

Surname	Centre Number	Candidate Number
Other Names		0

**GCSE**

4471/01



S16-4471-01

ADDITIONAL SCIENCE/BIOLOGY**BIOLOGY 2
FOUNDATION TIER**

P.M. TUESDAY, 17 May 2016

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	6	
3.	9	
4.	8	
5.	6	
6.	5	
7.	5	
8.	4	
9.	4	
10.	6	
Total	60	

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010001**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.

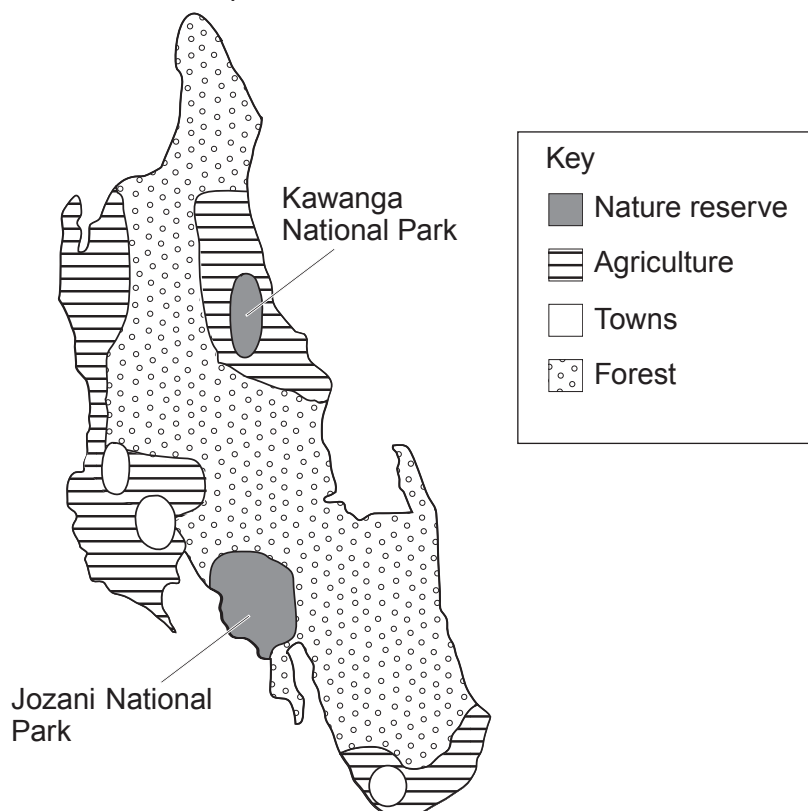
You are reminded that assessment will take into account the quality of written communication (QWC) used in your answer to question **10**.

Answer all questions.

- The red colobus monkey (*Procolobus kirkii*) lives in forests on the island of Zanzibar, feeding on leaves and tree bark. It is an endangered species and its numbers are declining because of human activities. This is despite the species being protected in the National Parks.



In 2012 conservationists estimated that there were 1600 red colobus monkeys on the whole island, with 50% of them living in the Jozani National Park. 150 colobus monkeys were then moved from the Jozani National Park to the Kawanga National Park to increase the population there. The diagram below shows a map of the island of Zanzibar.



Fact File – Human activities which harm the red colobus monkey.

The illegal capture for sale as pets in other countries.

Destroying habitat by using land.

Poisoning and hunting by farmers.

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(a) Use only the information opposite to answer the following questions.

(i) What is the habitat of the red colobus monkey on the island of Zanzibar? [1]

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(ii) Give **two** ways in which the use of land by humans has caused the habitat to be destroyed. [2]

.....

.....

(iii) The Kawanga National Park has not been as successful as the Jozani National Park in protecting the red colobus monkey. Suggest a reason for this. [1]

.....

(iv) Calculate the number of monkeys estimated to be living in the Jozani National Park after the conservationists had moved some of them to the Kawanga National Park. [2]

Number of monkeys=

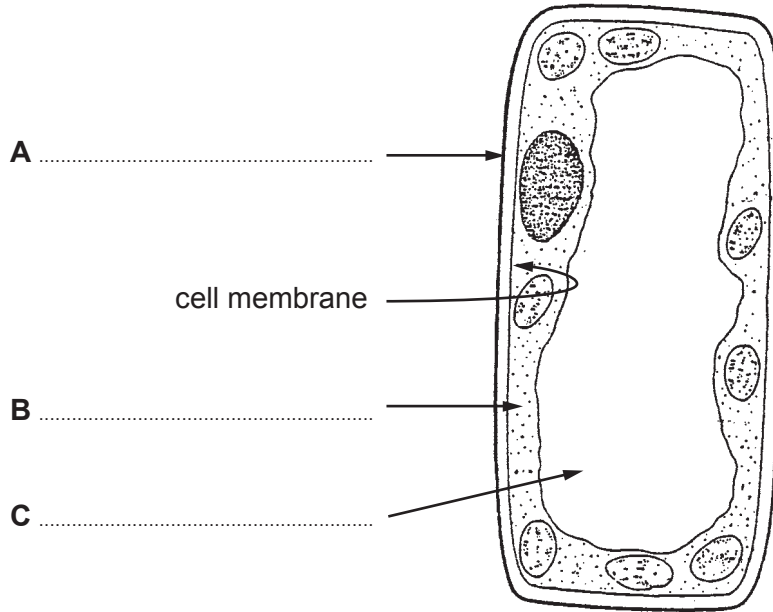
(b) How could the Convention on the International Trade in Endangered Species (CITES) help to protect the red colobus monkey? [1]

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2. (a) (i) Complete the labels **A**, **B** and **C** on the diagram of a plant cell below. [3]



(ii) State the function of the cell membrane. [1]

.....

(b) (i) Which two structures shown on the diagram would **not** be present in an animal cell? Underline your answer. [1]

A and B

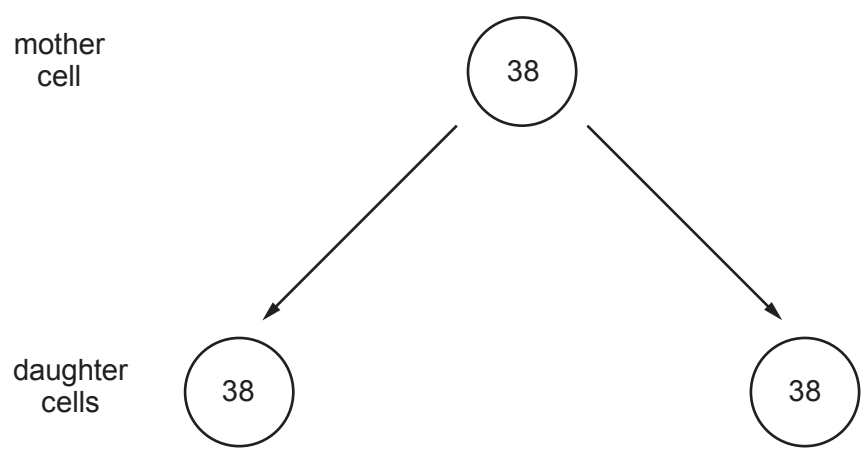
A and C

B and C

(ii) Name a structure shown in the diagram which would be present in both an animal cell and a yeast cell. [1]

.....

3. The diagram below shows cell division of a cell from a cat. The number of chromosomes is shown.



(a) What name is given to the type of cell division shown in the diagram? Give a reason for your answer. [2]

Type of cell division

Reason

(b) The table shows the numbers of chromosomes in the cells of pigeons and humans before and after dividing by meiosis.

(i) Complete the table. [1]






	number of chromosomes	
	cell before meiosis	sex cells (sperm and egg cells) after meiosis
human	46	
pigeon		40

(ii) State how many sex cells would be produced from one cell by meiosis and give the scientific term for these sex cells. [2]

.....

.....

- (c) The table below shows some animals, the number of chromosomes in their body cells and their adult body length.

animal (not shown to scale)	mean adult body length (cm)	number of chromosomes in body cells
carp fish 	80	104
chimpanzee 	100	48
earthworm 	10	36
goat 	65	60
hedgehog 	15	88

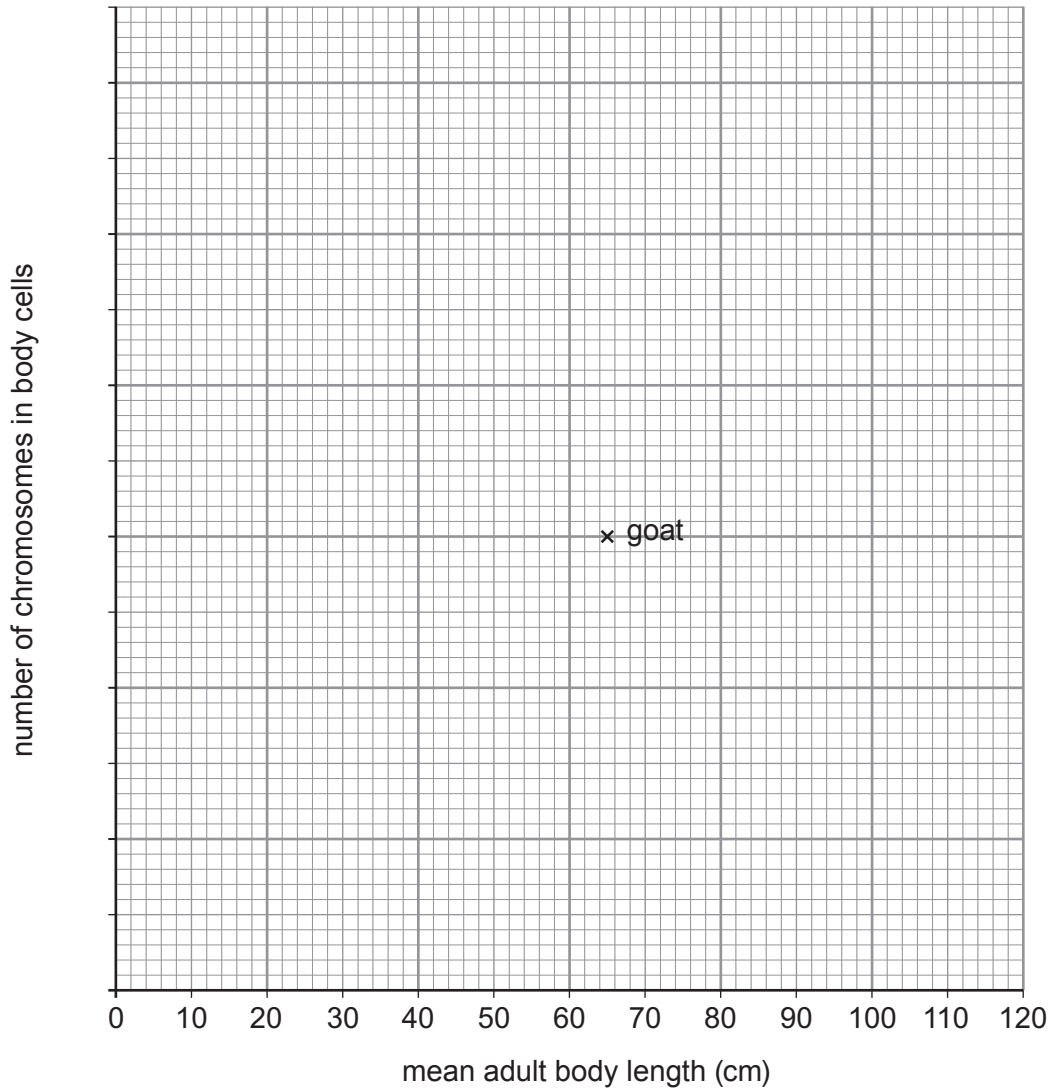
(i) Complete the **scattergraph** below by:

I. adding a scale for the number of chromosomes, [1]

II. plotting the values for each animal, [2]

III. labelling each of your plots.

The goat has been done for you.



(ii) What does the information in **this scattergraph** show?
Underline your answer. [1]

- A. The larger animals have larger numbers of chromosomes.
- B. The size of an animal is not related to the number of chromosomes.
- C. The smaller animals have larger numbers of chromosomes.

4. (a) Complete the sentences below.

[2]

During photosynthesis chlorophyll absorbs energy. Carbon dioxide and are converted into glucose and

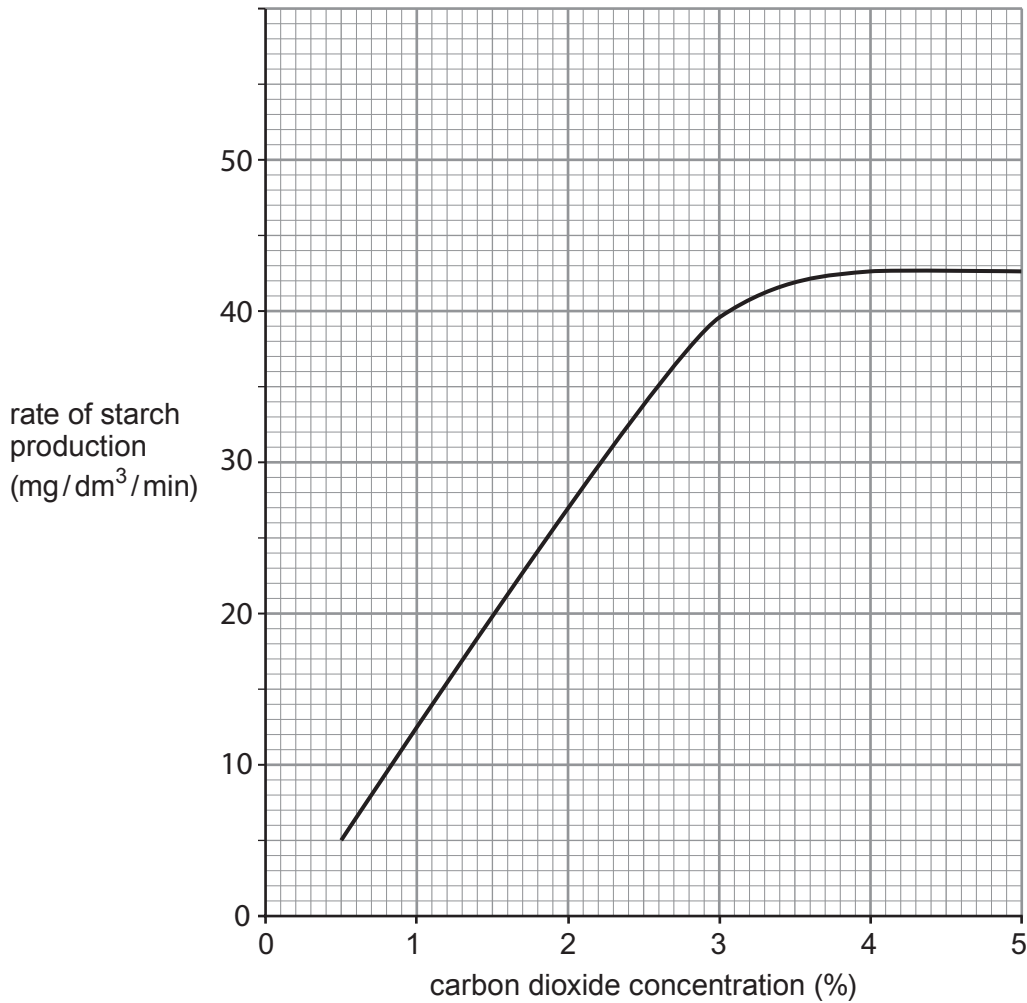
- (b) The glucose formed in photosynthesis may be stored as starch. Scientists investigated the effect of different concentrations of carbon dioxide on the rate of photosynthesis in algal cells. They recorded the mass of starch produced.



Large numbers of algal cells in containers with different concentrations of carbon dioxide.

The results of the investigation are shown on the graph below.

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From the graph

- (i) Describe the effect of increasing carbon dioxide concentration on the rate of starch production. [2]

.....

.....

- (ii) Calculate the change in the rate of starch production between levels of 1.5% and 2.5% carbon dioxide. [2]

..... (mg/dm³/min)

- (c) A chemical is used to indicate the presence of starch. Name the chemical and describe the colour change that would indicate a positive result. [2]

Chemical:

Colour change:

5. (a) Smoking affects health. State how people are made aware of this when they buy packets of cigarettes. [1]

- (b) (i) Cigarette smoke contains tar which causes cancer. Following laboratory observations in 1971, doctors predicted rates of lung cancer linked to cigarettes containing different levels of tar. Their predictions were based on people smoking 15 cigarettes per day.

tar content (mg / cigarette)	predicted rates of lung cancer (cases / 100 000 population)
7	10
9	15
11	108
17	146
22	174

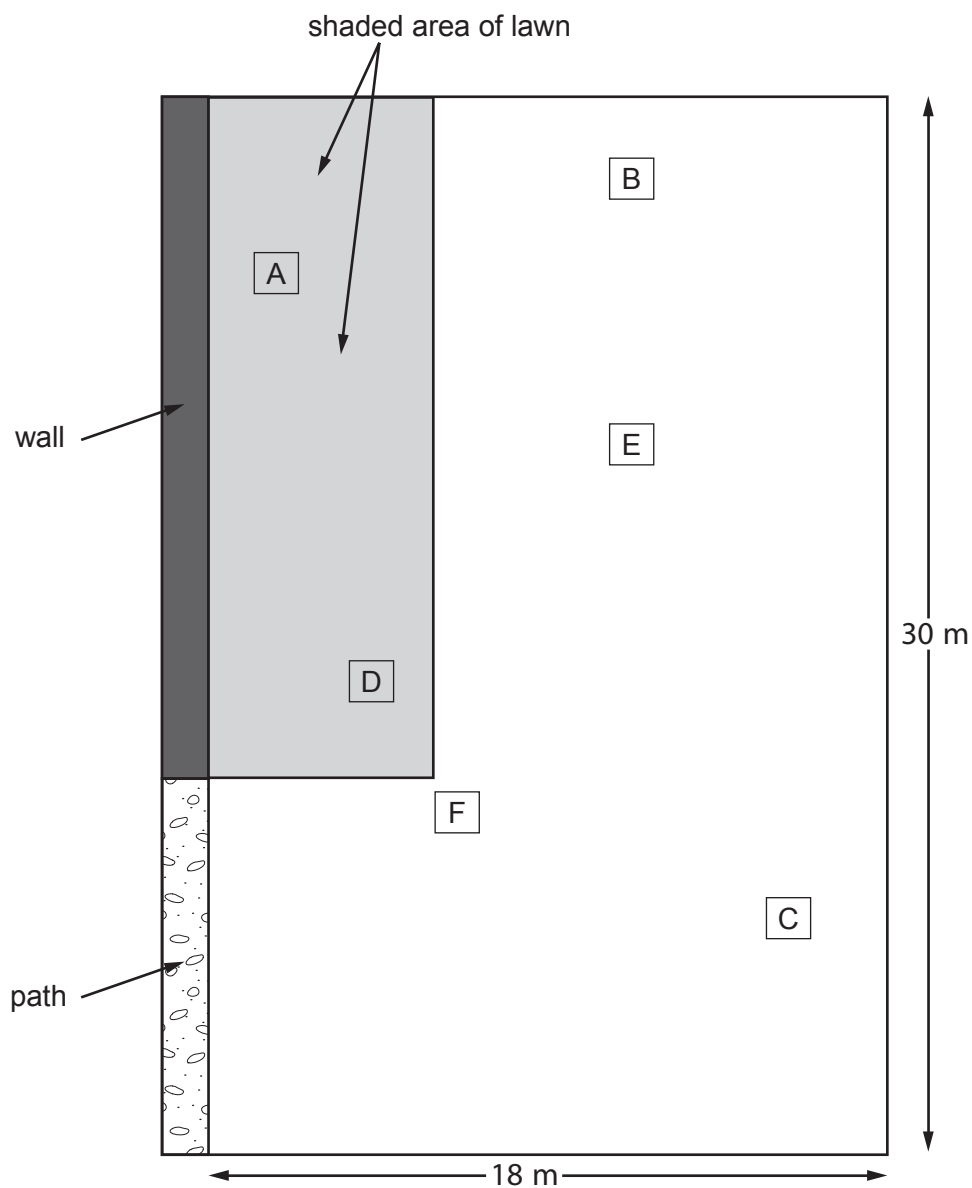
Giving evidence from the table, describe the effect of different levels of tar on the predicted rate of lung cancer. [2]

- (ii) In the 1970s, low tar cigarettes became cheaper and many people were smoking far more than 15 cigarettes per day. Suggest the effects on the rates of lung cancer in these people. [1]

- (c) Name **one** medical condition, other than cancer, which is linked to smoking cigarettes and describe the effects on the person. [2]

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6. Some students investigated the number of dandelion plants on a lawn. The diagram shows the lawn and the location of 6 quadrats (A to F) which the students had placed at random on the lawn.



Key: quadrat

The students counted the number of dandelions in each quadrat and recorded their results in the table below.

quadrat	number of dandelions
A	7
B	2
C	1
D	6
E	2
F	0

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only

- (a) Each quadrat measured 1 m^2 .
Calculate the mean number of dandelions per square metre for the 6 quadrats. [1]

Mean number of dandelions =

- (b) Calculate the area of the lawn. [1]

Area of lawn =

- (c) Use your answers from parts (a) and (b) to estimate the total number of dandelions on the lawn. [1]

Estimated total number of dandelions =

- (d) In fact, the **actual** number of dandelions on the lawn is 1 250.
Use the formula below to calculate the percentage error of the estimate in part (c) above. [1]

$$\text{percentage error} = \frac{\text{estimated number of dandelions} - \text{actual number of dandelions}}{\text{actual number of dandelions}} \times 100$$

percentage error = %

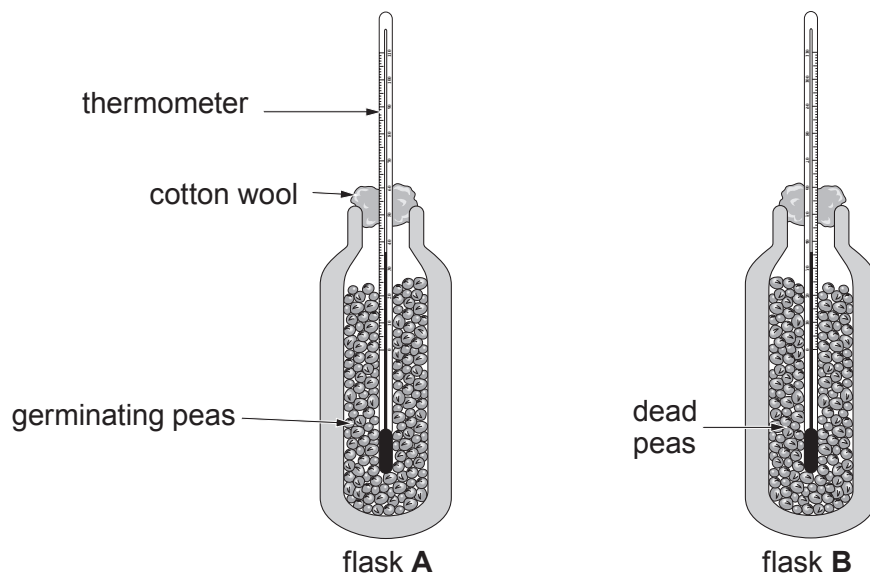
- (e) How could the strength of evidence in the investigation be improved? [1]

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7. Dan and Beth investigated the heat released by germinating peas.

The diagram below shows their experiment.



(a) The temperature of the peas in each flask was recorded at the start of the experiment and after two days. The results are shown in the table below.

flask	temperature (°C)	
	start	after two days
A	21	28
B	21	21

Describe and explain the results for **both** flasks.

[3]

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(b) The students did not disinfect the peas before setting up the experiment. Explain the importance of disinfecting the peas in order to make a valid conclusion. [2]

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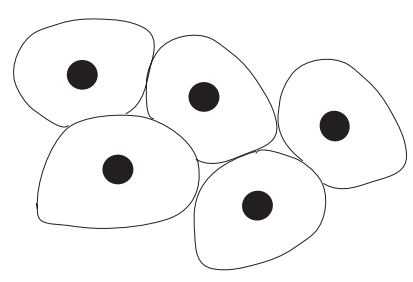
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8. (a) The drawing below shows human embryonic stem cells.



What features of stem cells could make them useful in treating many different medical conditions? [2]

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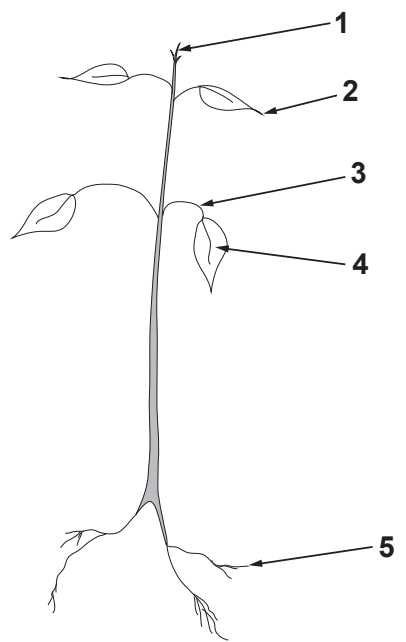
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(b) A laboratory in Japan has recently developed stem cells from human adult skin cells. Suggest why using human adult stem cells might be preferred to using human embryonic stem cells. [1]

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.....

(c) Plants also have stem cells.



Which **two** numbered parts (1 to 5) of the plant shown above contain stem cells? [1]

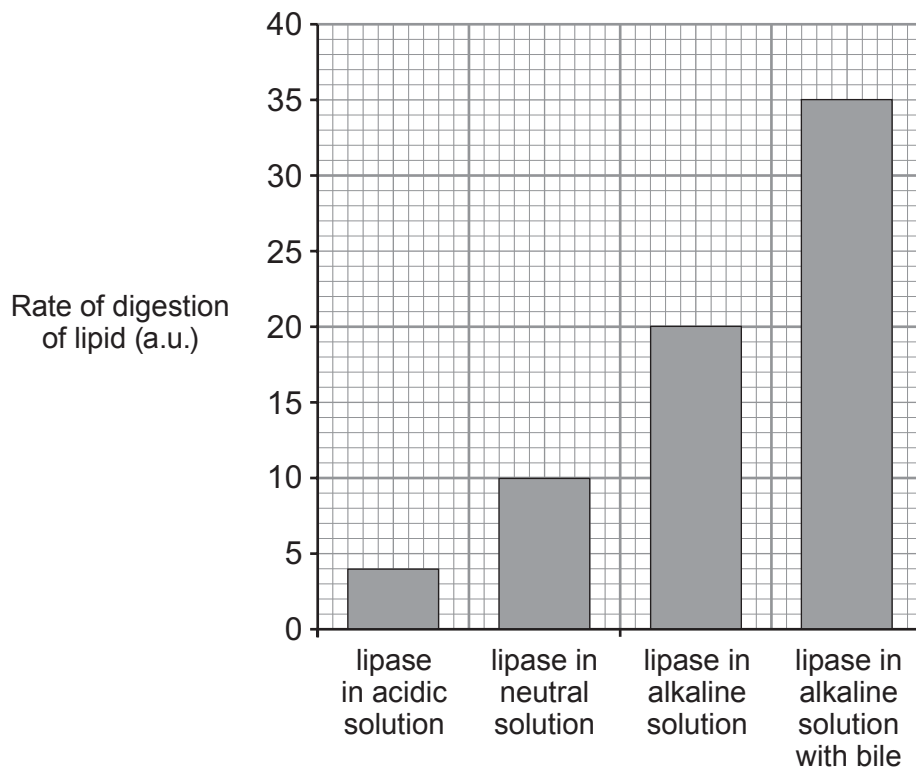
..... and

9. (a) Why do we need to digest large food molecules?

[1]

Examiner
only

(b) The graph below shows the rate of digestion of lipids by lipase under different conditions.



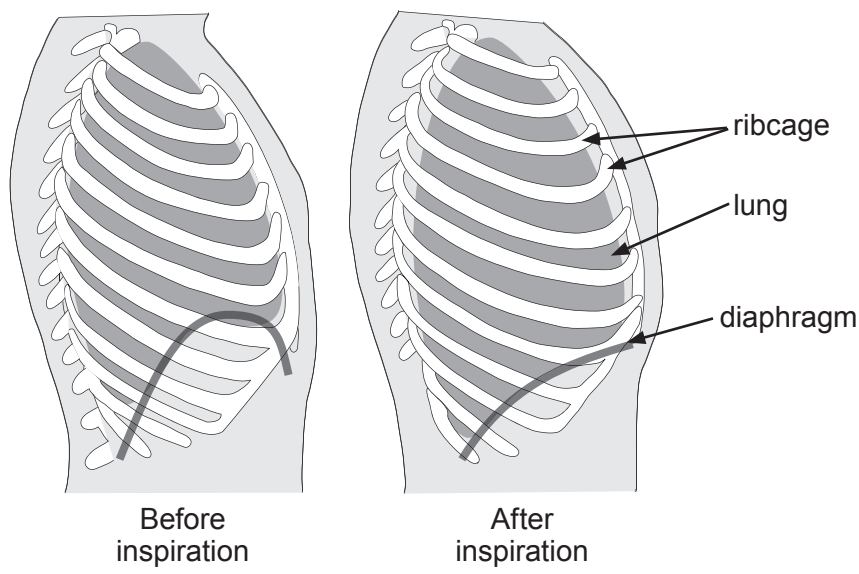
(i) Describe the effect of pH on the rate of digestion of the lipids.

[1]

(ii) Explain the effect of bile on the rate of digestion of the lipids.

[2]

10. The diagrams below show side views of the chest cavity before and after inspiration (breathing in).



Using both diagrams, explain how the movements of the **diaphragm and ribcage** bring about inspiration (breathing in). [6 QWC]

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