**GENERAL INTEGRATED SCIENCE– UNIT 1**

**TASK 2 – Cell Membrane Practical**

**NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ WEIGHTING: 8 %**

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**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 internal 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.**

You will be modelling the impact of temperature on diffusion in a real cell by recording **how much sodium hydroxide (NaOH) diffuses into agar jelly** at **different temperatures.**

1. **For this investigation, state the following:** *(2 marks)*

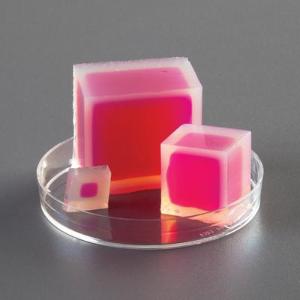
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1. **Create a concise and testable hypothesis for this experiment** *(2 marks)*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Materials**:

* 3 x Pre-made testubes part-full of agar jelly containing phenolphthalein (indicator for a base)
* Sodium hydroxide (a base)
* 3 x 200mL beakers
* Thermometer
* Stop watch
* 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 must collect three test tubes containing the agar jelly and three 200mL beakers.
2. Label the beakers A, B & C.
3. Place one test-tube into each beaker.
4. Put 150mls of ice-cold water in beaker A. Measure and record the temperature.
5. Repeat step 4 with 150mls of warm water in beaker B and 150mls of hot/50oC water in C.
6. Add 5mls of Sodium Hydroxide to each test-tube in beaker A, B and C, and start the stop watch.
7. Every three minutes record how much of the agar jelly has turned pink in each test-tube. Do this by using a ruler to measure the total spread of pink.
8. Continue measuring for 21 minutes.
9. **In the space below create an appropriate table to record how much agar has turned pink, at the three different temperatures, every three minutes** *(3 marks)*
10. **During the experiment you will be marked on**:
    1. Laboratory safety *(1 mark)*
    2. Appropriate care of laboratory equipment *(1 mark)*
11. **Graph all of your results for how much agar has turned pink at the three different temperatures on the grid below** *(6 marks)*

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1. Describe any trends shown in the graph.  *(3 marks)*

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1. Write an appropriate scientific conclusion for this experiment  *(2 marks)*

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1. State two variables that were controlled during your experiment and explain why they needed to be controlled. *(3 marks)*

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1. State one way to improve the reliability of this experiment *(1 mark)*

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1. Describe whether this was a valid experiment *(2 marks)*

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Additional Table Space

**Section 2**

**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. **Generating enough body heat to maintain a steady body temperature requires that the animal is able to make 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 special adaptations to keep 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 just from the heat in the air. When a lizard is moving slowly in the cold, it is because its muscle cells are unable to work faster.

1. State a definition for diffusion. *(1 mark)*

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1. Explain why the sodium hydroxide diffused faster in the warmer beakers. *(2 marks)*

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

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1. Cellular Respiration is the process that your body uses to generate ATP (energy), and also body heat.
2. State the nutrients needed by your cell to conduct Cellular Respiration. *(2 marks)*

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1. Name the cell organelle that respiration occurs in. *(1 mark)*

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1. In addition to cellular respiration, plants can also photosynthesise. Describe why humans cannot photosynthesise. *(1 mark)*

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

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1. To enter your cells, substances must cross the cell membrane. In the space below, draw and label a diagram of a cell membrane. *(2 marks)*