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Build-A-Membrane

Abstract

Cut, fold, and paste biomolecules to create a three-dimensional cell membrane with embedded proteins.

Learning Objectives

- Membranes have proteins embedded in them.

- Membrane-embedded proteins allow cellular signals and other molecules to pass through the membrane.

Logistics

Time Required

- **Class Time:**
  30 minutes

- **Prep Time:**
  10 minutes

Materials

Biomolecule cut-outs
Scissors
Tape
Copies of student instructions

Prior Knowledge Needed

None

Appropriate For:

Primary   Intermediate   Secondary   College

Module
Amazing Cells

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Classroom Implementation

Activity instructions:

- Have students work individually or in pairs to build a portion of a cell membrane by following the instructions on the student pages.

- On a large table, have students put their completed membrane sections together, matching channel protein to channel protein, to create one large, protein-studded membrane.

Discussion Points:

- A cell is enclosed, or defined by a membrane.

- A wide variety of proteins are located in and around membranes. These proteins can associate with membranes in a variety of ways.

  » Integral proteins extend through one or both layers of the phospholipid bilayer.

  » Some proteins are attached to lipid molecules which anchor them to the membrane.

  » Receptor proteins transmit signals across a membrane.

  » Transporter and channel proteins form pores through the membrane that can be opened and closed to allow specific molecules to pass through.

- Membranes also organize the interior of a cell. Cell organelles are defined by membranes.

- Membranes form spontaneously.

Quantities

Per Group of 2

➤ Student pages S1 - S4

➤ Scissors

➤ Tape

Extensions

Research a membrane protein and its specific function.

Standards

U.S. National Science Education Standards

Grades 9-12:
- Content Standard C: Life Science - The Cell; Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world.

B. AAAS Benchmarks for Science Literacy:

Grades 9-12
The Living Environment
- Cells

  » Every cell is covered by a membrane that controls what can enter and leave the cell.

Module

Amazing Cells

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Credits

Molly Malone, Genetic Science Learning Center
Sheila Avery, Genetic Science Learning Center (illustrations)

Funding

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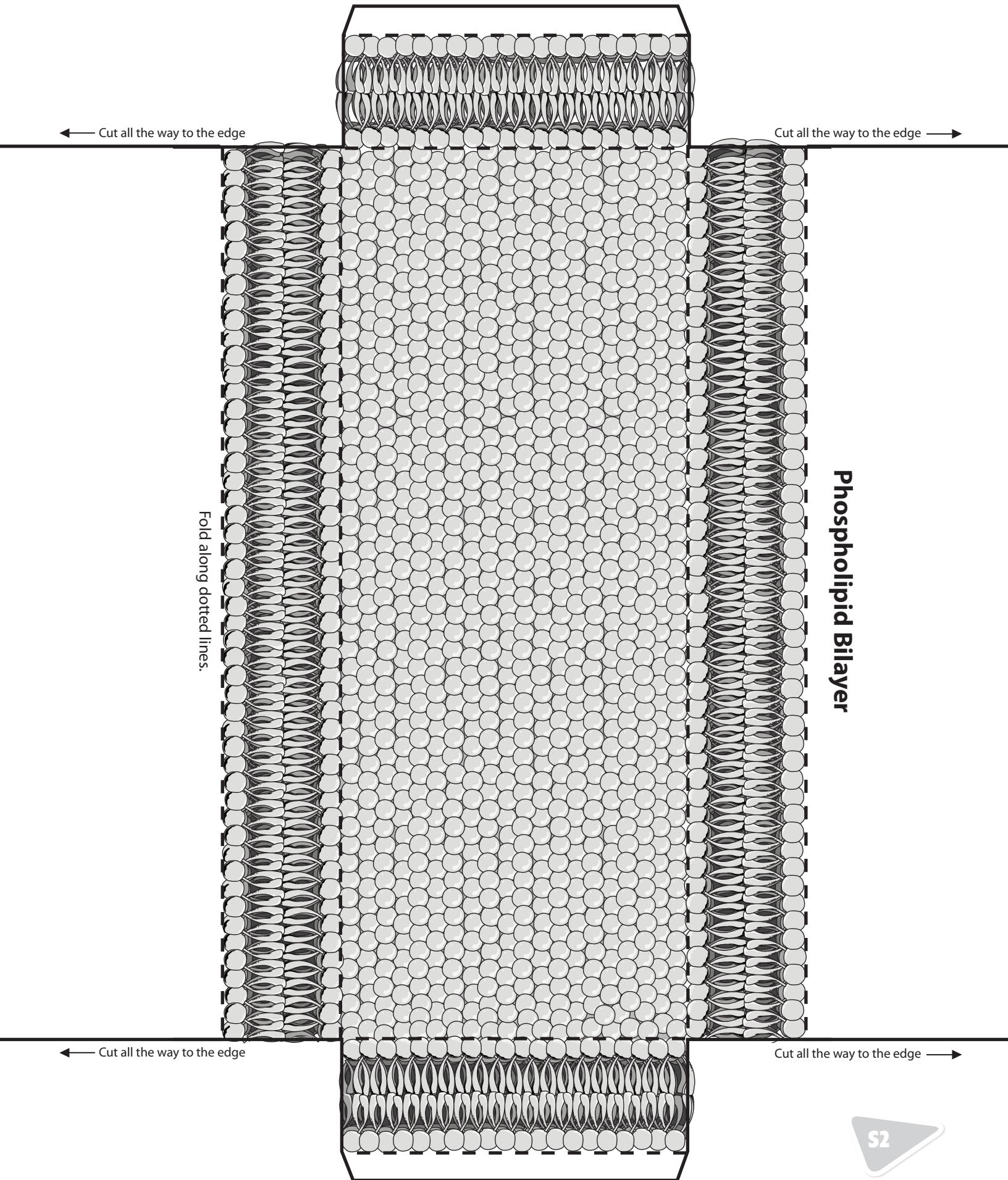Center

Build-A-Membrane

Cell membranes are made of phospholipid molecules that arrange themselves into two rows called a bi-layer. Proteins are embedded in the phospholipid bilayer, through one or both layers. These proteins help other molecules cross the membrane and perform a variety of other functions. Create a model of a small section of cell membrane by following the instructions below.
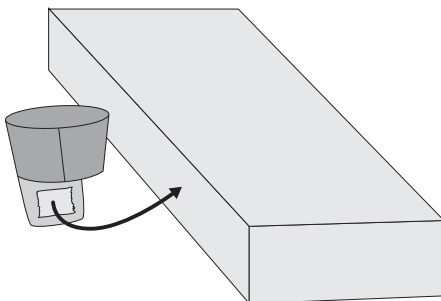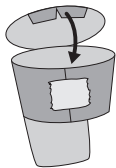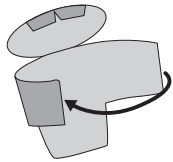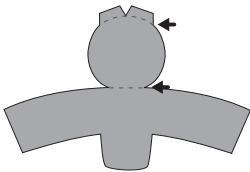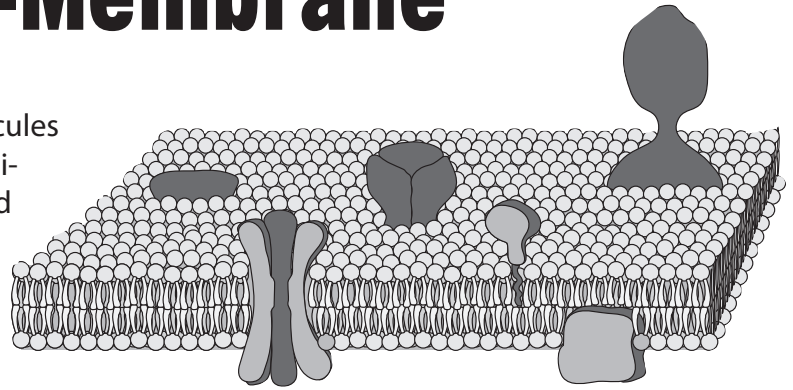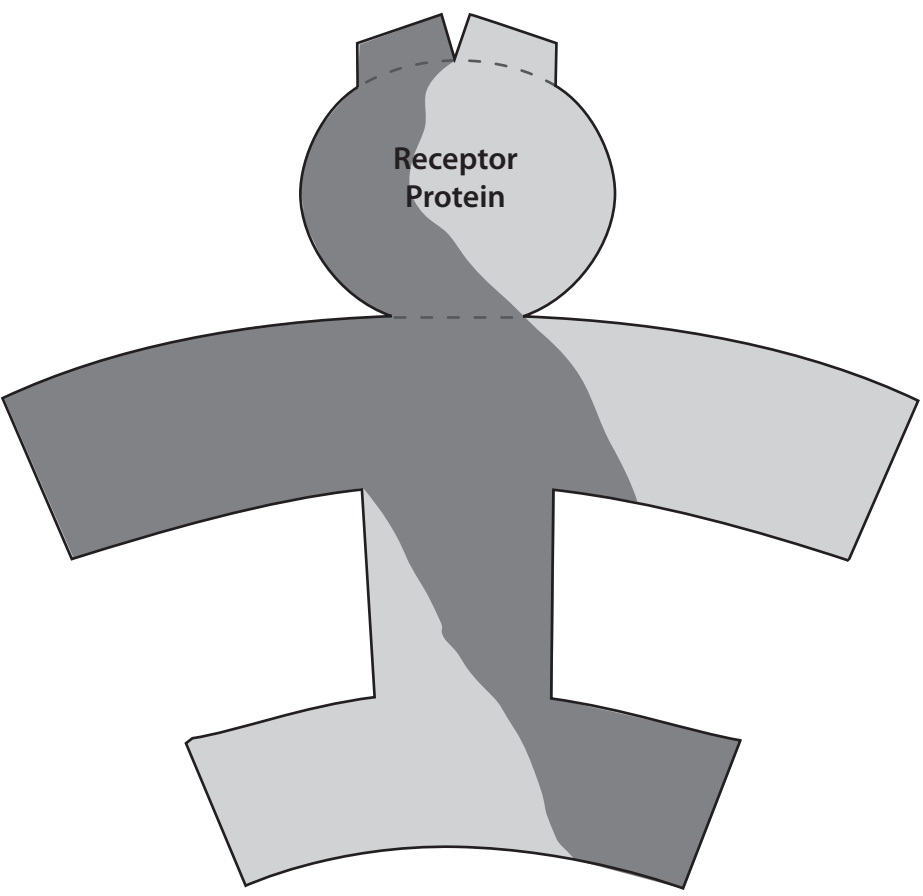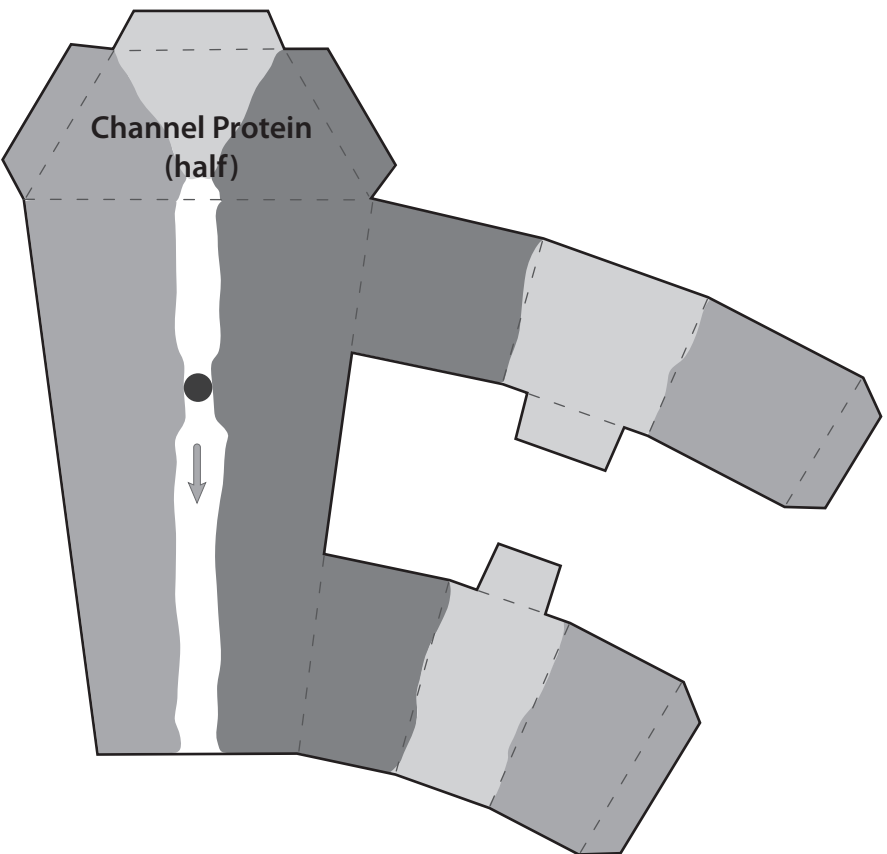
1. Cut out the phospholipid bilayer (page S2) along the solid lines. Cut all the way to the edges of the paper in the direction of the arrows.

2. Fold the phospholipid bilayer along the dotted lines and tape the edges together to form a fully enclosed rectangular box.

3. Cut out each protein (pages S3 and S4) along the solid black lines and fold along the dotted lines.

4. Form a 3-D shape by joining the protein sides and tops together and tape them in to place. Use the tabs to help you.

5. Tape the 3-D proteins into place along the edges of the phospholipid bilayer.

6. By staggering the transmembrane proteins back and forth along both long sides of the bilayer "box", the whole model will stand up by itself on a table.

Fold along dotted lines.

Phospholipid Bilayer

S2

**Channel Protein
(half)**

**Receptor
Protein**

Protein Cut-outs

S4

Transporter
Protein

Tethered
Protein

Anchored
Protein

Protein Cut-outs