

2023

Year 11 Integrated Science – Unit 1 Biological & Earth Systems

Task 3: Bacteria Investigation

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| --- | --- | --- | --- |
| **Assessment Type:** |  | Name: |  |
| Investigation |  |
| **Duration & Conditions:**  See section notes |  | Teacher: |  |
|  |  |  |  |
| **Assessment weighting:**  12.5% of year mark |  | Date: |  |

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# **PART THREE:** Report

You will be assessed on the following criteria:

|  |  |  |
| --- | --- | --- |
| **Heading** | **Content** | **Marks** |
| Introduction | * Introduces the experiment * Includes basic information about bacteria and how they respond to pH changes | 2 |
| Research | * Lists and describes the bacteria that you would expect to find given the source (phone and shoe) | 4 |
| Aim | * Clearly states the aim of the experiment | 1 |
| Variables | * Identifies the independent, dependent and at least two controlled variables | 4 |
| Hypothesis | * States a clear hypothesis with a prediction of how the dependent variable will change with the independent variable | 2 |
| Materials | * Lists material used in experiment | 1 |
| Method | * Lists the steps performed in the experiment in sufficient detail | 3 |
| Safety | * Lists and explains safety considerations for experiment | 2 |
| Observations | * Provides general observations on all samples (how they changed with source and how they changed with pH) * Provides detailed observations on at least one petri dish, including observations for each bacteria species | 6 |
| Discussion | * Reflects on the general observations and what they indicate (with respect to the aim and the hypothesis) * Identifies the bacteria observed on at least one petri dish | 6 |
| Improvements | * Lists and explain at least two possible improvements to the experiment | 4 |
| Conclusion | * States and explains whether the experiment supported the hypothesis | 2 |
| Referencing | * Provide sources for your research | 1 |

To investigate how well the bacteria that lives on everyday objects grows in different environments, students decided to get bacteria samples and study how they grew at different acidity levels (measured as pH).

The students collected samples from two locations: the bottom of a shoe, and a phone. They took 3 samples from each location using a cotton swab and wiped the swab on a petri dish with an agar paste (agar is a substance that contains all the nutrients that bacteria need to live and reproduce). The students made solutions of different pH (pH 3, pH 7 and pH 11). They then added one solution to each plate, adding just enough liquid to cover the plate.

The agar plates were placed in an oven and kept at 30oC for 5 days. After this time, they were taken out and the amount and types of bacteria were observed.

**Introduction**

*What are bacteria?*

*Why did the students think that changing the pH of solution would change the amount of bacteria grown?*

**Research**

*Name one type of bacteria that you would expect to see in this experiment:*

*Describe what that bacteria looks like when grown on a petri dish.*

*Name another type of bacteria that you would expect to see in this experiment:*

*Describe what that bacteria looks like when grown on a petri dish.*

*Would you expect the shoe to have different types of bacteria compared to the phone?*

*Why?*

**Aim**

The aim of this experiment was to investigate how the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ changes when the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is changed.

**Variables**

*Independent variable (what did the students change on purpose):*

*Dependent variable (what changed because the independent variable changed):*

*Controlled variables (what are two things that were kept the same for all the trials):*

1.

2.

**Hypothesis**

*State how you expect the dependent variable to change when independent variable changes.*

When the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Materials**

*List the materials and equipment used in this experiment. Some are provided for you.*

* hydrochloric acid
* sodium hydroxide
* distilled water
* universal indicator
* beaker

**Method**

*Write the steps students followed in the experiment (see the text at the start).*

**Safety**

*State one safety procedure or equipment that is important for this experiment.*

*Why is this important?*

**Observations**

Note: each different colour or shape represents a different type of bacteria

|  |  |  |  |
| --- | --- | --- | --- |
| **Source** | **pH 3 (acidic)** | **pH 7 (neutral)** | **pH 11 (basic)** |
| Shoe |  |  |  |
| Phone |  |  |  |

Describe how the amount of bacteria changes as the pH changes.

Describe how the types of bacteria changes as the pH changes.

Describe how the amount of bacteria changes as the source changes.

Describe how the types of bacteria changes as the source changes.

**Discussion**

*Use your observations to answer these questions.*

What is the effect of pH on the amount of bacteria?

Does this match your research / expectations?

What is the effect of source on the types of bacteria?

Does this match your research / expectations?

**Improvements**

*What is one improvement that you could make to this experiment?*

*Why would that improve it?*

*What is another improvement that you could make to this experiment?*

*Why would that improve it?*

**Conclusion**

*Did the data from the experiment support your hypothesis?* Yes No

Explain why.

**References**

*What websites, books or other references did you use for your research?*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Introduction** | Provides general information on bacteria | Provides information on bacteria and pH |  |  |  |  |
| **Research** | One example bacteria species given | Additional bacteria species given | Information on bacteria species given | Describes difference between species expected by source |  |  |
| **Aim** | Clearly states aim of experiment |  |  |  |  |  |
| **Variables** | Correctly identifies independent variable | Correctly identifies dependent variable | Correctly identifies one controlled variable | Correctly identifies another controlled variable |  |  |
| **Hypothesis** | Links independent and dependent variables | Includes direction of expected change |  |  |  |  |
| **Materials** | Lists materials used in experiment |  |  |  |  |  |
| **Method** | Method is clearly listed and explained | Method is complete | Sufficient detail to reproduce experiment |  |  |  |
| **Safety** | Identifies safety consideration for experiment | Explains safety risk |  |  |  |  |
| **Observations** | Provides observations on effect of pH | Provides observations on effect of source | Observations for pH and source are detailed, including number of colonies and variety of species | Provides detailed observations on one bacteria species | Provides detailed observations on additional species | Observations are tabulated and communicated clearly |
| **Discussion** | Discusses interpretation of pH observations | Discusses interpretation of source observations | Links pH observations to research | Links source observations to research | Identifies one bacteria species using observations and research | Identifies additional bacteria species using observations and research |
| **Improvements** | States one possible improvement to the experiment | Explains expected impact of improvement | States additional possible improvement to the experiment | Explains expected impact of additional improvement |  |  |
| **Conclusion** | States whether experiment results support hypothesis | Uses data to explain concluding statement |  |  |  |  |
| **Referencing** | Includes reference(s) for research information |  |  |  |  |  |

**Marking Key**

Each cell is worth 1 mark for a total of 38 marks.