Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4471/02

ADDITIONAL SCIENCE/BIOLOGY

BIOLOGY 2
HIGHER TIER

A.M. TUESDAY, 14 May 2013

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**6**	
3.	**8**	
4.	**6**	
5.	**6**	
6.	**8**	
7.	**8**	
8.	**8**	
9.	**6**	
Total	**60**	

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020001

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 **4** and question **9**.

Examiner only

Answer **all** *questions.*

1. Barack Obama, the President of the United States of America, supports research into the use of embryonic stem cells. However Newt Gingrich, who was hoping to become President, said in February 2012, that he would **'ban embryonic stem cell research if he became President'**.

Barack Obama

Newt Gingrich

(a) Suggest why some people support embryonic stem cell research, whereas others do not. [2]

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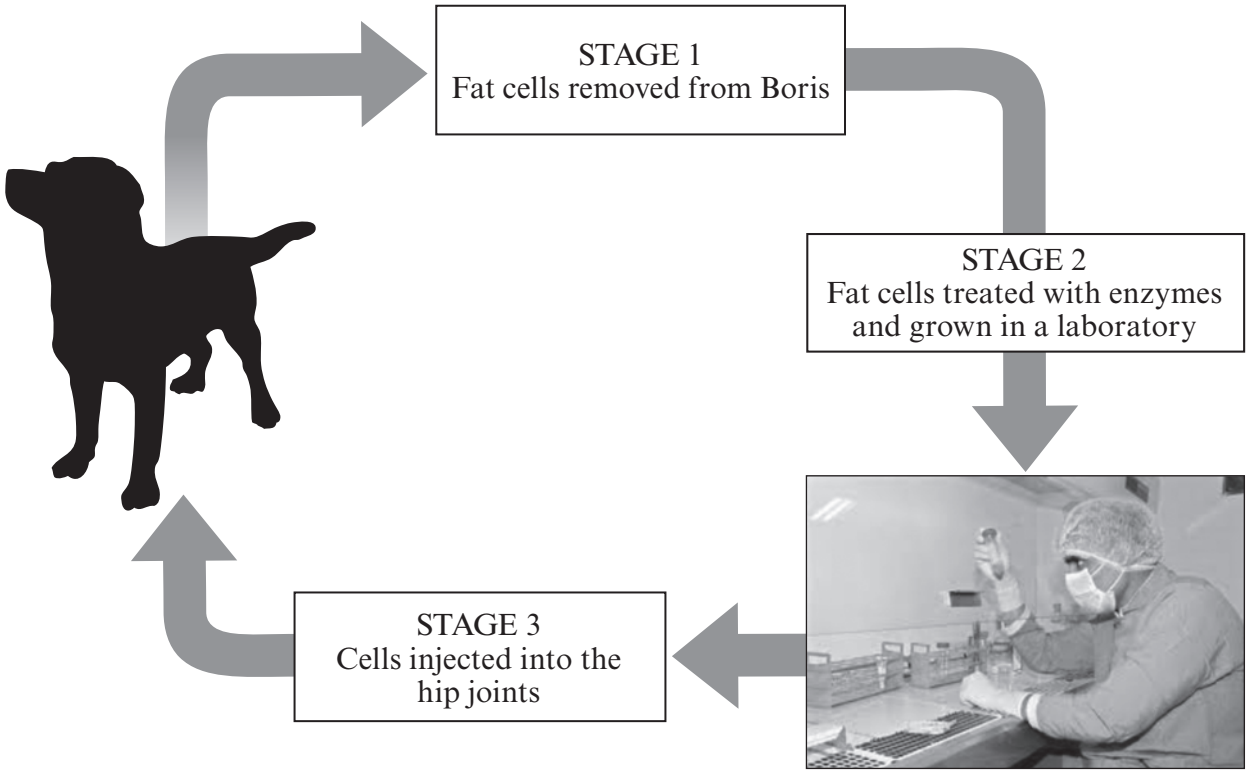
Examiner only

(b) In December 2010, a dog named Boris was treated for severe arthritis of the hip joints in a veterinary clinic in West Michigan, USA. Some of the stages in the treatment are shown below.



Three months after treatment Boris was examined at the veterinary centre. His hips were found to have greatly improved and X-rays of the hip joints showed evidence of repair of the joint tissues.

(i) State what type of cells are injected in STAGE 3 in the diagram above. [1]

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(ii) State **one** advantage of this method of treatment over the use of embryonic stem cells. [1]

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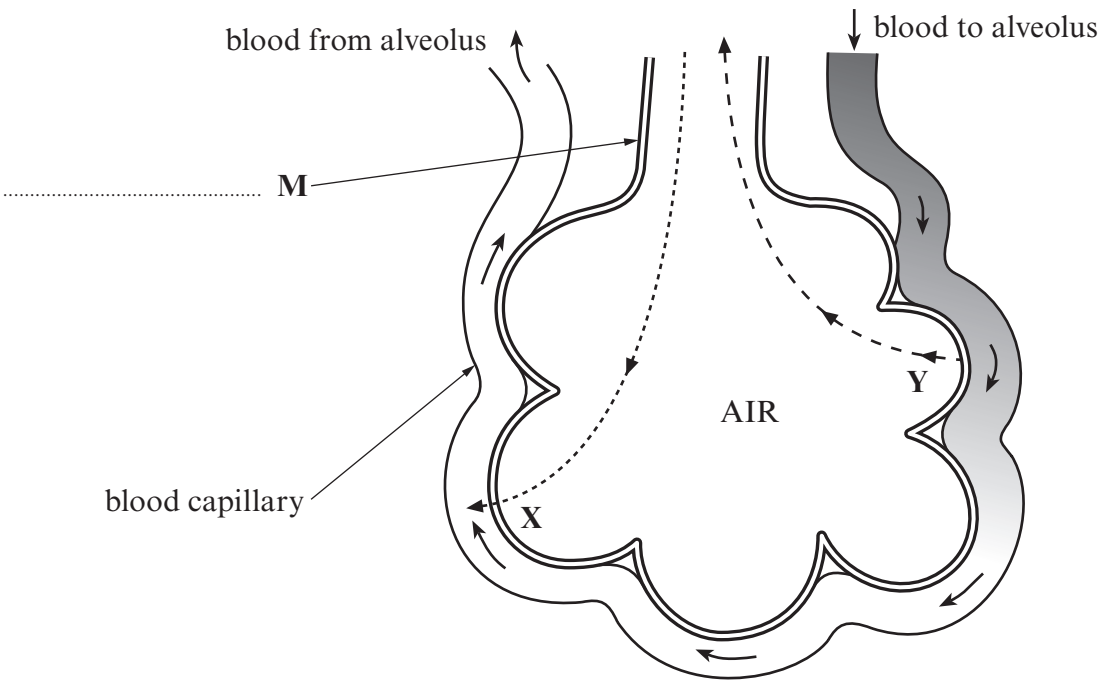
2. The diagram shows an alveolus.



(a) (i) Label structure **M** on the diagram above. [1]

(ii) Name gas **Y** shown on the diagram above. ..... [1]

(b) Explain how gas **X** passes from the alveolus into the blood capillary. [2]

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Examiner only

(c) Complete the table below to show the differences between inspired and expired air. [2]

Gas	Inspired air (%)	Expired air (%)
oxygen	21	.....
carbon dioxide	.....	4
nitrogen	79	79
water vapour	varies	1

6

3. A plant was destarched. A leaf on the plant was treated as shown in diagram **M** below. The plant was then placed in bright sunlight for 6 hours. The leaf was removed and tested for starch. The result is shown in diagram **N**.

Diagram **M**

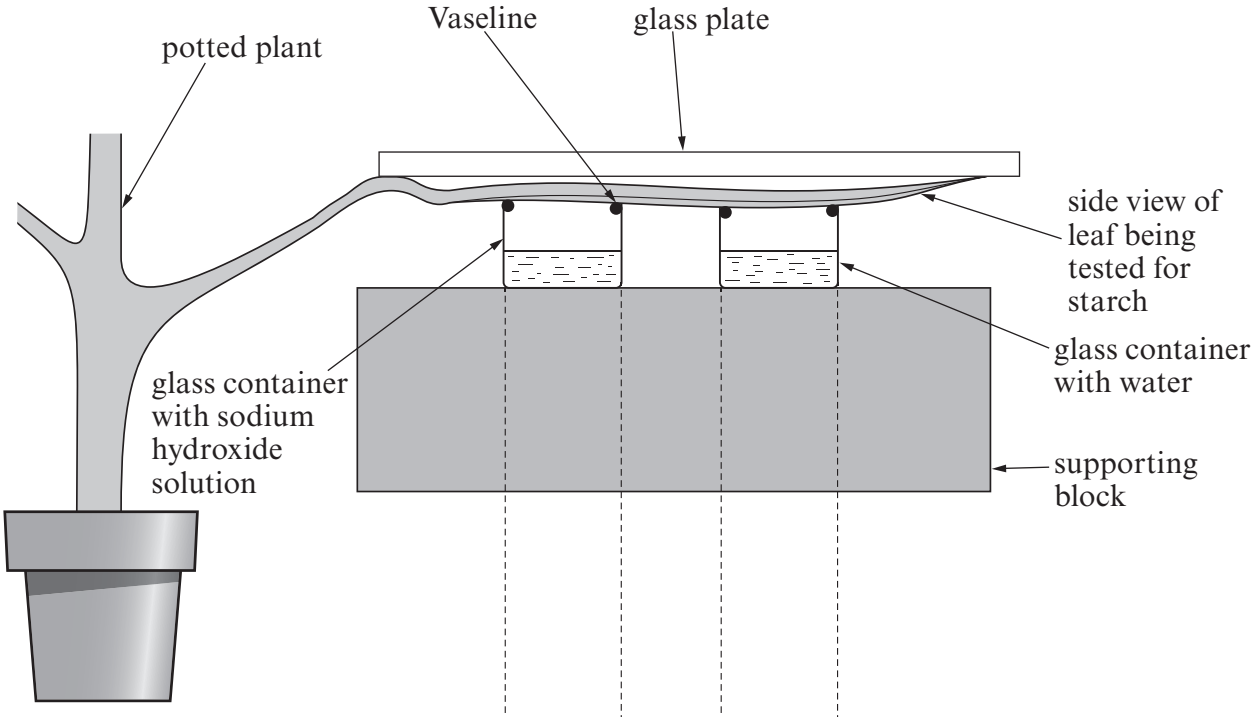
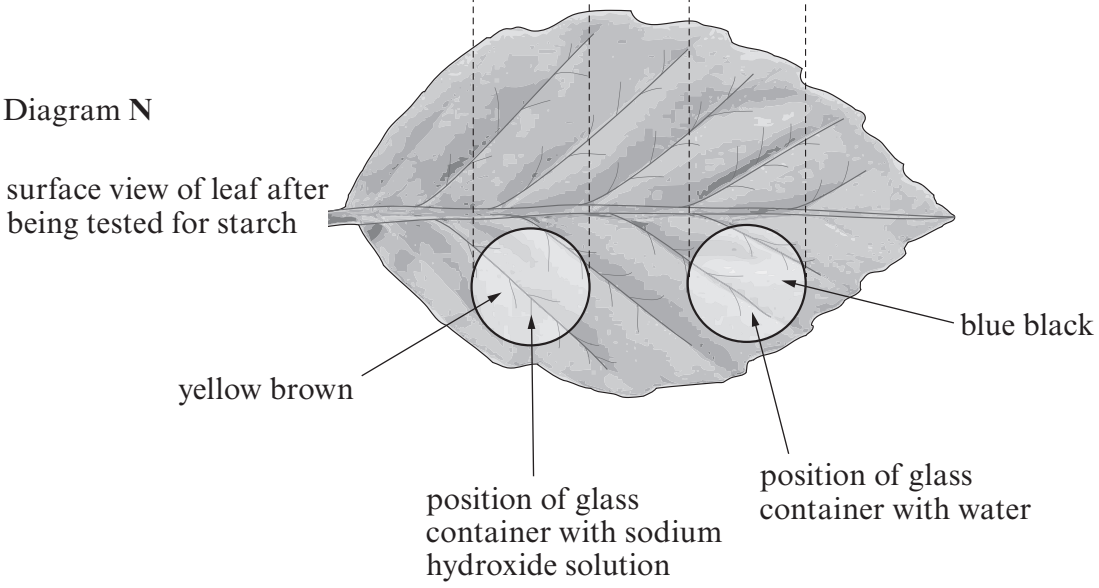


Diagram **N**



Examiner only

(a) State what the investigation shown opposite demonstrates. [1]

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.....

(b) (i) How would you completely remove all the chlorophyll from the leaf before testing for starch? [1]

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(ii) Name the chemical used to test for starch. [1]

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(iii) Explain why part of the leaf in diagram **N** is yellow-brown in colour. [3]

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(c) What was the purpose of the glass container with water? [1]

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(d) Why is it only possible to form a valid conclusion for this investigation if the glass plate and containers allow light through? [1]

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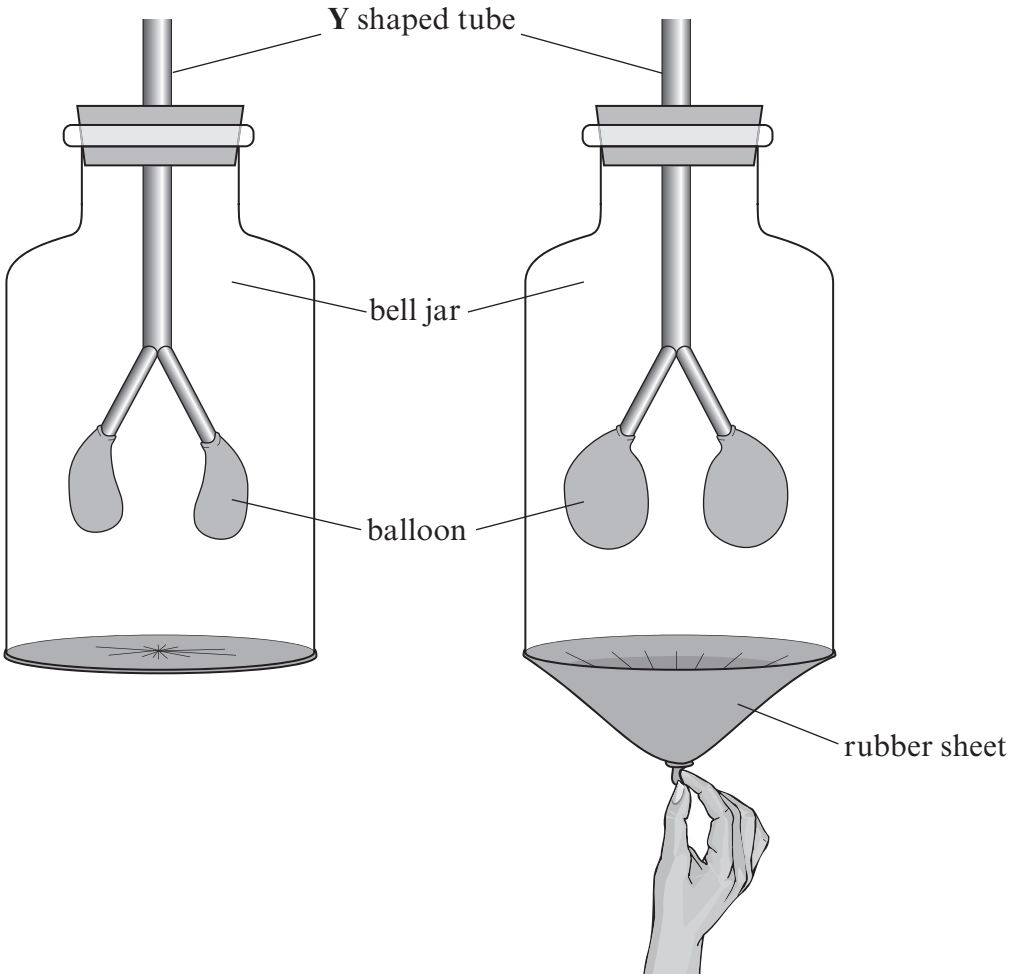
Examiner only

4. Explain how the bell jar model shown below can be used to illustrate **inspiration** (breathing in). In your explanation you must state which organs in the body are represented by the balloons and rubber sheet in the model. [6 QWC]



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Examiner only

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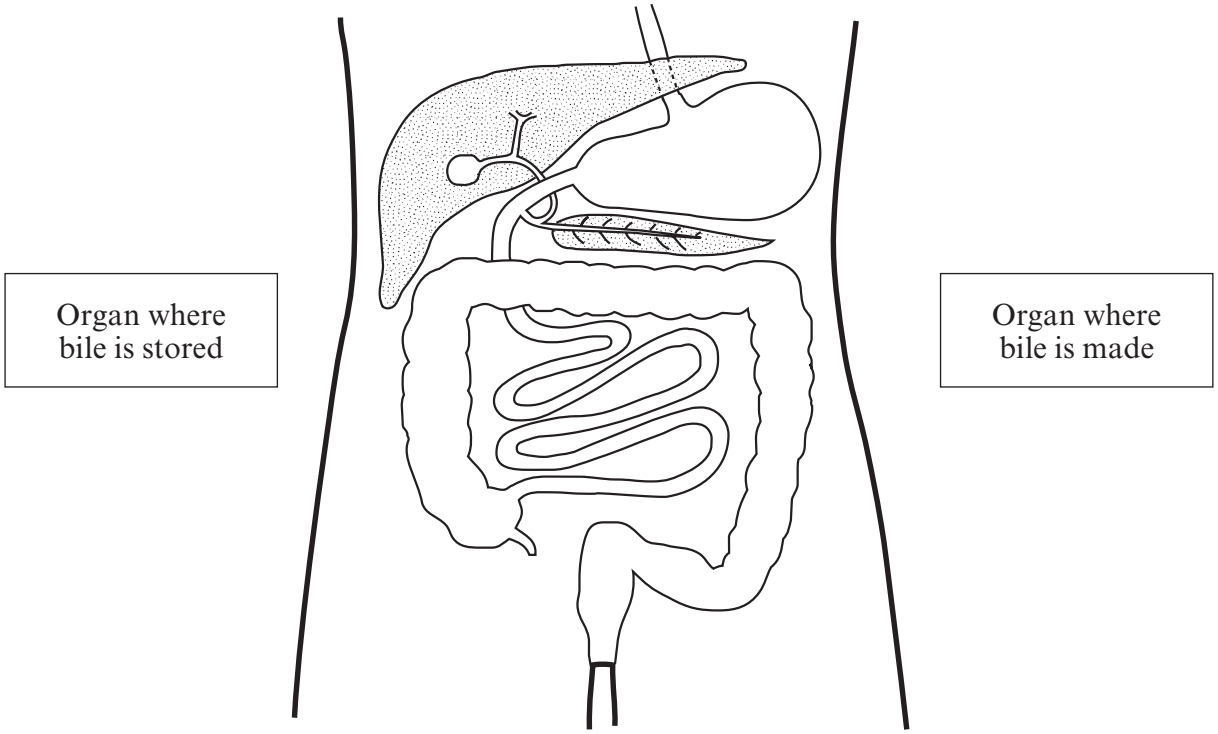
Turn over.

Examiner only

5. The diagram below shows part of the digestive system.



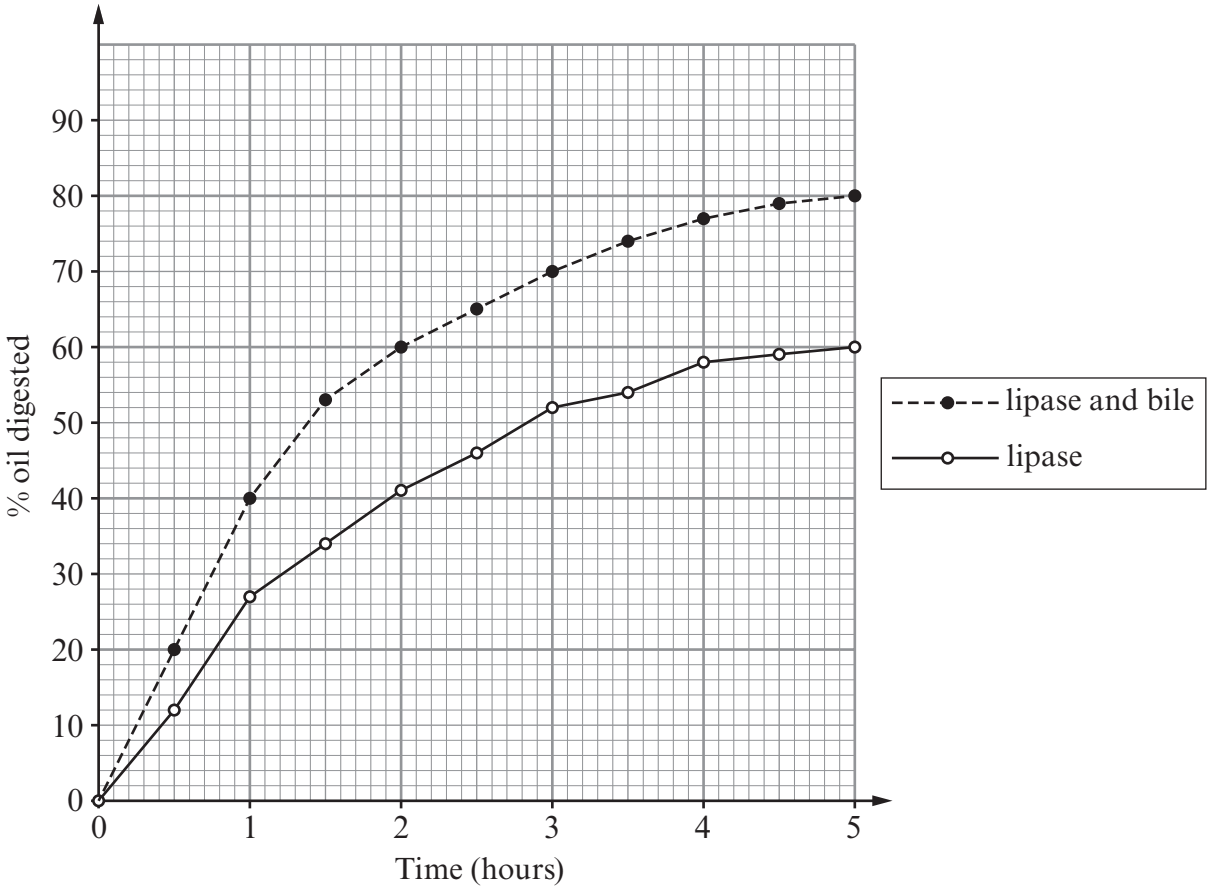
(a) On the diagram above carefully draw an arrow from each box to show the organ where:

(i) bile is made; [1]

(ii) bile is stored. [1]

Examiner only

(b) The graph below shows the digestion of olive oil (fat) by lipase enzyme at pH9 in the presence and absence of bile.



(i) Using only the information in the graph above **describe** the effect of bile on the rate of digestion of olive oil. [1]

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(ii) **Explain** the effect of bile on the digestion of olive oil. [3]

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6

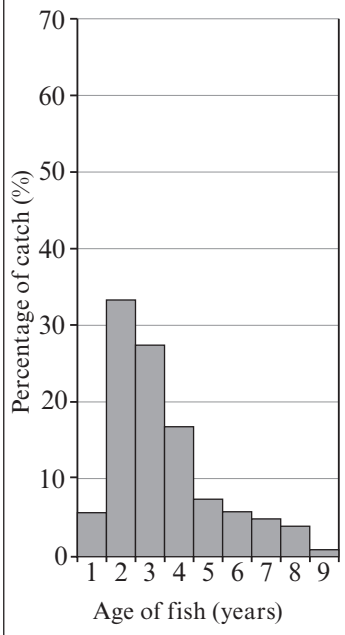
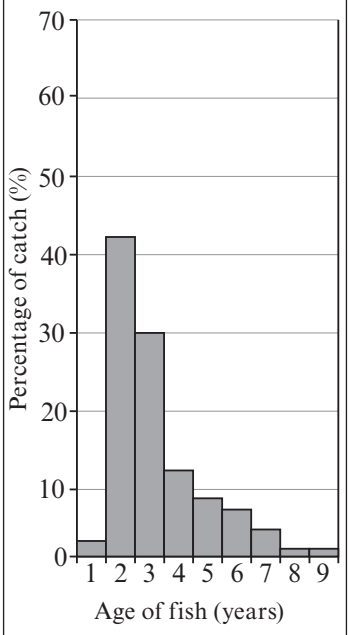
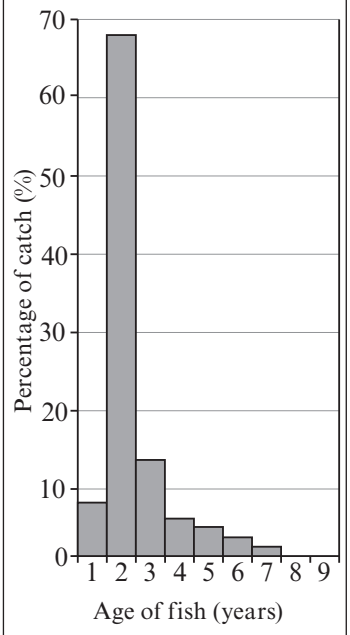
Turn over.

Examiner only

6. There has been legislation by the European Union (EU) to conserve species of fish such as cod.

North Sea cod can grow to a length of 100 cm and a mass of 15 kg. They breed for the first time when they are 3 - 4 years old and 50 cm long. Cod eat other commercially important species of fish.

The data shown below were recorded by monitoring cod caught in the North Sea in three periods between 1958 and 1982.

Period	1958-62	1968-72	1978-82
Mean catch per year (tonnes)	23 352	47 223	53 383
Age composition of catch			

(a) State **two** trends in the catch of cod shown in the data. [2]

(i) .....

(ii) .....

Examiner only

(b) Responding to the trends shown in the data, the EU introduced the following limits on the fishing industry:

1. Minimum length of cod to be kept = 30 cm (smaller fish are thrown back)

2. Minimum net mesh size (gaps in fishing net) = 9.0 cm instead of 8.5 cm

By 2011 the population of cod in the North Sea was increasing.
Explain how the limits introduced by the EU helped conserve cod in the North Sea. [3]

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(c) The EU placed one other limit on the fishing industry to try to conserve cod.
Suggest what this limit was. [1]

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(d) State **two** reasons why some fishermen were against the legislation made by the EU. [2]

(i) .....

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(ii) .....

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8

Turn over.

Examiner only

7. • Certain micro-organisms can grow in stored food and may cause the food to spoil.

• Micro-organisms can only grow when they can take in enough water from the food by a type of diffusion.

(a) Name this type of diffusion and describe how the micro-organism takes in water. [3]

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In the food industry the amount of available water in food is called 'water activity'. Pure water has a water activity of 1.0.

Table 1 below shows the water activity of some foods.

Table 1

Food	Water activity
uncooked fish	0.96
fish covered in salt	0.30
strawberry jam	0.83

Table 2 below shows the lowest water activity at which three different types of micro-organisms can survive.

Table 2

Micro-organism	Lowest water activity at which micro-organisms can survive
bacteria	0.95
yeasts (fungi)	0.85
moulds (fungi)	0.70

Examiner only

(b) Use the data in the tables opposite to:

(i) name the type of micro-organism that can survive in strawberry jam. [1]

.....

(ii) describe how salt acts as a preservative for fish. [2]

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(c) State the methods of asexual reproduction used by: [2]

(i) bacteria; .....

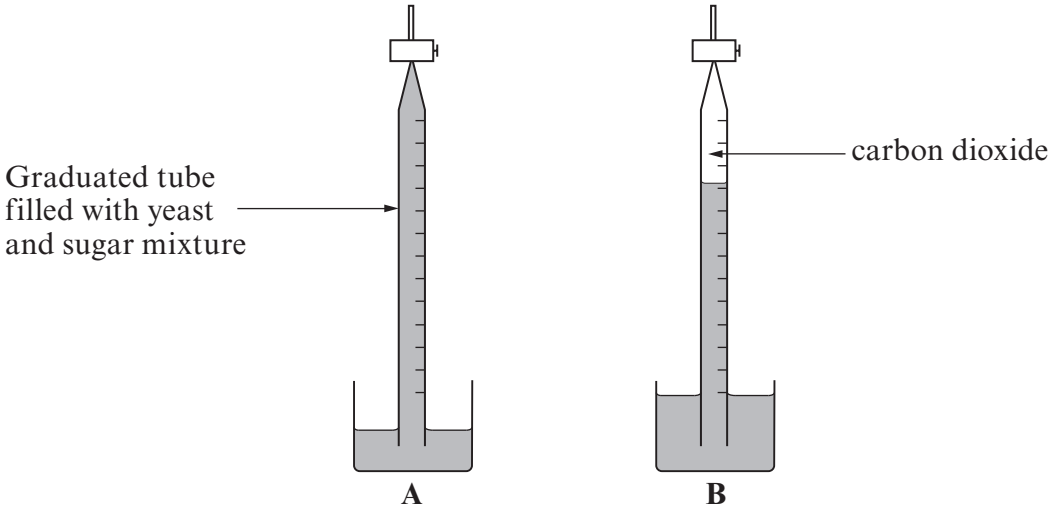
(ii) yeast. .....

8

Turn over.

Examiner only

8. Students investigated the production of ethanol from sugars by yeast. They used solutions of the same concentration of four different types of sugars, **P**, **Q**, **R** and **S**. For each sugar, they set up the apparatus as in diagram **A**. The volume of carbon dioxide was measured every five minutes for each apparatus as shown in diagram **B**.



The table below shows the results of the investigation.

Mixture	Volume of carbon dioxide (cm^3)						
	5 min	10 min	15 min	20 min	25 min	30 min	35 min
yeast + sugar **P**	3.0	10.0	17.0	26.0	35.0	38.0	40.0
yeast + sugar **Q**	0.5	1.0	1.5	2.0	2.0	2.0	2.0
yeast + sugar **R**	0.5	1.0	1.0	1.5	1.5	1.5	1.5
yeast + sugar **S**	4.0	11.0	19.0	27.0	36.0	40.0	42.0
yeast + water	0.5	0.5	0.5	1.0	1.0	1.0	1.0

(a) (i) Suggest which sugar produced the most ethanol. .....

[1]

(ii) Suggest how the mixture of yeast and water was able to produce carbon dioxide.

[1]

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Examiner only

(iii) Why did the rate of production of carbon dioxide eventually slow down in all of the graduated tubes? [1]

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(iv) Why was it important that the graduated tubes were **completely** filled with the yeast and sugar mixture at the start of the investigation? [1]

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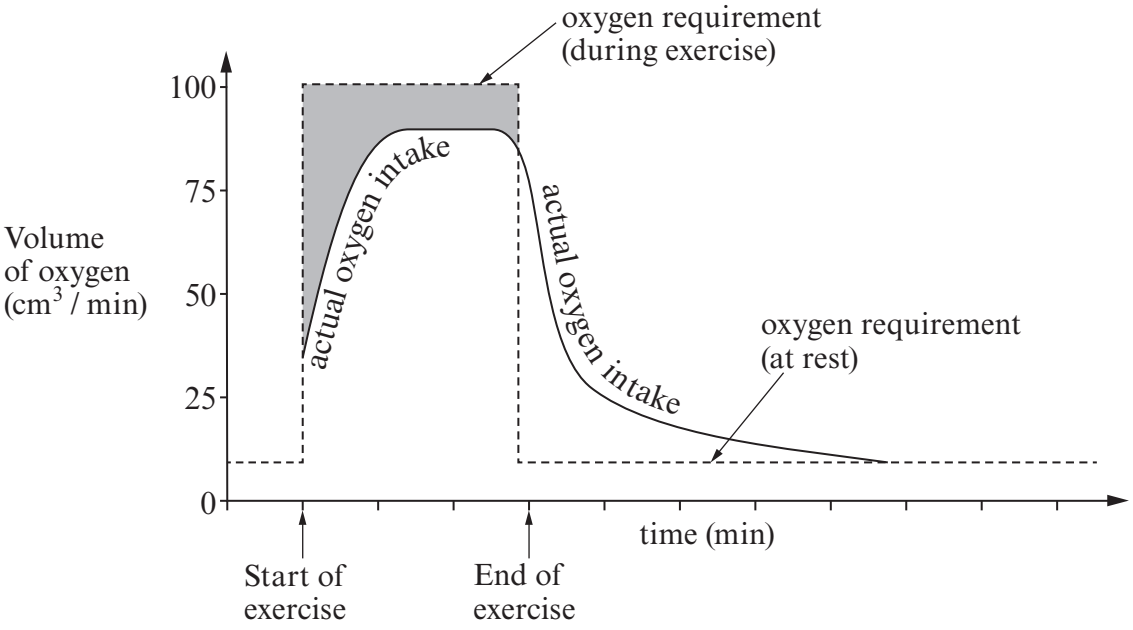
(b) The graph below shows the volume of oxygen required during exercise and the actual volume of oxygen taken in by an athlete.



(i) State the term used to describe the difference between the volume of oxygen required and the actual oxygen intake, as shown by the shaded area of the graph above. [1]

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(ii) State the chemical that is produced in the shaded area of the graph shown above. [1]

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(iii) How would you expect the shaded area in the graph above to be affected by a long period of regular training by an athlete? [1]

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(iv) State the type of respiration that takes place during rest. [1]

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Examiner only

9. Outline the basic structure of DNA and explain the meaning and importance of the genetic code in the production of proteins. An account of protein synthesis is not required.

DO NOT USE DIAGRAMS. [6 QWC]

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