Year 11 Integrated Science - General

Science Inquiry Skills

Task 1: Microscope Practical Investigation

VALIDATION – MARKING KEY

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| Student Name: |  | |
| Date: |  | |
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| Total weighting of Task 1: Microscope Practical Investigation: 12.5% | | |
| **Weighting of this task in Investigation 1: 7.5%** | | |
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| I acknowledge that all the information contained in this task is my own work and not taken from other sources. | | |
|  | |  |
| (Student Signature) | | |

Marks:

/ 20

***Read the following information and answer the questions that follow.***

Miranda is a veterinary student and wanted to know what happened to red blood cells when they are exposed to different water solutions. To test this, she was given three samples of blood from an animal at her clinic.

Chart, diagram

Description automatically generatedMiranda exposed the first sample to distilled water (hypotonic solution), the second to a 40% salt solution (hypertonic solution), and the third in an isotonic solution (same concentration as cell). An Isotonic solution is one that has the same concentration as another solution. If these two solutions are separated by a semipermeable membrane, the solution will flow equal parts out of each solution and into the other.

The method of Miranda’s experiment is as follows:

1. Miranda placed a drop of each blood sample on three different slides, labelled them distilled water, salt solution and isotonic, then viewed them under a microscope at 400x magnification.
2. She then calculated the number of red blood cells in her field of view, determined average cell diameter and recorded them in her table.
3. Miranda then added three drops of distilled water to her distilled water slide, three drops of salt solution to her salt solution slide and three drops of isotonic solution to her isotonic slide.
4. She then recorded the any immediate changes to the average cell diameter and recorded them in her table.
5. Lastly, she recorded any changes to the average cell diameter on all three slides every ten minutes for the next thirty minutes.
6. Miranda’s investigation results are in the table below.

|  |  |  |  |
| --- | --- | --- | --- |
| Time (minutes) | Cell Diameter (µm) | | |
| Distilled water | Salt Solution | Isotonic |
| Before | 7 | 7 | 7 |
| Initial (0) | 7 | 6 | 7 |
| 10 | 8 | 4 | 7 |
| 20 | 10 | 2.5 | 7 |
| 30 | 0 | 2 | 7 |

***Answer the following questions related to Miranda’s investigation.***

1. What is the aim of the investigation? (1 mark)

To see what happens to red blood cells then they are exposed to solutions with different concentrations

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1. What is the independent variable of this investigation? (1 mark)

The different solution concentrations

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1. What is the dependent variable of this investigation? (1 mark)

The cell diameter

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1. Write a hypothesis for this investigation *(an if, then statement).* (1 mark)

If the solution a red blood cell is exposed to is changed, then the diameter of the cell will change.

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1. What is the variable the Miranda has controlled in the investigation? (1 mark)

The amount of solution added to the microscope slide with the blood smear, the intervals in which she took measurements, the isotonic solution.

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1. What was the purpose of the isotonic microscope slide? (1 mark)

It is a control variable, where the solution concentration is not changed.

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1. What would have been the problem if Miranda had put more than three drops of solution on one of her slides? (1 mark)

The ratio of solution to blood smear would be different in the three slides, so her experiment would not be fair.

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1. The following questions are related to the graph below.
2. Using evidence from the graph in your answer, what happened to the blood cells in the distilled water (hypotonic solution)? (2 marks)

Up until the 20minute mark, the cell diameter expanded as much as it could. After 20 minutes the cell membrane burst, therefore the diameter became zero.

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1. Using evidence from the graph in your answer, what happened to the blood cells in the salt solution (hypertonic solution)? (2 marks)

Over time, the diameter of the cells in the hypertonic solution decreased until there were no more water particles in the cell.

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1. Summarise the results of this investigation. What do these results indicate about how water concentration impacts red blood cells? (2 marks)

Cells in the isotonic solution did not have an increase or decrease in diameter. The cells in the isotonic solution decreased in size as the water left the cell, and the cells in the distilled water solution expanded until the membrane could no longer support the high amount of water within the cell.

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1. Describe one way Miranda could have improved on her red blood cell investigation.

(2 marks)

She could have repeated her trials to get a more accurate measure of diameter changes.

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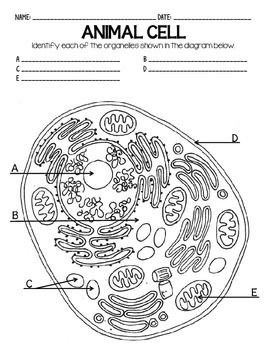
1. The red blood cells Miranda looked at under 400x magnification had an average starting diameter of 7µm. What would be the diameter of the cells at 100x magnification? (1 mark)

\_\_\_\_\_\_\_\_\_28µm\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Diagram

   Description automatically generated Miranda drew the below diagram of her microscope specimen. List the three things it is missing. (1.5 marks)
2. \_\_\_No title \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_Shaded area\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_No magnification \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Identify each of the organelles shown in the diagram below. (2.5 marks)



1. \_\_\_Nucleus\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_ Cytoplasm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_Lysosomes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. \_\_\_Cell membrane\_\_\_\_\_\_\_\_\_\_\_\_
5. \_\_\_Mitochondria \_\_\_\_\_\_\_\_\_\_\_\_\_