Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

New GCSE

4471/02

ADDITIONAL SCIENCE

HIGHER TIER
BIOLOGY 2

A.M. WEDNESDAY, 9 January 2013

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**2**	
2	**3**	
3	**5**	
4	**8**	
5	**6**	
6	**6**	
7	**7**	
8	**7**	
9	**7**	
10	**9**	
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 used in your answer to question **5** and question **10**.

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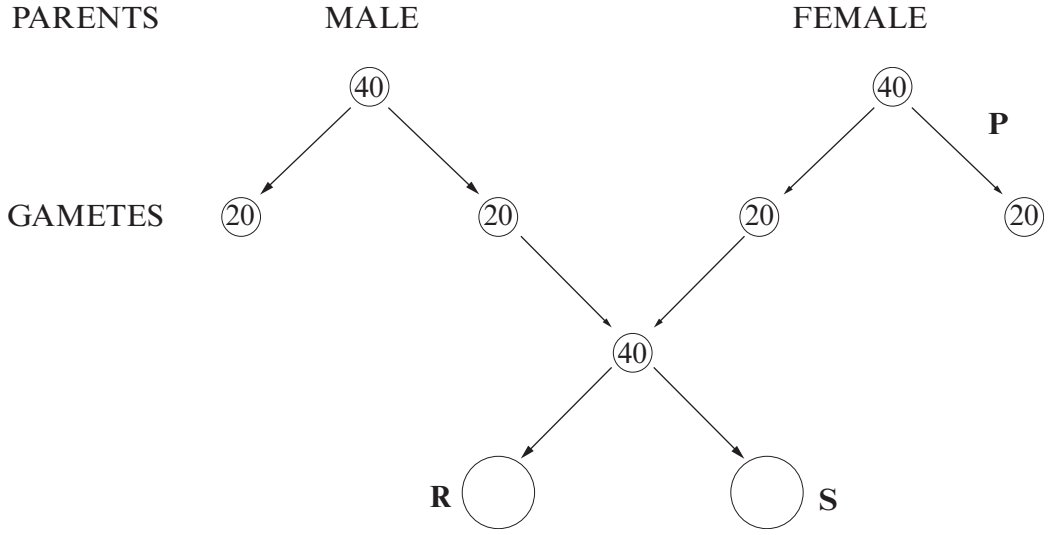
Answer **all** *questions.*

1. The following diagram represents the stages in the life cycle of a mammal.
The numbers of chromosomes in cells at different stages in the life cycle are shown.



(a) Name the type of cell division taking place at letter **P**. [1]

.....

(b) Complete the diagram above by writing in the number of chromosomes found in **each** of the cells labelled **R** and **S** produced during growth. [1]

2

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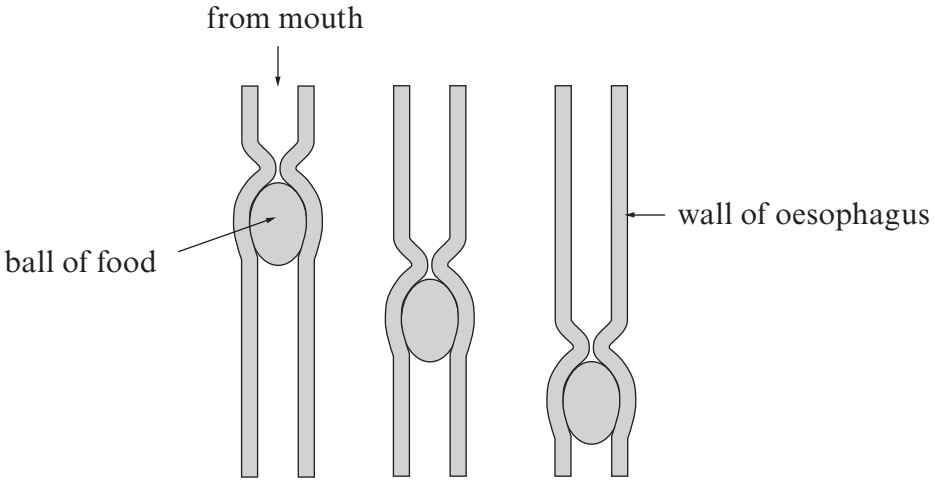
2. The diagram shows a ball of food moving along the oesophagus (gullet).



(a) What name is given to this process? [1]

.....

(b) Explain how the ball of food is moved along the oesophagus. [2]

.....

.....

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3

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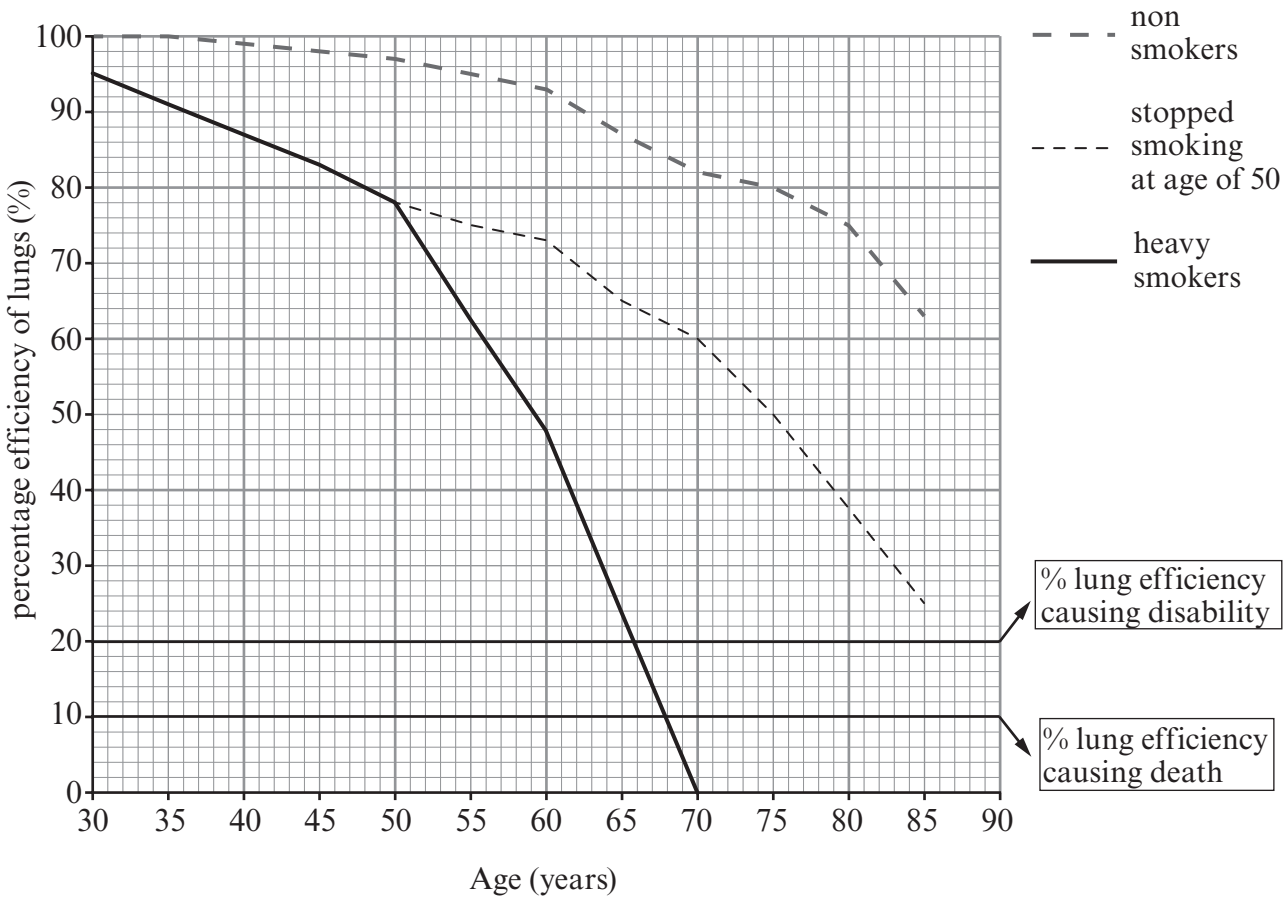
3. The graph below shows the efficiency of the lungs (how well they work) in three different groups of people: non-smokers, smokers who stopped smoking at the age of 50 and heavy smokers.



(a) What is the difference in percentage efficiency of a 60 year old non-smoker and a 60 year old heavy smoker? [1]

..... %

(b) (i) Continuing to smoke heavily can damage the lungs and lead to disability. At what age does the graph above show this disability occurring? [1]

.....

(ii) Suggest what the lung damage mentioned in (i) could be. [1]

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(c) Susan is a 50 year old heavy smoker.

Use the graph opposite to suggest what Susan might expect to happen if she gives up smoking now. [2]

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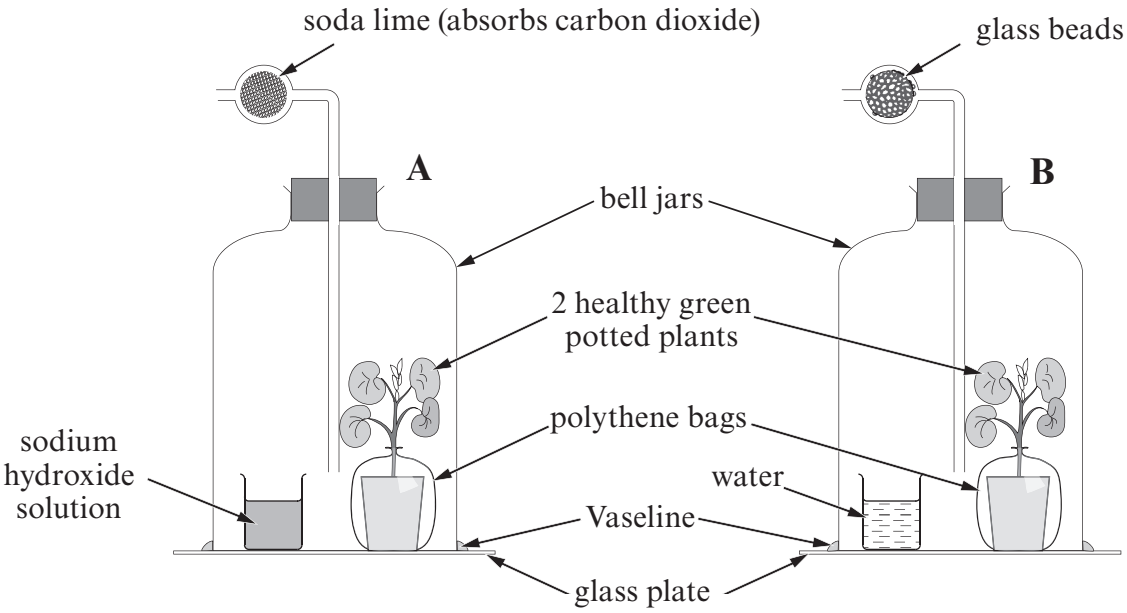
4. The experiment was set up in a school laboratory using the apparatus shown below and left near a window for 4 days.



(a) State the purpose of the experiment. [1]

.....

(b) State the function of

(i) the polythene bag [1]

.....

.....

(ii) the sodium hydroxide solution [1]

.....

.....

(iii) the apparatus labelled **B**. [1]

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.....

(iv) the Vaseline. [1]

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(c) Explain why the plants were placed in the dark for 48 hours prior to the experiment. [1]

.....

.....

(d) At the end of the experiment a leaf was taken from each plant and tested for starch. State the colour observed for each leaf and the reason.

(i) Apparatus **A** [1]

colour observed .....

reason .....

.....

(ii) Apparatus **B** [1]

colour observed .....

reason .....

.....

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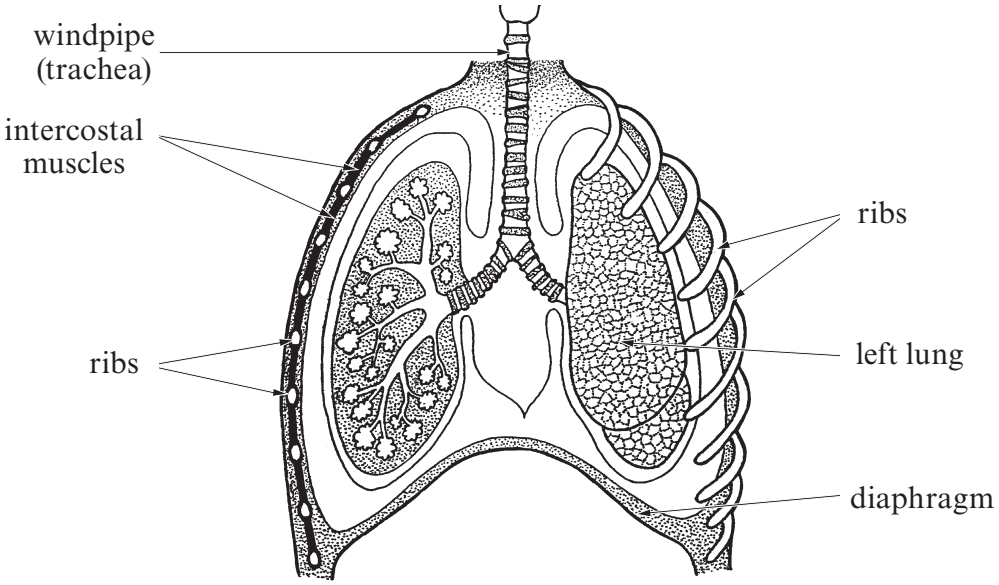
5. The diagram below shows a section through the chest.



Use the above diagram **and your own knowledge** to explain how air is drawn into the lungs during inspiration (breathing in). [6 QWC]

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6

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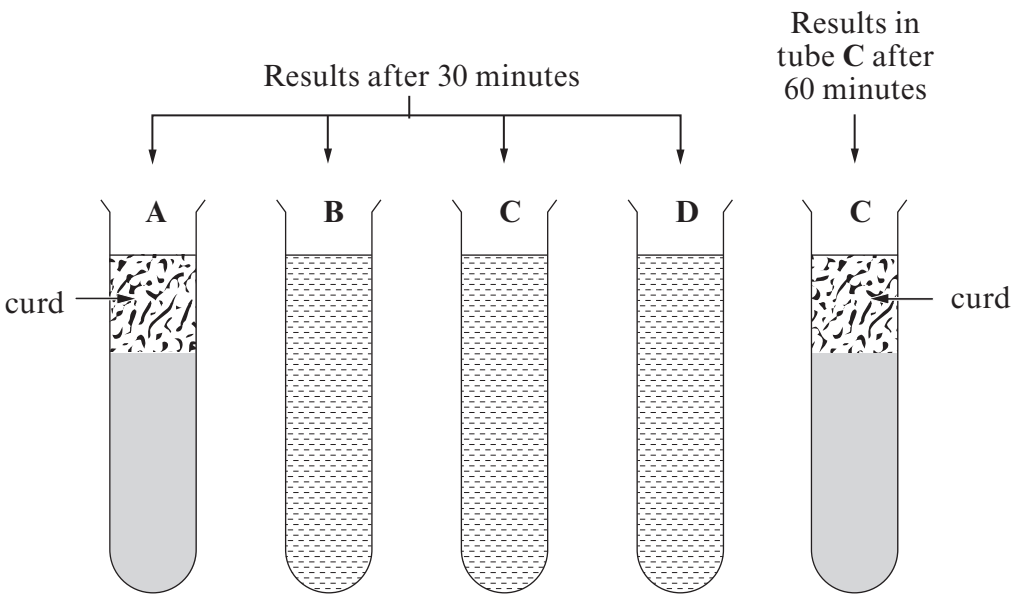
6. Rennilase is an enzyme which acts on milk during cheese making. It turns milk protein into solid milk curd.
An experiment using rennilase was set up as shown by the table below.

Tube	**A**	**B**	**C**	**D**
Contents of test tube at start	rennilase	rennilase	rennilase	boiled, cooled rennilase
	milk	milk	milk	milk
pH	4.5	9	4.5	4.5
Temperature (°C)	30	30	15	30



(a) (i) State the effect of pH on the action of rennilase. [1]

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(ii) Explain why no curd was produced in tube **D**. [1]

.....

(iii) Explain why no curd was produced in tube **C** after **30** minutes. [2]

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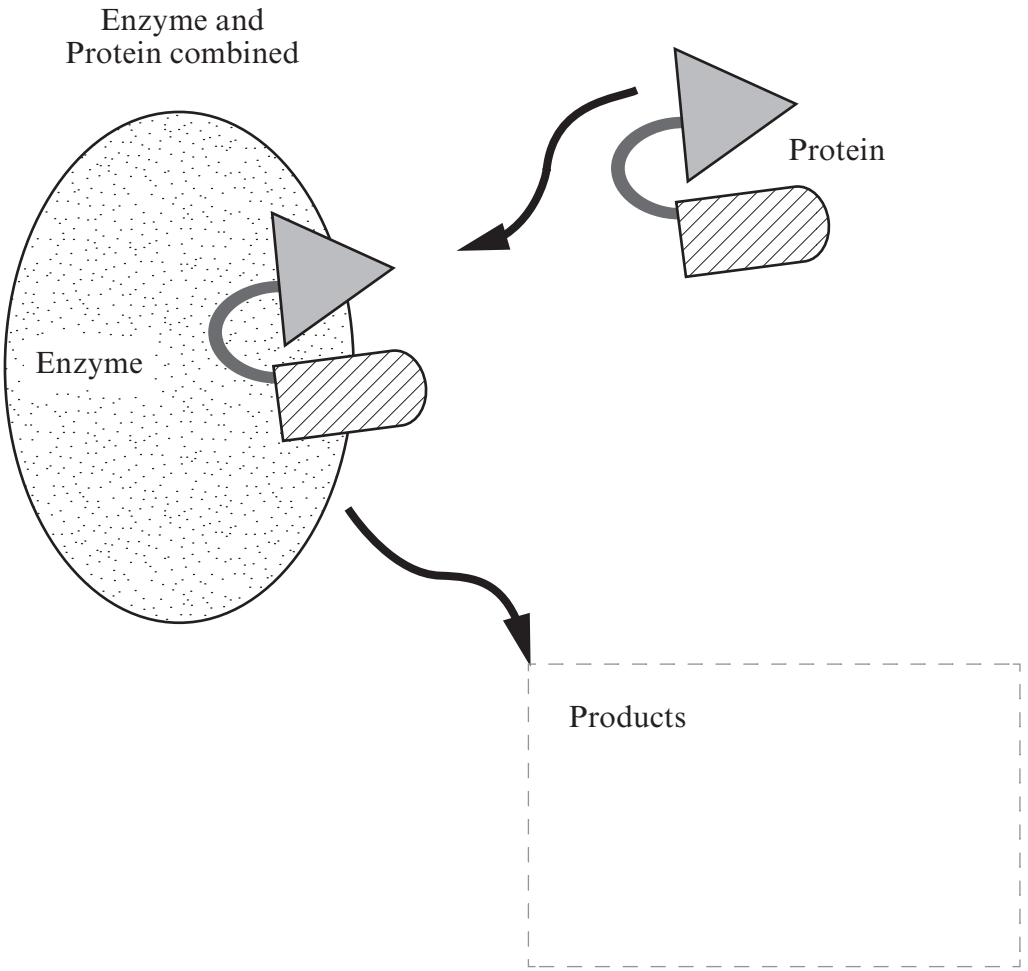
(b) The diagram below shows a model of an enzyme reacting with a protein molecule.

(i) In the box below, sketch the products that would result from this enzyme reaction. [1]



(ii) State the name given to this model of enzyme action. [1]

.....

6

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7.

- Sheep and cattle can be infected with a disease caused by the bluetongue virus.
- The bluetongue virus is carried by biting insects called midges.
- Midges can be killed by insecticides.
- Researchers at Swansea University have discovered a fungus *(Metarhizium anisopliae)* that can kill midges under laboratory conditions.
- In 2011 field trials began to investigate if midges can be controlled by the fungus.

(a) (i) Describe the basic structure of a virus. [2]

.....

.....

.....

(ii) Underline the most accurate statement below concerning the reproduction of viruses: [1]

Viruses only reproduce in

I dead cells

II animal cells

III living cells

IV plant cells

(b) Suggest **one** disadvantage of the use of insecticides in killing midges. [1]

.....

(c) What term is used to describe the use of a fungus to kill midges? [1]

.....

(d) Suggest **two** possible problems which could prevent the fungus being used successfully in killing the midges in the field trials. [2]

I. .....

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II. .....

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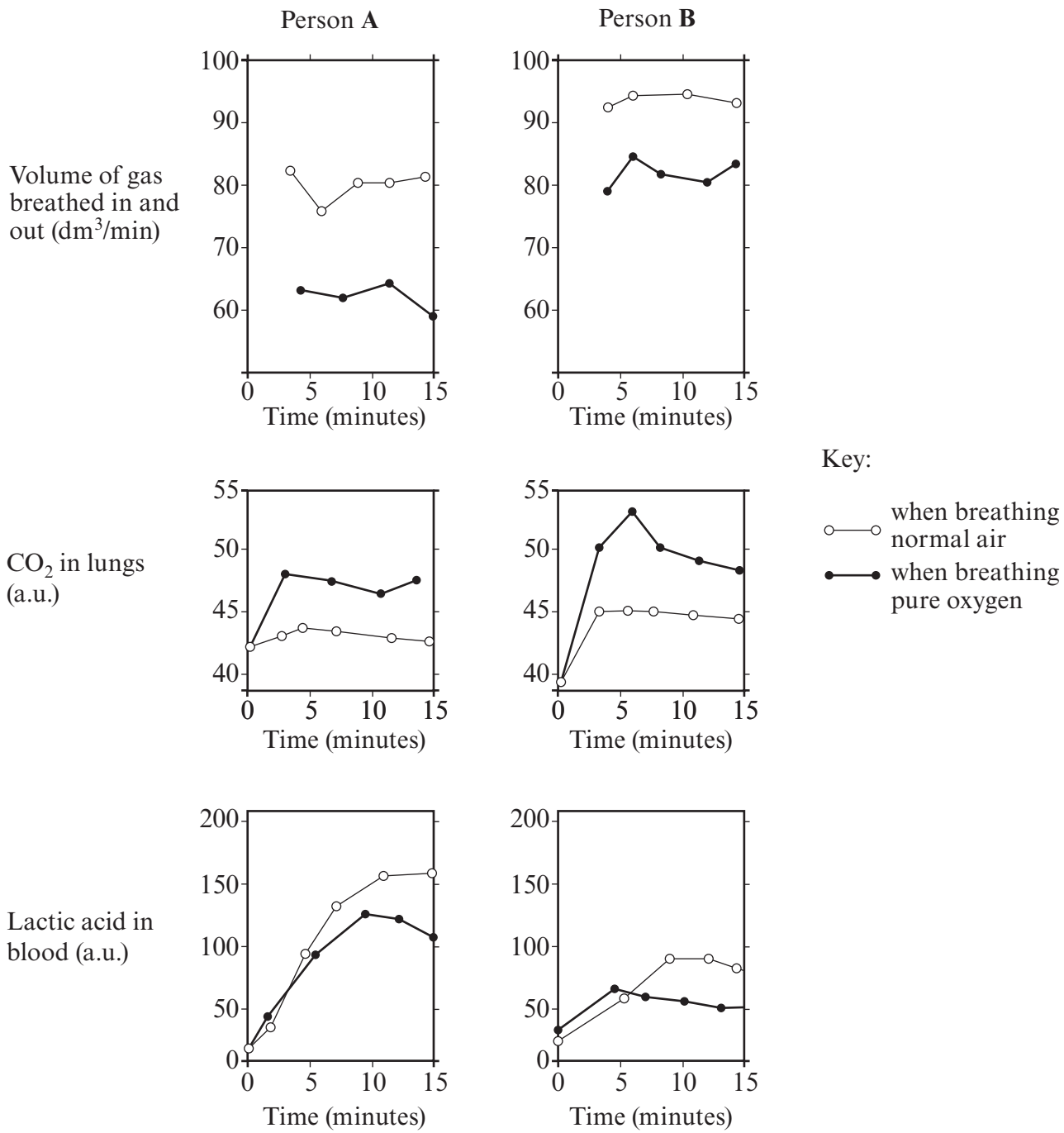
8. Two people, **A** and **B**, exercised vigorously for 15 minutes. The following measurements were taken for each person during the exercise:

- volume of gas breathed in and out
- carbon dioxide in the lungs
- lactic acid in the blood

The people then rested and repeated the process while breathing pure oxygen. The results are shown in the following graphs.



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(a) (i) Use the graphs opposite to state the effect of breathing pure oxygen, compared to breathing normal air, on the **volume** of gas breathed in and out per minute. [1]

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(ii) Person **B** is a trained athlete; person **A** is not. Give **three** pieces of evidence from the graphs to support this. [3]

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II. .....

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III. .....

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(b) State the chemical that is changed into lactic acid. [1]

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(c) Suggest why there is more carbon dioxide present in the lungs when pure oxygen is breathed rather than breathing normal air. [1]

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(d) Give a reason for the lower level of lactic acid when pure oxygen is breathed. [1]

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7

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9.

White clawed crayfish

The population of the British white clawed crayfish, *Potamobius pallipes*, has been decreasing in Wales.
In order to conserve the species, scientists from the Environment Agency Wales (EAW) released 50 white clawed crayfish into the river Rhymney in South Wales in 2010.
Two years later, the population of *Potamobius pallipes* was estimated at the place where they were released using the following method:

56 were captured, marked and released. The next day, a total of 48 were captured, of which 16 had been marked on the previous day.

The size of the population for the area sampled can be calculated using the formula:

$$\mathbf{P = \frac{a \times b}{r}}$$

Where **P** = population
a = number captured, marked and released in the first sample
b = number captured in second sample
r = number recaptured

(a) Calculate the population of *Potamobius pallipes* in the area sampled. [2]
Show your working.

Answer = ...

Examiner only

(b) What could the scientists do to be more confident of the results? [1]

.....

(c) In the calculation completed on the opposite page, what assumption is being made about the movement of individuals into (immigration) and out of (emigration) the area sampled? [1]

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(d) Suggest **three** ways in which an introduced alien species of crayfish could increase the death rate of *Potamobius pallipes* in the river Rhymney. [3]

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II. .....

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III. .....

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10. In 2010, an accident happened at an offshore oil well in Louisiana. Many thousands of tonnes of oil leaked out and caused massive pollution to oyster fisheries.
Oysters live in sea water with a salt concentration of 2%.
In order to flush away the oil, fresh water was pumped over the oysters. This lowered the salt concentration to almost zero and caused most of the oysters to die.

(a) Explain why most of the oysters died. [6 QWC]

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(b) Oysters need copper to make a chemical that carries oxygen around their bodies. The oysters concentrate the copper in their bodies from sea water where it is in a very low concentration.

(i) Name the process by which oysters concentrate the copper in their bodies. [1]

.....

(ii) State **two** ways in which this process differs from diffusion. [2]

I. .....

II. .....

END OF PAPER

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