**ST MARY'S SCIENCE DEPARTMENT:**

**BIOLOGY**

**F**

# GCSE BIOLOGY **HOMEWORK BOOK**
# **TOPIC 4:** MICROBES
# STUDENT BOOK

**YOU MUST ANSWER ALL THREE SECTIONS IN EACH PART OF THE HOMEWORK TASKS**

| | |
|---|---|
| **NAME** | |
| **CLASS** | |
| **TEACHER** | |
| **FORM** | |

| TASK | MARK | GRADE |
|---|---|---|
| 1 | | |
| 2 | | |
| | | |
| OVERALL | | |

**GCSE BIOLOGY**

**YEAR 10**

**TOPIC 1**

# HOMEWORK SCHEDULE

Please use the following table to ensure each homework task is completed and submitted on time.

Carrying out these homework tasks can only increase your ability to gain a high grade in the GCSE examinations.

Failure to hand in work on time will lead to sanctions to complete this work.

| Task | Submission Date | Completed? | On Time? |
|---|---|---|---|
| **Task 1**<br>Antibiotics 1 | | | |
| **Task 2**<br>Antibiotics 2 | | | |

**SCIENCE DEPARTMENT MARKING CODE**

**ID =** Insufficient detail in answer
**W =** Wrong understanding of science
**IR =** Irrelevant information given.
**V =** This is too vague to get a mark.
**AQ =** Answer the question asked
**R =** Read the question/information
**M =** Maths mistake
**BOD =** Benefit of the doubt given.
**E =** Explain the answer further please.
**U =** Wrong units used.
**SF** = Wrong significant figures used.
**SP** = Wrong spelling of a technical term
**SR** = Same reason given more than once.
**A circle means this lost you marks**
**An underline means this gained you marks**

**PLEASE READ**

This homework booklet has made with custom selected examination questions and activities to assess your understanding in the concepts covered in class. This will increase your familiarity with the style of examination questions.

Carrying out these questions can only increase your ability to gain a high grade in the GCSE examination.

Thank you for your hard work in completing this book, and good luck.

Mr. Turnbull

## TASK 1: ANTIOBIOTICS 1

## SPEC CHECK

| Content | Achieved? |
|---|---|
| Bacteria multiply by simple cell division (binary fission) as often as once every 20 minutes if they have enough nutrients and a suitable temperature.<br>Bacteria can be grown in a nutrient broth solution or as colonies on an agar gel plate.<br><br>Uncontaminated cultures of microorganisms are required for investigating the action of disinfectants and antibiotics. | |
| Students should be able to describe how to prepare an uncontaminated culture using aseptic technique.<br><br>They should be able to explain why:<br>• Petri dishes and culture media must be sterilised before use<br>• Inoculating loops used to transfer microorganisms to the media must be sterilised by passing them through a flame<br>• The lid of the Petri dish should be secured with adhesive tape and stored upside down<br>• In school laboratories, cultures should generally be incubated at 25°C. | |
| Students should be able to calculate cross-sectional areas of colonies or clear areas around colonies using $\pi r^2$. | |
| Students should be able to calculate the number of bacteria in a population after a certain time if given the mean division time. | |

**Target Setting**

In this assessed piece of work, what target should I look to achieve in completing this task? Please refer to your marking feedback for your target.

From your previous work, fill in the following boxes with your personal progress in Physics.

| What Topics Do I Know Well? | What Topics Do I Need to Revise? |
| --- | --- |
| | |

## SECTION A

**This is a revision question on a previous topic.**

You should aim to spend **10 minutes** answering this section.

**1.** Eating food containing Salmonella bacteria can cause illness.

**1.1** Two symptoms of infection by Salmonella are vomiting and diarrhoea.

What causes these symptoms?

**[1 mark]**

.....

.....

**1.2** Give **two** ways a person with a mild infection of Salmonella can help prevent the spread of the bacteria to other people.

**[2 marks]**

1

.....

.....

2

.....

.....

**1.3** In very serious infections of Salmonella, a doctor can prescribe drugs to kill the bacteria.

What type of drug can the doctor prescribe to kill the bacteria?

**[1 mark]**

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**1.4** A person with AIDS may take longer than a healthy person to recover from a Salmonella infection.

Explain why.

**[2 marks]**

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**1.5** Salmonella bacteria can be transmitted from chickens to humans. Chickens can be vaccinated to prevent the transmission of Salmonella bacteria to humans.

Suggest **one other** way farmers could prevent the transmission of Salmonella from chickens to humans.

**[1 mark]**

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A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

The scientist took samples from two work surfaces:

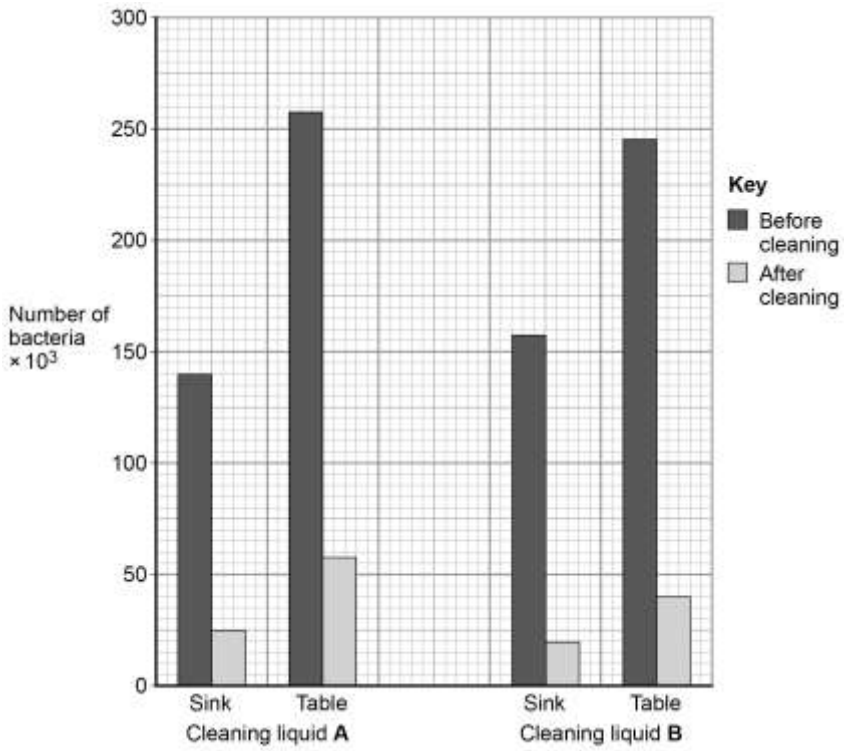
• Before the surfaces had been cleaned with the cleaning liquids

• After the surfaces had been cleaned with the cleaning liquids.

The samples were then analysed for the number of bacteria they contained.

The results are shown in **Figure 1.**

**Figure 1**




**1.6** Which cleaning liquid is the more effective?

Give a reason for your answer.

**[1 mark]**

Cleaning Liquid .....

Reason

.....

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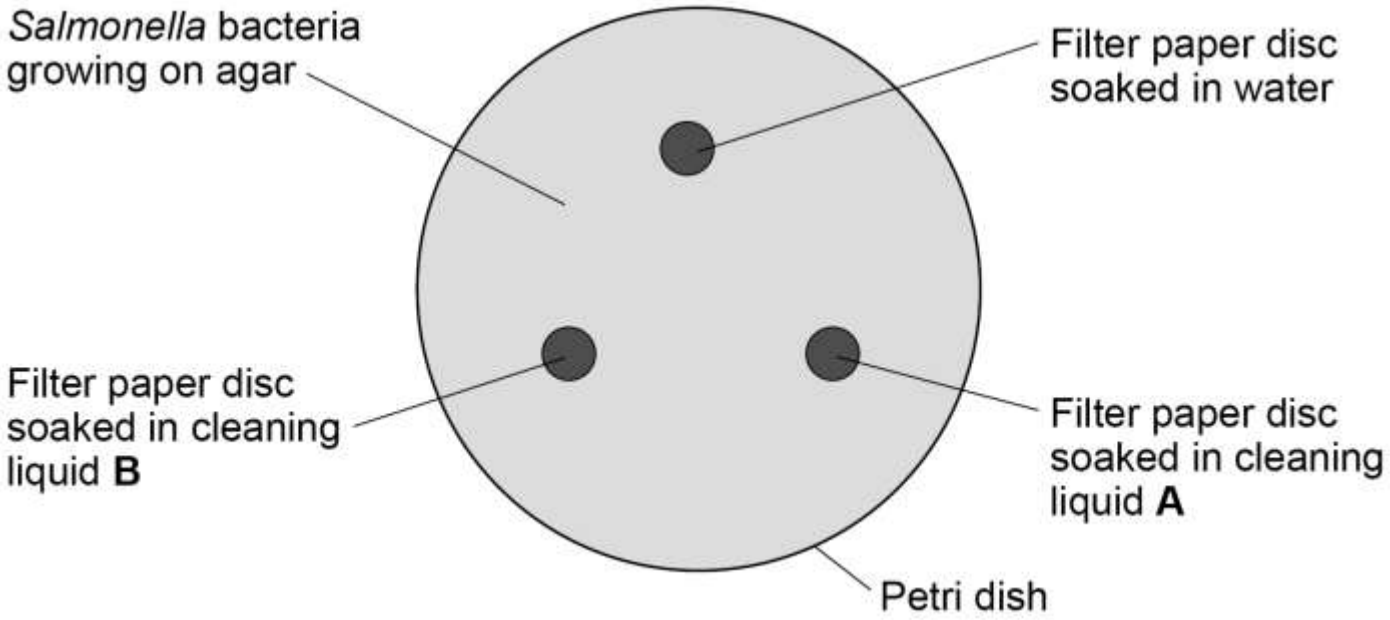
.....

The scientist investigated the effect of cleaning liquid **A** and cleaning liquid **B** on Salmonella bacteria grown in a laboratory.

**Figure 2** shows the way the investigation was set up.

**Figure 2**




The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.

The results are shown in **Table 1.**

**Table 1**

| Filter paper disc | Area around disc with no bacteria growing in $cm^2$ |
|---|---|
| Water | 0 |
| Cleaning liquid **A** | 11 |
| Cleaning liquid **B** | 13 |

**1.7** What measurement would the scientist need to take to calculate the area where no bacteria were growing?

**[1 mark]**

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**1.8** Give **one** change **to** the investigation that would allow the scientist to check if the results are repeatable.

**[1 mark]**

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**1.9** The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per $dm^3$.

Suggest **one other** factor the restaurant owner should consider when choosing which cleaning liquid to use.

**[1 mark]**

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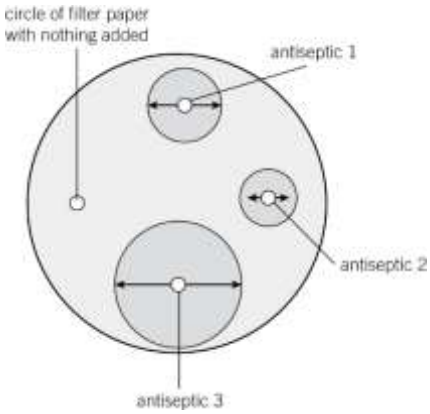
## SECTION B

**This is a question to revise understanding carried out in lesson.**

You should aim to spend **10 minutes** answering this section.

**1.** Dylan set up a culture plate of bacteria and placed three filter paper circles onto the plate. The discs were labelled 1, 2, and 3; each disc contained a different disinfectant. Disinfectant chemicals kill bacteria but are too strong to be used on human tissue.

Dylan then incubated the plate for 5 days. These are his results.




**1.1** Explain what is meant by a zone of inhibition.

**[1 mark]**

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**1.2** There are strict regulations in place to prevent you becoming ill when working with microorganisms. Match the following safety steps to their purpose.

**[2 Marks]**

| | |
|---|---|
| Clean benches with disinfectant | Pathogenic bacteria grow more rapidly at body temperature |
| Incubate plates at a maximum of 25 °C | To prevent growth of harmful anaerobic bacteria |
| Do not seal plates completely | To kill any bacteria present |

**1.3** Explain why you should use aseptic technique throughout this practical.

**[1 mark]**

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## SECTION C

**This is a challenge question to extend your understanding.**

You should aim to spend **10 minutes** answering this section.

**1.** Dylan set up a culture plate of bacteria and placed three filter paper circles onto the plate. The discs were labelled 1, 2, and 3; each disc contained a different disinfectant.

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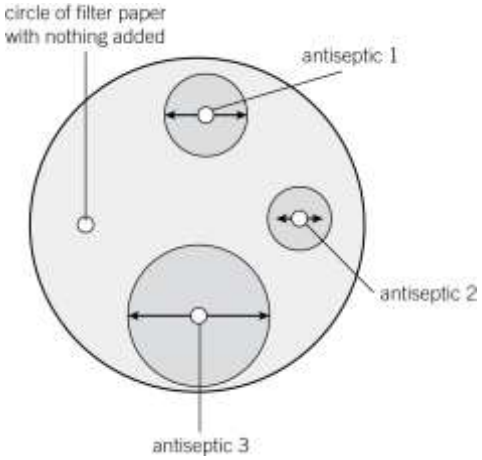


**1.1** Describe how Dylan inoculated the agar plate with bacteria.

**[1 Mark]**

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**1.2** State and explain **two** hazards that he controlled in his experiment.

**[4 Marks]**

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**1.3** Calculate the zone of inhibition for each disc.

**[3 Marks]**

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**1.4** State and explain which disinfectant was the most effective.

**[2 Marks]**

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**FEEDBACK SHEET**

| | | | |
|---|---|---|---|
| **Overall Mark:** | **/25** | **GRADE ACHIEVED:** | |
| **Section A: Mark** | /11 | **9** ☐ | **5** ☐ |
| **Section B: Mark** | /4 | **8** ☐ | **4** ☐ |
| **Section C: Mark** | /10 | **7** ☐ | **3** ☐ |
| | | **6** ☐ | **U** ☐ |

| **Knowledge and understanding shown** | Unsatisfactory | Satisfactory | Good | Outstanding |
|---|---|---|---|---|

| | | |
|---|---|---|
| **Strengths:** | ☐ Basic Knowledge of Concepts<br>☐ Quality of Written Communication<br>☐ Working Scientifically<br>☐ Answering Examination Questions<br>☐ Analytical Skills<br>**Others** (Topic Specific) | ☐ Applications of Concepts<br>☐ Mathematical Skills<br>☐ Experimental Technique<br>☐ Previous Topics<br>☐ Problem Solving |
| **Areas to Improve:** | ☐ Basic Knowledge of Concepts<br>☐ Quality of Written Communication<br>☐ Working Scientifically<br>☐ Answering Examination Questions<br>☐ Analytical Skills<br>**Others** (Topic Specific) | ☐ Applications of Concepts<br>☐ Mathematical Skills<br>☐ Experimental Technique<br>☐ Previous Topics<br>☐ Problem Solving |

| | | | | |
|---|---|---|---|---|
| **Progress:** | Unsatisfactory | Satisfactory | Good | Outstanding |
| **Working:** | Below | In line with | Above | **(your target)** |
| **Effort:** | Poor | Inconsistent | Good | Excellent |

**To improve further you need to:**

| | |
|---|---|
| ☐ Carry out **independent** revision. | ☐ Revise the equations. |
| ☐ Complete outstanding work. | ☐ Check the units on answers. |
| ☐ Make corrections as indicated by the teacher. | ☐ Check the correct amount of sig figs on answers. |
| ☐ Attend intervention for this topic | ☐ Check to convert values correctly. |
| ☐ Include more information in responses. | ☐ Show your full working out. |
| ☐ Include more key words in responses. | ☐ Check your calculations. |
| ☐ Attend departmental revision sessions. | ☐ Revise the science investigative skills. |
| ☐ Read the questions carefully. | ☐ Revise the key concepts of the topics. |
| ☐ Explain your answers in more detail. | ☐ Thoroughly check your work for mistakes. |
| ☐ Carry out revision on Seneca Learning. | Other: |

**Student response**

## TASK 2: ANTIOBIOTICS 2

## SPEC CHECK

| Content | Achieved? |
|---|---|
| Bacteria multiply by simple cell division (binary fission) as often as once every 20 minutes if they have enough nutrients and a suitable temperature.<br>Bacteria can be grown in a nutrient broth solution or as colonies on an agar gel plate.<br><br>Uncontaminated cultures of microorganisms are required for investigating the action of disinfectants and antibiotics. | |
| Students should be able to describe how to prepare an uncontaminated culture using aseptic technique.<br><br>They should be able to explain why:<br>• Petri dishes and culture media must be sterilised before use<br>• Inoculating loops used to transfer microorganisms to the media must be sterilised by passing them through a flame<br>• The lid of the Petri dish should be secured with adhesive tape and stored upside down<br>• In school laboratories, cultures should generally be incubated at 25°C. | |
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**Target Setting**

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From your previous work, fill in the following boxes with your personal progress in Physics.

| What Topics Do I Know Well? | What Topics Do I Need to Revise? |
| --- | --- |
| | |

## SECTION A

**This is a revision question on a previous topic.**

You should aim to spend **10 minutes** answering this section.

**1.** This question is about digestion.

**1.1** Name the enzyme that digests starch in the human digestive system.

**[1 mark]**

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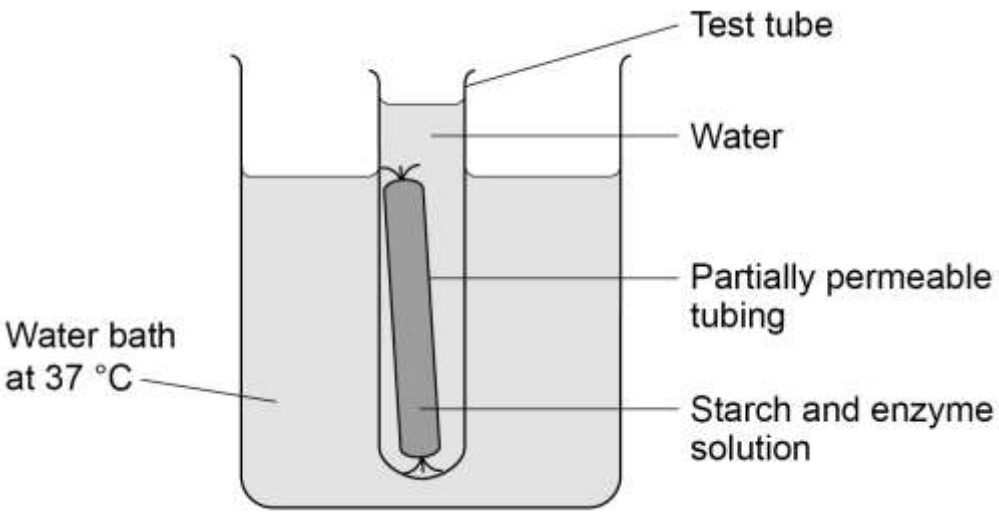
A student set up a model to represent the digestion and absorption of food molecules in the digestive system.

**Figure 2** shows the student's model.

**Figure 2**




This is the method used.

**1.** Fill a test tube with water at 37 °C

**2.** Test the water for starch and for sugar.

**3.** Mix together starch and enzyme solution and immediately test it for starch and for sugar.

**4.** Fill some partially permeable tubing with the starch and enzyme mixture.

**5.** Seal the tubing and place it in the test tube of water.

**6.** Place the test tube in a water bath at 37 °C

**7.** After 30 minutes, test the mixture inside the partially permeable tubing and test the water in the test tube for starch and for sugar.

**1.2** Suggest which parts of the body the partially permeable tubing and the water in the test tube represent.

**[2 marks]**

Partially permeable tubing .....

Water in the test tube .....

**Table 2** shows the results.

**Table 2**

| Test | Description of liquid | Result of starch test | Result of sugar test |
|---|---|---|---|
| 1 | Mixture inside tubing at start | ✓ | ✗ |
| 2 | Water in the test tube at start | ✗ | ✗ |
| 3 | Mixture inside tubing after 30 minutes | ✓ | ✓ |
| 4 | Water in the test tube after 30 minutes | ✗ | ✓ |

**Key**
✓ = Present
✗ = Not present

**1.3** Name the reagents used to test for starch and for sugar.

**[2 marks]**

Starch

.....

.....

Sugar

.....

.....

**1.4** Why was there no sugar present in test **1**?

**[1 mark]**

.....

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**1.5** Explain the results for test **3**.

**[2 marks]**

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**1.6** Explain the results for test **4**.

**[2 marks]**

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## SECTION B

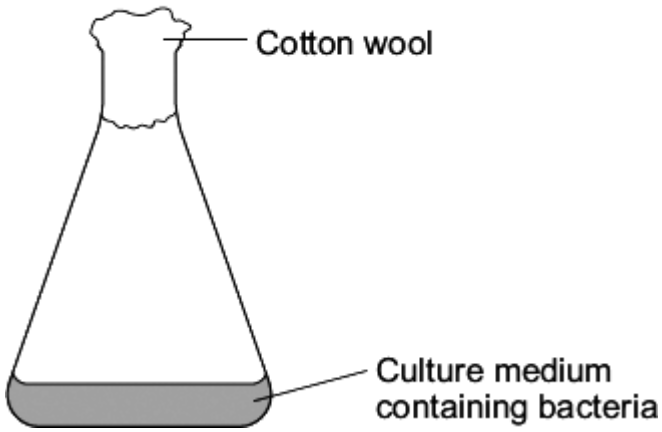
**This is a question to revise understanding carried out in lesson.**

You should aim to spend **10 minutes** answering this section.

**1.** Some students grew one species of bacterium in a flask.

**Diagram 1** shows the flask.

**Diagram 1**



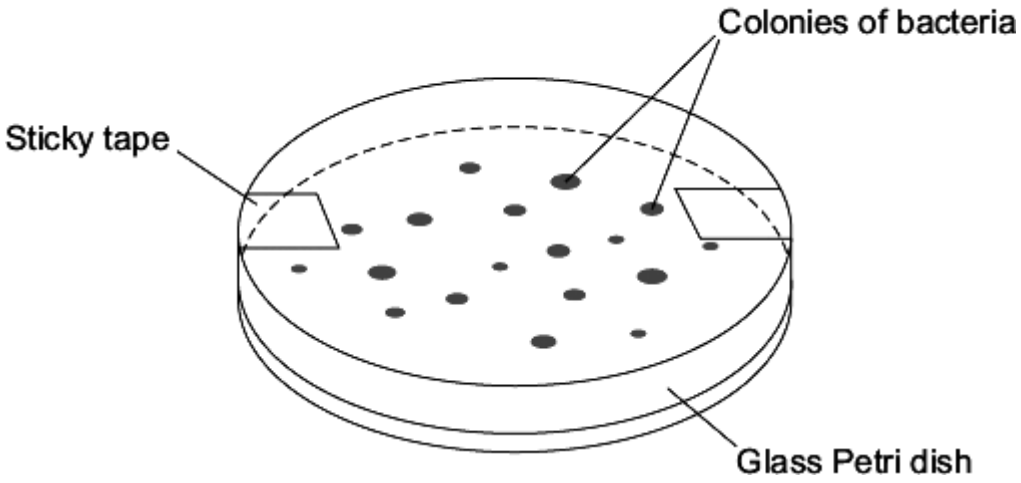

The students wanted to find the number of bacteria in 1 $cm^3$ of the culture medium.

The students:

- diluted 1 $cm^3$ of the culture medium from the flask with 999 $cm^3$ of water
- added 1 $cm^3$ of diluted culture to sterilised nutrient agar in a Petri dish
- placed the Petri dish in an incubator at 25 °C.

**Diagram 2** shows the Petri dish after 3 days in the incubator.

**Diagram 2**



**1.1** Each colony of bacteria is formed where one bacterium landed on the agar jelly.

How is each colony formed?

**[1 mark]**

.....

.....

**1.2** Complete the following calculation to find how many bacteria there were in 1 $cm^3$ of the undiluted culture.

**[2 Marks]**

Number of colonies of bacteria in the Petri dish = _____

These colonies were formed from 1 $cm^3$ of the culture diluted × 1000.

Therefore, number of bacteria in 1 $cm^3$ of undiluted culture = _____

**1.3** It is important to sterilise the culture medium and all the apparatus before use.

Explain why.

**[2 marks]**

.....

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.....

**1.4** The bacteria would grow faster at 35 °C. In a school laboratory, the Petri dish should **not** be incubated at a temperature higher than 25 °C.

Why?

**[1 mark]**

.....

.....

**1.5** The students decided to repeat their investigation.

Why?

**[1 mark]**

.....

.....

## SECTION C

**This is a challenge question to extend your understanding.**

You should aim to spend **10 minutes** answering this section.

**1.1 Microorganisms** can be grown on agar jelly in a Petri dish.

**List A** gives three actions used when growing microorganisms.
**List B** gives four possible effects of these actions.

Draw a straight line from each action in **List A** to its effect in **List B**.

**[3 Marks]**

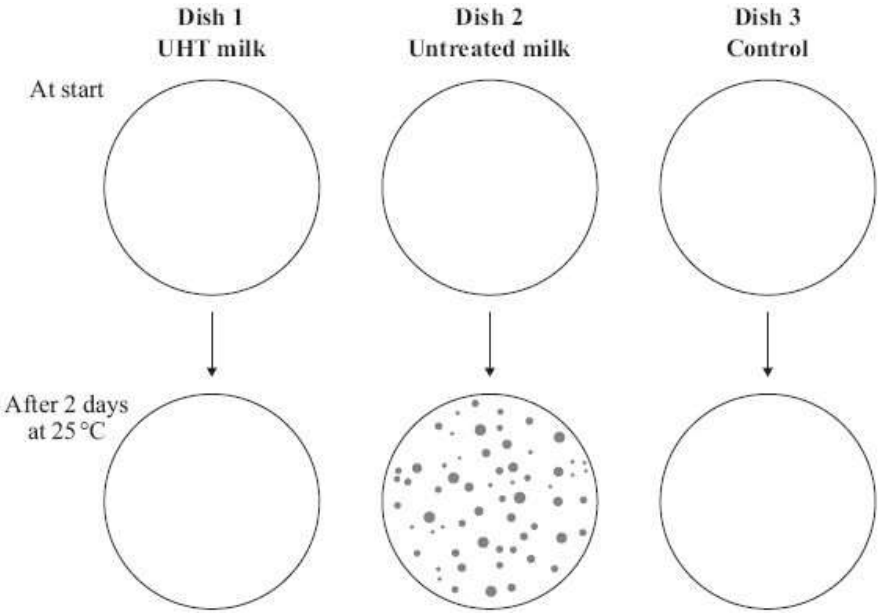
| List A – Action | List B – Effect |
|---|---|
| | To reduce the growth of pathogens |
| The agar jelly is heated at 120°C for 30 minutes | |
| | To kill unwanted microorganisms |
| Make sure the temperature for growing the microorganisms is no higher than 25 °C | |
| | To prevent microorganisms from the air getting into the Petri dish |
| The lid of the Petri dish is held on with tape | |
| | To prevent oxygen entering the Petri dish |

**1.2** UHT milk is milk that has been heated to 135 °C, then cooled.

In an investigation, three sterile Petri dishes containing sterile agar jelly were set up as follows.

- UHT milk was added to dish **1**.
- Untreated milk was added to dish **2**.
- Dish **3** was left unopened as a control.
- The dishes were kept at 25 °C for two days.

The results are shown in the diagram below.




**1.3** Describe the difference in appearance between dishes **1** and **2** after two days.

**[1 mark]**

.....

.....

**1.4** Give **one** reason for this difference.

**[1 mark]**

.....

.....

**1.5** There was no change in the appearance of dish **3** after two days.

Give **one** reason why.

**[1 mark]**

.....

.....

**FEEDBACK SHEET**

| | | | |
|---|---|---|---|
| **Overall Mark:** | **/23** | **GRADE ACHIEVED:** | |
| | | **9** ☐ | **5** ☐ |
| | | **8** ☐ | **4** ☐ |
| | | **7** ☐ | **3** ☐ |
| | | **6** ☐ | **U** ☐ |
| **Section A: Mark** | /10 | | |
| **Section B: Mark** | /7 | | |
| **Section C: Mark** | /6 | | |

| **Knowledge and understanding shown** | Unsatisfactory | Satisfactory | Good | Outstanding |
|---|---|---|---|---|

| | | |
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| | | | | |
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| ☐ Explain your answers in more detail. | ☐ Thoroughly check your work for mistakes. |
| ☐ Carry out revision on Seneca Learning. | Other: |

**Student response**

**Acknowledgements**

This document has been produced by Mr J Turnbull.

All relevant information has been credited in the document.

This document has been produced for educational purposes only.

This document has been produced for the AQA GCSE Science Specification.