Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017

Double Award Science: Biology

MV18

Unit B2

Foundation Tier

[GSD41]

FRIDAY 9 JUNE, MORNING

Time

1 hour 15 minutes, plus your additional time allowance.

Instructions to Candidates

write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Complete in black ink only.

Answer **all nine** questions.

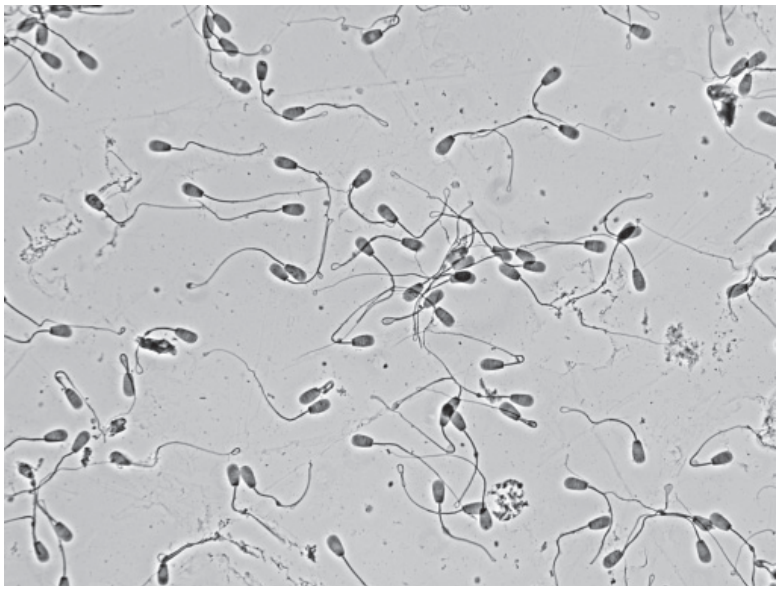
Information for Candidates

The total mark for this paper is 90.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question **6(a)(i)**.

1 **(a)** The photograph shows sperm cells.



(i) What is the function of a sperm cell? [1 mark]

_____

_____

(ii) Give **one** way a sperm cell is adapted for its function. [1 mark]

_____

_____

(b) Males and females produce the sex hormones testosterone and oestrogen.

These hormones cause the development of secondary sexual characteristics.

(i) State where testosterone is produced and give **two** secondary sexual characteristics that it causes to develop in **males**. [3 marks]

(ii) State where oestrogen is produced and give **two** secondary sexual characteristics that it causes to develop in **females**. [3 marks]

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2 **(a)** Complete the sentences about the different types of blood vessel in the body by writing the correct words in the spaces. [4 marks]

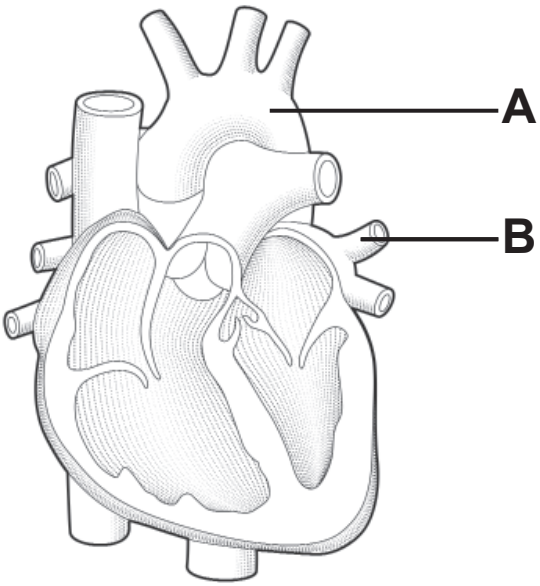
Choose the words from the list.

backflow	**pumping**	**capillaries**
arteries	**permeable**	**impermeable**

_____ carry blood under pressure away from the heart. Veins carry blood back to the heart. They have valves that prevent the _____ of blood.

_____ allow the exchange of substances with tissues through _____ walls.

(b) The diagram shows a heart with its blood vessels. Use this diagram and your knowledge to answer the questions that follow.



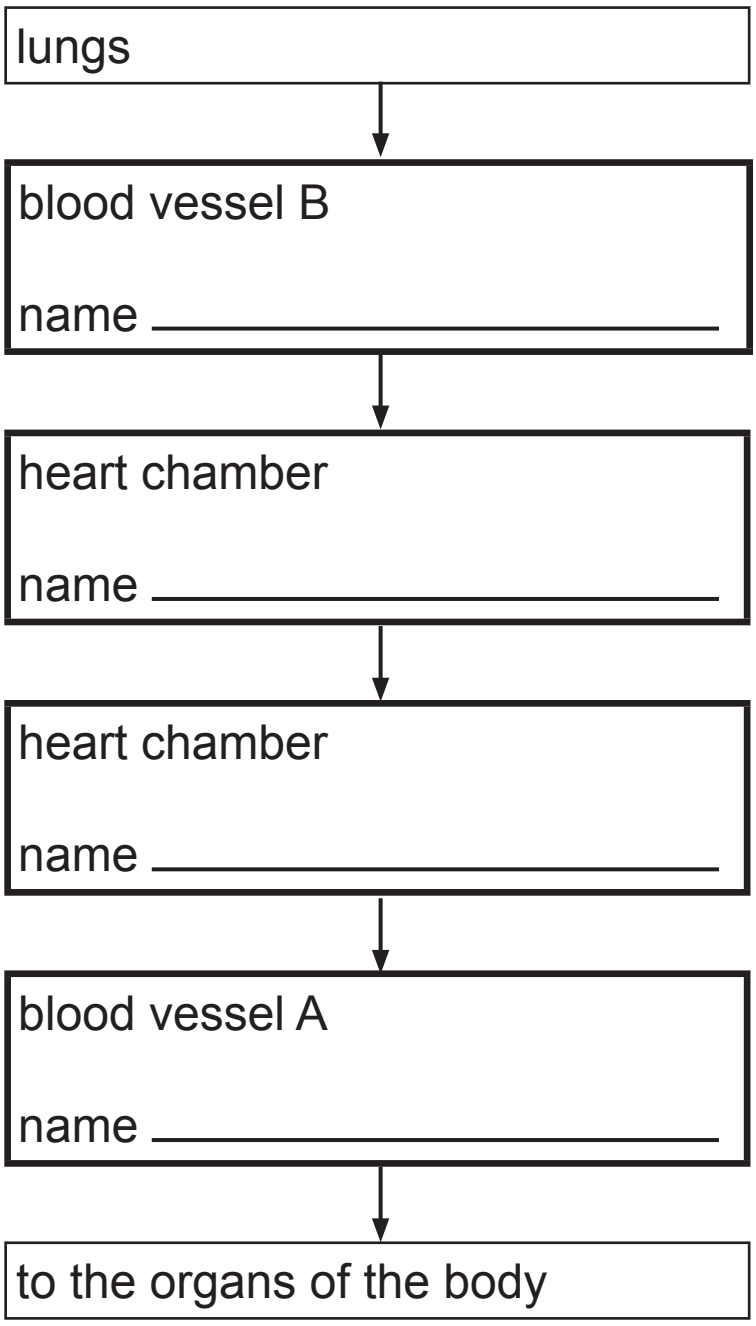
Blood passes through the heart twice when completing one circuit of the body.

(i) Name this type of blood circulation. [1 mark]

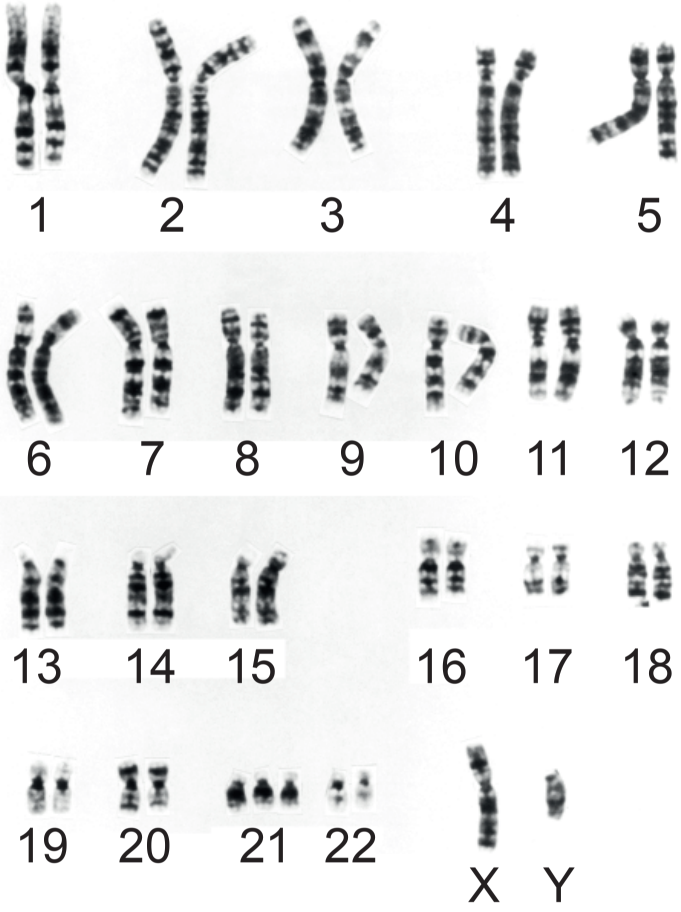
_____

The diagram below shows the pathway of the oxygenated blood **from** the lungs to the heart and then through the heart to the organs of the body.

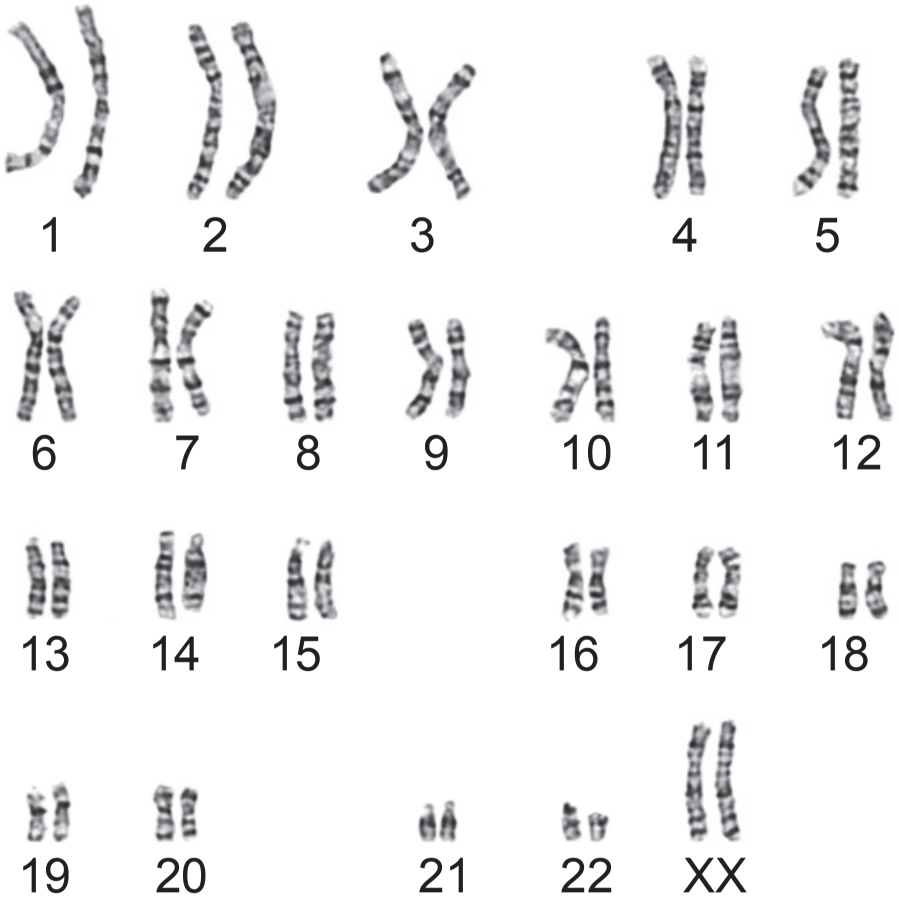
(ii) Complete the diagram by writing the **names** of the blood vessels and heart chambers in the boxes. [4 marks]



Person A



Person B



3 **(a)** The photographs opposite show the chromosomes of two people.

(i) Person A is male. How can you tell this from the photograph? [1 mark]

_____

(ii) Identify **one** difference in the **number** of chromosomes in the two photographs.

Name the condition this causes in person A. [2 marks]

Difference _____

Name of condition _____

(b) Skin cells carry out a type of cell division called mitosis.

(i) Why do skin cells carry out mitosis? [1 mark]

_____

(ii) How many daughter cells are produced when a skin cell divides by mitosis? [1 mark]

_____

(iii) How does the number of chromosomes in **each** of the daughter cells compare to the number of chromosomes in the original skin cell? [1 mark]

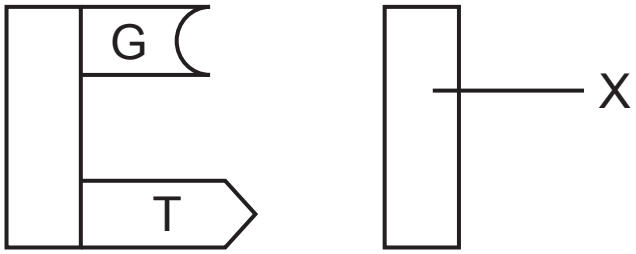
_____

(iv) Name the **other** type of cell division and state where it occurs in the **female** body. [2 marks]

Type of cell division _____

Where it occurs _____

(c) The diagram shows part of a DNA molecule.



(i) **Complete the diagram** by drawing the shapes of the two bases that link with the G and T bases shown.
Label the bases with the correct letters. [3 marks]

(ii) Name the part of the DNA molecule labelled X. [1 mark]

_____

(iii) What term is used to describe the shape of the DNA molecule? [1 mark]

_____

(iv) Where would you find DNA in a cell? [1 mark]

_____

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(Questions continue overleaf)

4 **(a)** The table shows some of the health benefits of stopping smoking.

The information is based on a person who smoked 20 cigarettes a day.

Time since stopping smoking	**Health Benefits**
First few hours	Blood pressure and heart rate return to normal.
24 hours	Mucus clears from lungs.
2–3 days	No carbon monoxide in the body. Energy levels increase. Sense of taste and smell improves.
2–12 weeks	Blood circulation improves.
10 years	Risk of lung cancer falls to half that of a smoker.

Use the information in the table and your knowledge to answer the following questions.

(i) Suggest why a person's heart rate returns to normal within the first few hours of stopping smoking.
[1 mark]

_____

_____

(ii) A person's energy levels increase 2–3 days after stopping smoking.

Explain why. [3 marks]

(iii) Name the substance in cigarette smoke that can cause lung cancer. [1 mark]

(iv) Suggest why there is still a risk of developing lung cancer 10 years after stopping smoking. [1 mark]

The diagram shows a cigarette.

The smoke given off by the burning end of this cigarette contains more toxic chemicals than the smoke inhaled directly by the smoker.

(b) Use the diagram to suggest why. [1 mark]

_____

_____

(c) When a person who is not smoking breathes in cigarette smoke it is known as passive smoking.

The table shows some health problems in children and babies caused by passive smoking in the United Kingdom (UK).

Health problems in children and babies	**Number of children and babies affected in one year**
Lung infections	20 000
Sudden infant deaths	40
Meningitis	2 000
Middle ear disease	120 000
Wheezing and asthma	

The number of children and babies suffering from wheezing and asthma in one year is 11 times higher than those suffering from meningitis.

(i) Use the data in the table opposite to calculate how many children and babies suffered from wheezing and asthma due to passive smoking.

Show your working. [2 marks]

_____

(ii) Suggest why passive smoking causes more damage to the lungs of children and babies than to the lungs of adults. [1 mark]

_____

_____

_____

The harmful effects of smoking have been known for many years.

(d) Suggest **two** reasons why it took such a long time before smoking was banned in public places. [2 marks]

1. _____

_____

_____

2. _____

_____

_____

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(Questions continue overleaf)

5 **(a)** The World Health Organisation (WHO) has published some facts about sexually transmitted infections (STIs).

They are listed below.

- Worldwide, more than one million people get a sexually transmitted infection (STI) every day.
- The majority of people with STIs have no symptoms.
- STIs such as gonorrhoea and chlamydia are major causes of infertility.

(i) A person has been infected with a STI.

Use **only the facts listed above** to suggest why this person may **not** go to a doctor to be diagnosed with the STI. [1 mark]

_____

_____

(ii) Another person has the symptoms of a STI.

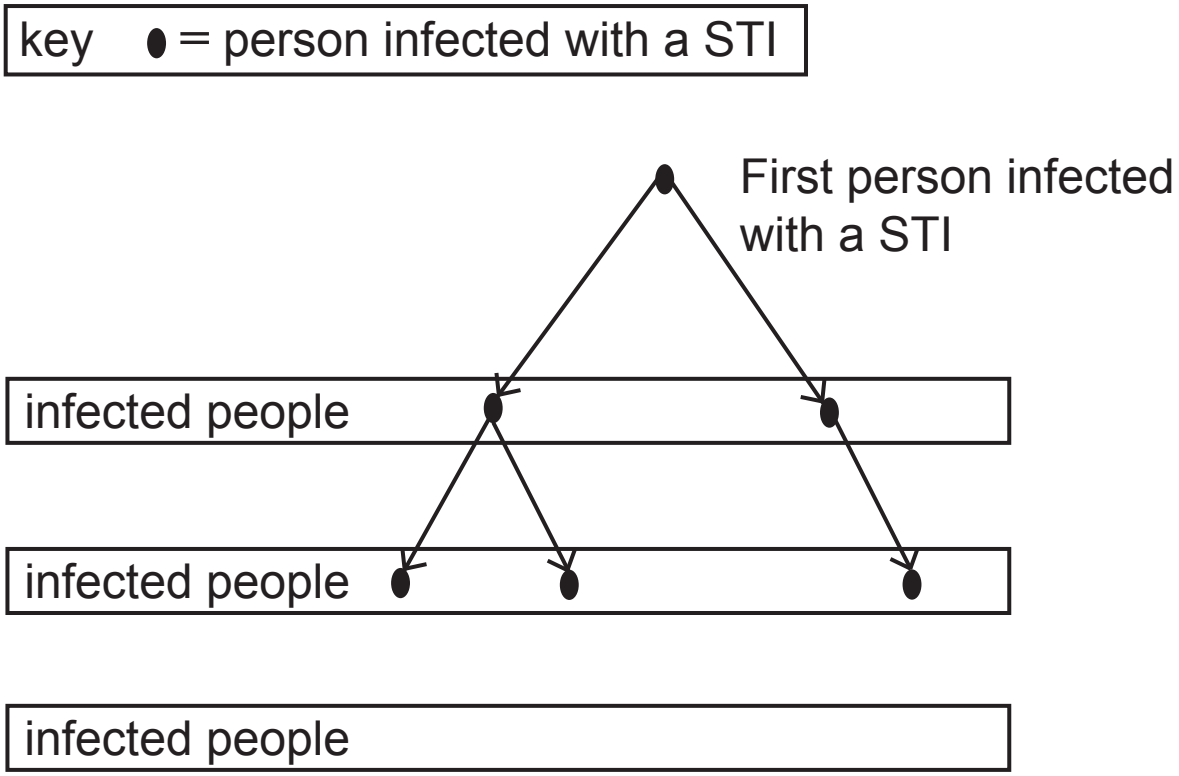
Suggest why this person may not go to a doctor to be treated for the STI. [1 mark]

_____

_____

(b) A person infected with a STI can pass the STI on to other people.

(i) Complete the diagram to show the sequence of infection if each infected person has two sexual partners. [2 marks]



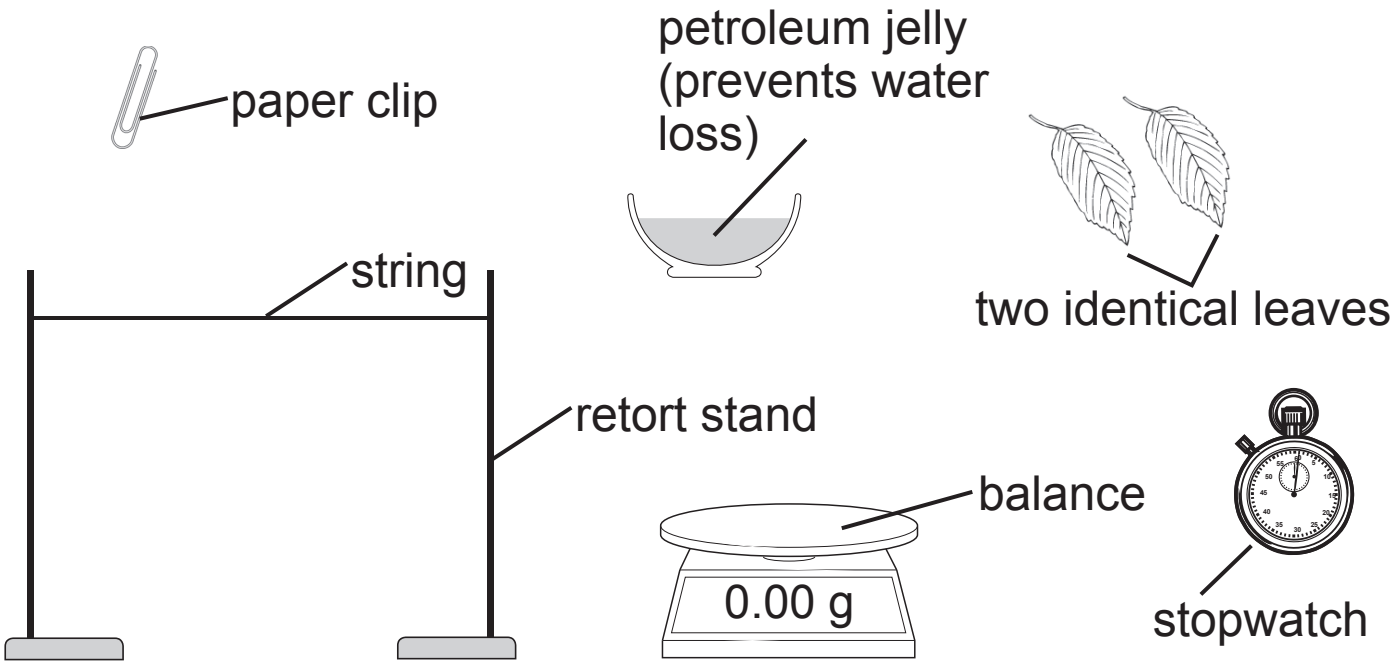
The first person passes on the STI.

(ii) Use the diagram to state how many **more** people will be infected with this STI. [1 mark]

_____

6 **(a)** Fiona was asked to carry out an investigation in the laboratory to compare the **rate** of water loss from the upper surface of one leaf with the **rate** of water loss from the lower surface of a second identical leaf.

The diagram shows the apparatus and materials that she was given.



(i) Describe how Fiona would set up and carry out her investigation. [6 marks]

In this question you will be assessed on your written communication skills, including the use of specialist scientific terms.

(ii) Name **two** factors, other than humidity, that Fiona would need to control during her investigation. [2 marks]

1. _____

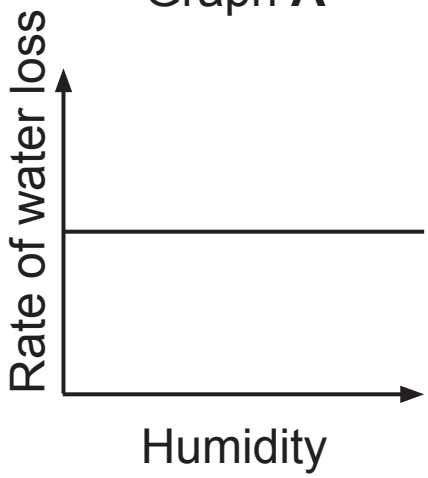
2. _____

(iii) Name the pores in leaves through which water is lost. [1 mark]

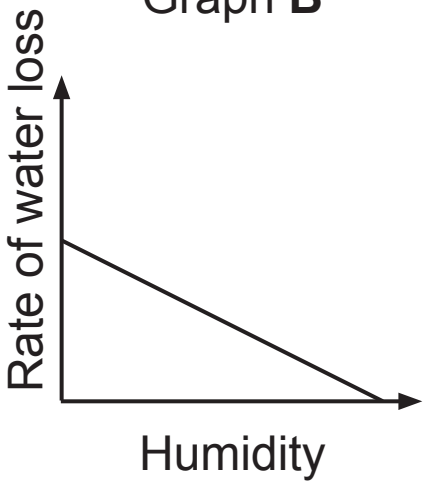
_____

(b) Which of the graphs, **A**, **B** or **C**, shows the rate of water loss if the humidity around a plant **increases**?
[1 mark]

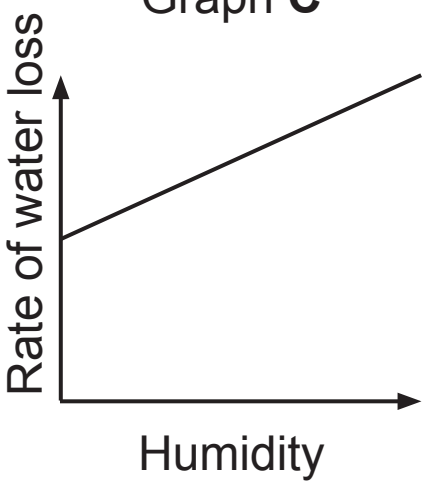
Graph **A**



Graph **B**



Graph **C**



Graph _____

(c) Give **two** uses of water in plants. [2 marks]

1. _____

_____

2. _____

_____

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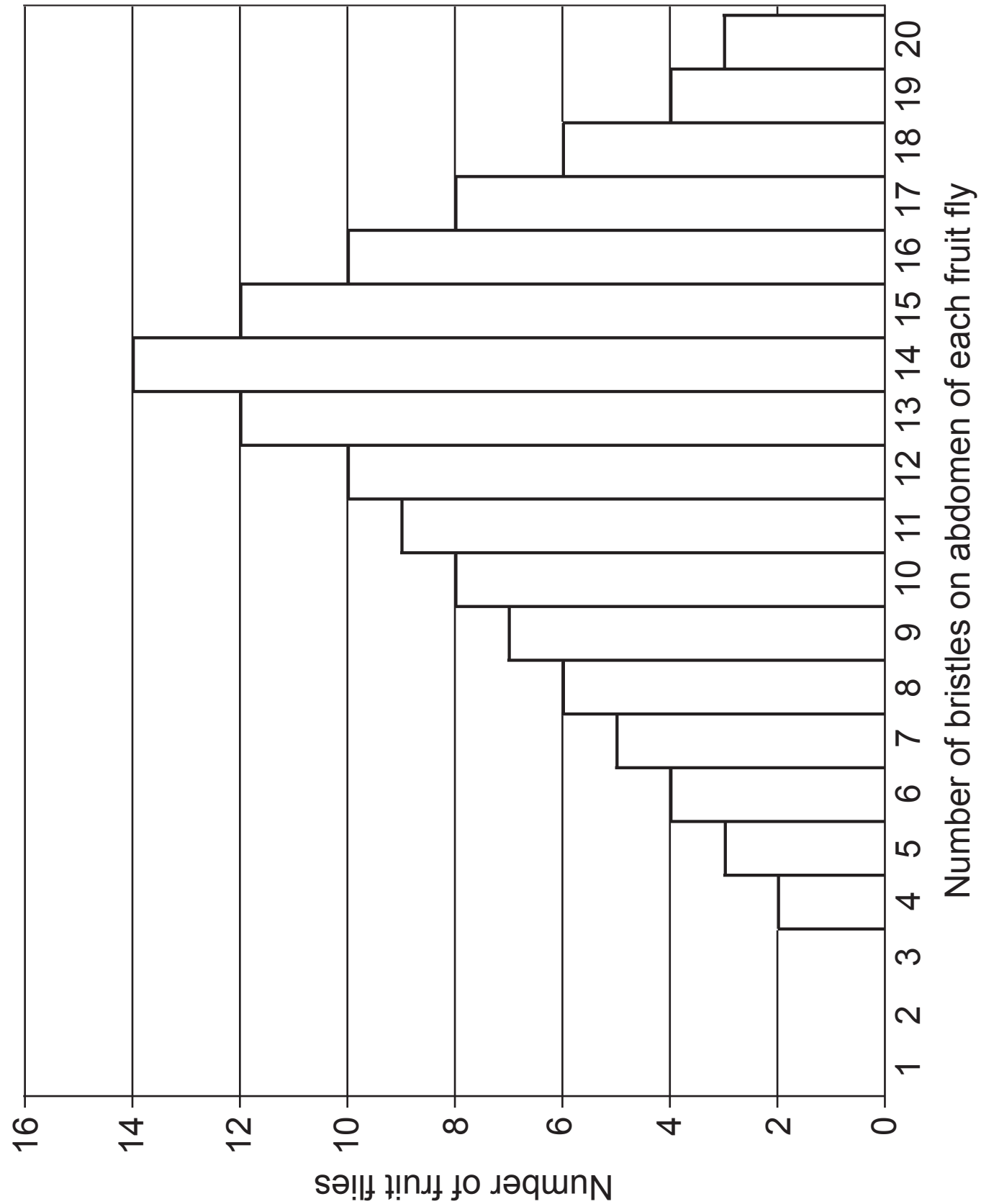
(Questions continue overleaf)



7 **(a)** Fruit flies are often used in genetic studies.

Fruit flies have bristles (small hairs) on their abdomens.
These bristles act as touch sensors.
The photograph shows a fruit fly.

In a study of fruit flies the number of bristles on the abdomen of each fly was counted.

The graph opposite shows the results of the study.

Use the information given opposite to answer the following questions.

(i) What is the range of the number of bristles on the abdomens of these fruit flies? [1 mark]

_____ to _____

(ii) How many fruit flies in this study have 15 or more bristles? [2 marks]

Show your working.

(iii) Suggest why it is an advantage for the fruit flies to have a larger number of bristles. [2 marks]

_____

_____

_____

_____

_____

_____

(b) Most fruit flies have red eyes. Some fruit flies have purple eyes.
The allele **R** for red eyes in fruit flies is dominant to the allele **r** for purple eyes.

(i) Fruit flies with red eyes can have two different genotypes.
Give these genotypes. [2 marks]

_____ and _____

A fruit fly that is homozygous for red eyes is crossed with a fruit fly with purple eyes.

(ii) Use a Punnett square to show the genotypes of the offspring that would be produced from this cross. [4 marks]

(iii) Give the eye colour of the offspring produced by this cross. [1 mark]

8 Polio is a disease caused by a virus.

Since 1988 the World Health Organisation (WHO) has had a vaccination programme aimed at wiping out polio worldwide.

In 1988, the number of people with polio worldwide was 350 000.

In 2014, the number of people with polio worldwide was 386.

(a) Calculate the **percentage reduction** in the number of people with polio worldwide from 1988 to 2014.

Give your answer to **two** decimal places. [3 marks]

Show your working.

(b) Afghanistan, Nigeria and Pakistan are three countries that still have people with polio.

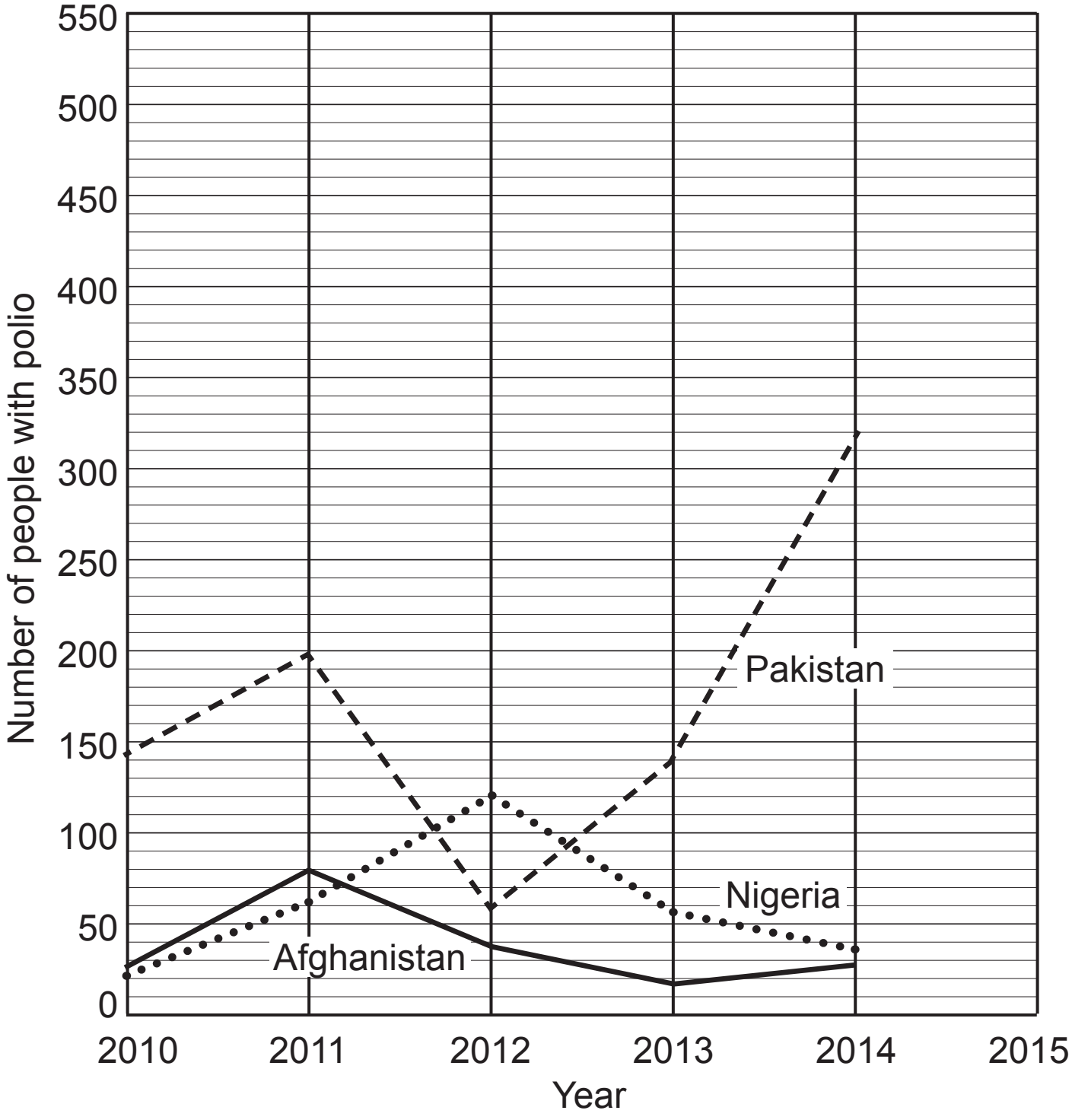
In these countries, polio vaccine is given by drops into the mouth. The vaccine is given on three separate occasions.

(i) Suggest **one** advantage of using a vaccine that can be given by drops into the mouth rather than by injection. [1 mark]

_____

_____

The graph shows the number of people with polio in Afghanistan, Nigeria and Pakistan between 2010 and 2014.



(ii) In which one year period is the trend in all three countries the same? [1 mark]

_____ to _____

(iii) Use the graph to give a **difference** in the trend for Nigeria and Pakistan between 2012 and 2014. [1 mark]

_____

_____

_____

Assume that the trend in numbers of people with polio in Pakistan **continued at the same rate** as in 2013–2014.

(iv) Draw a line on the graph to find the number of people with polio in Pakistan in 2015.

Give the number of people with polio in Pakistan in 2015. [2 marks]

Number of people _____

9 Matthew carried out an investigation into osmosis in potatoes.

He cut five potato cylinders and measured their lengths.
He placed one potato cylinder into each of five different concentrations of sugar solution and left them for 24 hours.
After 24 hours Matthew removed the potato cylinders, dried them and remeasured their lengths.

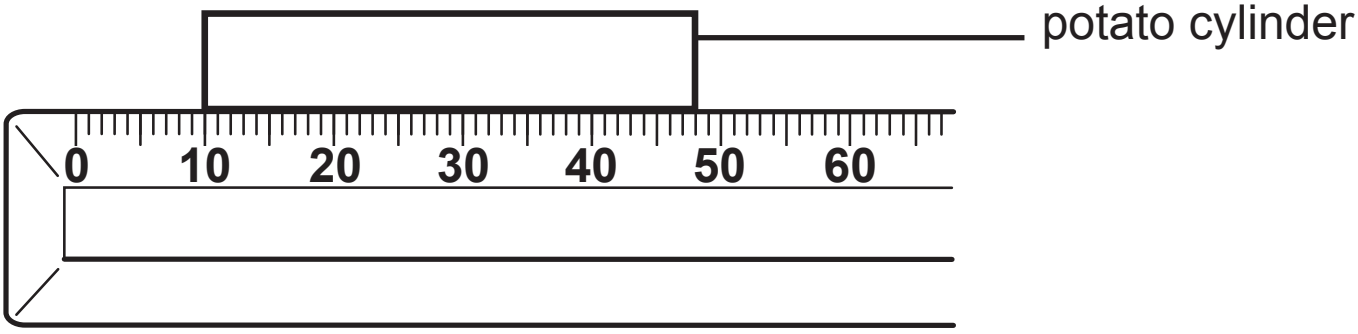
The table shows some of his results.

Concentration of sugar solution/%	**Length of potato cylinder at start/mm**	**Length of potato cylinder after 24 hours/mm**	**Percentage change in length of potato cylinder**
0	41	45	+9.8
5	42	44	+4.8
10	41	40	–2.4
15	42	45	+7.1
20	42		–9.5

The diagram below shows the potato cylinder after it had been left in the 20% sugar solution for 24 hours.

(a) Use the ruler shown in the diagram to measure the length of the potato cylinder.

Write your answer in the empty box **in the table opposite.** [1 mark]



(b) The result for the potato cylinder in 15% sugar solution is anomalous.

(i) How can you tell that this is an anomalous result? [1 mark]

(ii) Suggest a **reason** for this anomalous result. [1 mark]

(c) Look at the column for the percentage change in length of the five potato cylinders in the table on page 32.

(i) Use this information to suggest a **possible** concentration of sugar solution inside the potato used in the investigation. [1 mark]

Concentration inside the potato

_____ **%**

(ii) Explain your answer to part **(i)**. [2 marks]

_____

_____

_____

_____

_____

_____

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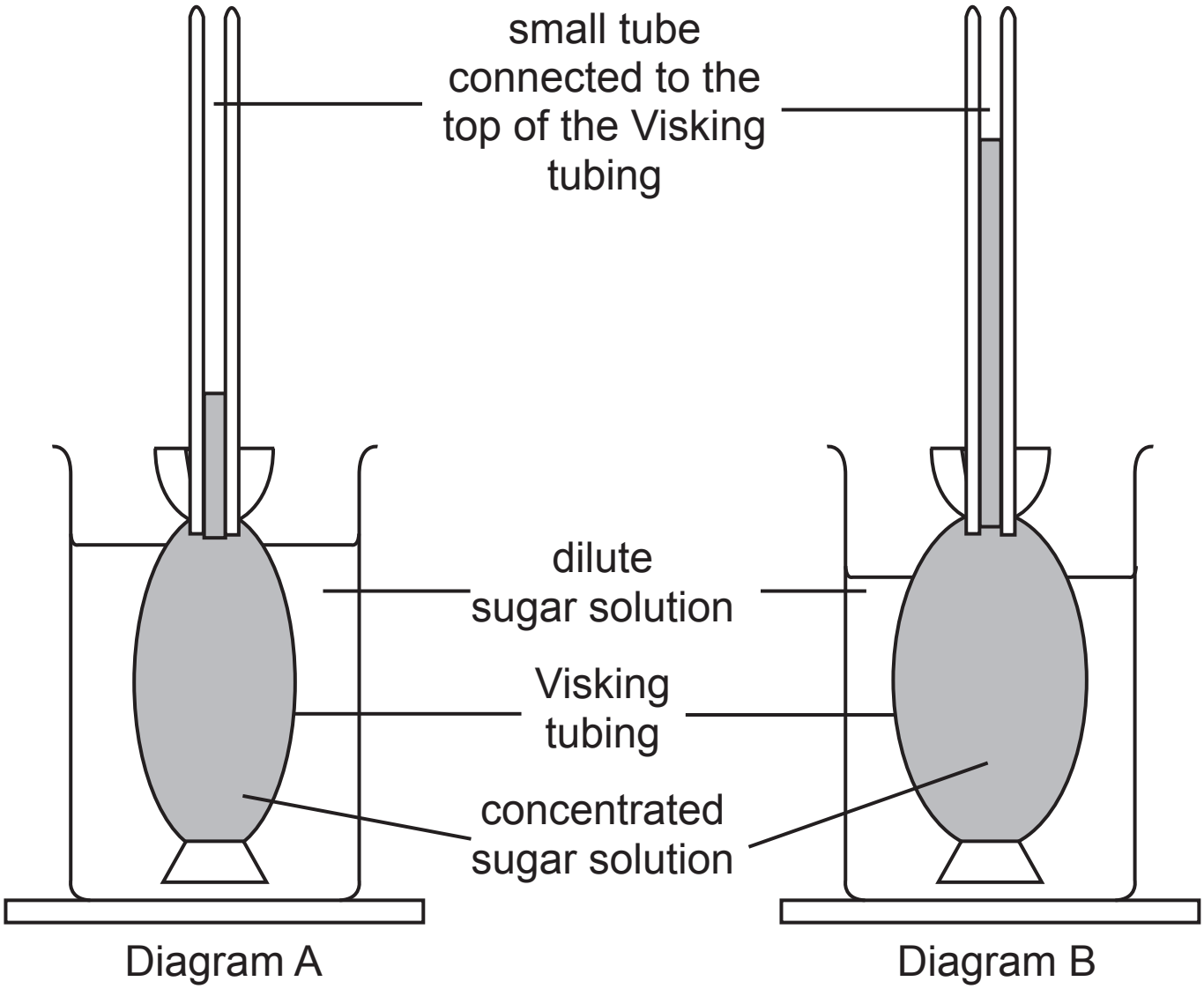
(Questions continue overleaf)

(d) The diagrams show another osmosis experiment.

Visking tubing is selectively permeable.

- Diagram A shows the apparatus at the start of the experiment.
- Diagram B shows the apparatus **after three hours**.



(i) What structure in a cell does Visking tubing represent? [1 mark]

_____

(ii) Use diagrams A and B and your knowledge to describe and explain the results **after three hours**. [3 marks]

Description

Explanation

THIS IS THE END OF THE QUESTION PAPER

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Adapted from © Drosophila bristles and the nature of quantitative genetic variation by Trudy F.C Mackay and Richard F Lyman. Published by National Center for Biotechnology Information, July 2005

Q8 .....Polio Factsheet 114. © Copyright World Health Organization (WHO), 2018. All Rights Reserved.

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Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number