**Integrated Science Unit 1**

**Task 2: Effects of Temperature on the Cell membrane**

**Task Type : Science Inquiry**

**Weighting of Task : 7 %**

**Temperature and diffusion**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. There are TWO SECTIONS in this science inquiry activity. You must attempt ALL sections.
2. You are not permitted to use your notes.
3. The time allowed to complete the questions is 60 minutes.

|  |  |  |
| --- | --- | --- |
|  | **Marks Allocation** | **Your Total** |
| **Section One** | 25 |  |
| **Section Two** | 10 |  |
| **TOTAL** | 36 |  |
|  | | Percentage % |

**Section one**

**Introduction**

**Diffusion**

Dissolved substances have to pass through the cell membrane to get into or out of a cell. Diffusion is one of the processes that allows this to happen. For a cell to survive this process must occur quickly.

Diffusion occurs when particles spread. Molecules of a material move from an area of high concentration (where there are many molecules) to an area of low concentration (where there are fewer molecules). Diffusion happens when the particles are free to move. This is true in gases and for particles dissolved in liquids. Particles diffuse down a concentration gradient, from an area of high concentration to an area of low concentration. This is how the smell of cooking travels around the house from the kitchen, for example.

In the lungs, the blood will continue to take in oxygen from the air spaces, as long as the concentration of oxygen there is greater than in the blood. Oxygen diffuses across the lung walls into the blood, and the circulation takes the oxygen-rich blood away.

**Osmosis**

Cell membranes are selectively permeable. This means the membrane lets some substances through, but not others. This regulates which substances can pass through, as well as how much of each substance can enter or exit at a given time. Selective permeability is essential to cells’ ability to obtain nutrients, eliminate wastes, and maintain a stable interior environment different than that of the surroundings (maintain homeostasis).

**Aim**: to investigate how temperature would affect the rate of diffusion of nutrients in or out of a cell.

1. For this investigation state the following: (4 marks)

**Hypothesis: If temperature increases, then the diffusion rate will increase compared to cold**

**temperatures**

**Independent Variable**: change in temperature

**Dependent Variable**: how far the sodium hydroxide diffuses into the agar/distance sodium hydroxide

moves

**Materials**:

Pre-made test tubes half-full with agar jelly containing phenolphylene (indicator for a base)

Sodium hydroxide (a base)

Beakers

Thermometers

Stop watches

Ice and a kettle

**Note**: When Sodium Hydroxide (base) comes in contact with the agar jelly and the indicator, the jelly will turn pink. As the sodium hydroxide diffuses down the jelly the jelly will turn pink and the amount of pink jelly can be measured.

**Procedure:**

1. Each group collect 9 test-tubes containing the jelly and three beakers. Label the beakers A, B & C.
2. Place three test-tube sin each beaker.
3. Put 150mls of ice cold water in beaker A – measure the temperature, 150mls of warm water in beaker B – measure the temperature and 150mls of hot/50oC water in C.
4. Add 5mls of Sodium Hydroxide to each test-tube in beaker A and start the stop watch.
5. Repeat step four for beakers B and C.
6. Every 5 minutes record how much of the jelly has turned pink.
7. Continue measuring for 20 minutes.
8. **Identify three control variables and give specific details**: (3 marks)

For each – half mark for identifying the variable, half a mark for being specific

1. Eg surface area sodium hydroxide in contact with the same, use same diameter teste-tubes
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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4. **During the experiment you will be marked on**:
   1. Laboratory safety safety equipment on, safe use of chemicals (2 marks)
   2. Appropriate care of laboratory equipment care is taken with hot water, put equipment away/clean lab equipment (2 marks)
5. **In the space below draw a table of your results** (4 marks)

Headings or if title explains table

Units

Correct information

Averages calculated

1. **Draw a graph of your results** (5 marks)

##### Title – independent and dependent variable

Axis labelled correctly with units

Scales on axis correct

Points plotted accurately

Line graph

1. Explain the trends shown in the graph (3 marks)

As temperature increases the sodium hydroxide moves further down the agar/diffuses further (1)

Uses data to support description eg in cold water ……….., in hot water ……….. (2)

1. What conclusions can you make from the results of the experiment? (2 marks)

*Must make a reference to the results shown in the graph (1 mark) and then link to hypothesis (1 mark)*

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1. Define diffusion (1 mark)

Molecules of a material move from an area of high concentration (where there are many molecules) to an area of low concentration (where there are fewer molecules).

1. Give an example of diffusion in your home (2 marks)

1 mark for identifying example, 1 mark for describing

e.g. spraying air freshener (1) the smell starts close by to you but then spreads throughout the room

1. Explain why the sodium hydroxide diffused faster in the warmer water baths (2 marks)

Molecules move faster when warm (1) so drag sodium hydroxide through the agar quicker so moves quicker (1)

1. Explain why reptiles move slower when they are cold (2 marks)

Nutrients diffuse into cells slower (1), so slow to make energy needed to move (1)

1. Using your knowledge of diffusion, explain why rubbish bins smell worse in summer than winter.

(2 marks)

The smell particles given off by the rubbish move quicker in the heat/or heat makes them move (1) so move further from the bin so you can smell them/move out of the bin(1)

1. Using your knowledge of diffusion and cells, explain why you think it is important for a person to remain active when in a very cold climate such as Antarctica? (2 marks)

If they are active their body will stay warm (1) therefore the cells will be able to function and person stay alive (1)