Q1. A gardener wants to add compost to the soil to increase his yield of strawberries.

The gardener wants to make his own compost.

(a) An airtight compost heap causes anaerobic decay.

Explain why the gardener might be against producing compost using this method.

.....

.....

.....

.....

(2)

(b) The gardener finds this research on the Internet:

'A carbon to nitrogen ratio of 25:1 will produce fertile compost.'

Look at the table below.

Type of material to compost	Mass of carbon in sample in g	Mass of nitrogen in sample in g	Carbon:nitrogen ratio
Chicken manure	8.75	1.25	7:1
Horse manure	10.00	0.50	20:1
Peat moss	9.80	0.20	**X**

Determine the ratio **X** in the table above.

.....

Ratio .....

(1)

(c) Which type of material in the table above would be **best** for the gardener to use to make his compost?

Justify your answer.

.....

PhysicsAndMathsTutor.com

.....

(1)

(d) Some of the leaves from the gardener's strawberry plant die.

The dead leaves fall off the strawberry plant onto the ground.

The carbon in the dead leaves is recycled through the carbon cycle.

Explain how the carbon is recycled into the growth of new leaves.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

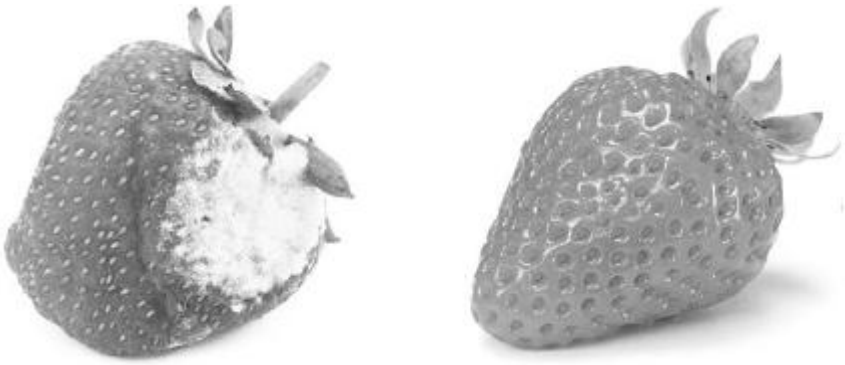
(6)

(e) The diagram below shows two strawberries.

- Both strawberries were picked from the same strawberry plant.
- Both strawberries were picked 3 days ago.
- The strawberries were stored in different conditions.

Strawberry A **Strawberry B**

PhysicsAndMathsTutor.com



A © sarahdoow/iStock/Thinkstock, B © Mariusz Vlack/iStock/Thinkstock

Give **three** possible reasons that may have caused strawberry **A** to decay.

1 .....

.....

2 .....

.....

3 .....

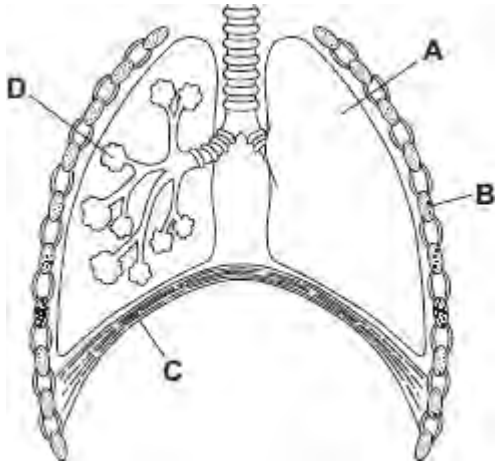
.....

(3)
(Total 13 marks)

PhysicsAndMathsTutor.com

Q2.(a) **Diagram 1** shows part of the breathing system.

Diagram 1



(i) Use words from the box to name the parts labelled **A**, **B**, **C** and **D**.

alveolus	**diaphragm**	**lung**	**rib**	**trachea**

A .....

B .....

C .....

D .....

(4)

(ii) Parts **B** and **C** move when we breathe **in**.

Part **B** moves .....

Part **C** moves .....

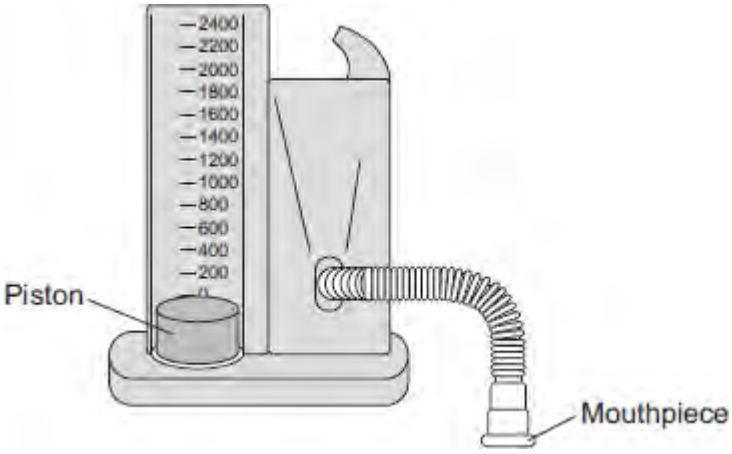
(2)

(b) A student used the apparatus shown in **Diagram 2** to measure the maximum volume of air that he could breathe in one breath.
When the student breathes in, the piston moves upwards.

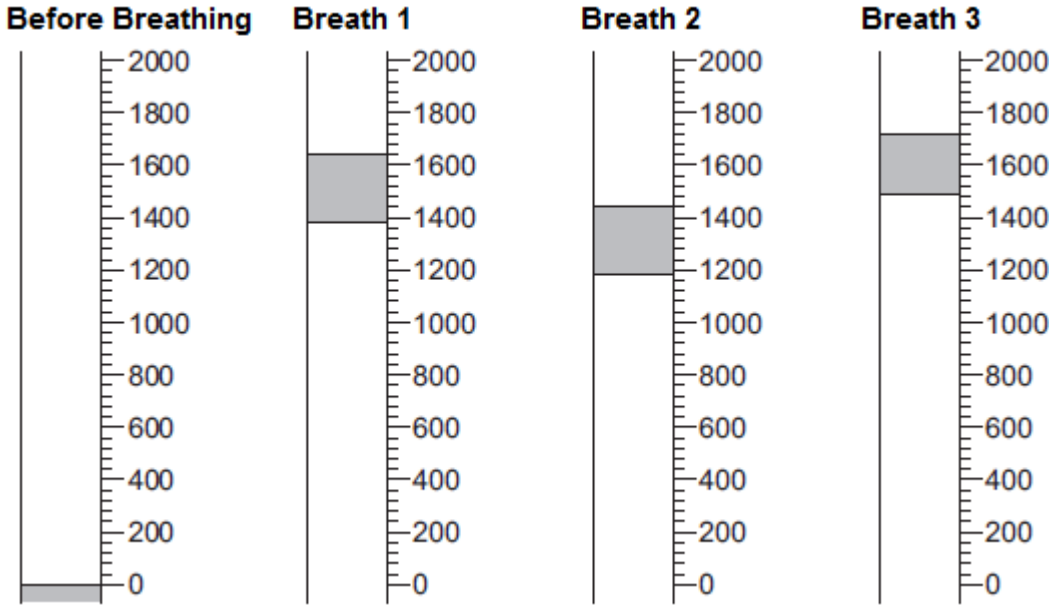
PhysicsAndMathsTutor.com

The piston moves back down after the student has breathed out.

Diagram 2



The student breathes in through the apparatus three times.
The drawings show the position of the piston after each of the three breaths.
The volumes are measured in cm^3.



(i) Read the volume of each breath and write the volume in the table.

PhysicsAndMathsTutor.com

	Breath 1	Breath 2	Breath 3
Volume in cm^3	.....	.....	.....

(3)

(ii) Calculate the mean volume of air breathed in.

.....

.....

Mean volume of air breathed in = ... cm^3

(2)

(c) A teacher asks the student to investigate if students who take part in sports activities can breathe in a larger volume of air than students who do not take part.

Describe briefly how the student could use the **same** apparatus to do the investigation.

.....

.....

.....

.....

.....

.....

.....

.....

(3)

(d) **Photograph 1** shows a different piece of apparatus used to measure the volume of air that a person can breathe in one breath.

Photograph 1

PhysicsAndMathsTutor.com

© Digital Vision/Photodisc

When the student breathes out through the apparatus the pointer on the scale moves. The pointer stays in the same position when the student has finished.

Explain **one** advantage, apart from size, of using this apparatus rather than the apparatus described in part **(b)**.

.....

.....

.....

.....

(2)

(e) **Photograph 2** shows one type of mechanical ventilator.

Photograph 2

PhysicsAndMathsTutor.com

© Emine Donmaz/iStock

(i) Use information from **Photograph 2** to suggest how this type of ventilator works.

.....

.....

.....

.....

(2)

(ii) Use information from **Photograph 2** to suggest two disadvantages of this type of ventilator.

1.....

.....

2.....

.....

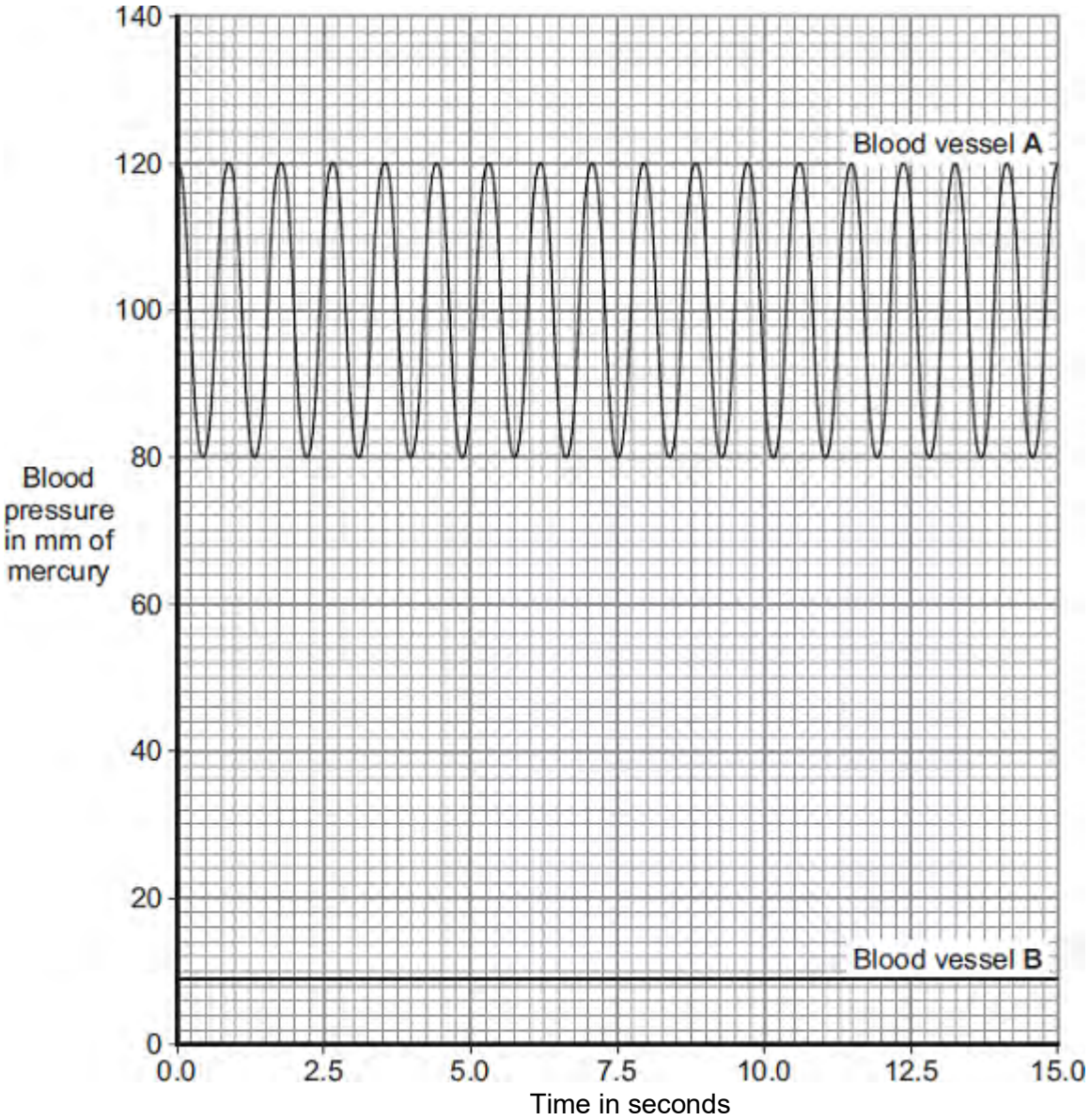
(2)

(Total 20 marks)

PhysicsAndMathsTutor.com

Q3. The heart pumps the blood around the body. This causes blood to leave the heart at high pressure.

The graph shows blood pressure measurements for a person at rest.
The blood pressure was measured in an artery and in a vein.



(a) Which blood vessel, **A** or **B**, is the artery?

Blood vessel .....

Give **two** reasons for your answer.

Reason 1 .....

.....

Reason 2 .....

PhysicsAndMathsTutor.com

.....

(2)

(b) Use information from the graph to answer these questions.

(i) How many times did the heart beat in 15 seconds? .....

(1)

(ii) Use your answer from part (b)(i) to calculate the person's heart rate per minute.

.....

.....

Heart rate = ... beats per minute

(1)

(c) During exercise, the heart rate increases.

The increased heart rate supplies useful substances to the muscles at a faster rate.

Name **two** useful substances that must be supplied to the muscles at a faster rate during exercise.

1 .....

2 .....

(2)

(Total 6 marks)

PhysicsAndMathsTutor.com

Q4.Figure 1 shows an athlete running on a treadmill.

Figure 1

© Starush/istock/Thinkstock

After running for several minutes, the athlete's leg muscles began to ache.
This ache was caused by a high concentration of lactic acid in the muscles.

(a) The equation shows how lactic acid is made.

glucose ⟶ lactic acid (+ energy)

Name the process that makes lactic acid in the athlete's muscles.

.....

(1)

(b) Scientists investigated the production of lactic acid by an athlete running at different speeds.

In the investigation:

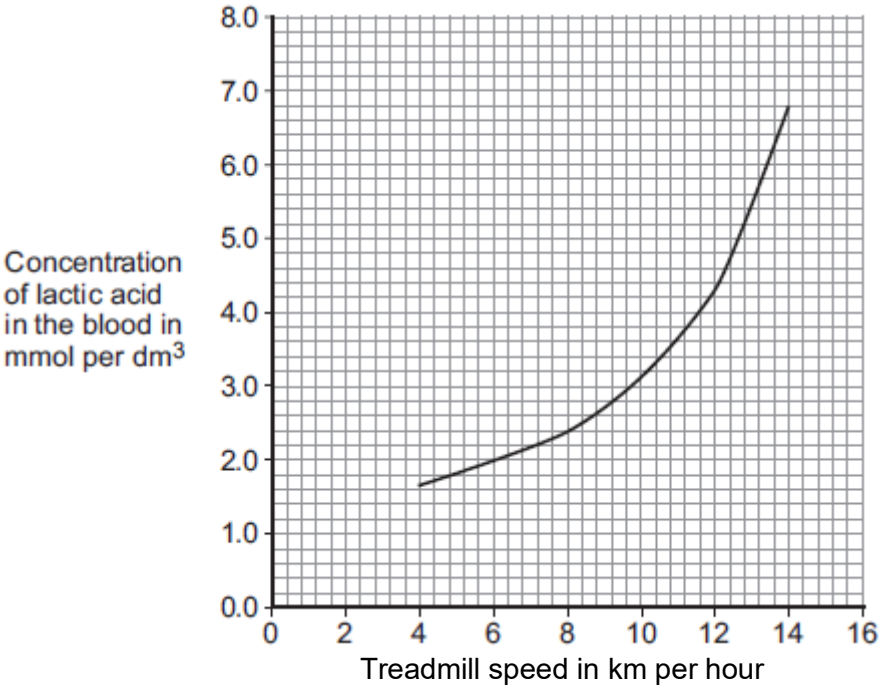
- the athlete ran on the treadmill at 4 km per hour
- the scientists measured the concentration of lactic acid in the athlete's blood after 2 minutes of running.

The investigation was repeated for different running speeds.

Figure 2 shows the scientists' results.

PhysicsAndMathsTutor.com

Figure 2



(i) How much more lactic acid was there in the athlete's blood when he ran at 14 km per hour than when he ran at 8 km per hour?

.....

.....

.....

Answer = ... mmol per dm^3

(2)

(ii) Why is more lactic acid made in the muscles when running at 14 km per hour than when running at 8 km per hour?

.....

.....

.....

.....

PhysicsAndMathsTutor.com

.....

.....

(3)
(Total 6 marks)

PhysicsAndMathsTutor.com

Q5. Photosynthesis needs light.

(a) Complete the **balanced symbol** equation for photosynthesis.

$$6CO_2 + \text{.....} \xrightarrow{\text{light}} \text{.....} + 6O_2$$

(2)

(b) A green chemical indicator shows changes in the concentration of carbon dioxide (CO_2) in a solution.

The indicator solution is **green** when the concentration of CO_2 is normal.

The indicator solution turns **yellow** when the concentration of CO_2 is high.

The indicator solution turns **blue** when the concentration of CO_2 is very low or when there is no CO_2.

The indicator solution does not harm aquatic organisms.

Students investigated the balance of respiration and photosynthesis using an aquatic snail and some pondweed.

The students set up four tubes, **A**, **B**, **C** and **D**, as shown in the table below.

The colour change in each tube, after 24 hours in the light, is recorded.

Tube A	**Tube B**	**Tube C**	**Tube D**
			
Indicator solution only	Indicator solution + pondweed	Indicator solution + snail	Indicator solution + pondweed + snail
Stays green	Turns blue	Turns yellow	Stays green

PhysicsAndMathsTutor.com

(i) What is the purpose of **Tube A**?

.....

.....

(1)

(ii) Explain why the indicator solution in **Tube C** turns yellow.

.....

.....

.....

.....

(2)

(iii) Predict the result for **Tube D** if it had been placed in the dark for 24 hours and **not** in the light.

Explain your prediction.

Prediction.....

.....

Explanation.....

.....

.....

.....

(3)
(Total 8 marks)

PhysicsAndMathsTutor.com