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Friday 7 June 2019 – Afternoon

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/08 Paper 8 (Higher Tier)

Time allowed: 1 hour 10 minutes

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You must have:
- a ruler (cm/mm)

You may use:
- a scientific or graphical calculator
- an HB pencil

J250/08

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Answer **all** the questions.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- This document consists of **20** pages.

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SECTION A

Answer **all** the questions.

You should spend a maximum of 20 minutes on this section.

Write your answers to each question in the box provided.

1 In 2008 there were 16 600 people with liver disease. Of these, 600 survived liver disease due to a liver transplant.

Calculate the percentage of people with liver disease who survived because of a liver transplant in 2008.

A 3.6%

B 3.7%

C 26.7%

D 27.7%

Your answer ☐ **[1]**

2 Look at the sperm cell.



The eye can see objects 0.1 mm.

What **minimum** magnification will be needed before the eye can see the head of this sperm cell?

A 0.167×

B 1.67×

C 16.7×

D 167×

Your answer ☐ **[1]**

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3 A genetic cross occurs between a heterozygous individual and a homozygous recessive individual.

What is the probability of these individuals having offspring that are homozygous recessive?

A 0 in 4

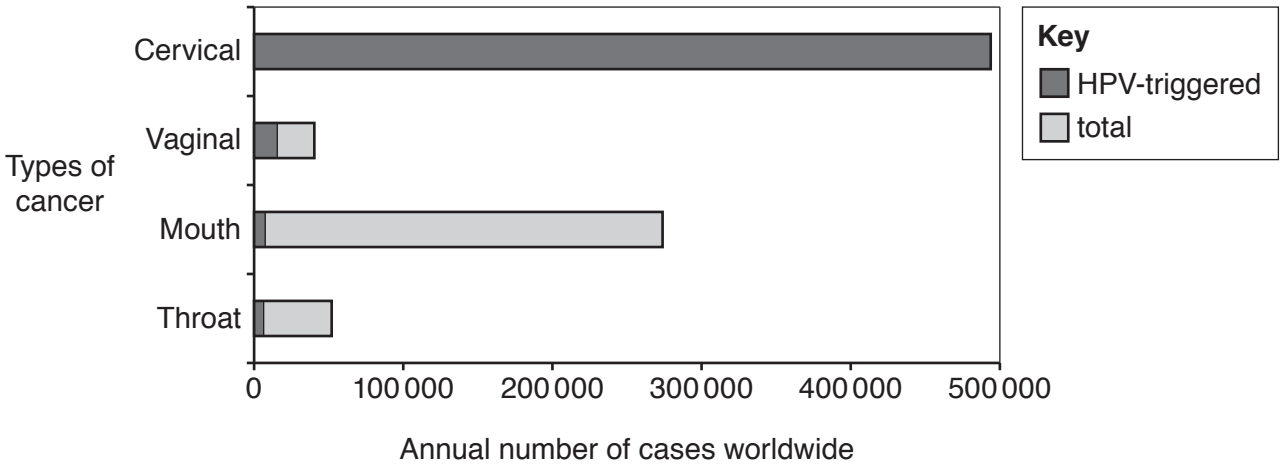
B 1 in 4

C 2 in 4

D 3 in 4

Your answer ☐ **[1]**

4 The graph shows the annual number of cancer cases worldwide and the number of cases triggered by HPV infections.



From evidence in the graph, which cancer is linked most strongly to HPV infections?

A Cervical cancer

B Vaginal cancer

C Mouth cancer

D Throat cancer

Your answer ☐ **[1]**

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5 Which is the best technique to investigate the effect of shade from a tree on the types of plants growing in a field?

A Capture-recapture

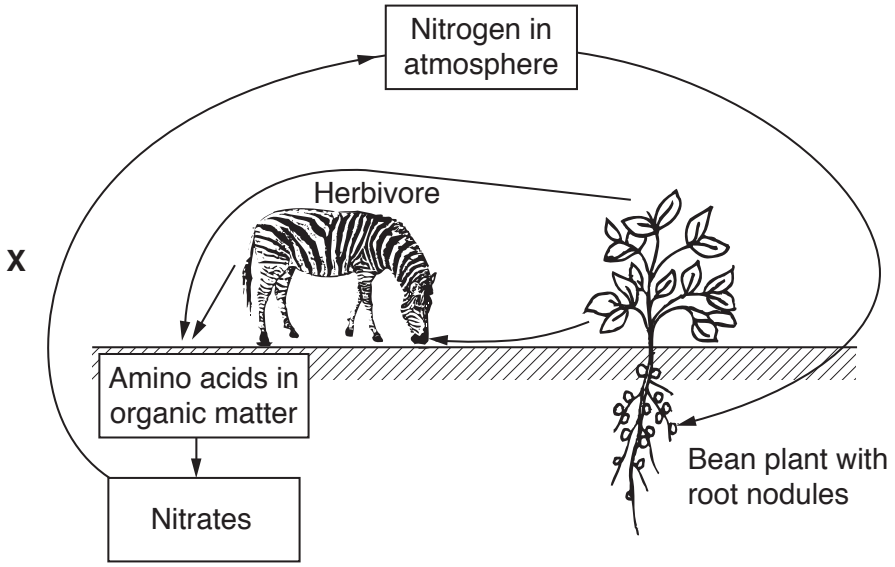
B Line transect

C Pitfall traps

D Quadrat sampling in a grid

Your answer ☐ **[1]**

6 Look at the diagram of part of the nitrogen cycle.



What is happening at **X**?

	Conversion
A	Amino acids to nitrogen
B	Nitrates to amino acids
C	Nitrates to nitrogen
D	Nitrogen to nitrates

Your answer ☐ **[1]**

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7 MRSA is a type of bacteria that cannot be treated with most antibiotics.

How has MRSA developed?

A Genetic engineering

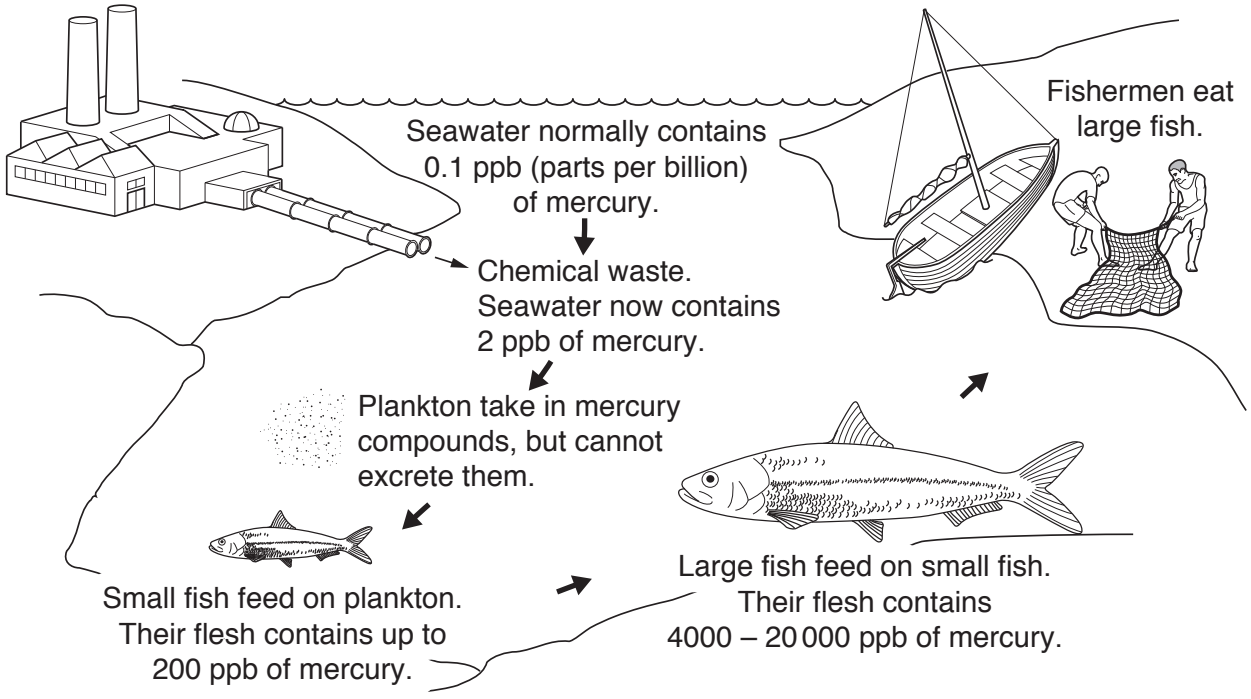
B Natural selection

C Protein synthesis

D Selective breeding

Your answer ☐ **[1]**

8 Look at the effects of mercury waste from a factory.



The fishermen became ill.

What is the most likely explanation for this?

A Mercury builds up in the food chain.

B Mercury in the seawater gets onto their hands.

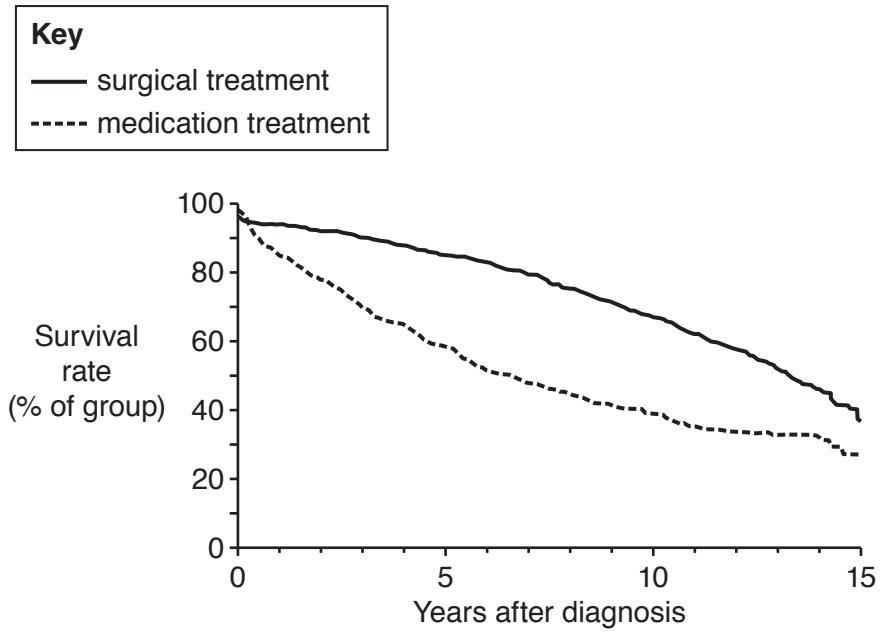
C Mercury kills their food supply.

D They breathe in mercury vapour fishing near the factory.

Your answer ☐ **[1]**

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9 The graph shows the survival rates for two groups of patients diagnosed with ≥ 50% blockage of a coronary artery. One group was treated with surgery, the other group were treated with medication.



How many years after diagnosis was there the biggest difference in survival rates between the two types of treatment?

	Years after diagnosis
A	2 – 4
B	6 – 8
C	10 – 12
D	13 – 15

Your answer ☐ **[1]**

10 New drugs are tested using preclinical trials.

Which statement describes a preclinical trial?

A One group of volunteers are given a placebo, another group the drug.

B The drug is tested on human cells.

C Volunteers are given a placebo only.

D Volunteers are given the new drug.

Your answer ☐ **[1]**

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SECTION B

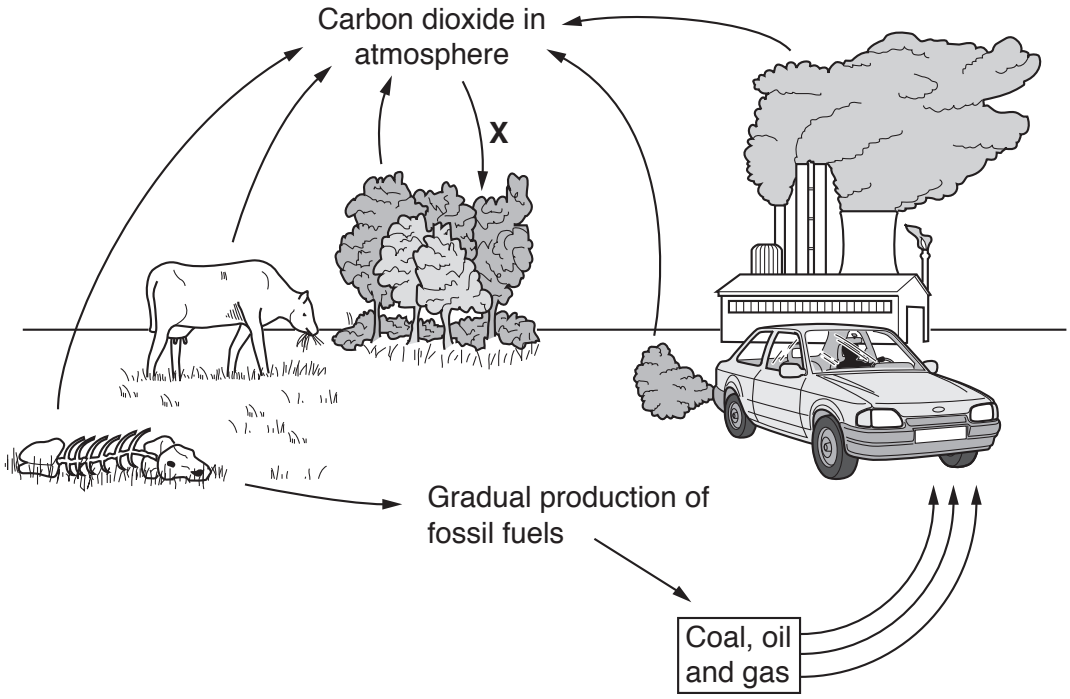
Answer **all** the questions.

11 **(a)** Water is cycled in nature.

Name **one** abiotic factor that affects water uptake by a plant.

..... **[1]**

(b) Look at the diagram of the carbon cycle.



(i) Which process is shown by arrow **X** in the diagram?

Tick (✓) **one** box.

Combustion ☐

Decomposition ☐

Photosynthesis ☐

Respiration ☐ **[1]**

(ii) Which process releases carbon when organisms **die**?

Tick (✓) **one** box.

Combustion ☐

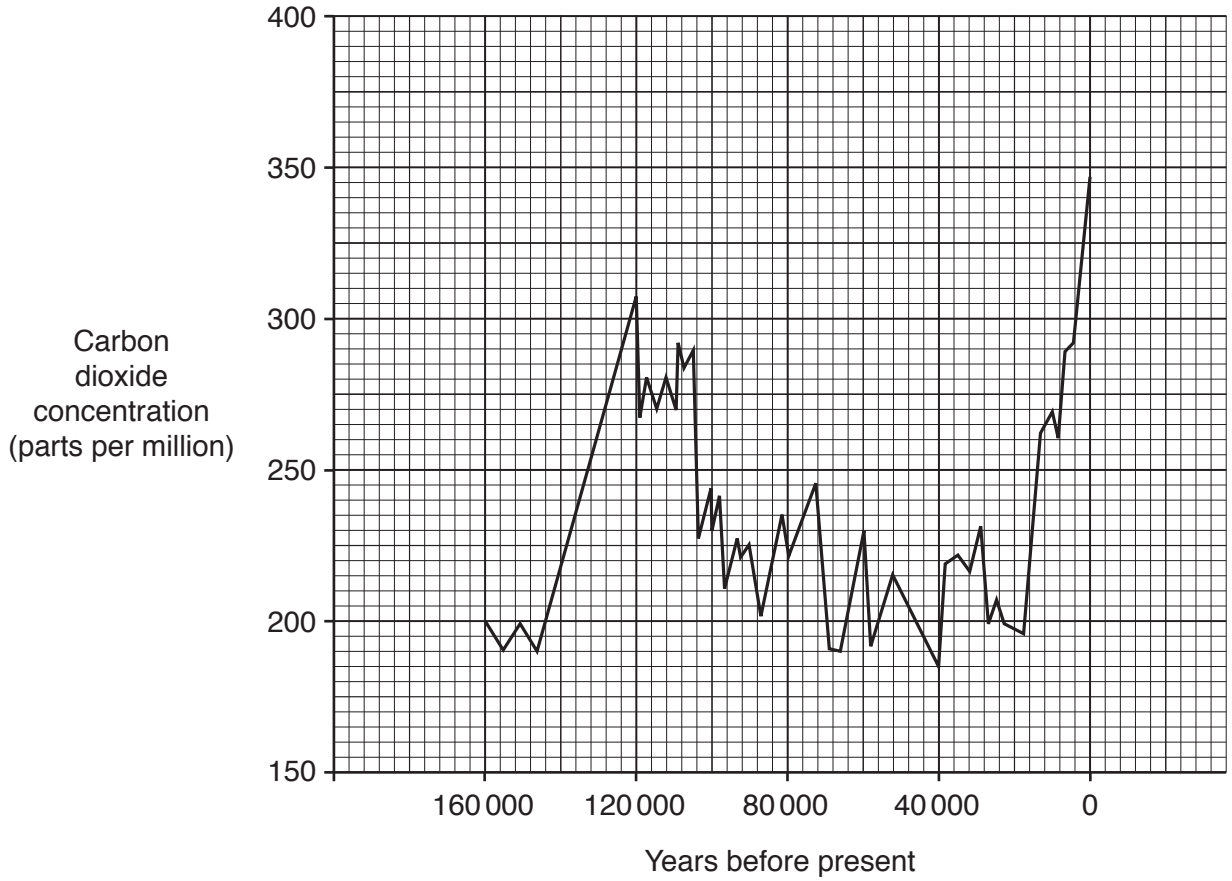
Decomposition ☐

Photosynthesis ☐

Transpiration ☐ **[1]**

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(c) The graph shows how carbon dioxide levels in the atmosphere have changed during the last 160 000 years.



(i) Read this statement:

Carbon dioxide levels in the atmosphere are rising out of control.

What evidence is there in the graph for and against this statement?

for .....

.....

against .....

.....

[2]

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(ii) Look at the section of the graph for the last 20 000 years.

What conclusion can be made about the release of carbon dioxide into the atmosphere and also its removal from the atmosphere during the last 20 000 years?

.....

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..... **[2]**

(iii) Describe how human activity has contributed to the trends in the graph and suggest how this activity could affect biodiversity.

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..... **[3]**

(d) The information in the box is part of a scientific journal report.

> **Growing crops with shiny leaves could cause an annual global cooling of over 0.1 °C.**
>
> **This is almost 20% of the total global temperature increase since the Industrial Revolution.**

Most crop plants have non-shiny leaves.

A few varieties of crop plants do have shiny leaves but they do **not** all produce high yields.

Explain how scientists could use selective breeding to help reduce global temperatures.

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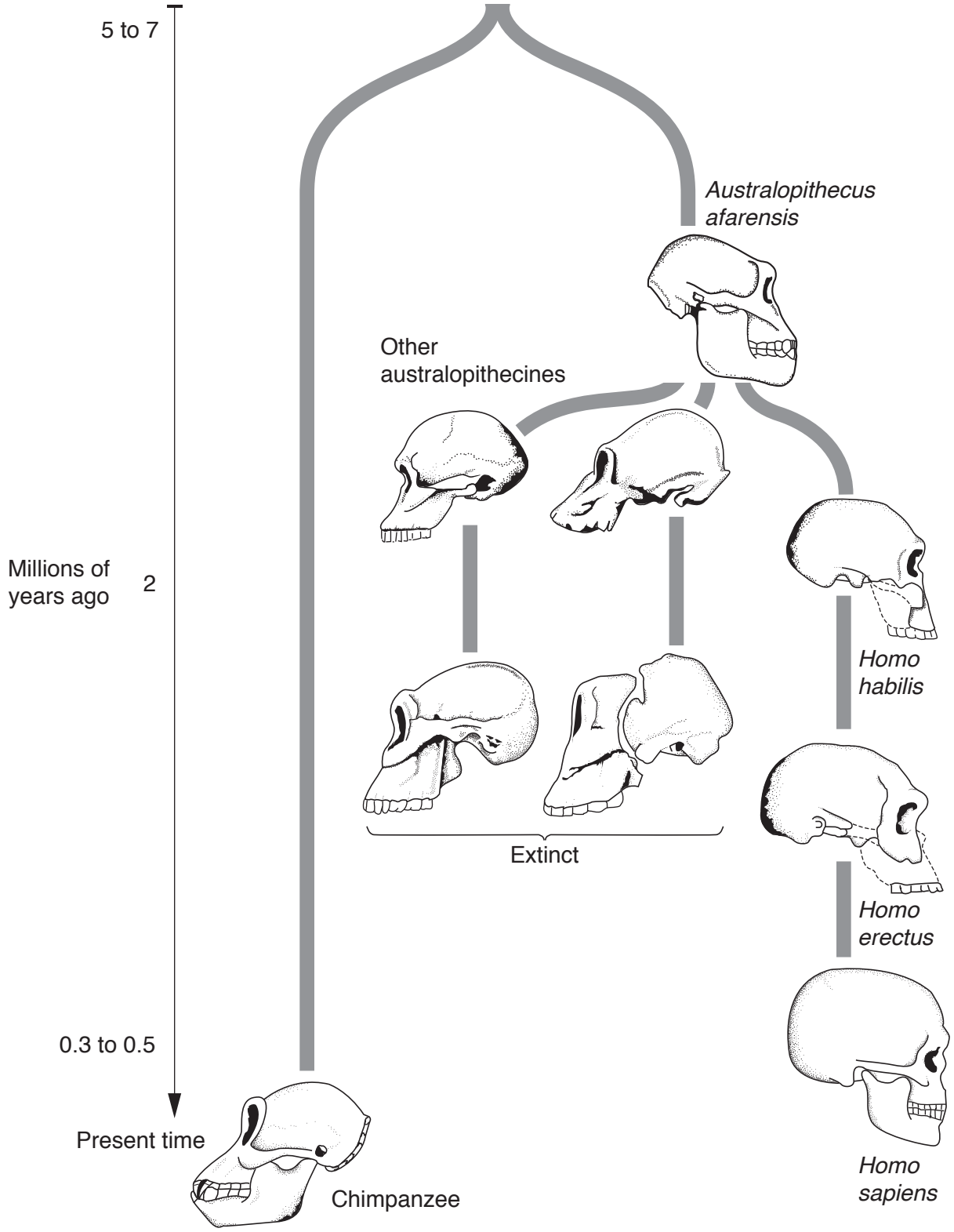
.....

..... **[2]**

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12* (a) Look at the diagram, it shows how humans, *Homo sapien*s, evolved.

It also shows that humans are closely related to other apes, like chimpanzees.



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Describe how humans, *Homo sapiens*, evolved from *Australopithecus afarensis* and the evidence for this shown in the diagram.

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..... **[6]**

(b) (i) Describe how the use of DNA in phylogenetics has changed classification systems.

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..... **[2]**

(ii) How does the structure of DNA support its use in phylogenetics?

.....

.....

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..... **[2]**

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13 (a) HIV is a virus that causes AIDS.

Some countries have set up centres where a person is counselled and tested for HIV.

The aim is to reduce new infections by 50%.

(i) Write down **two** types of testing that can be done to identify someone with HIV.

1 .....

.....

2 .....

.....

[2]

(ii) Humans who contract HIV do not die from the virus. Instead they die from AIDS-related diseases such as tuberculosis (TB).

HIV infects human cells by inserting genes into the cells. The human cells then copy the genes.

TB is caused by bacteria that infect the lungs.

Explain why a person with HIV is more likely to die from TB than a person without HIV.

Use ideas about the immune system in your answer.

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..... **[4]**

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(b) HIV can be transmitted during unprotected sexual intercourse.

Name **one** method of contraception and explain why it prevents the transmission of HIV.

Name of method of contraception .....

Why it prevents the transmission of HIV .....

..... **[2]**

(c) **(i)** Scientists are trying to develop a vaccine against HIV.

Explain how a vaccine could protect people against HIV.

.....

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..... **[3]**

(ii) Which **type** of medication can be used to treat people who already have HIV?

..... **[1]**

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14 **(a)** Plant material decomposes to make compost.

Gardeners add compost to their soil to increase crop yield.

Give **one** reason why compost increases crop yield.

.....

..... **[1]**

(b) Gardeners use compost activator to speed up the decomposition of plant material.

Compost activator contains bacteria.

Scientists are developing a new compost activator. To do this they need to isolate samples of bacteria.

They prepare agar jelly plates containing streaks of different bacteria. **Fig. 14.1** shows a scientist preparing an agar jelly plate.

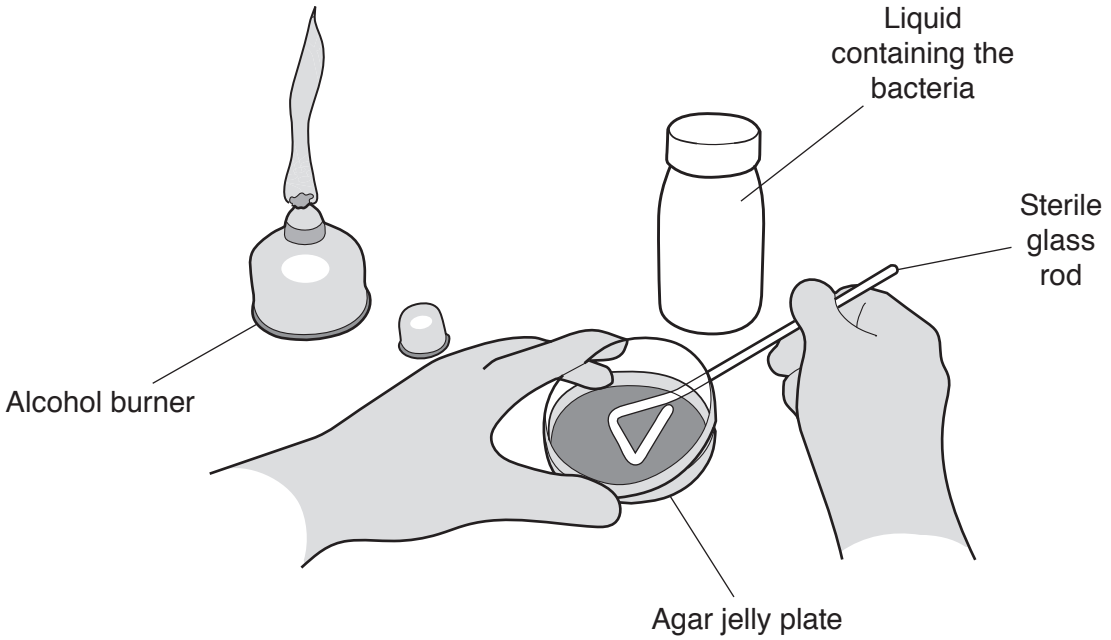


Fig. 14.1

(i) In **Fig. 14.1** the scientist uses a sterile glass rod to transfer the bacteria.

Suggest why this is better than just pouring the liquid directly from the bottle.

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..... **[2]**

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(ii) Some bacteria grow faster at 37 °C than at 25 °C.

The scientist chooses to grow the bacteria at 25 °C.

Suggest why this would be safer than growing them at 37 °C.

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..... **[2]**

(c) The scientist observes some of the bacteria growing on the agar plates using a light microscope.

The diagram in **Fig. 14.2** shows a bacterium cell.

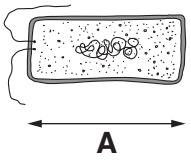


Fig. 14.2

The length (**A**) of the bacterium in **Fig. 14.2** has been magnified 2500×.

What is the actual length of the bacterium?

Give your answer in **standard form**.

Actual length = ... mm **[2]**

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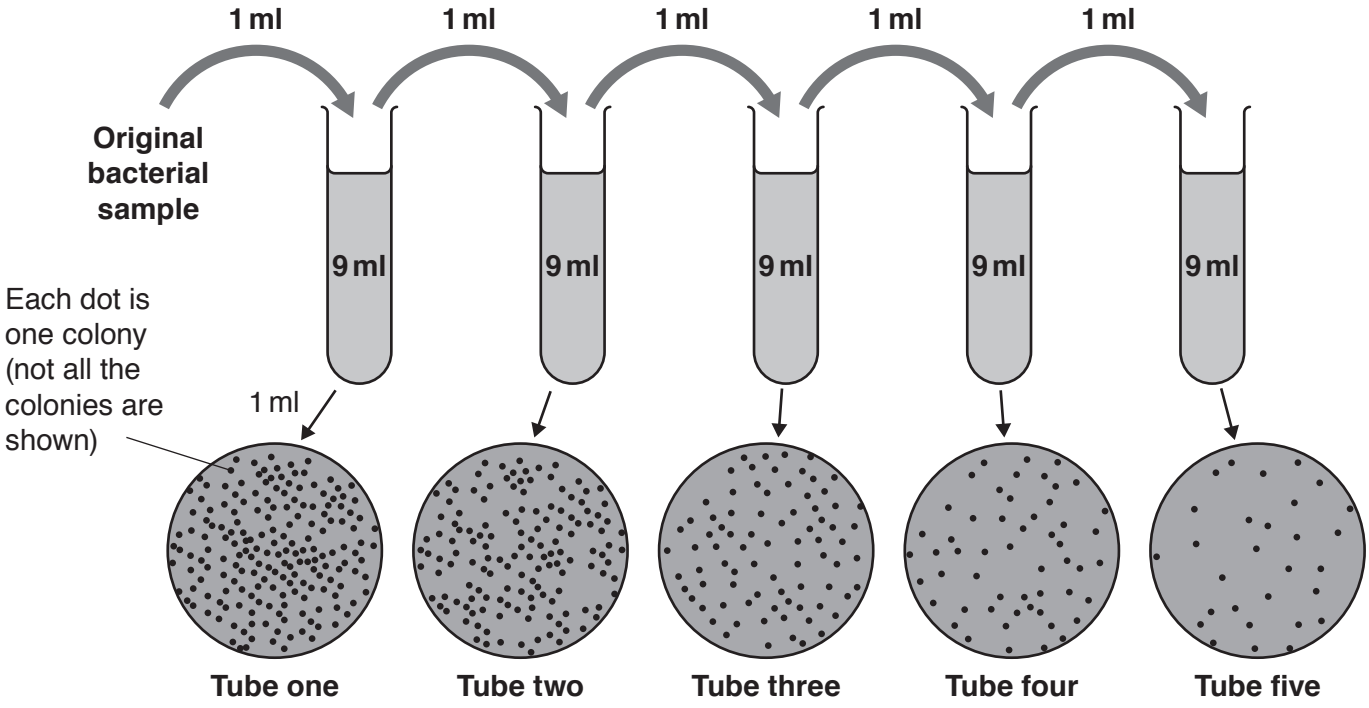
(d) The scientist counts colonies to work out the number of bacteria in a sample.

Each colony contains millions of bacteria growing close together. This makes them visible.

Each visible colony is known as a colony forming unit (CFU).

When the concentration of bacteria in a sample is high, a serial dilution is done.

Look at the results of a serial dilution.



Tube one contains 1 ml of the original sample and 9 ml of distilled water.

The dilution factor of tube one is 10.

The scientist then takes 1 ml of the mixture from this tube and adds it to the next.

(i) What is the final dilution factor in **tube five**?

Final dilution factor = ... **[1]**

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(ii) The scientist puts 1 ml from each tube onto a separate agar plate.

The scientist then leaves the bacteria to grow so that the bacterial colonies become visible.

They use this formula to calculate the number of bacteria in the original sample:

number of bacteria in the original sample = number of CFU in sample × dilution factor

There are **29** CFU grown from the sample taken from **tube 5**.

Calculate the number of bacteria in the **original** sample.

Give your answer in **standard form**.

Number of bacteria in the original sample = ... CFU per ml **[2]**

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15 The diagram in **Fig. 15.1** shows events that occur during human sperm production.

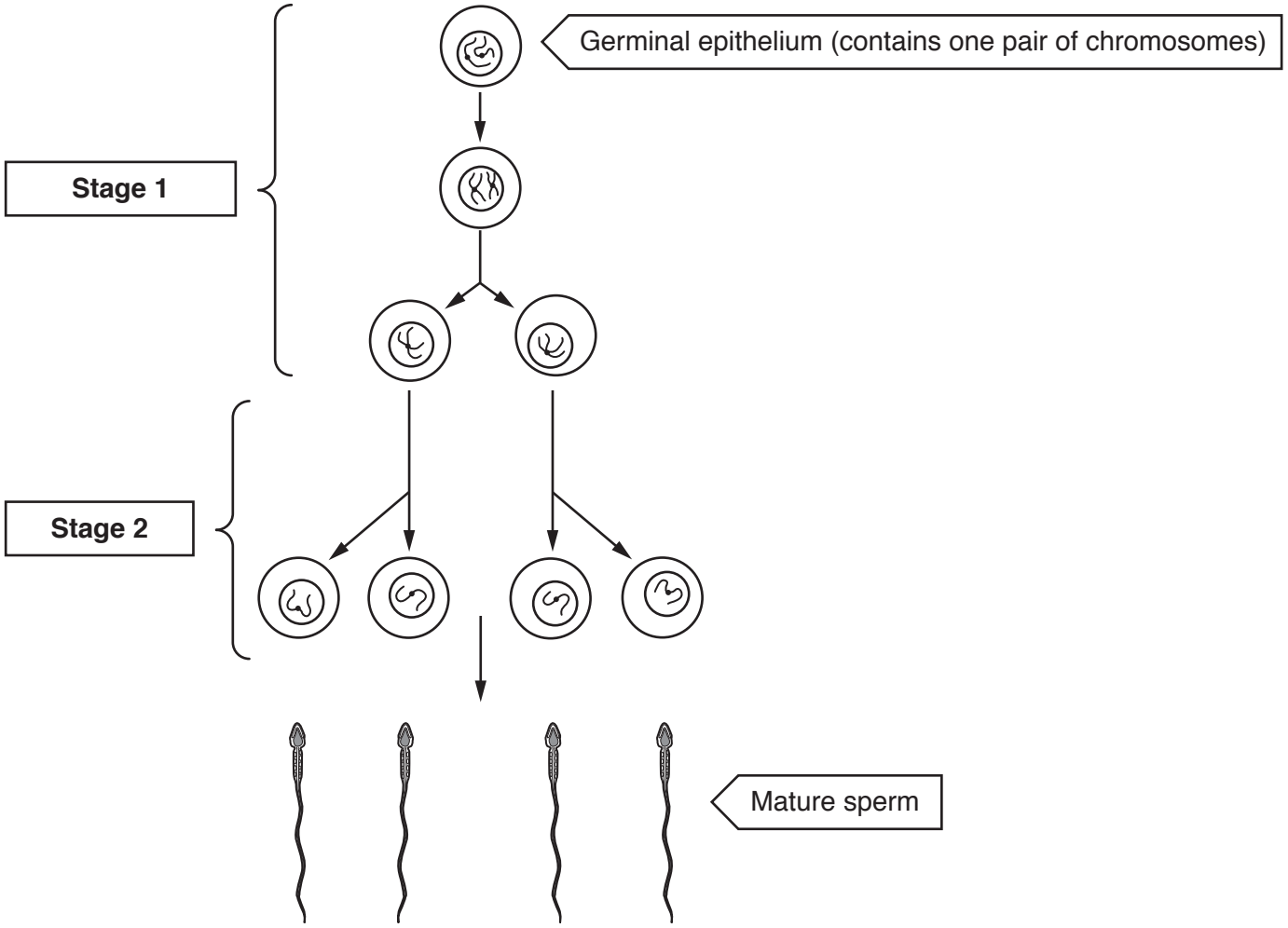


Fig. 15.1

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(a) (i) Cells in the germinal epithelium have the ability to turn into sperm cells.

Which term describes cells that have the ability to turn into specialised cells?

..... **[1]**

(ii) Compare the number of chromosomes in human germinal epithelium cells and human mature sperm cells.

..... **[1]**

(b) Describe the events that occur at **Stage 1** and **Stage 2** in **Fig. 15.1**.

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..... **[2]**

(c) Sperm production occurs best at 35.0 °C due to the enzymes involved.

Explain why the testes are positioned outside of the body cavity.

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..... **[2]**

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

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