Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Education
Advanced Subsidiary/Advanced

WJEC CBAC

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

312/01

BIOLOGY

MODULE BI2

A.M. MONDAY, 4 June 2007

(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	

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. *(a)* Name the main tissue involved in water and mineral transport in plants. [1]

.....

(b) State the **main** hypothesis used to explain the transport of organic solutes in plants. [1]

.....

(c) Name the compound required by plants to synthesise amino acids. [1]

.....

(d) Name the type of flow between blood and water which occurs in bony fish gills. [1]

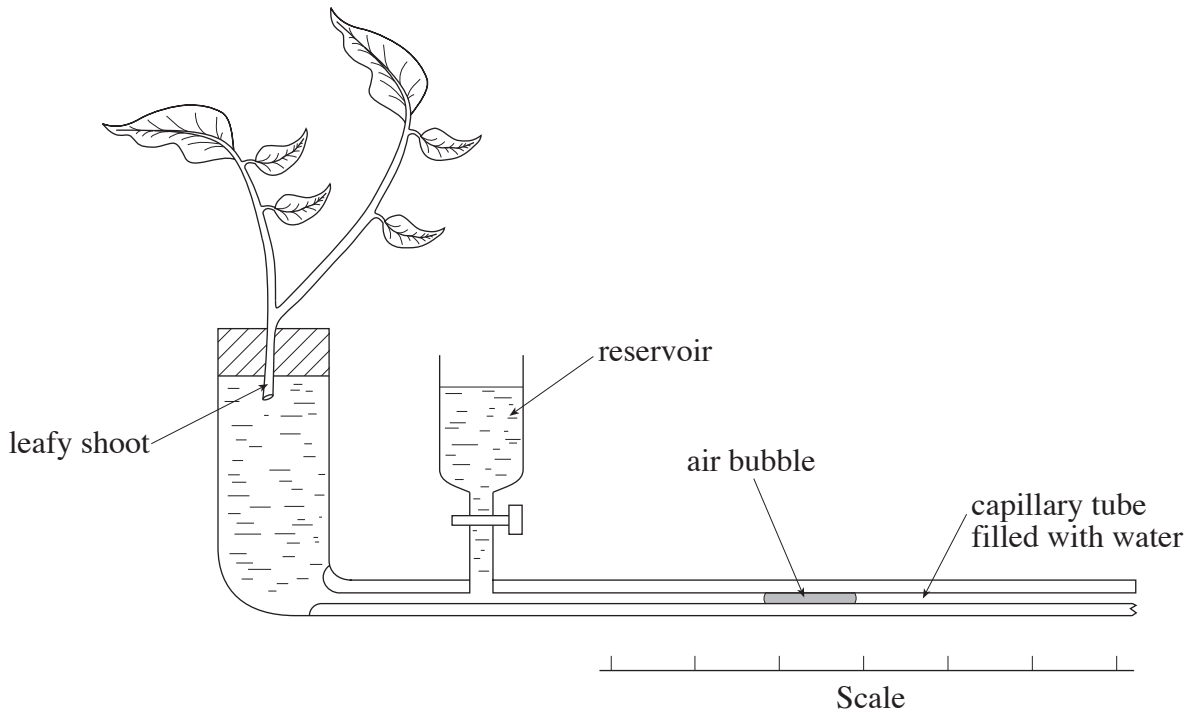
.....

(e) Name the fluid involved in the exchange of materials between blood and body cells. [1]

.....

(Total 5 marks)

2. A student used the apparatus shown below to estimate the rate of transpiration in a leafy shoot.



(a) (i) Name this piece of apparatus. [1]

.....

(ii) What exactly does the apparatus measure? [1]

.....

(iii) What is the purpose of the air bubble? [1]

.....

(b) (i) What **two** steps would you take to assemble this apparatus correctly? [2]

.....

.....

.....

(ii) State the function of the reservoir. [1]

.....

(c) Describe how you would use the assembled apparatus to measure the effect of wind speed on transpiration rate. [3]

.....

.....

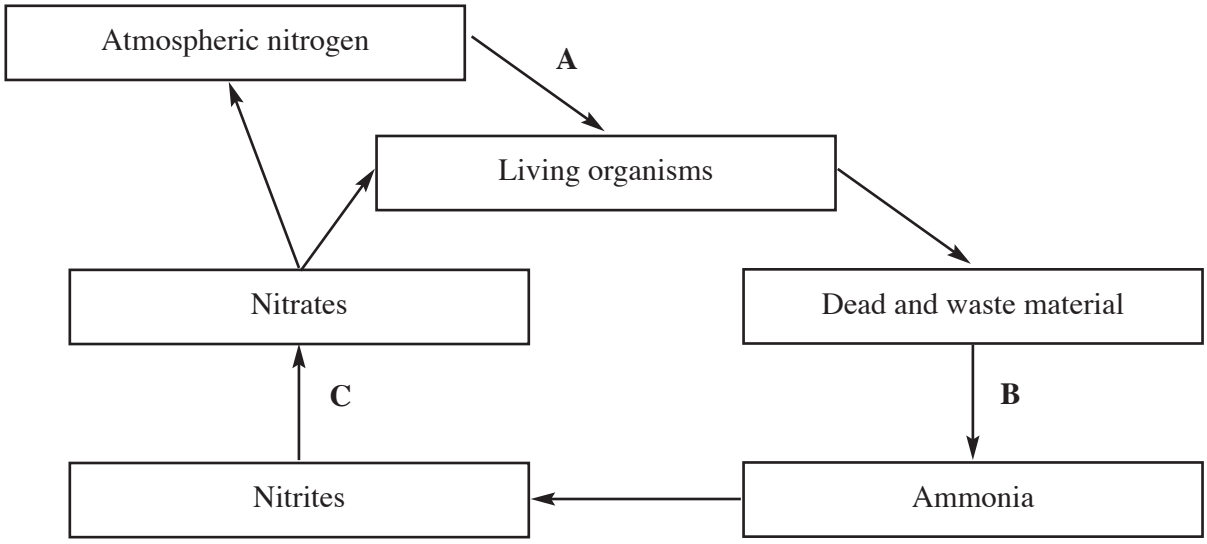
.....

.....

.....

(Total 9 marks)

3. The diagram below shows the sequence of stages involved in the cycling of nitrogen.



(a) Name the processes indicated by the arrows in the diagram above. [3]

A .....

B .....

C .....

(b) Describe the biological effects on a freshwater lake of a large quantity of nitrate fertiliser draining from farmland into the lake. [4]

.....

.....

.....

.....

.....

.....

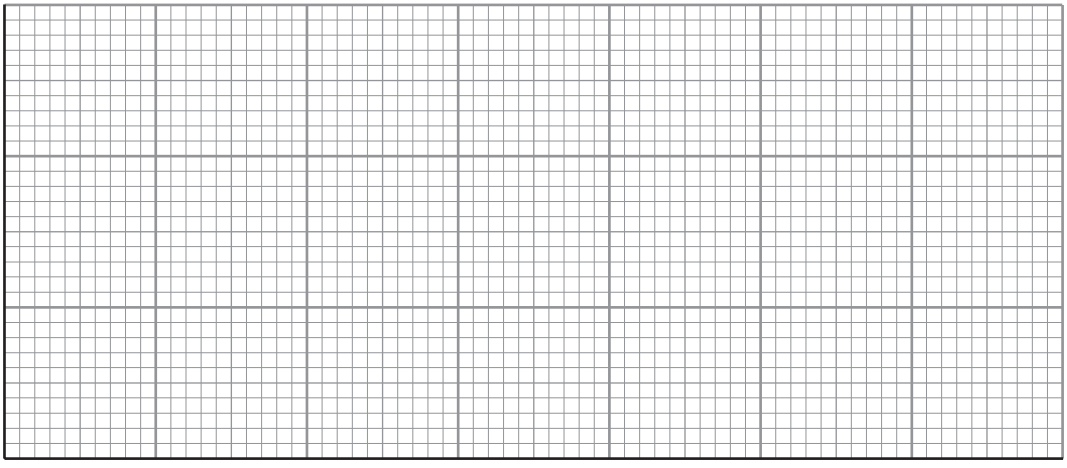
(Total 7 marks)

4. A group of students produced a pyramid of biomass for a field of grassland.
A number of areas of $1m^2$ were sampled. All the plant material in each $1m^2$ area was cut down to soil level and weighed. All animals in each $1m^2$ area were identified, sorted into carnivores and herbivores and weighed.

The results are shown in the table below.

Organisms	*Mean Biomass/g/m²*
Green Plants	1400
Herbivores	200
Carnivores	20

(a) (i) Using this data construct a labelled pyramid of biomass on the graph paper below. [3]



(ii) Give **two** reasons for the loss in biomass between trophic levels in the food chain. [2]

1. .....

.....

2. .....

.....

(b) State **two** sources of error in collecting data for pyramids of biomass. [2]

1. .....

.....

2. .....

.....

(c) Only a small percentage of the light energy which falls on green plants is incorporated into biomass. Give **two** reasons for this. [2]

.....

.....

.....

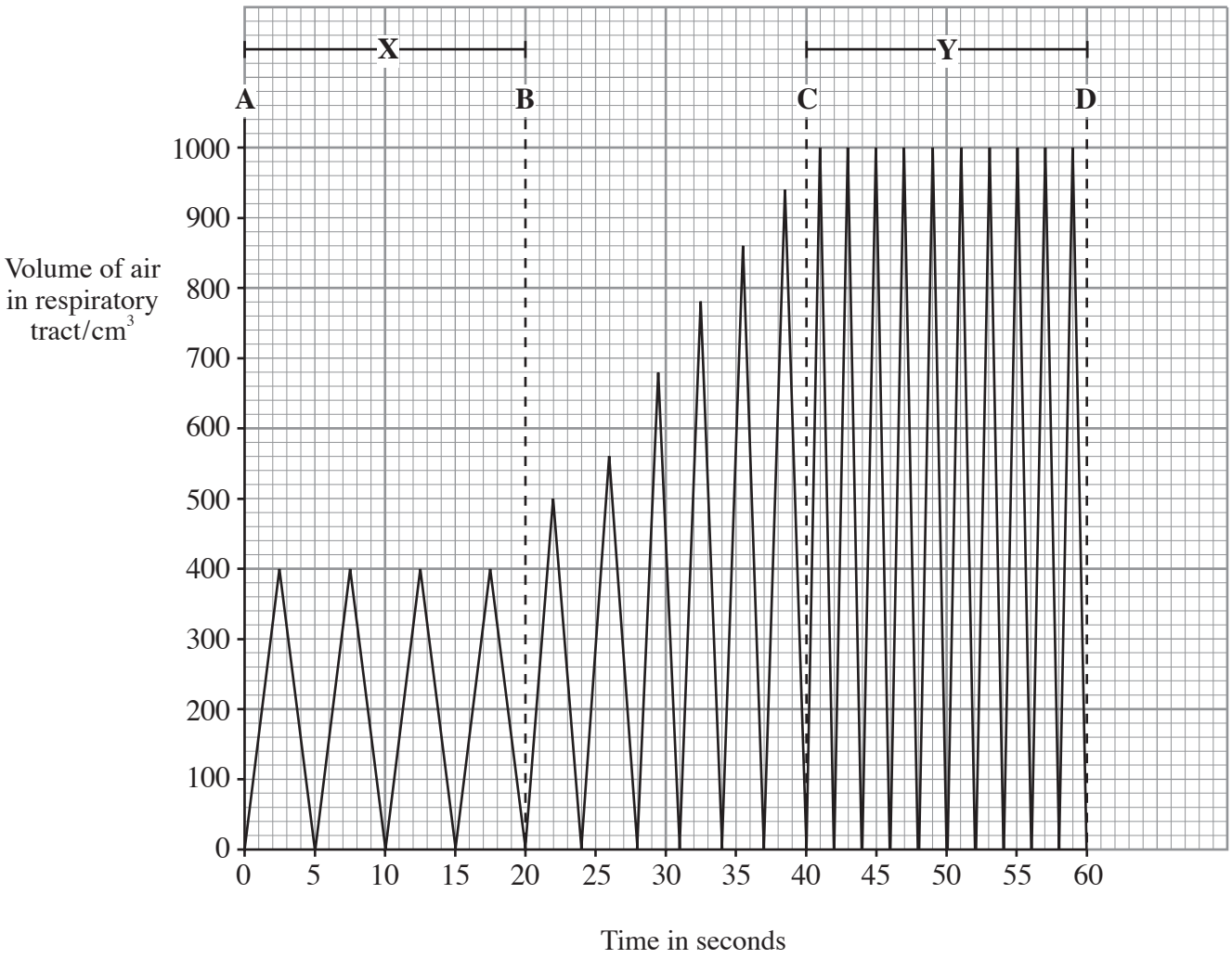
(Total 9 marks)

5. *(a)* Outline the mechanism of ventilation in the lungs by completing the table below.

	Inspiration	*Expiration*
External intercostal muscles		
Movement of ribcage		
Diaphragm		
Volume of thorax		
Pressure in thorax		
Direction of movement of air		

[6]

The graph below shows a modified spirometer trace of a normal human adult over a period of time.



(b) Using the graph, calculate the volume of air which would enter the lungs **per minute** if the person continued to breathe at the rate shown between **A – B** and **C – D**. [2]

Show your working in each case.

(i) Between A and B.

..... per minute.

(ii) Between C and D.

..... per minute.

(c) Fully describe and compare the spirometer traces in regions **X** and **Y**. [3]

.....

.....

.....

.....

(d) How would you expect the tidal volume in **X** to differ if the person suffered from asthma? [1]

.....

.....

(Total 12 marks)

6. The red spider mite is a pest which feeds on various crop plants. It can be controlled by using predatory mites which feed on the red spider mite eggs. The life cycles of both mites are completed in fourteen days.
The same number of adult red spider mites and predatory mites were placed on the same plant in the laboratory and the total number of eggs, young and adults of each species were recorded at regular intervals and the results shown below.

Day	*Number of eggs, young and adults*	
	Red spider mite	*Predatory mite*
0	10	10
5	25	15
10	50	20
15	130	40
20	370	65
25	580	106
30	574	122
35	412	138
40	180	152
45	77	91
50	58	30
55	104	14
60	300	26

(a) (i) Which five day period shows the **smallest** change in red spider mite numbers? [1]

.....

(ii) Suggest an explanation for this change. [1]

.....

(b) (i) Explain the change in predator numbers between days 40 and 55. [1]

.....

(ii) Explain the change in red spider mite numbers between days 50 and 60. [1]

.....

(c) (i) The crop yield is reduced when red spider mite numbers are above 300 per plant. Suggest how you could **maintain** successful biological control. [1]

.....

.....

(ii) Explain why your suggestion would be effective. [1]

.....

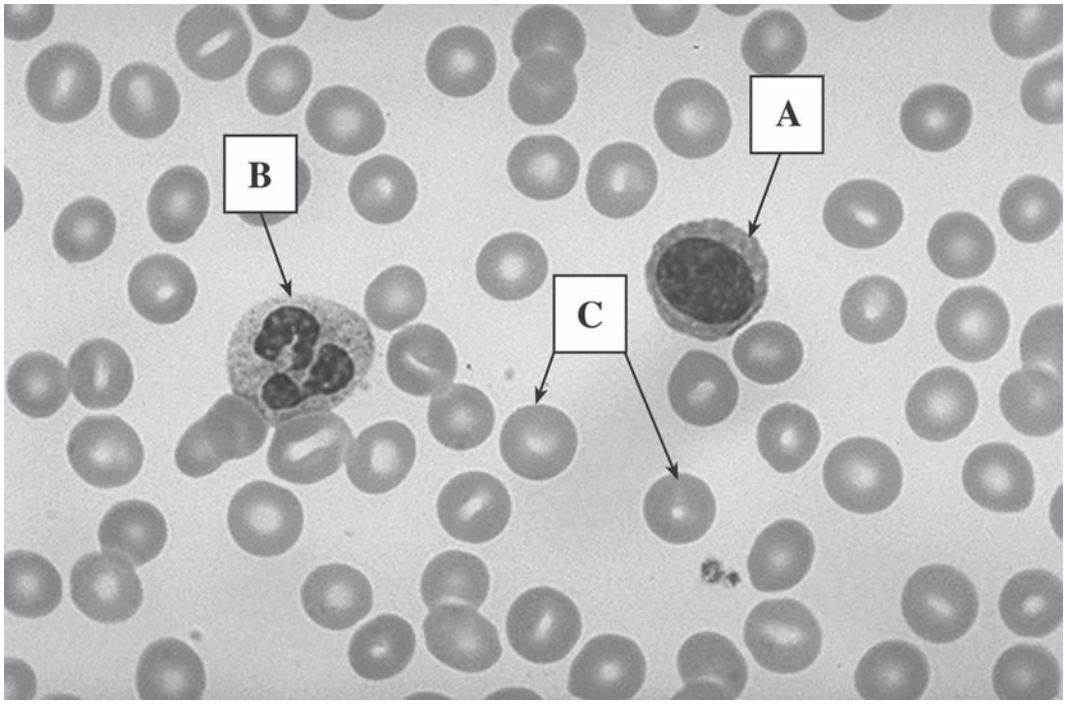
.....

(d) Give **one** advantage of controlling pests by biological control rather than with chemicals. [1]

.....

(Total 7 marks)

7. The photograph below is of a human blood smear.



(a) Identify cells **A**, **B** and **C** by giving the correct terms below. [3]

A .....

B .....

C .....

(b) Explain how **two** features of cell **C** enable it to carry out its function. [2]

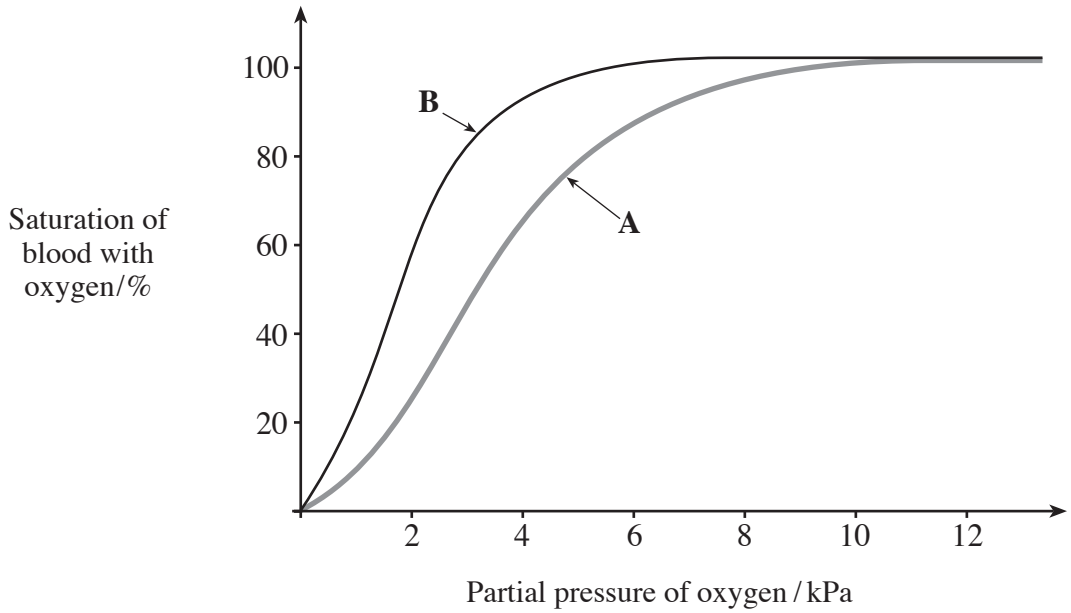
1. .....

.....

2. .....

.....

The graph below shows the oxygen dissociation curve for normal adult human haemoglobin (**A**) and *Arenicola* (lugworm) haemoglobin (**B**). *Arenicola* lives in muddy sand on the seashore.



(c) What is the advantage of the S-shaped curve shown by haemoglobin [2]

(i) in the tissues?

.....

.....

(ii) in the lungs?

.....

.....

(d) (i) Draw a line on the graph to show the effect on the human haemoglobin of being at a higher CO_2 concentration. [1]

(ii) Name this effect. ..... [1]

(e) (i) *Arenicola* has a curve to the left of human haemoglobin. What is the advantage of this to the lugworm? [1]

.....

(ii) What does this suggest about the conditions that *Arenicola* lives under? [1]

.....

(Total 11 marks)

8. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* Explain how the cardiac cycle is initiated and controlled. [10]

Or *(b)* Give an illustrated account of the structure and function of stomata in the leaf. Briefly explain the opening mechanism of stomata. [10]

(Total 10 Marks)