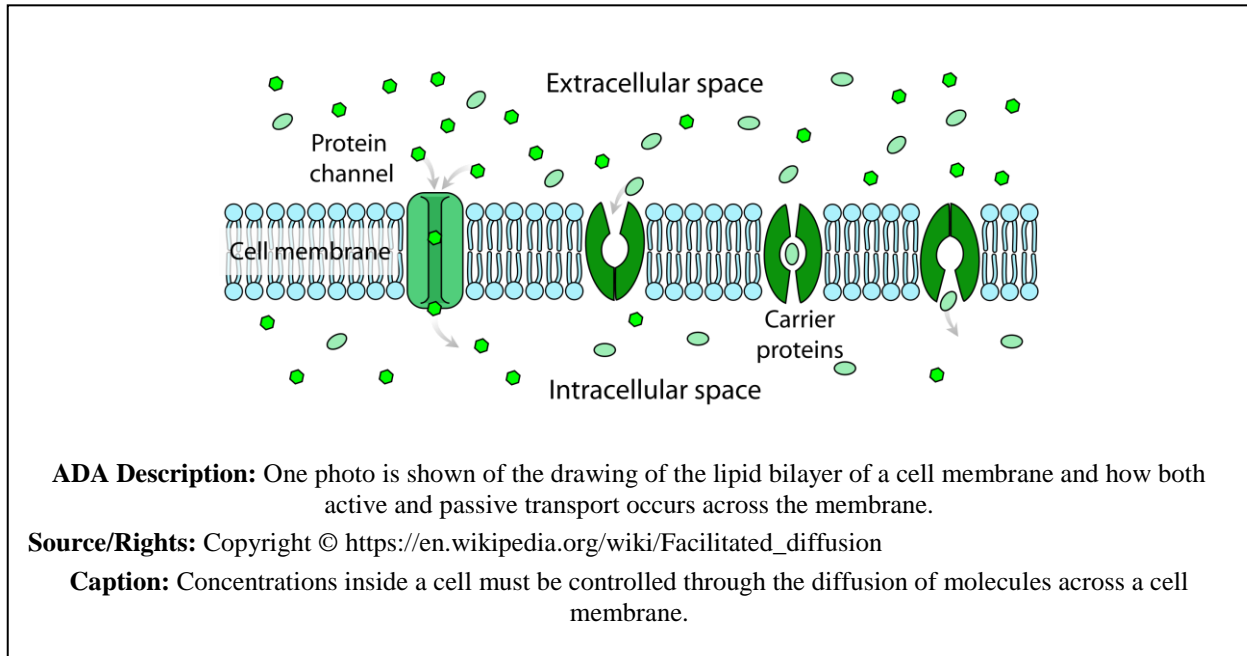


Diffusion

Subject Area(s) Life Sciences

Associated Unit Cell Transport

Lesson Title Diffusion across a membrane



Grade Level 9

Lesson # 1 of 1

Lesson Dependency

Time Required Three or four 50 minute periods

Summary

Day 1: Hook and Introduction: Students will be present with an extended bell ringer where they are shown a simple drawing of the lipid bilayer of a cell membrane and asked to explain how a molecule like water or glucose would cross the membrane and get into or out of the cell. After time has been given for students to brainstorm in groups and share ideas as a class a video showing diffusion of food coloring throughout a beaker containing water will be shown. Following this video students will be asked to brainstorm what factors they think would affect the rate of the diffusion they just viewed.

Day 2: Diffusion of food coloring in water lab – students will learn about how stirring and temperature affect diffusion rate of food coloring in a container of water. After making hypotheses about each factor they will time and compare the rate of diffusion in 1) a stirred versus unstirred beaker and 2) a beaker filled with cold water, room temperature water and hot water.

Day 3: Selective Permeability Lab: Students will observe the movement of three different types of molecules (glucose, iodine and starch) across a selectively permeable membrane (dialysis tubing) and draw conclusions which molecules moved across the membrane. Based on their observations they will then reach conclusions about the relative size of each molecule.

Day 4: Selective Permeability Lab Argument Driven Inquiry: Using whiteboards students will make claims about their results from the Selective Permeability Lab, back them up with evidence and state justifications for their claims based on their evidence. This may be conducted in a round robin approach with members of each group rotating around to see and discuss the results of other groups.

Engineering Connection

Engineering Category

Choose the category that best describes this lesson's amount/depth of engineering content:

1. Engineering analysis or partial design

Keywords

Diffusion, molecule, selective permeability, membrane

Educational Standards (List 2-4)

[State STEM Standard](#) (required)

SC.912.N.3.5 Describe the function of models in science and identify the wide range of models used in science.

[ITEEA Standard](#) (required)

Standard 10 The role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

- A. Asking questions and making observations helps a person to figure out how things work.

[NGSS Standard](#) (strongly recommended)

SC.912.L.14.2

Explain the role of cell membranes as a highly selective barrier (passive and active transport).

SC.912.N.1.3

Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.

SC.912.N.1.6

Describe how scientific inferences are drawn from scientific observations, and provide examples from the content being studied.

[CCSS Standard](#) (strongly recommended)

LAFS.1112.RST.1.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.

Pre-Requisite Knowledge

Learning Objectives

After this lesson, students should be able to understand the process of diffusion and how a selectively permeable membrane allows some types of molecule to pass through while other are not able to pass through the membrane. This should give students a foundation for learning about passive diffusion, facilitated transport and active transport in cells.

Introduction / Motivation (5E – Engage)

In Biology students must learn how cells function and the role of the cell membrane. One the cell membrane's important roles is to act as a selectively permeable membrane that allows some molecules to pass through while preventing others from doing so. Understanding the concept of diffusion is a starting point for understanding the different ways that selectively permeable cell membranes function. Students will begin by brainstorming how different molecules might pass or be prevented from passing across a cell membrane. Following this they will watch a video showing diffusion in action and in the absence of a membrane at:

<https://www.youtube.com/watch?v=Bz02z4GSS0k>

Lesson Background & Concepts for Teachers (5E – Explain)

Following the engagement activity some basic vocabulary necessary for the labs may be introduced.

Vocabulary / Definitions

Word	Definition
Diffusion	Process by which particles tend to move from an area where they are more concentrated to an area where they are less concentrated
Molecule	Smallest unit of most compounds that displays all the properties of that compound
Selective Permeability	Property of biological membranes that allows some substances to pass across it while others cannot
Membrane	An enclosing or separating barrier

Associated Activities (5E – Explore)

Students will engage in the Diffusion of food coloring in water lab where they are able to manipulate temperature after generating hypotheses about how temperature will affect the rate of diffusion throughout a beaker of water. Following this they will engage in the Selective Permeability Lab where they will be able to observe the diffusion (or lack of) three different types of molecules across a semipermeable membrane.

Lesson Closure

After recording observations of the results students should be able to make claims about the relative sizes of the different molecules and defend their conclusions in a round robin discussion with other groups of students.

Assessment (5E – Evaluate)

Students learning can be assessed during the presentation and round robin discourse of each group's claim, evidence and justification which is based on their interpretation of their results. A more formal assessment could be used in addition to or to replace this aspect of the lesson.

Lesson Extension Activities (5E – Extension)

Additional Multimedia Support

References

Dialysis Tubing Experiment:

<http://schoolworkhelper.net/selective-permeability-of-dialysis-tubing-lab-explained/>

Attachments

Other

Redirect URL

Contributors Robert Herzog

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Acknowledgements

Classroom Testing Information