



General Certificate of Secondary Education
2015

Centre Number

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Candidate Number

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Biology

Unit 2
Higher Tier

[GBY22]

MONDAY 15 JUNE, MORNING



TIME

1 hour 45 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.

Do not write outside the boxed area on each page or on blank pages.

Complete in blue or black ink only.

Answer **all fourteen** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 115.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Questions **3** and **14**.

1 Height is an example of variation.

(a) Name the type of variation shown by height.

[1]

(b) The heights of 10 pupils in a class of 26 were measured to the nearest centimetre.

The results are shown.

~~182~~ ~~156~~ ~~160~~ 172 168 169 165 178 166 168

(i) Complete the tally chart for these results.
The first three have been done for you.

Height/cm	Tally	Number of pupils
155–159		1
160–164		2
165–169		
170–174		
175–179		

[2]

(ii) Suggest which type of graph should be used to present these results.

Put a circle around the correct answer.

bar chart

histogram

pie chart

[1]

(iii) What percentage of pupils were less than 165 cm tall?
Show your working.

_____ % [2]

(iv) Suggest why this percentage may not be reliable.

[1]

(c) (i) Height may be affected by a number of environmental factors.
Suggest one.

[1]

(ii) Give **one** cause, other than environmental, of variation in height.

[1]

2 During pregnancy the baby can be screened for chromosome abnormalities.

Cells from the baby are removed and allowed to divide. During the cell division the chromosomes are photographed.

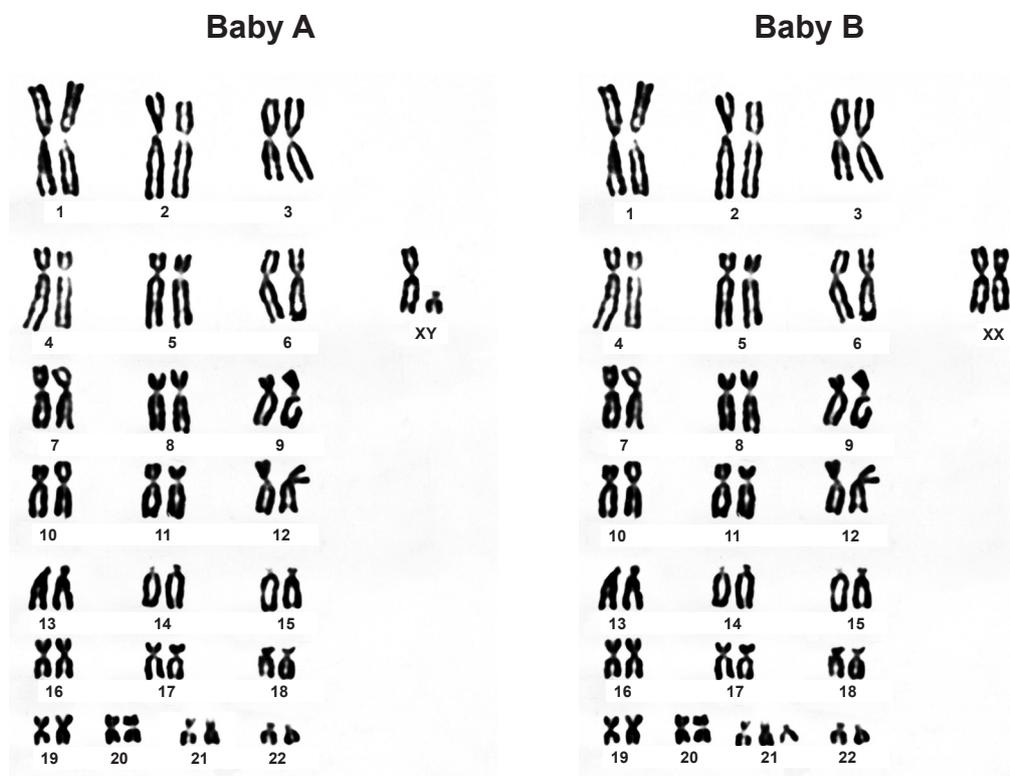
(a) Name this type of screening test.

[1]

(b) Name the part of the cell where chromosomes are found.

[1]

The photographs show the chromosomes of two babies.



© Leonard Lessin / Science Photo Library

Baby **B** suffers from a chromosome abnormality.

(c) Name the condition caused by this chromosome abnormality.

_____ [1]

(d) What term describes the random change that causes chromosome abnormalities?

_____ [1]

Identical twins have identical sets of chromosomes.

(e) Give **one** piece of evidence from the photographs to explain why baby **A** and baby **B** are **not** identical.

_____ [1]

(f) Give **two** ethical issues that may arise because of this screening test.

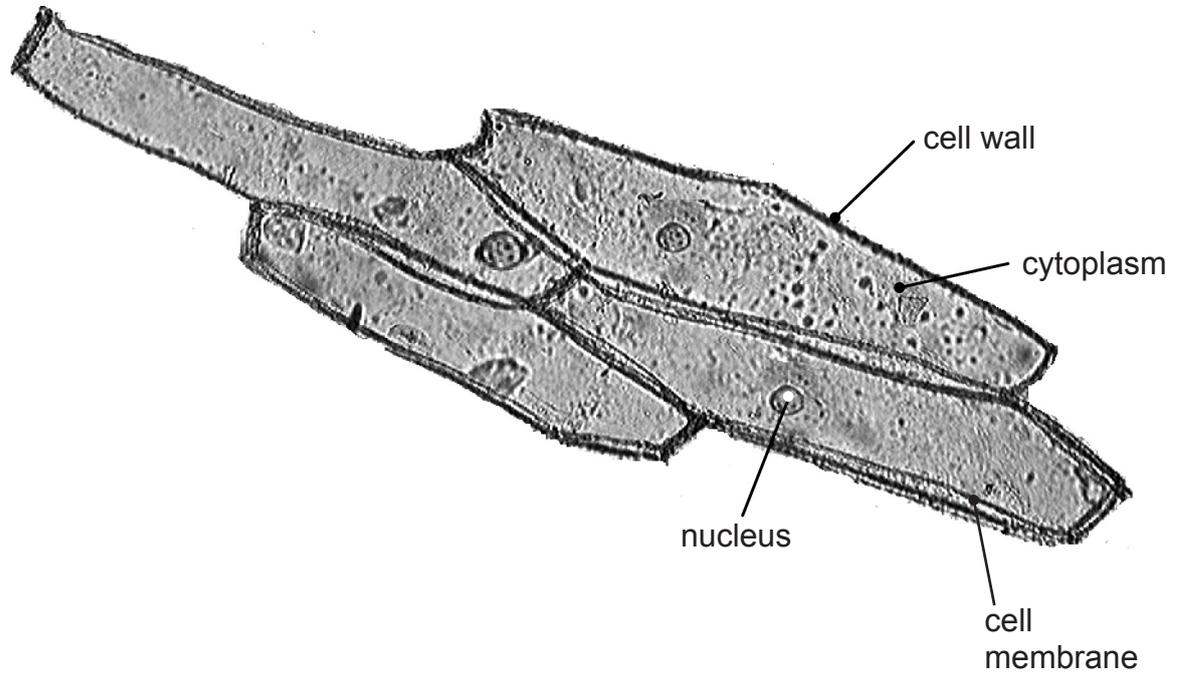
_____ [2]

[Turn over

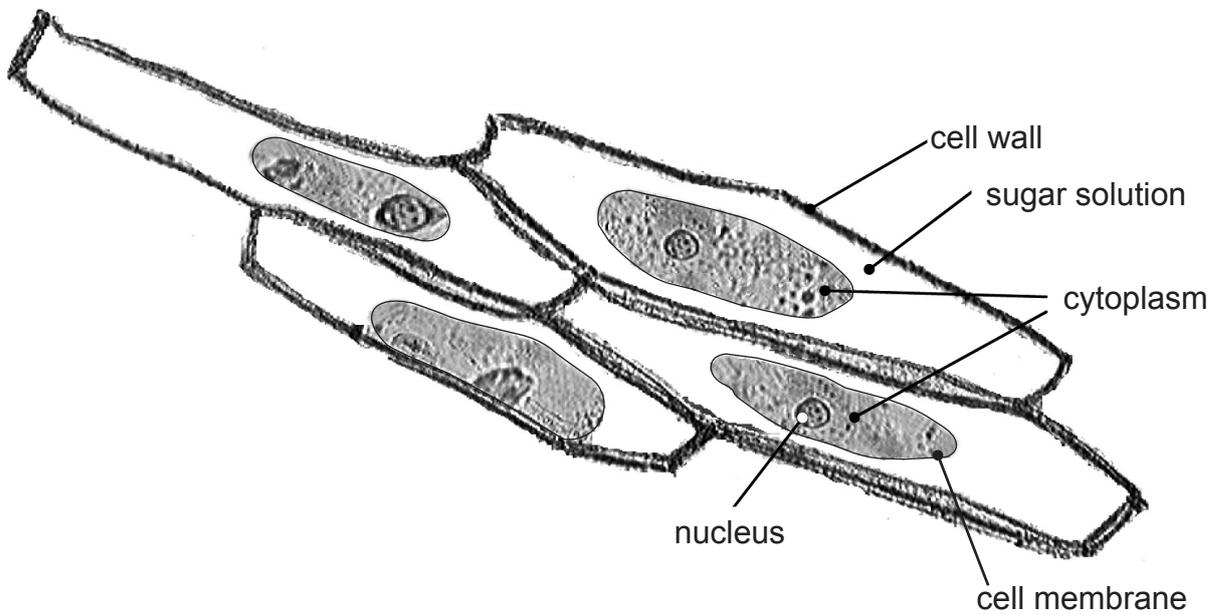
3 Onion tissue was moved from water into a concentrated sugar solution.

The photographs show cells of the onion tissue in each solution.

Onion cells placed in water



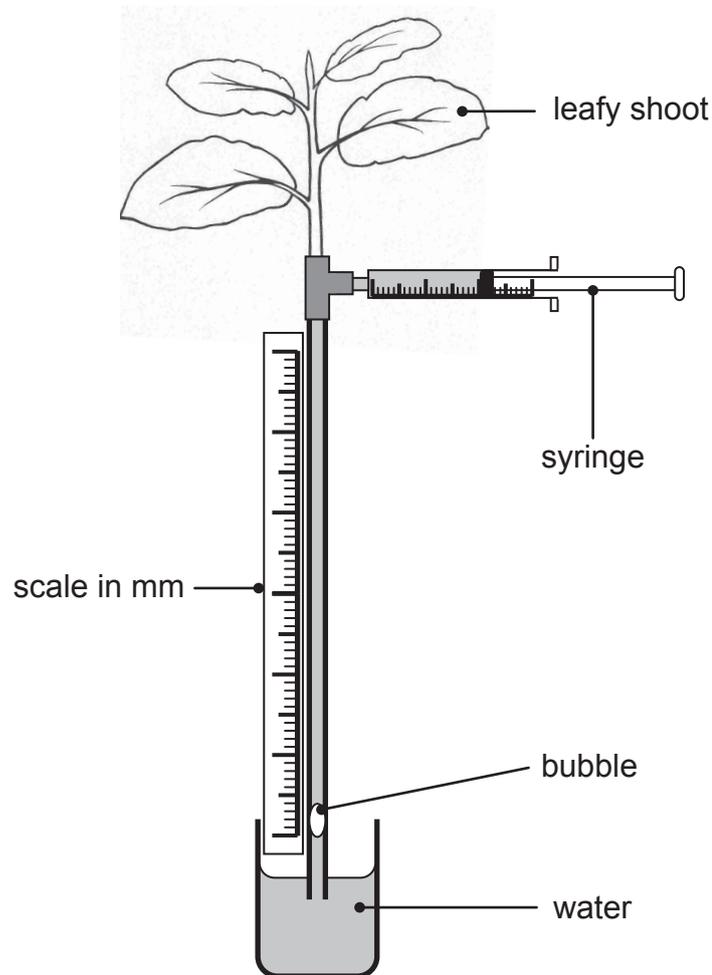
Onion cells placed in concentrated sugar solution



- 4 A student observed that the plants in her bathroom did not need watering as often as those in her living room.

She proposed a hypothesis that a low rate of transpiration in the plants was due to the high humidity in the bathroom.

The diagram shows the potometer she used to test this hypothesis.



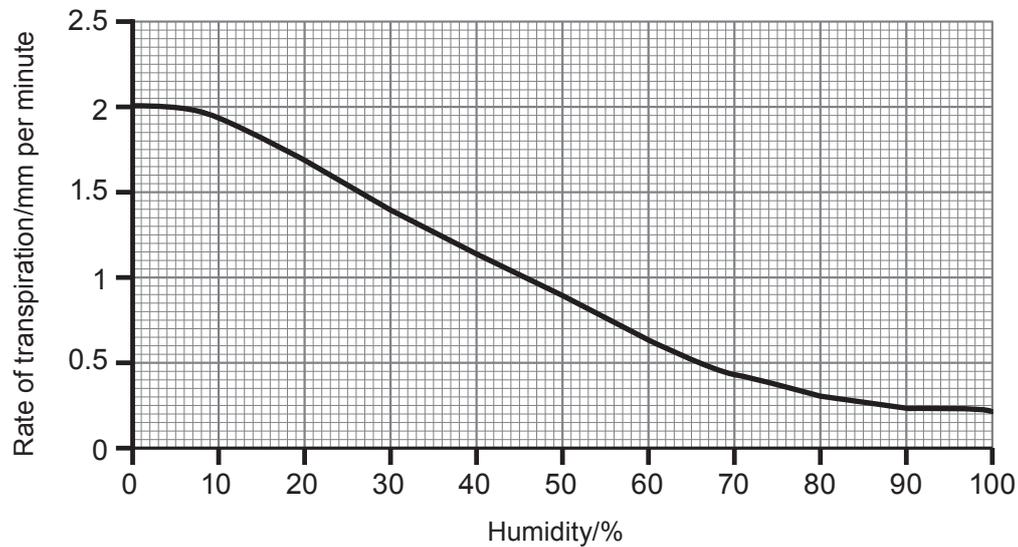
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- (a) What measurements would the student have to take to allow her to calculate the rate of transpiration?

[2]

The student repeated the experiment using the same leafy shoot in different percentage humidities.

The graph shows the results of these experiments.



She measured the humidity in the bathroom and the living room.

The bathroom was 80% and the living room 20%.

The student concluded that these results supported her hypothesis.

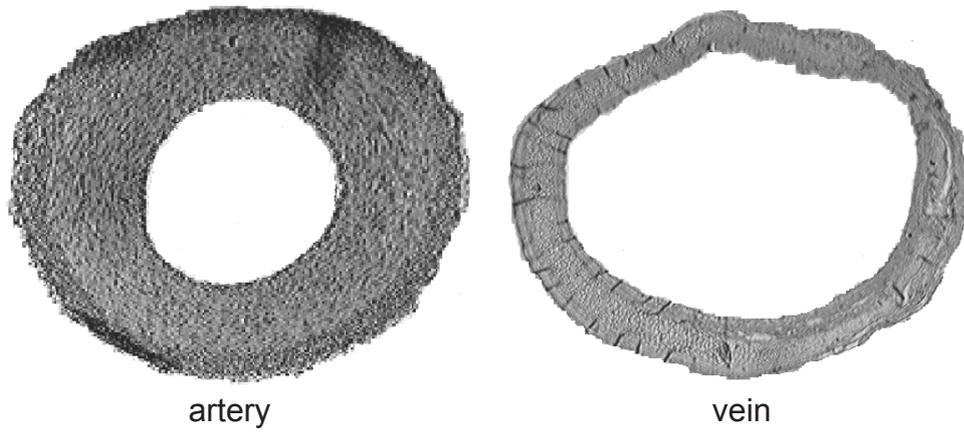
(b) Describe and explain how she came to this conclusion.

Use data from the graph in your answer.

[4]

[Turn over

5 The photograph shows a cross section through an artery and a vein.



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(a) Describe **two** differences shown in the photograph, between the artery and vein.

1. _____ [1]

2. _____ [1]

Veins contain valves.

(b) Explain why valves are needed in veins.

_____ [1]

(c) The wall of the artery contains elastic fibres.

Describe the function of these elastic fibres.

[2]

(d) Name the blood vessel which carries blood from the aorta to the head.

[1]

(e) Name the blood vessel which carries blood from the head to the vena cava.

[1]

(f) The capillaries in the lungs slow down the flow of blood.

Suggest why the blood needs to flow slowly through the lung capillaries.

[1]

[Turn over

6 (a) Diagram X shows a cell dividing by mitosis.

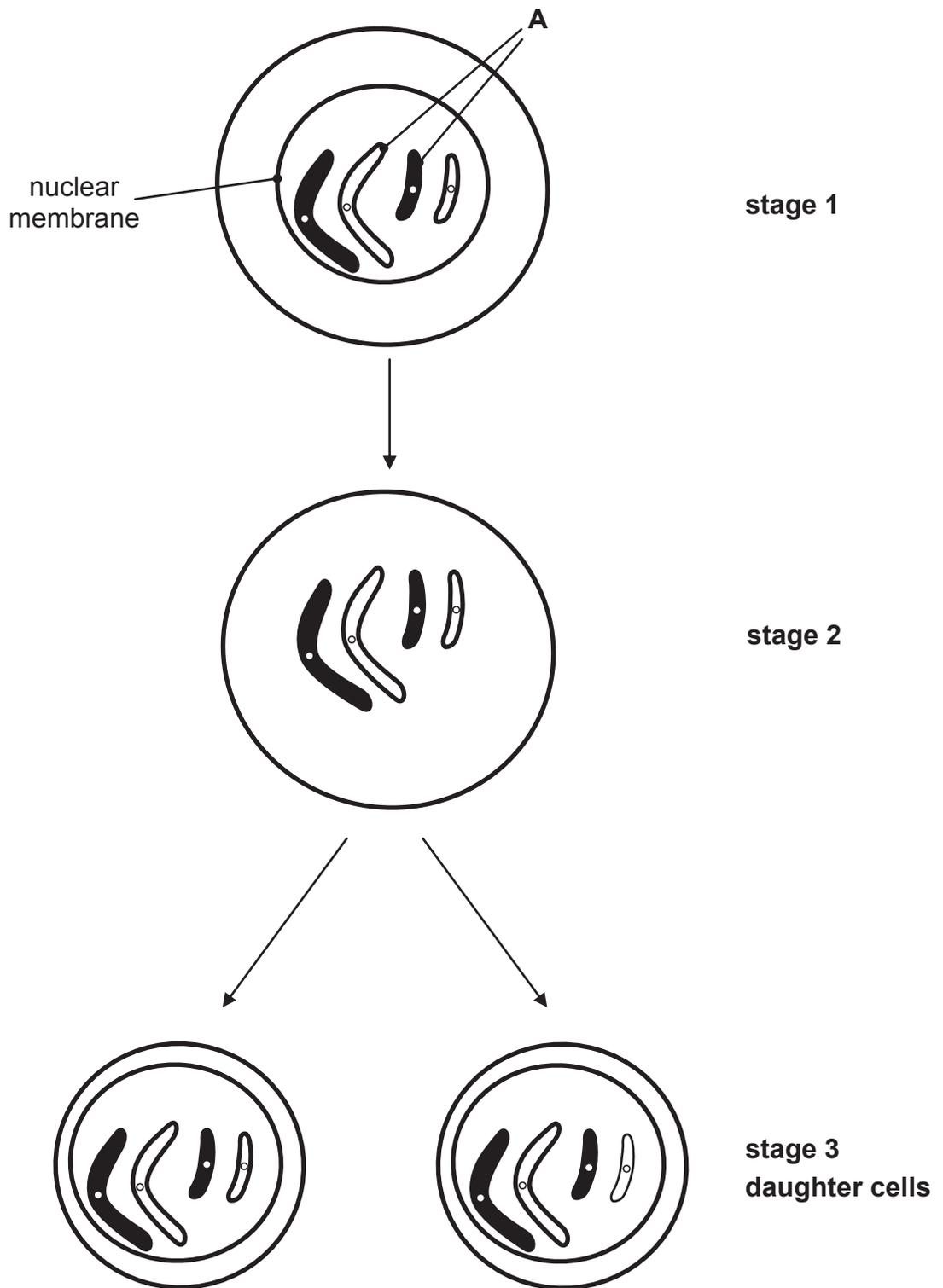


Diagram X

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Look at diagram X.

(i) Name structures A.

_____ [1]

(ii) Describe how the cell changes between stages 1 and 2.

_____ [1]

(iii) What happens to structures A between stages 2 and 3?

_____ [1]

(iv) Explain why the cells produced in stage 3 are described as clones.

_____ [1]

(v) Name the type of reproduction which uses mitosis to produce clones.

_____ [1]

[Turn over

(b) Diagram Y shows a cell that has divided by **meiosis**.

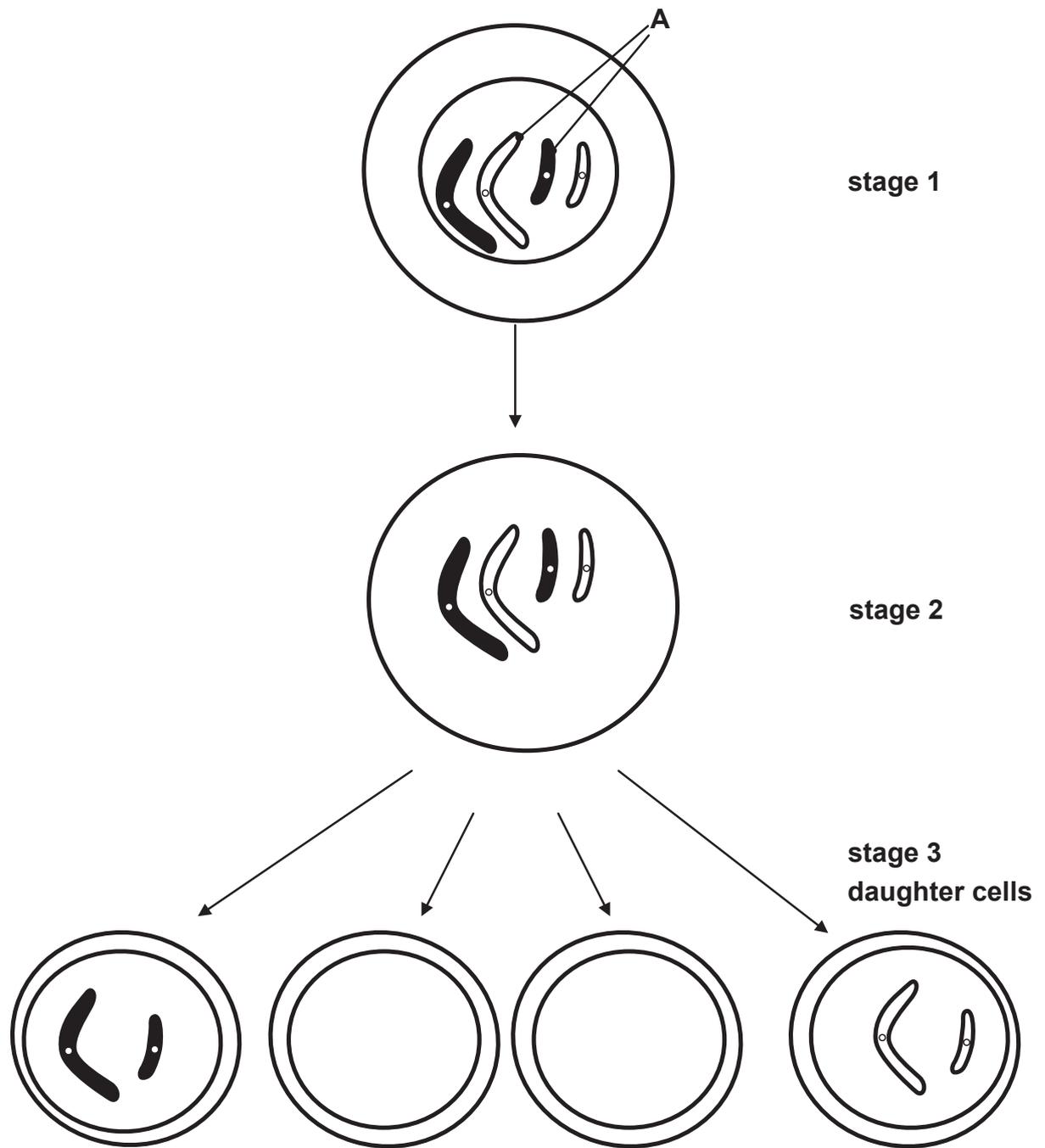


Diagram Y

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(i) Complete diagram **Y** to show the arrangement of structures **A** in the daughter cells. [2]

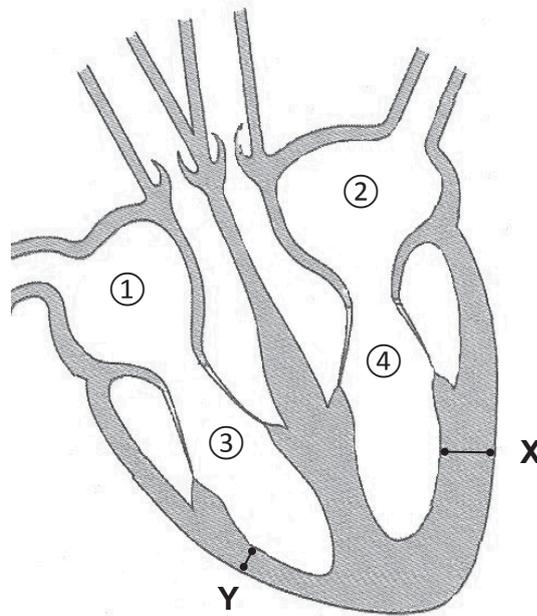
(ii) Use evidence from diagrams **X** and **Y** to identify **two** differences between the daughter cells produced by mitosis and meiosis.

1. _____ [1]

2. _____ [1]

(iii) Name **one** type of cell produced by meiosis. [1]

7 The diagram shows a section through a heart.



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(a) On the diagram, write the letter **L** to label one chamber of the heart which contains blood low in oxygen. [1]

(b) Look at the diagram above. Starting with ①, write down the correct sequence in which blood passes through the heart. [1]

① ○ ○ ○

(c) Explain why the muscle of the heart is much thicker at **X** than at **Y**. [2]

(d) Name the blood vessels which carry oxygen and glucose to the heart muscle cells. [1]

(e) Describe and explain what happens to heart muscle cells during a heart attack.

[3]

(f) Explain why a heart attack may result in death.

[1]

Exercise affects heart muscle cells.

The table shows the results of an investigation into how the frequency of exercise affects the performance of the heart muscle.

Frequency of exercise	Average resting heart rate/beats per minute	Volume of blood pumped per beat/cm ³
None	80	60
Once a week	70	70
Once a day	60	90

(g) Use evidence from the table to explain the effect of regular exercise on heart muscle.

[3]

[Turn over

8 Anaemia is a disorder of the blood.

(a) Patients with anaemia feel extremely tired.

Explain why.

[3]

(b) Anaemia affects the heart rate.

Describe and explain how the heart rate is affected.

[2]

(c) Give **one other** symptom of anaemia.

[1]

(d) In extreme cases of anaemia a blood transfusion may be needed.

What is a blood transfusion?

[1]

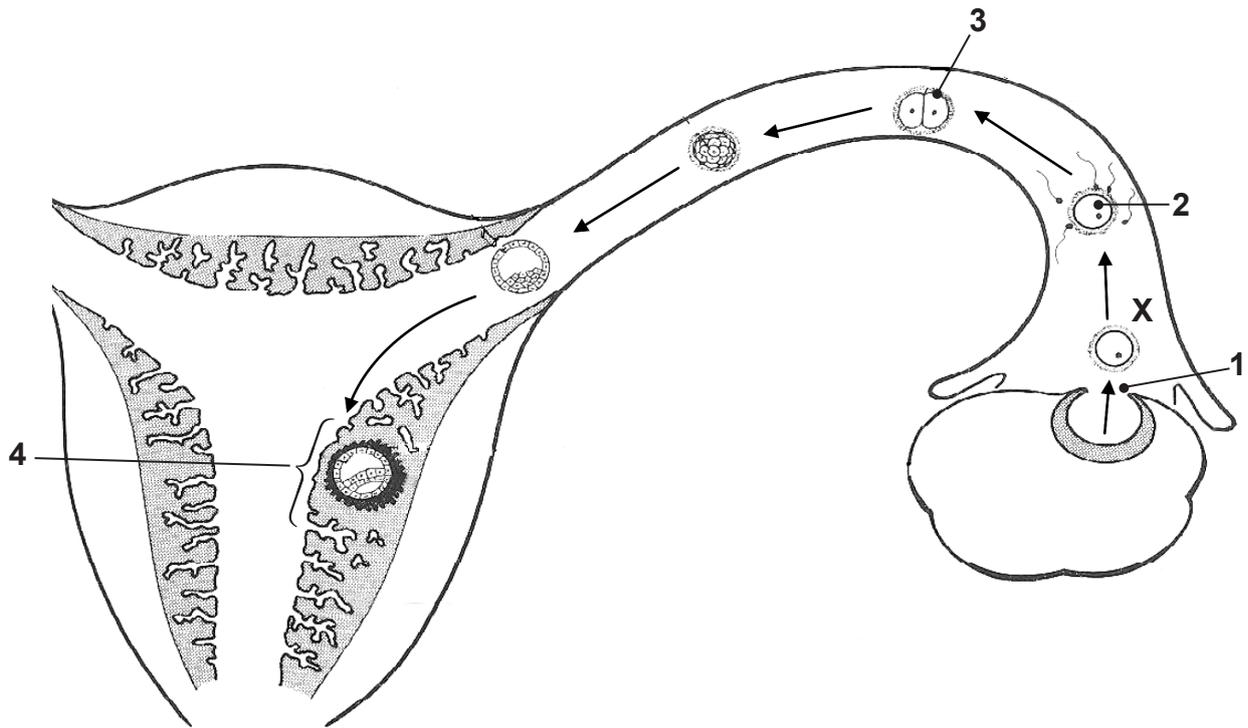
(e) Describe **one other** treatment for anaemia.

[1]



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(Questions continue overleaf)

9 The diagram shows some processes which take place in the female reproductive system when sperm are present.



© Biology GCSE Edition by Geoff Jones and Mary Jones. (ISBN: 978-0521338691) Published by Cambridge University Press, 1987.

(a) Name the processes occurring at 1 and 3.

Process 1 _____ [1]

Process 3 _____ [1]

(b) Name and describe the processes occurring at 2 and 4.

Process 2 _____

Description _____
_____ [2]

Process 4 _____

Description _____
_____ [2]

(c) The placenta has many villi.

Explain how the villi adapt the placenta for its function.

_____ [2]

[Turn over

10 (a) The passage describes natural selection in rock pocket mice.

Read the passage and answer the questions that follow.

The rock pocket mouse is found in desert areas of Arizona, USA.
The fur of this mouse has two colours, sandy or dark.
The main predators of these mice are owls.
In most of the desert areas the majority of the mice have the sandy fur.
In some areas of the desert dark rocks have come to the surface.
In these areas most of the mice have dark fur.

(i) Use information from the passage to explain the term variation.

[2]

(ii) Variation and natural selection may lead to evolution.

Explain how rock pocket mice with dark fur show natural selection.

[4]

(b) Natural selection can lead to evolution. Explain how.

[2]

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11 (a) Children can be given a vaccine to bring about active immunity against certain diseases.

(i) Name the type of active immunity produced by vaccination.

[1]

(ii) Explain how a vaccine brings about active immunity.

[4]

(iii) Explain how passive immunity differs from active immunity.

[1]

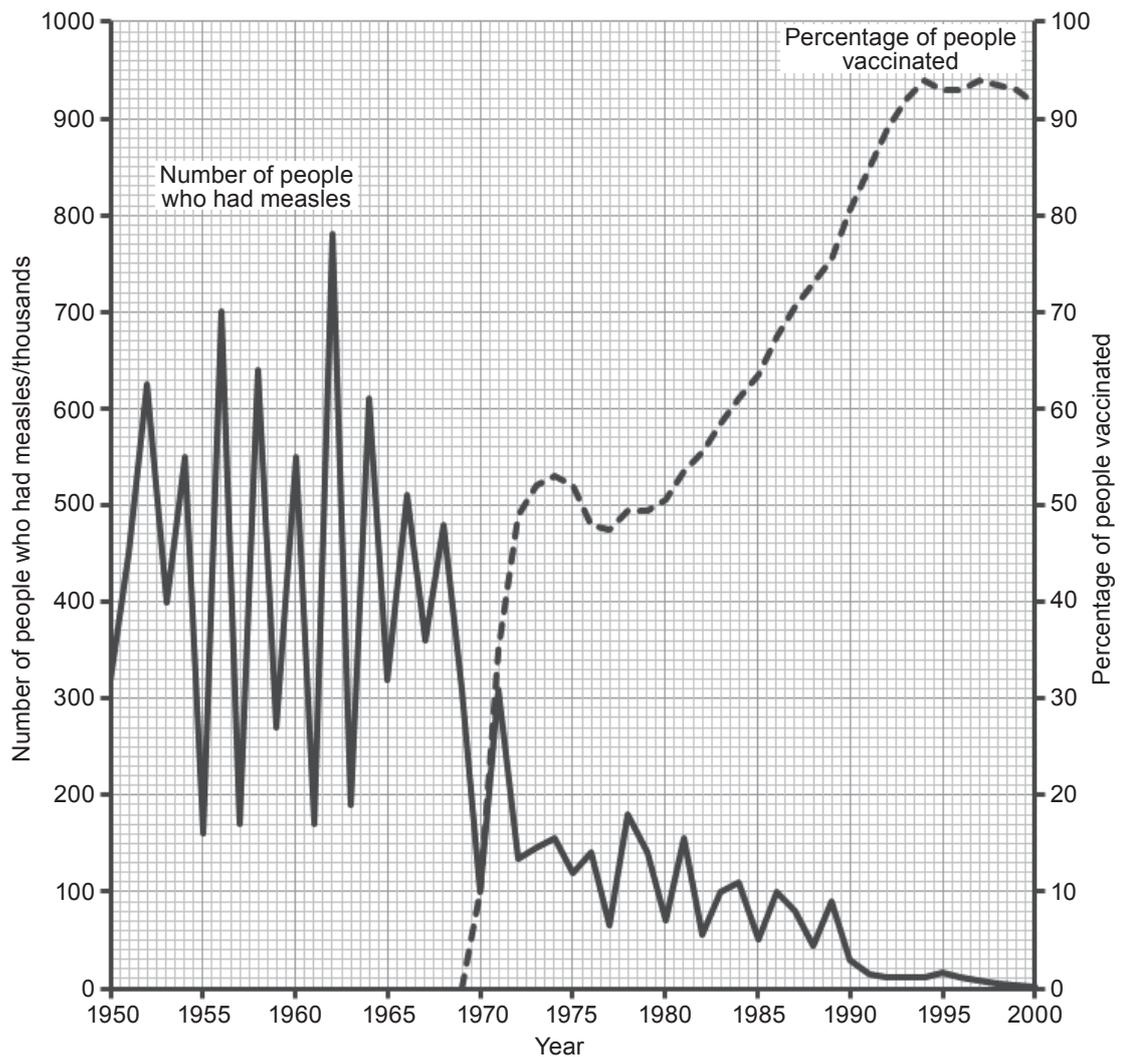
(b) Children are vaccinated against measles between the ages of 12 and 13 months.

(i) Suggest why children below the age of 12 months do not need to be vaccinated against measles.

[1]

[Turn over

The graph shows the number of people in the UK who had measles and the percentage of people vaccinated against measles.



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- (ii) Calculate the change in the number of people who had measles between 1960 and 1980.

Show your working.

[3]

(iii) Explain this change.

[1]

The national immunisation programme aims to eliminate measles in the population. It has a target percentage of people to be vaccinated against measles.

(iv) Use the graph to suggest a value for this target.

[1]

12 Describe and explain **two** aseptic techniques followed when **inoculating** a sterile agar plate with bacteria using an inoculating loop.

1. Aseptic technique _____ [1]

Explanation _____ [1]

2. Aseptic technique _____ [1]

Explanation _____ [1]

13 Some bacteria have developed antibiotic resistance.

(a) What is meant by antibiotic resistance?

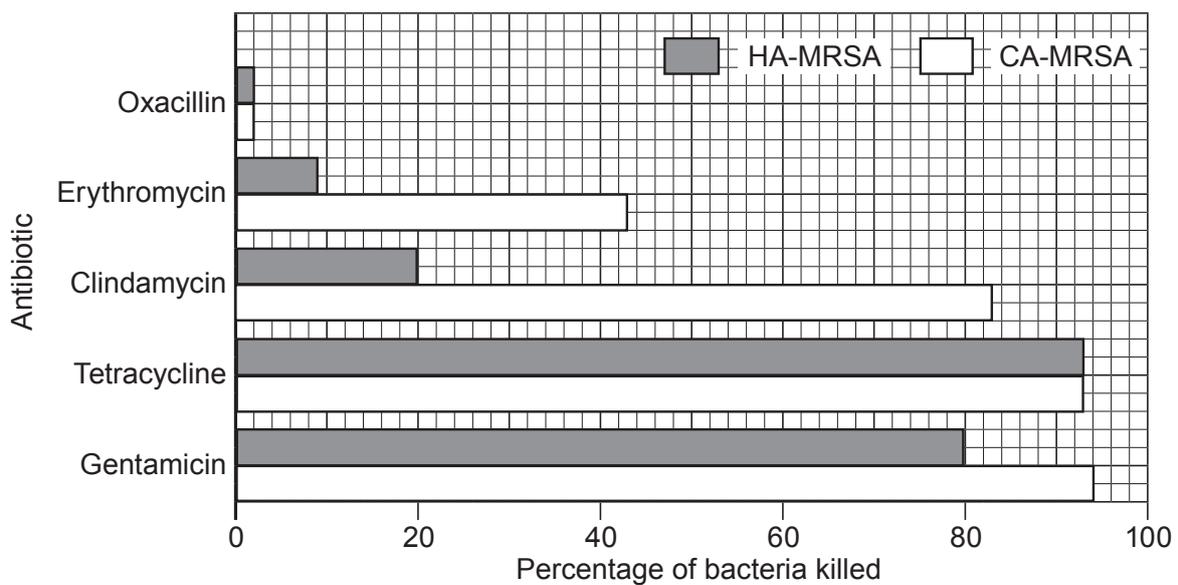
[1]

Hospitals use different antibiotics when treating patients with bacterial infections such as MRSA.

(b) Name the type of organism which produces antibiotics.

[1]

The graph shows the percentage of two strains of MRSA bacteria killed by different antibiotics.



Adapted © Figure 2 from Comparison of Community and Health Care – Associated Methicillin-Resistant *Staphylococcus aureus* Infection by Timothy S. Naimi, MD et al. Published by JAMA

(c) Which antibiotic is least effective at killing both strains of MRSA?

[1]

[Turn over

(d) Suggest which antibiotic should be used for treating each strain of MRSA.

Use data to explain your choice.

[3]

(e) Erythromycin has been used in hospitals for many years to treat bacterial infections.

A large proportion of the MRSA bacteria found in hospitals are now resistant to this antibiotic.

This has led scientists to conclude that resistance to erythromycin is caused by mutation.

(i) Explain how scientists have reached this conclusion.

[2]

(ii) Suggest **two other** reasons why patients in hospitals may have a high risk of contracting MRSA.

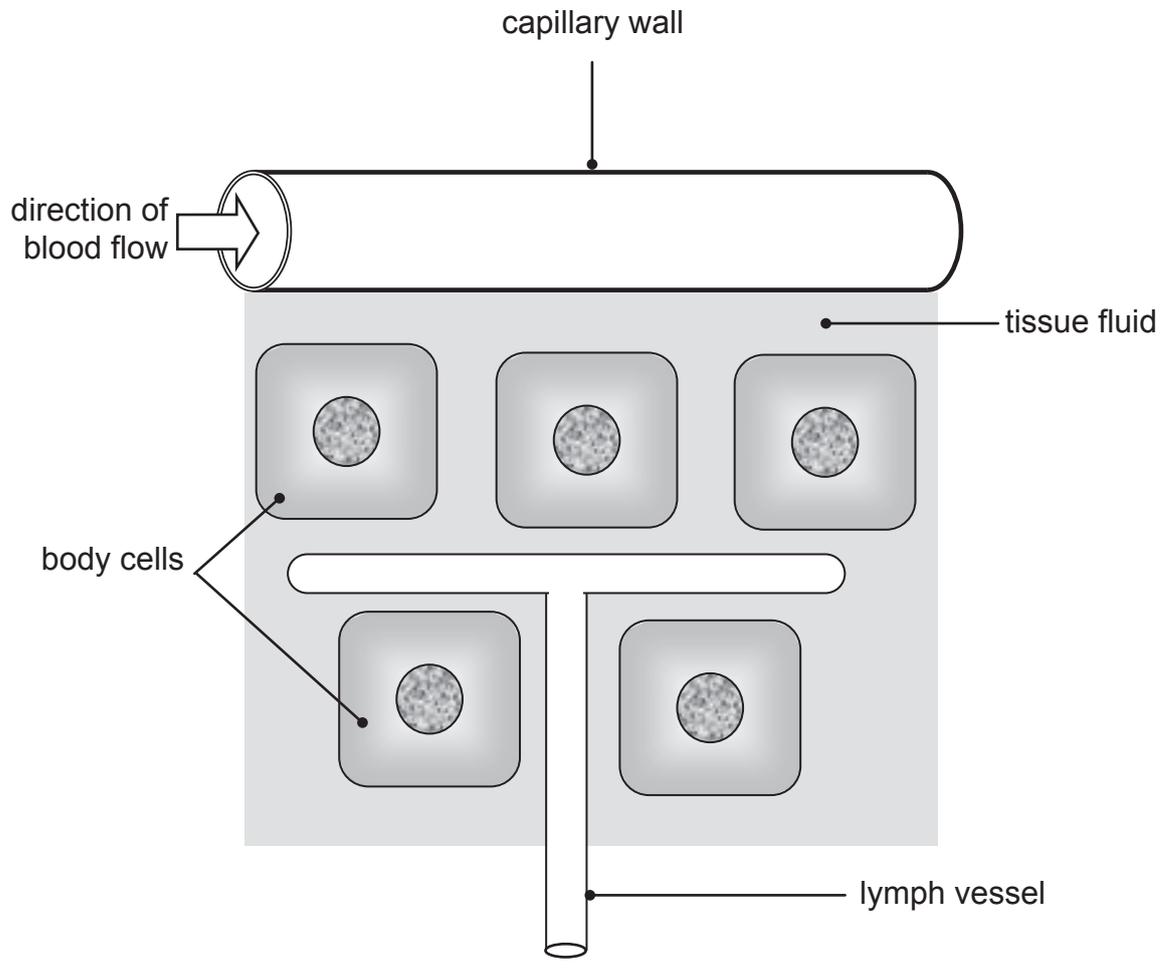
1. _____
_____ [1]

2. _____
_____ [1]

(iii) Explain why it is important to continue to develop new types of antibiotic.

_____ [1]

14 The diagram shows a capillary with surrounding body cells and a lymph vessel.



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Examiner Number

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