Surname	Centre Number	Candidate Number
First name(s)		0

GCSE

S24-3430U40-1

3430U40-1

FRIDAY, 10 MAY 2024 – MORNING

SCIENCE (Double Award)
Unit 4 – BIOLOGY 2
FOUNDATION TIER

1 hour 15 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**4**	
3.	**5**	
4.	**8**	
5.	**6**	
6.	**12**	
7.	**6**	
8.	**6**	
9.	**9**	
Total	**60**	

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01

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. Do not use gel pen or correction fluid.

You may use pencil for graphs and diagrams only.

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.

If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

Question **7** is a quality of extended response (QER) question where your writing skills will be assessed.

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Answer **all** questions.

1. **Image 1** shows an oak tree. Its scientific name is *Quercus robur*.

Image 1

(a) Complete the following sentences using **only** words from the box. [2]

animal	plant	*Quercus*	fungus	*robur*

The oak tree belongs to the ..... kingdom.

The genus of the oak tree is ..... .

(b) Underline the **two** correct statements about naming organisms. [1]

Scientific names are the same all over the world.

Scientific names are different all over the world.

Common names are the same all over the world.

Common names are different all over the world.

(c) State **one** resource oak trees need for growth. [1]

.....

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2. Organisms have adaptations to help them survive in their habitats. **Image 2** shows a polar bear (*Ursus maritimus*) walking on deep snow.

Image 2

(a) **Use a ruler to draw lines** to join the adaptations with their function. [3]

Adaptation	Function
Large paws	To kill prey
White colour	Spread weight over large area
Thick layer of fat	Camouflage
Sharp teeth	Insulation to reduce heat loss

(b) The polar bear is a vertebrate.
State what is meant by the term vertebrate. [1]

.....

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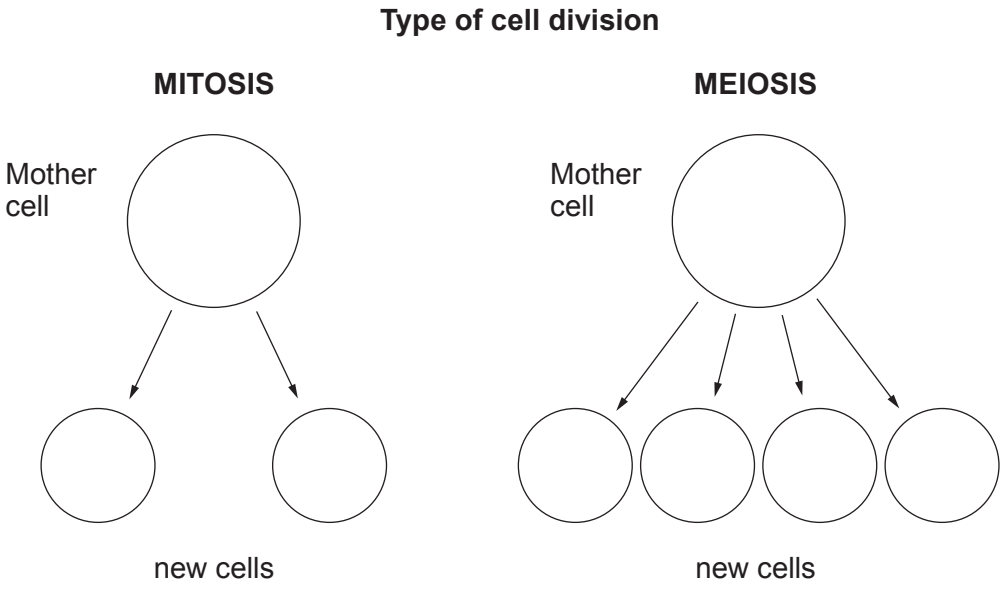
3. Mitosis and meiosis are the two types of cell division. **Image 3** shows the number of new cells formed after mitosis and meiosis in a human cell.

Image 3



Cell division by mitosis can sometimes get out of control. This is what causes cancer. Cancer often begins in one organ of the body before spreading to others.

One in two people will develop some form of cancer. Cancer can occur at any age but it is more likely to occur in the elderly.

(a) Use this information and your own knowledge to answer the following questions.

(i) State how many daughter cells are made during: [2]

I Mitosis .....

II Meiosis .....

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(ii) **Complete the following table** by writing True or False against each statement. [3]

Statement	True or False
Both types of cell division can cause cancer.	.....
Cancer is more likely to occur the older you are.	.....
The number of chromosomes in each cell is the same after mitosis and meiosis.	.....
Both types of cell division occur all over the body.	.....

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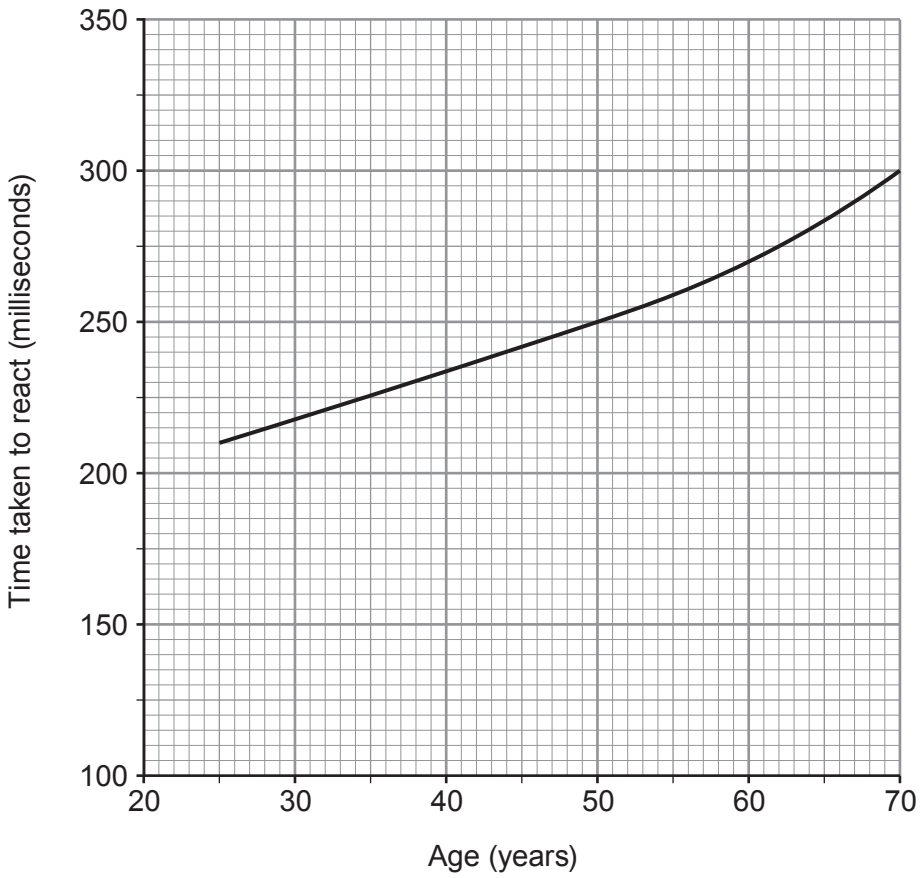
05

4. Year 11 students investigated the effect of age on reaction time. They used the following method:

- Five teachers of different ages were selected.
- Each teacher sat at a computer waiting for the letter X to appear on the screen.
- When the X appeared, the teacher pressed the space bar.
- The time taken for each teacher to react was recorded by the computer.

The results are shown in **Graph 4**.

Graph 4



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(a) State the conclusion that can be made from the results shown in **Graph 4**. [1]

.....

.....

(b) State **two** variables that should have been controlled to make this a fair test. [2]

1. .....

2. .....

(c) State what the students should do to have more confidence in their results. [1]

.....

.....

(d) (i) State the stimulus being detected in this investigation. [1]

.....

(ii) State how information travels along neurones. .[1]

.....

(iii) State the **two** parts of the central nervous system. [2]

1. .....

2. .....

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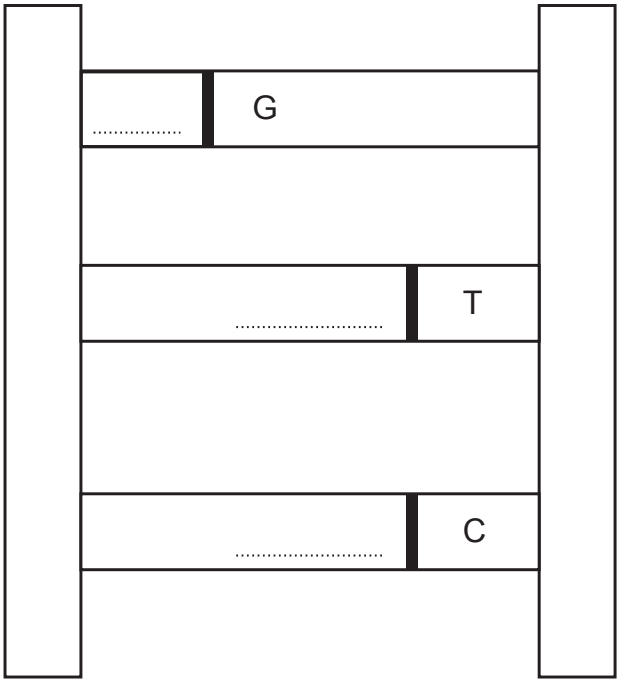
5. **Image 5.1** shows part of a DNA molecule. There are four different bases in a DNA molecule, A, T, C and G.

(a) **Complete Image 5.1** by adding letters to make three correct base pairs. [2]

Image 5.1



(b) State the scientific term used to describe the shape of a DNA molecule. [1]

.....

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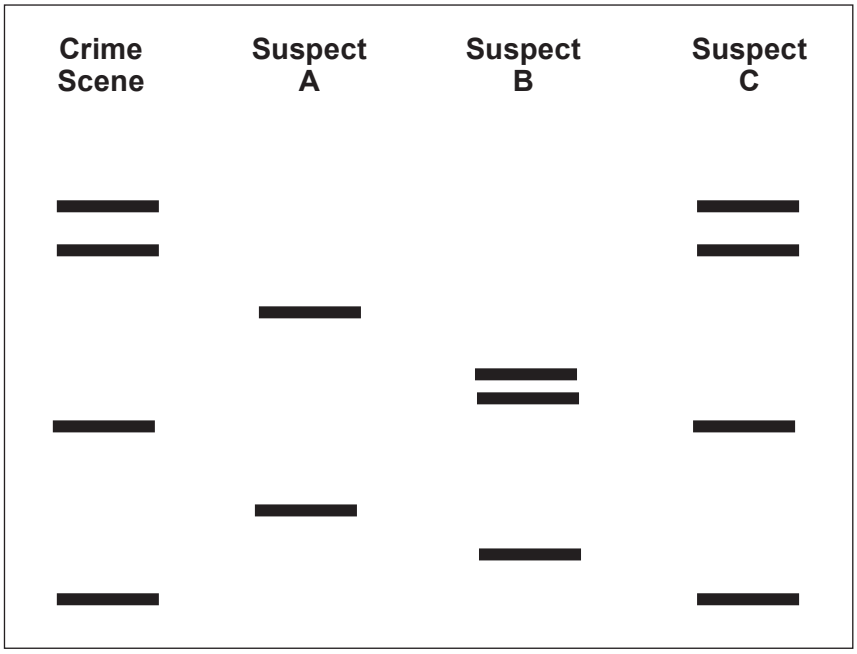
(c) Forensic scientists can use DNA profiling to identify criminals. They compared DNA left at a crime scene to the DNA of three suspects **A**, **B** and **C**. This is shown in **Image 5.2**.

Image 5.2



(i) Use the DNA profile shown in **Image 5.2** to state which of the suspects **A**, **B or C** is most likely to have committed the crime. Explain your answer. [2]

Suspect .....

Explanation .....

.....

(ii) State **one** other use of DNA profiling. [1]

.....

6

6. Diabetes is a condition that causes a person's blood glucose level to become too high. The percentage of the Welsh population that were being treated for diabetes between 2014 and 2020 is shown in **Table 6.1**.

Table 6.1

Year	Percentage of Welsh population being treated for diabetes
2014	5.4
2015	5.6
2016	5.7
2017	5.9
2018	6.0
2019	6.1
2020	6.2

(a) Use the data in **Table 6.1** to complete **Graph 6.2** by: [4]

(i) Labelling the y axis;

(ii) Plotting the points;

(iii) Using a ruler to join the plots.

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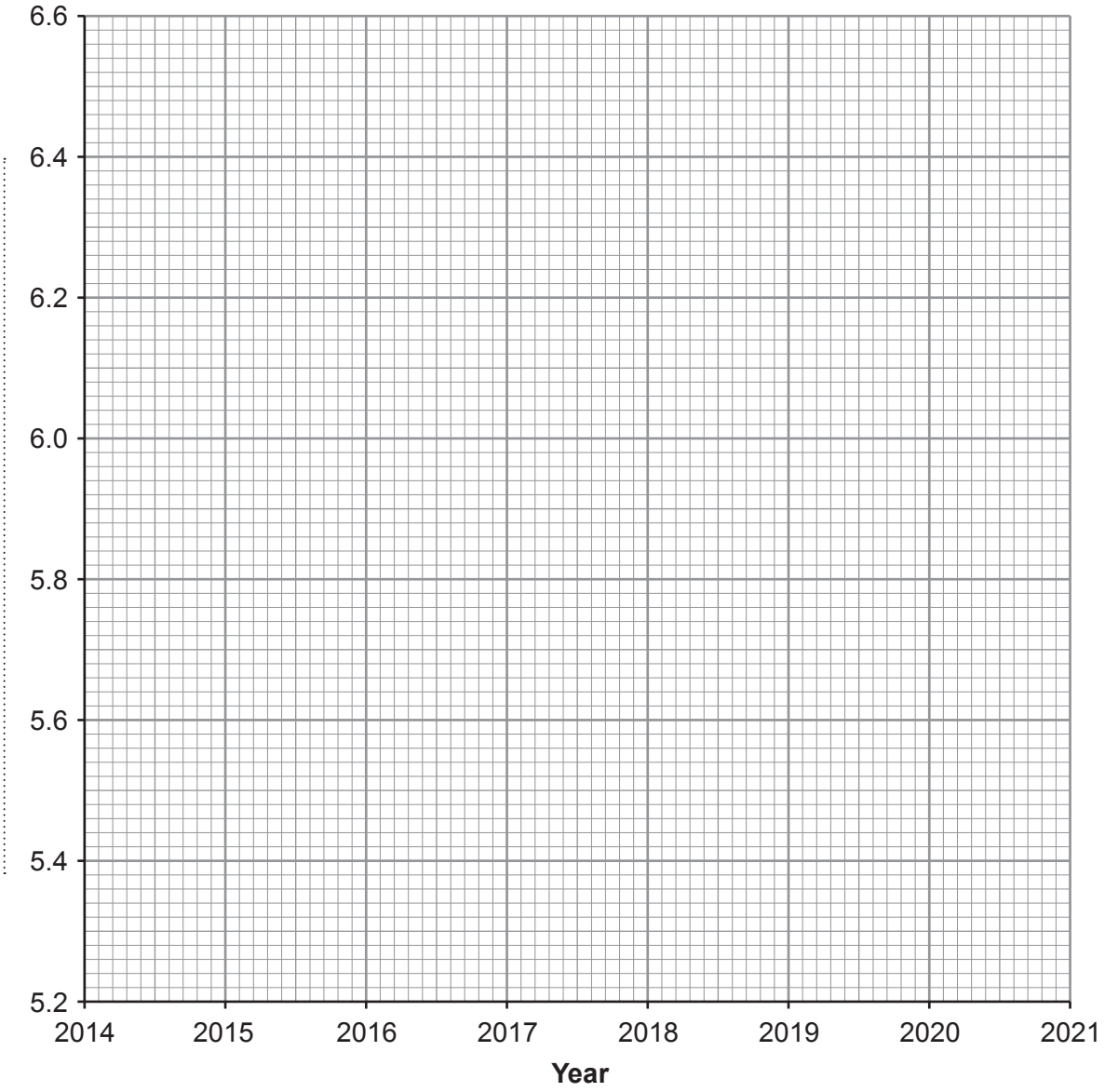
Graph 6.2



(b) (i) Describe the trend shown in **Graph 6.2**. [1]

.....

.....

.....

(ii) If the trend shown between 2019 and 2020 continued, estimate the percentage of the population that was treated for diabetes in 2021. **Extend your line on Graph 6.2** to show how you reached this answer. [2]

Percentage = ...

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(iii) Suggest **one** reason why the percentage of people being treated for diabetes is lower than the actual percentage of people who have diabetes. [1]

.....

.....

(c) State the name of the hormone that lowers the blood glucose level. [1]

.....

(d) (i) Describe the chemical test you would use in a school laboratory to test a urine sample for the presence of glucose. You do not need to include the result in your answer. [2]

.....

.....

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.....

(ii) Suggest a colour that would be observed if a sample of urine from a diabetic was tested for the presence of glucose. [1]

.....

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7. When we exercise, our body temperature rises and must be brought down. **Images 7.1** and **7.2** show the appearance of the structures present in the skin of an athlete at rest and during exercise.

Image 7.1

at rest

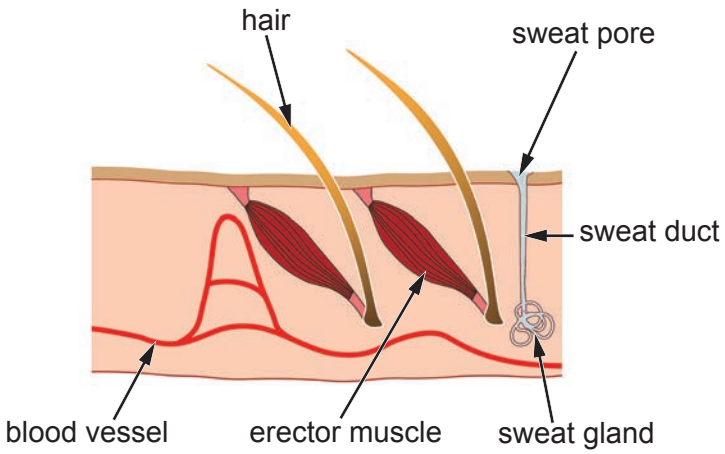
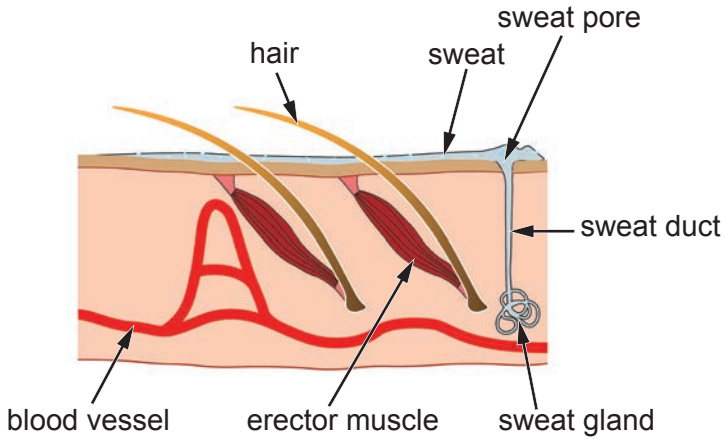


Image 7.2

during exercise



Use **Image 7.1** and **Image 7.2** to describe some changes that take place in the structures in the skin during exercise.
Explain how changes in **blood flow** and **sweat production** help cool the athlete down when exercising. [6 QER]

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8. (a) State the meaning of the term phenotype. [1]

.....

.....

(b) The ability to roll the tongue into a U-shape is controlled by a dominant allele (**T**). The recessive allele is represented by **t**.

A man heterozygous for tongue rolling has a child with a woman who is recessive for the characteristic.

(i) Use the letters given above to give the genotype of: [1]

the man .....

the woman .....

(ii) Complete the Punnett square below to show the possible genotypes of their children. [2]

(iii) Complete the following to show the **ratio** of the genotypes of the children. [1]

Homozygous dominant	:	Heterozygous	:	Homozygous recessive
.....	:	.....	:	.....

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(c) In 1952 Professor Philip Matlock investigated tongue rolling in 33 pairs of genetically **identical** twins. Professor Matlock published the data shown in **Table 8.1**.

Table 8.1

Feature	Number of pairs of identical twins
both can roll their tongues	18
neither can roll their tongues	8
one twin can roll their tongue but the other cannot.	7
Total	33

[Source: Philip Matlock, Ohio State University]

State the evidence from **Table 8.1** which suggests that tongue rolling is not controlled entirely by a gene. [1]

.....

.....

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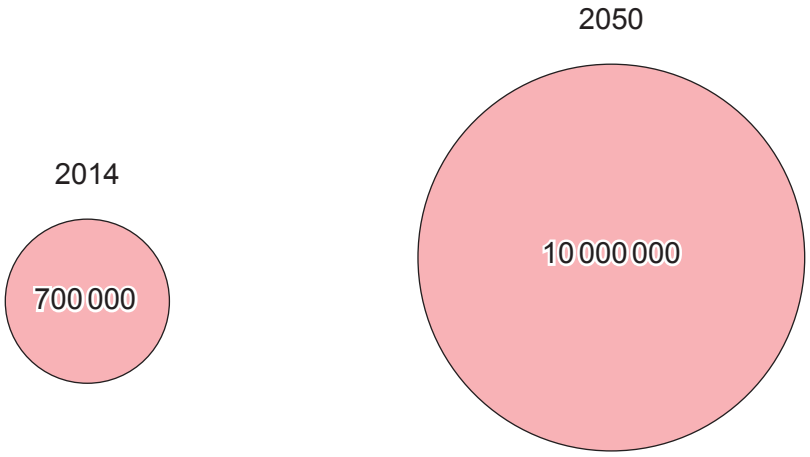
9. The term superbug is used to describe disease-causing (pathogenic) bacteria that are no longer killed by certain antibiotics. These bacteria have developed antibiotic resistance.

Image 9.1 shows the actual deaths from superbugs in the world in 2014 and the predicted deaths in 2050.

Image 9.1



[Source: United Nations]

(a) (i) Use the equation below to calculate the percentage increase in predicted deaths from superbugs in the world between 2014 and 2050.
Give your answer to **the nearest whole number**. [3]

$$\frac{\text{number in 2050} - \text{number in 2014}}{\text{number in 2014}} \times 100$$

Percentage increase in deaths = ...

(ii) State the main reason for the increase of antibiotic resistance in some pathogenic bacteria. [1]

.....

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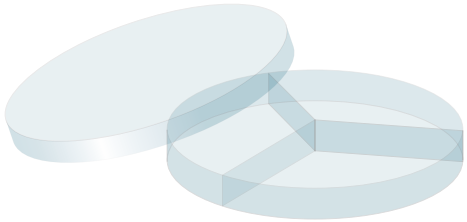
(b) Health scientists were experimenting on the effect of the antibiotic methicillin on three different species of pathogenic bacteria. They used a triple compartment Petri dish in their experiment.

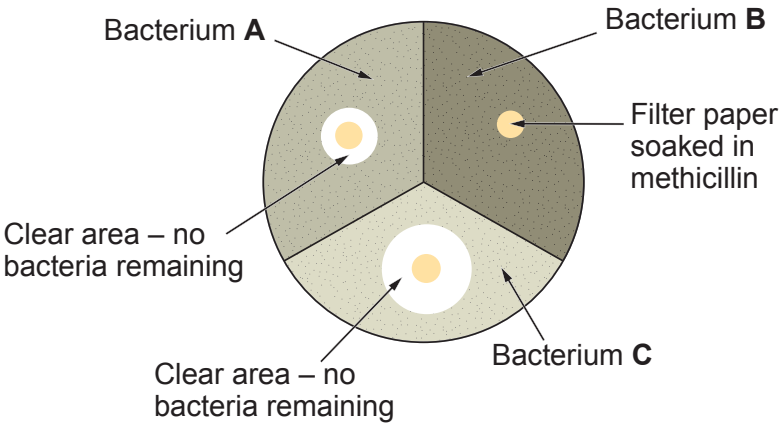


The method they used is shown below:

- Each compartment was filled with a nutrient jelly (agar), which allows bacteria to grow.
- Bacteria species **A**, **B** and **C** were each placed in a different compartment.
- A disc of filter paper containing the antibiotic methicillin was placed in the centre of each compartment.
- The Petri dish lid was used to close the dish. The dish was then placed in an incubator at 37 °C.
- After two days the Petri dish was examined.

Image 9.2 shows the surface view of the Petri dish after 2 days. The shaded areas show where bacteria were living. The clear areas show where there were no bacteria remaining.

Image 9.2



(i) Use **Image 9.2** to identify which bacterium is the superbug MRSA. Circle your answer. [1]

A **B** **C**

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(ii) Explain your answer. [1]

.....

.....

.....

(c) Sir Alexander Fleming discovered penicillin, the first antibiotic, in 1928. However, it was not used on a patient until 1942. There is still a long delay between the discovery of new drugs and their use in treating disease today.

(i) State the source of the penicillin discovered by Sir Alexander Fleming. [1]

.....

(ii) State **one** reason for the long delay between the discovery of new drugs and their use in treating disease in humans. [1]

.....

.....

(iii) Suggest why it is important to **medical science** that global biodiversity is maintained. [1]

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END OF PAPER

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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