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| Candidate Name | Centre Number | Candidate Number |
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WELSH JOINT EDUCATION COMMITTEE  
 General Certificate of Education  
 Advanced Subsidiary/Advanced



CYD-BWYLLGOR ADDYSG CYMRU  
 Tystysgrif Addysg Gyffredinol  
 Uwch Gyfrannol/Uwch

312/01

**BIOLOGY**

**MODULE BI2**

A.M. WEDNESDAY, 10 January 2007

(1 hour 30 minutes)

**For Examiner's Use Only**

|                        |  |
|------------------------|--|
| <b>Total<br/>Marks</b> |  |
|------------------------|--|

**INSTRUCTIONS TO CANDIDATES**

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 of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

1. The following list of terms concerns parts of the nitrogen cycle.

|          |                           |
|----------|---------------------------|
| <b>A</b> | primary consumer          |
| <b>B</b> | secondary consumer        |
| <b>C</b> | saprophyte                |
| <b>D</b> | legume                    |
| <b>E</b> | nitrogen fixing bacterium |
| <b>F</b> | nitrification             |
| <b>G</b> | excretion                 |
| <b>H</b> | defaecation               |
| <b>I</b> | denitrification           |

Below are five statements. Select from the above list the **letter** for the appropriate term that matches the statement.

- (i) A plant in which atmospheric nitrogen is converted into nitrates.
- (ii) A type of organism that breaks down the bodies of dead plants and animals.
- (iii) An animal that eats other animals.
- (iv) The process of removing nitrogenous waste from an organism.
- (v) The conversion of ammonium ions to nitrate ions.

[5]

**(Total 5 marks)**

- 2. (a) Complete the following paragraph, about the heart and heartbeat, by inserting the most appropriate word or words. (Abbreviations will not be accepted.) [7]

The mammalian heart is made up of a special type of muscle called ..... muscle. This muscle has the ability to contract and relax without any stimulation and is therefore said to be ..... . The heartbeat is initiated in an area of the right atrium called the ..... . The wave of excitation passes across both atria until it reaches an area of tissue in the septum called the ..... . This in turn passes the wave to a group of fibres called the ..... which transfers the wave to the tip of the ventricles. This causes the ventricles to ..... from the base upwards and forces blood to flow out of the heart through the aorta and .....

- (b) Explain why small, unicellular organisms do not require a specialised gaseous exchange surface and transport system. [4]

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**(Total 11 marks)**

3. Before competing, athletes often train at high altitudes for several weeks after which time their red blood cell count increases. The table shows these changes in a group of athletes.

| <i>Altitude/m</i> | <i>Number of red blood cells<br/>/<math>10^{12}dm^{-3}</math></i> |
|-------------------|---|
| 0                 | 5.0   |
| 6000              | 6.20  |

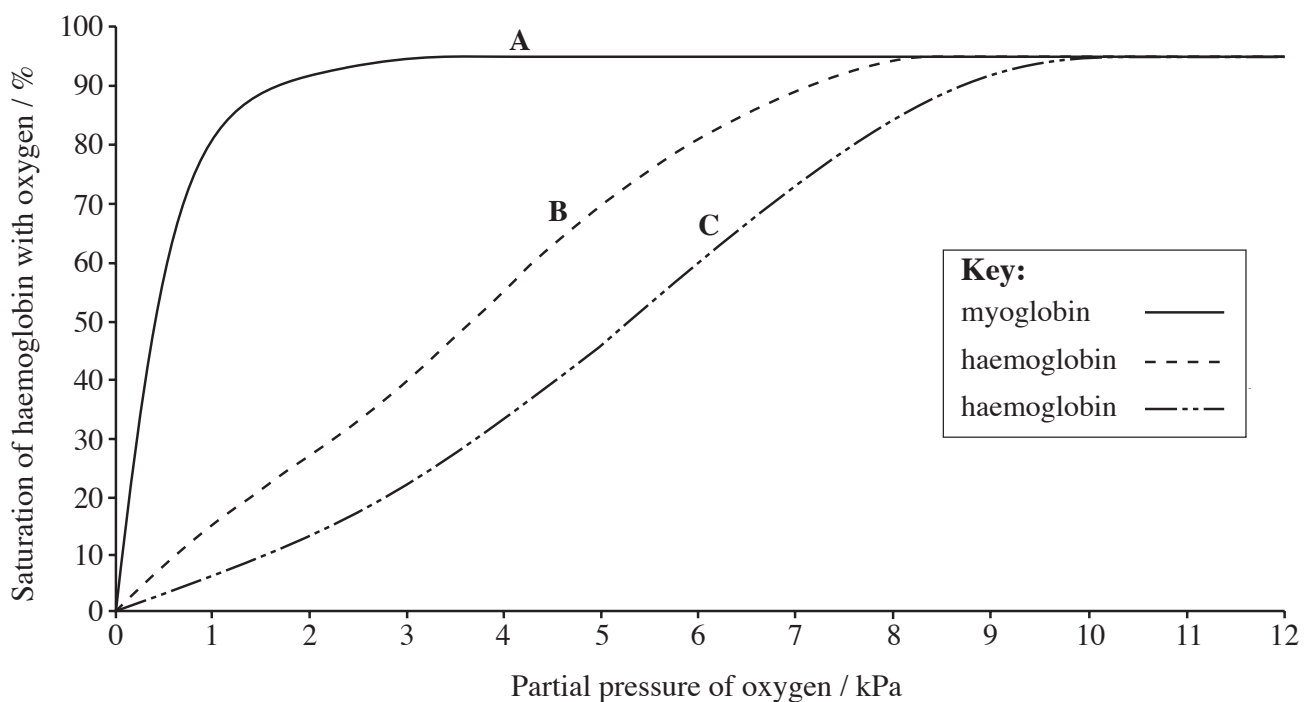
- (a) (i) Calculate the percentage increase in red blood cells in the athletes after several weeks at 6000 metres. Show your working. [2]

.....  
 .....

- (ii) Explain the benefit of this increase in red blood cell count. [3]

.....  
 .....

- (b) The graph shows the oxygen dissociation curve of myoglobin (labelled **A**) and haemoglobin at two different partial pressures of carbon dioxide (labelled **B** and **C**).



(i) Name the form in which oxygen is transported in the red blood cells. [1]

.....

(ii) State the percentage (%) saturation of myoglobin at a partial pressure of 2kPa. [1]

.....

(iii) Which of the curves **B** or **C** shows the greater dissociation at partial pressures between 9 and 12kPa? [1]

.....

(c) Curves **B** or **C** could represent those for fetal and maternal haemoglobin.

(i) State which curve could represent fetal haemoglobin and give a reason. [2]

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.....  
.....

(ii) Explain how this is an advantage to the fetus. [2]

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(d) Myoglobin is an oxygen carrying pigment found in muscle cells. With reference to the graph suggest a function for myoglobin. [2]

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**(Total 14 marks)**

4. The area of a leaf of a marrow plant was measured for 18 days and the results shown in the table.

| <i>Day</i> | <i>Leaf area/cm<sup>2</sup></i> |
|------------|---------------------------------|
| 2          | 3                               |
| 4          | 20                              |
| 6          | 42                              |
| 8          | 70                              |
| 10         | 120                             |
| 12         | 185                             |
| 14         | 210                             |
| 16         | 225                             |
| 18         | 225                             |

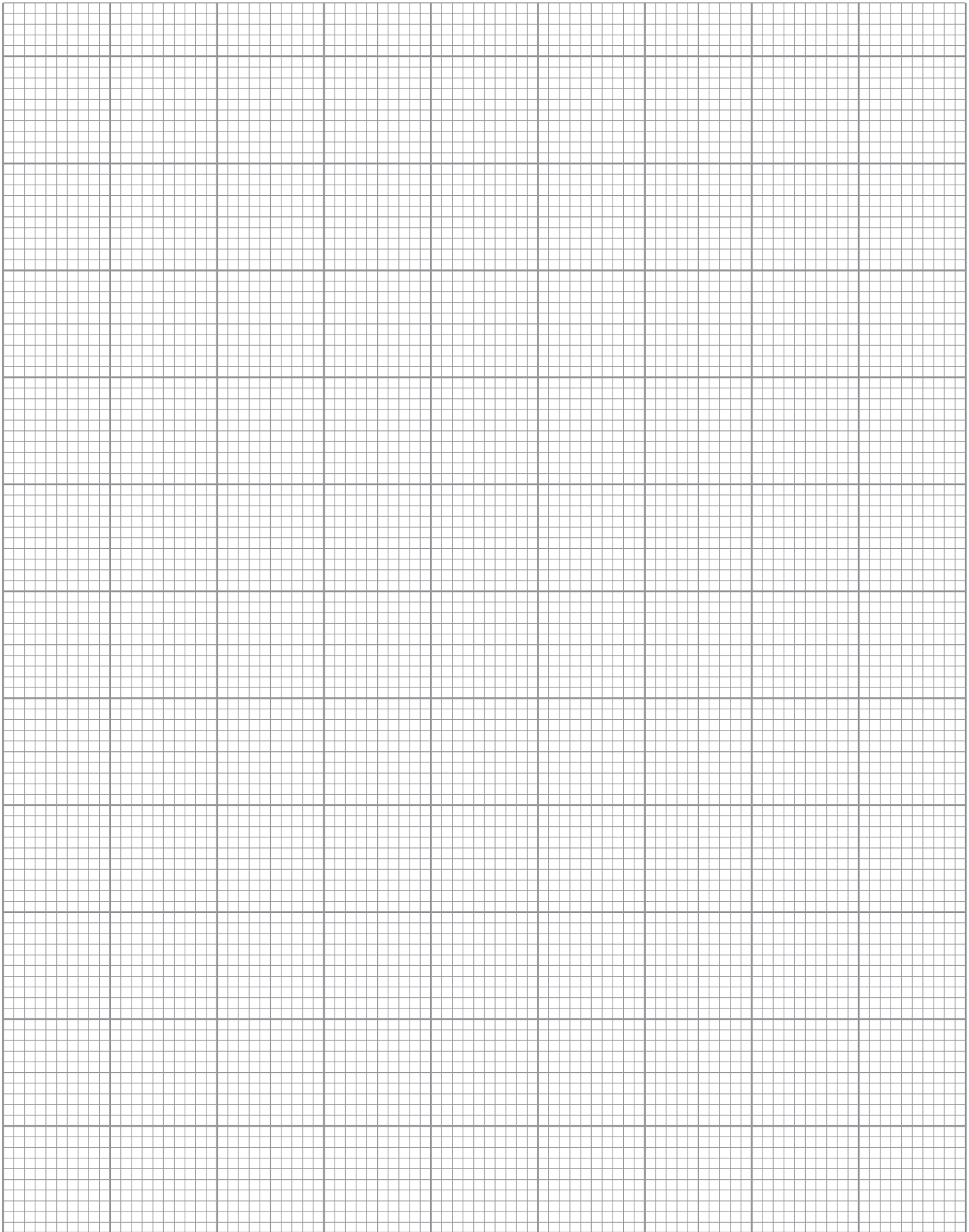
- (a) (i) Plot a graph, on the grid opposite, to show the change in leaf area with time. [4]
- (ii) Mark on the graph, using **A** to **B**, the section of the line which represents the lag phase of growth. [1]
- (b) If this had been a growth curve for a bacterial culture the death phase would have started after day 16.  
Suggest why the death phase happens for the growth curve of bacteria but the death phase does not happen for the growth curve of the marrow plant leaf. [2]

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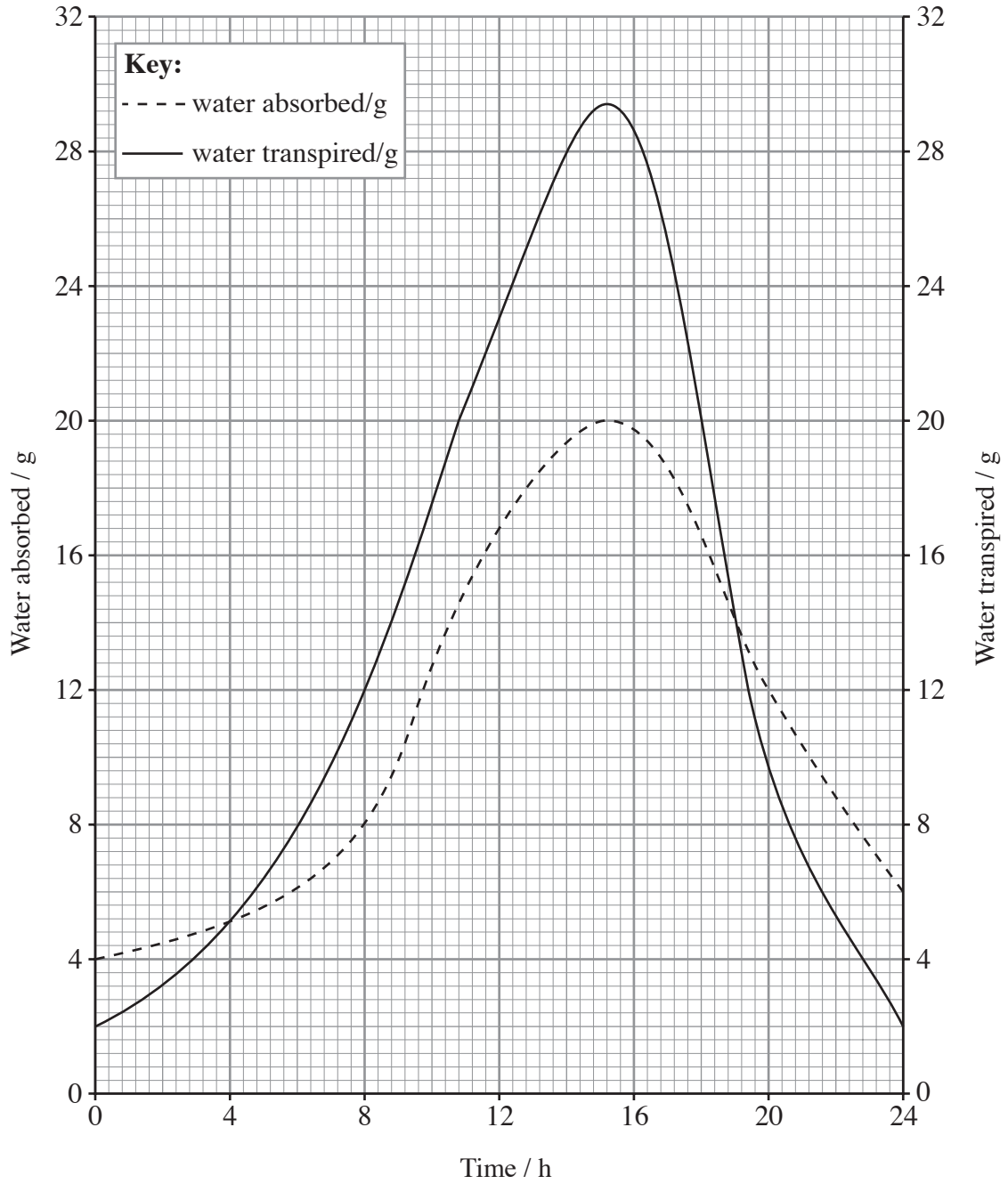
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**(Total 7 marks)**



5. The graph below shows how the rates of transpiration and water absorption of a plant changed over a 24 hour period.



- (a) (i) Compare the rates of transpiration and water absorption over the 24 hour period. [3]

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- (ii) By how many times does the rate of water absorption increase from its lowest point to its highest point? Show your working. [2]

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- (iii) Between which times is the plant most likely to wilt?  
Explain your answer. [4]

Times .....

Explanation .....

.....

.....

- (b) Briefly, describe the processes involved in the opening of the stomatal pores. [4]

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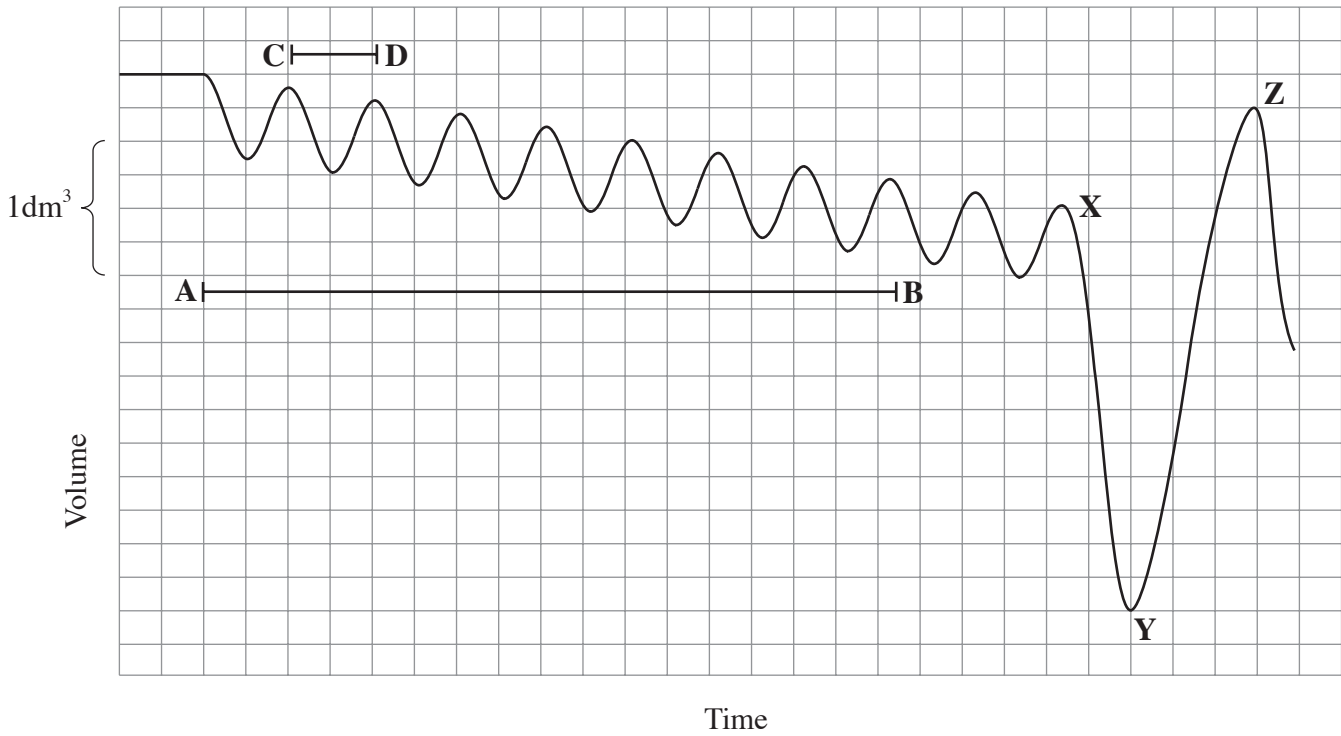
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**(Total 13 marks)**

6. A spirometer can be used to measure the volumes of air breathed in and out by a person. The movements of the spirometer are recorded on a revolving drum as a trace. An example of such a trace is shown.



- (a) (i) Calculate the total volume of air breathed in **and** out during the period shown **A** to **B** on the trace. [1]

.....

.....

- (ii) State the name given to the volume of air shown as **C-D** on the trace. [1]

.....

- (iii) Describe what has happened to the breathing pattern of the person to cause the trace between points **X**, **Y** and **Z**. [2]

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(b) The spirometer contains a fixed volume of oxygen. Suggest why the peaks and troughs of the trace become lower between points **A** and **B**. [2]

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(c) The trace was made of a person who had been resting. State **two** ways in which the appearance of the trace would have been different between points **A** and **B** if the person had carried out vigorous exercise immediately prior to breathing into the spirometer. [2]

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(d) Explain why the spirometer cannot be used to measure the total capacity of the lungs. [2]

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**(Total 10 marks)**



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