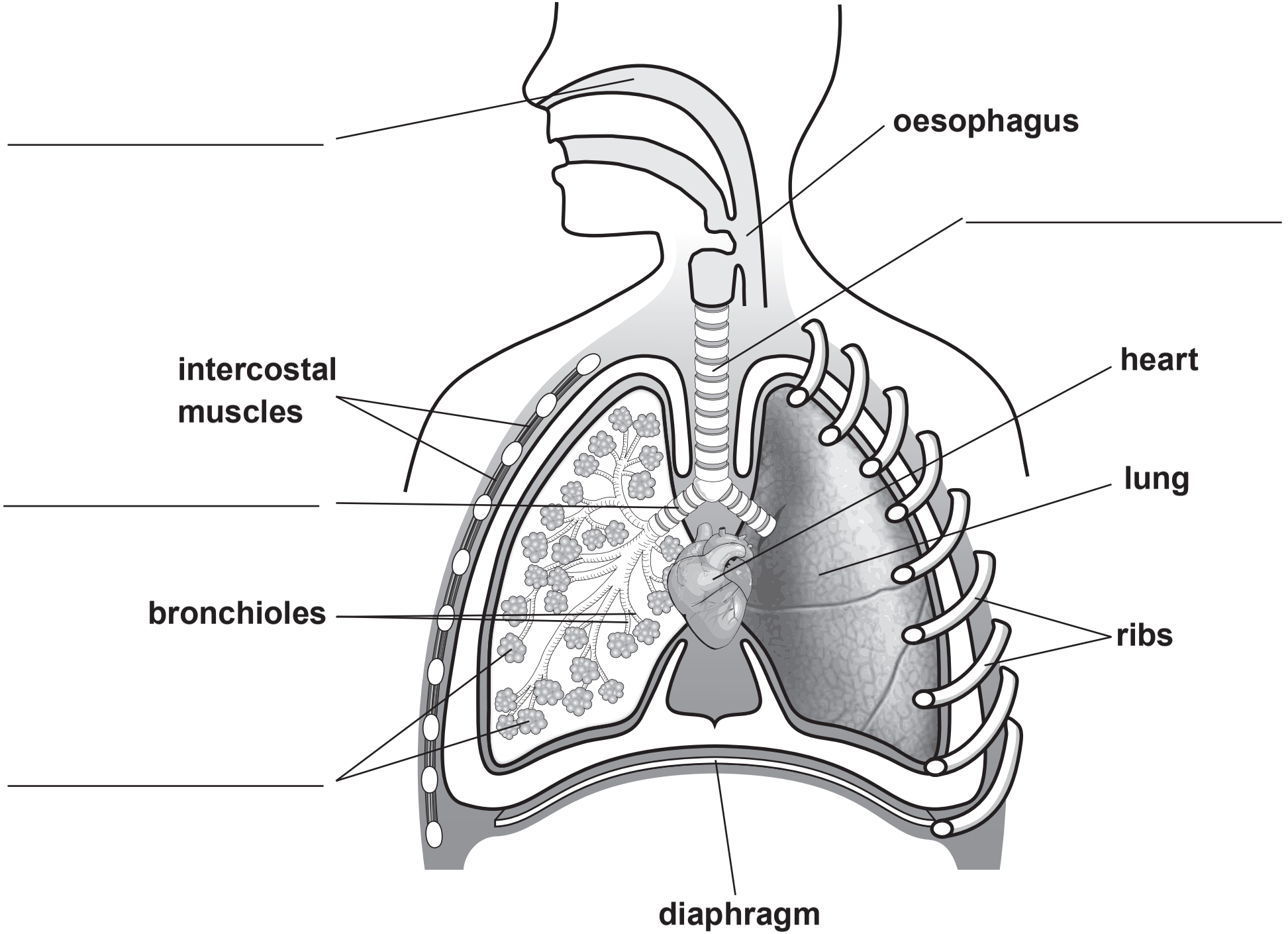
The relative atomic mass of carbon is 12. The relative atomic mass of oxygen is 16.

(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


oesophagus
intercostal muscles
heart
lung
bronchioles
ribs
diaphragm

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 opposite using only words from the list below. [4]
One label in the list is NOT needed in the diagram.

ventricle

alveoli

nasal cavity

trachea

bronchus

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

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

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]

_____

9

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

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

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

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	_____	_____	_____

8

Material	Density (kg/m^3)	Stiffness (GPa)	Melting point (°C)	Tensile strength (MPa)	Brittle
aluminium	2 700	69	660	90	No
steel	7 800	210	1 357	1 200	No
polyester	1 900	150	121	250	Yes

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

(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 _____

_____

_____

_____

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

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

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

4(b) (ii) **Use data from the table opposite page 11 to state THREE differences between aluminium and polyester. [3]**

1. _____

_____

2. _____

_____

3. _____

_____

4(b) (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

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]

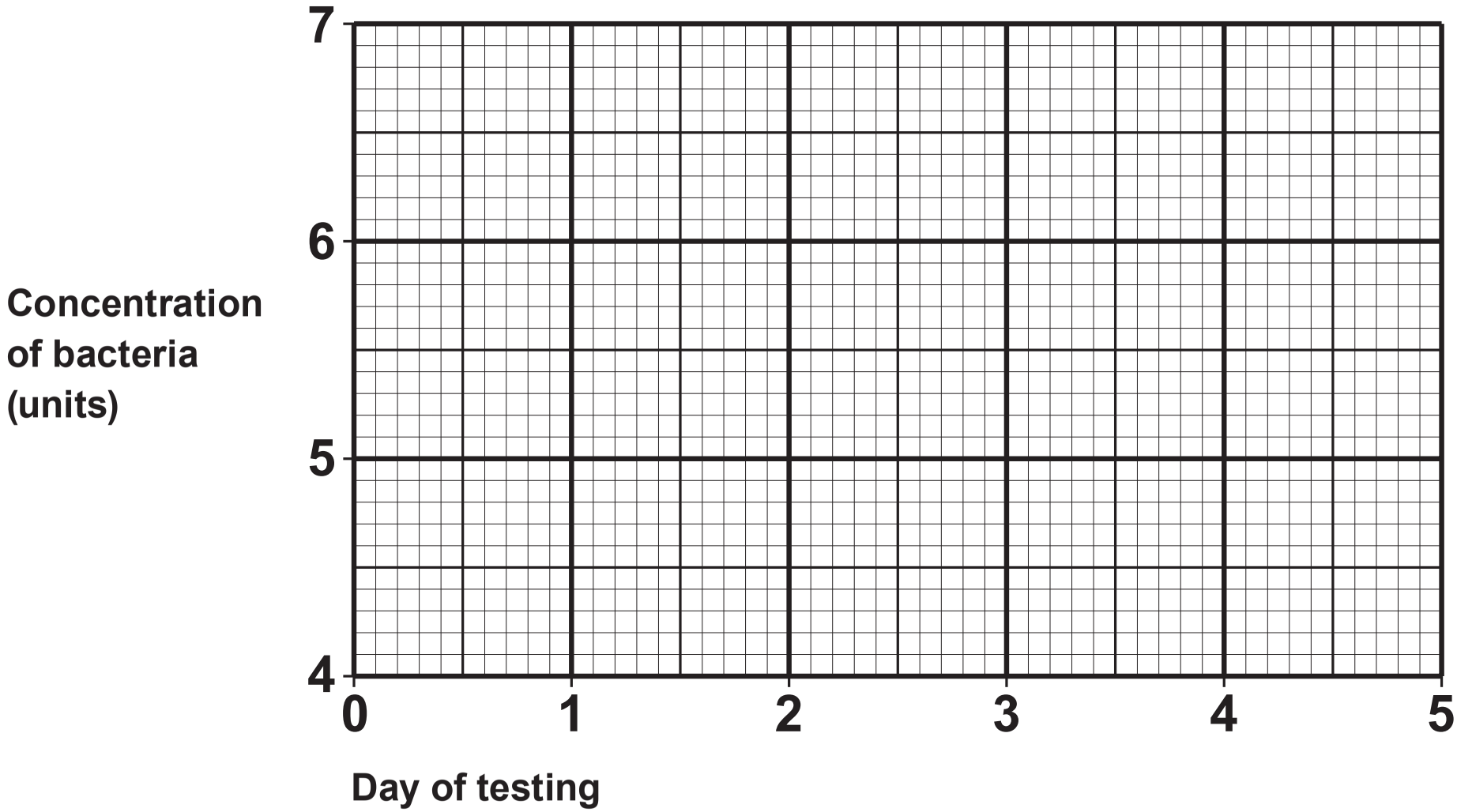
5(b) **Some people claim that bacteria will not survive in the stomach. The food manufacturer claims that the bacteria will survive and their numbers will increase.**

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 opposite and join the plots, point to point.**

[3]


Concentration of bacteria (units)
7
6
5
4
0
1
2
3
4
5
Day of testing

5(b) (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]**

5(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. _____

_____

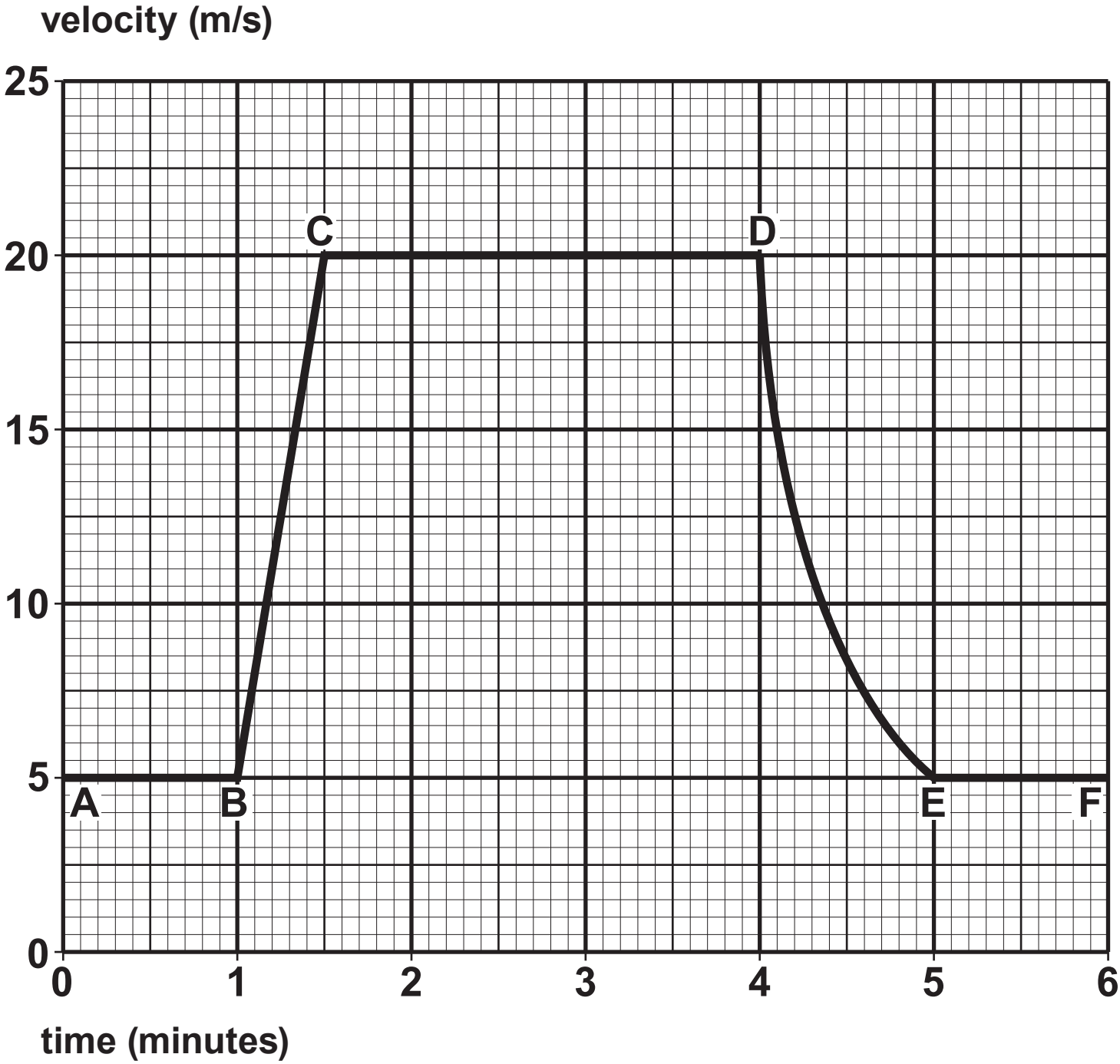
2. _____

_____

(ii) **Name ONE symptom of food poisoning caused by harmful bacteria. [1]**

_____

11


velocity (m/s)
25
20
15
10
5
0
A
B
C
D
E
F
0
1
2
3
4
5
6
time (minutes)

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

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

6(ii) **Calculate the distance travelled by the cyclist between C and D on the graph opposite page 20.**

[3]

Use the equation:

distance = velocity × time

distance travelled = _____ m

6(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**

END OF PAPER

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