**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.

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|  | **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:**

**Independent Variable**:

**Dependent Variable**:

**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-tubes in 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)
9. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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12. **During the experiment you will be marked on**:
    1. Laboratory safety (2 marks)
    2. Appropriate care of laboratory equipment (2 marks)
13. **In the space below draw a table of your results.** (4 marks)
14. **Draw a graph of your results.** (5 marks)

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

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

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**Section 2**

1. Read the below information, and then answer the questions.

**How animals survive in cold conditions**

When we look at our bodies on a miniature scale, down into the reactions that occur in our cells, we find that cold temperatures are linked to slower movement. Temperature is a measure of how fast molecules are moving, the colder the molecules are, the slower they move. Slower (colder) molecules make for slower reactions.

Humans are endotherms (commonly called “warm-blooded”), which means they create their own body heat, so in most cases, you can’t blame your laziness on the cold. **Generating your own heat from within that is sufficient to maintain a steady body temperature requires that the animal is able to generate enough heat in the first place and then hang onto it. This is done by taking enough energy as food to generate the heat and having adaptations to retain the heat generated.**

For ectothermic (“cold-blooded”) animals that don’t create their own body heat, the temperature of the surroundings can affect their activity. Typically, they raise their temperature by basking in the sun until they are warm enough to become active. Reptiles and amphibians do this while invertebrates (such as spiders) are usually small enough to be able to warm up quickly to the ambient temperature from the air alone without basking in direct sunlight. When a lizard is moving slowly in the cold, it is due to its muscle cells being unable to work faster.

1. Define diffusion. (1 mark)

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

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

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

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

(2 marks)

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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)

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