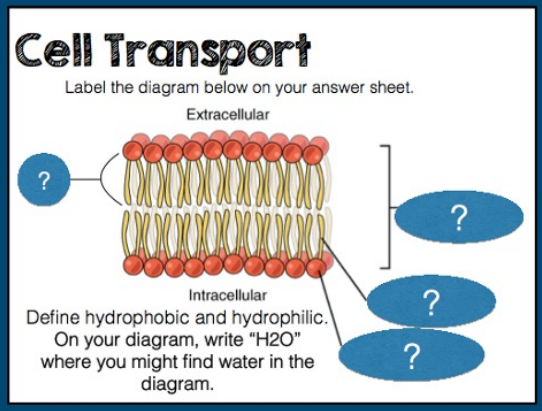
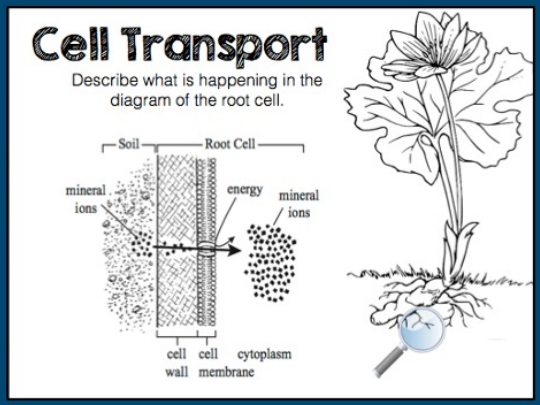
# cell transport *unit plan*

## GRADES 8 + COMPLETE UNIT

## TOPICS:

- ✓ Simple diffusion
- ✓ Passive Transport
- ✓ Active Transport
- ✓ Transport proteins
- ✓ Cell size- volume :surface area
- ✓ How cell transport affects life



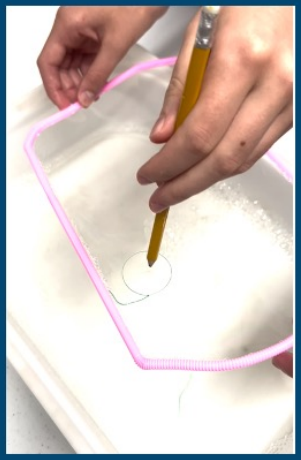



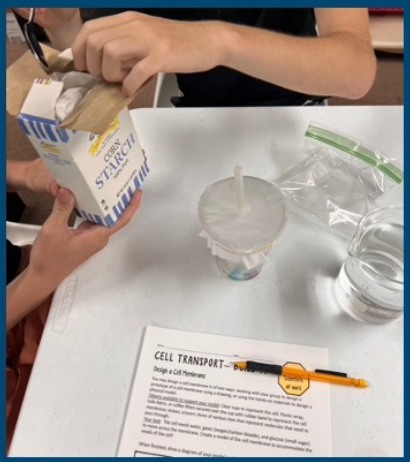

biology roots

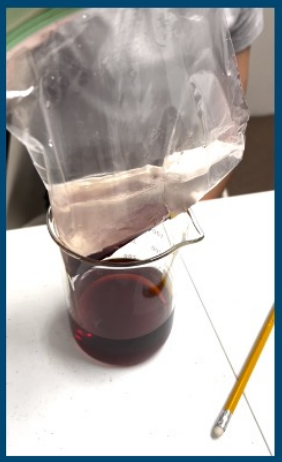
# Cell Transport ATLAS Activities (optional)

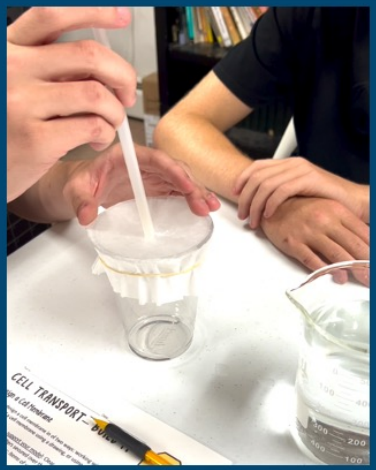
## Analyzing and Thinking Like A Scientist

### Includes guided inquiry, models, and case studies.








Name: _____ Date: _____

## CELL TRANSPORT– BUILD IT

CAUTION: Scientists at work

### Design a Cell Membrane

You may design a cell membrane in of two ways: working with your group to design a prototype of a cell membrane using a drawing, or using the hands-on materials to design a physical model.

Objects available to support your model: Clear cups to represent the cell. Plastic wrap, tulle fabric, or coffee filters secured over the cup with rubber band to represent the cell membrane; straws; scissors; items of various sizes that represent molecules that need to pass through.

Your task: The cell needs water, gases (oxygen/carbon dioxide), and glucose (small sugar) to move across the membrane. Create a model of the cell membrane to accommodate the needs of the cell!

When finished, draw a diagram of your model in the space below.

Name: _____ Date: _____

## Explore It! Predict

Copy the definition of **diffusion** provided by your teacher:

Copy the definition of **osmosis** provided by your teacher:

**Intro:** The cell membrane is selectively permeable, meaning it is picky about what it allows in and out- and thank goodness for that. Imagine if we could never let things in or out... we would eventually grow toxic from wastes building up inside of us, or, we wouldn't be able to let any food or oxygen into our bodies for survival! In this activity, we will demonstrate diffusion on a large-scale basis to simulate how cells might use transport on a small-scale basis.

**Background Info:** Iodine is a biological indicator for starch. This is because it changes color in the presence of cornstarch.

**Materials required:**
250 mL Beaker
Plastic bag
Cornstarch
Iodine

**Directions:** Using a plastic baggie, add about 2 spoonfuls of cornstarch, then fill it about 1/3 of the way with water. Securely tie the baggie so that it is closed (you may use thread or rubber bands to reinforce). Put aside. Fill your beaker up with approximately 200 mL of water. Add about 30 drops of iodine. Place the cornstarch baggie into the beaker.

Name: _____ Date: _____

## Explore It! Simulate the Cell Membrane

**Materials:**

- 1000ml beaker
- 900ml water
- 100ml dish soap
- 25ml corn syrup
- 4 bendy straws
- Additional straw
- Thread
- Tray

**Set up:**

1. Mix the water, soap, and corn syrup in the 1000ml beaker to create a bubble solution.
2. Flatten the "short end" of each of the 4 bendy straws
3. Connect 4 straws together by inserting short ends into long ends to create a square.
4. Place straw frame into the tray
5. Add just enough bubble solution from the beaker to cover the straw frame.

In order to explore your cell membrane, gently lift the frame out of the tray. Be sure enough bubble solution is spanned across to create a full sheet over the frame.

**For the cell membrane concepts listed below, explore how your membrane model supports each one:**

| Concept | Task (be sure the frame has a thin layer of bubble solution across it before you attempt each task) | How your model supports the concept |
|---|---|---|
| Membranes are fluid (flexible; not easily broken) | Carefully hold the frame so that it is parallel to the tray, lift it and begin to gently move the frame up and down until the membrane bounces. | |
| Membranes can self repair | Using the extra straw or your finger, cover it with extra bubble solution. *Slowly* push it through the membrane, then slowly pull it out. | |

## Can be used in one of two ways:

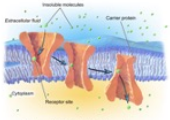
1. As student-lead guided inquiry done in groups before teacher-lead instruction.
2. Or you can choose what you would like to use during traditional teacher-lead instruction.

# Engaging, editable PowerPoint includes simple diffusion, osmosis, facilitated diffusion, endocytosis, exocytosis, sodium potassium pump

## Facilitated Diffusion

Facilitated diffusion is **passive transport** (requires no energy) used to move **ions and polar molecules** across the membrane with the assistance of **proteins.**

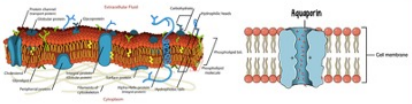
Proteins are needed to assist ions and polar molecules because the inner portion of the cell is nonpolar and will resist any polar molecules trying to pass through.




Facilitated Diffusion

## Osmosis

Water can pass through the cell membrane without proteins in small quantities. Though water is a **polar** molecule, it can diffuse across the cell membrane unassisted. It is small enough that its polarity is not strong enough for the cell membrane to repel it.




**Water can move through the cell membrane without the aid of proteins to some degree. However, channel proteins called aquaporins assist water movement across the cell and result in HIGHER permeability (higher rate of osmosis.)**

## Hypertonic

A cell is in a hypertonic solution if the concentration of water inside the cell is HIGHER than the concentration outside the cell.

Water diffuses from high to low.

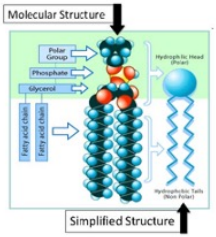
Water leaves the cell.

This is why you should NEVER drink salt water. Doing so will severely dehydrate you!




Think "SALT SUCKS"

## What is a phospholipid?

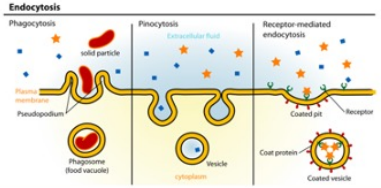



A phospholipid is a lipid with a phosphate group attached. Notice that there is a polar group attached to the phosphate.

Polar= attracted to water.
Nonpolar= repelled by water.

There are 3 types of **endocytosis**:

- Phagocytosis- taking in solid food particles.
- Pinocytosis- taking in dissolved or broken down substances
- Receptor mediated- the cell brings in **specific** substances using receptors (specific hormones, proteins, etc.)



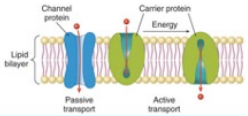

## General Types of Transport Proteins:

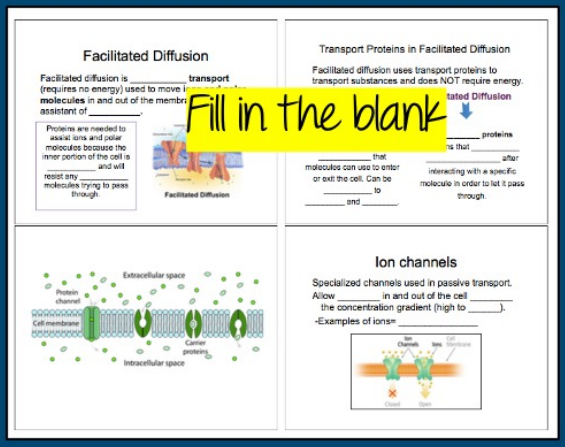
**Transport proteins are used to assist molecules across the cell membrane.**

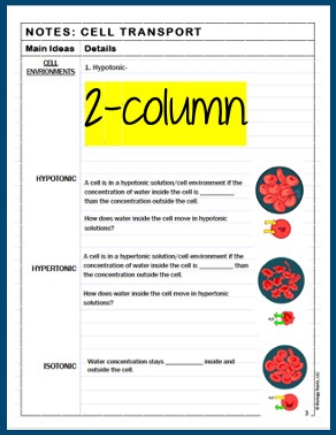
**Channel Proteins** -small openings in the cell membranes; usually used for ions or polar molecules (passive transport)

- **Gated channel proteins-** channel proteins that have a "gate" or flap to open and close in order to let certain substances in or out.

**Carrier Proteins**- transport proteins that can move substances by changing their shape (both passive and active).

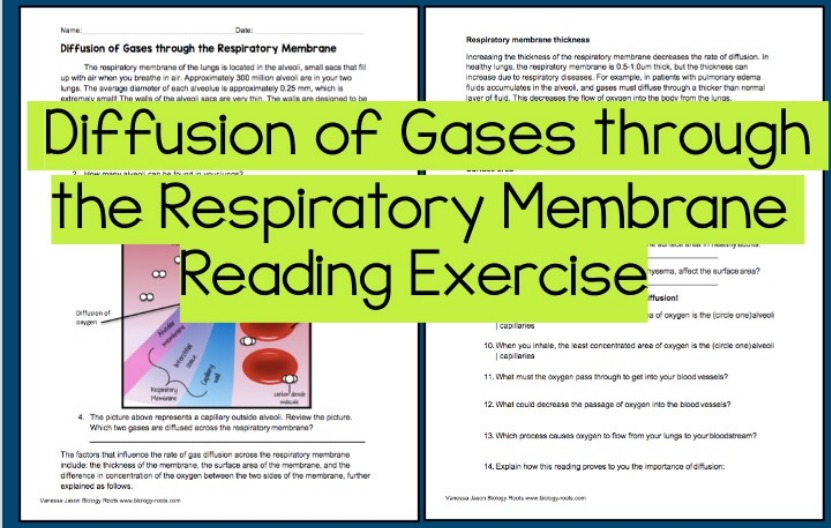


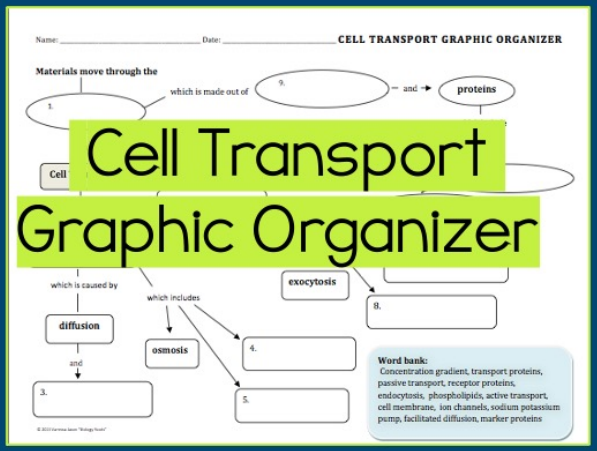




Two types of student notes to choose from: fill-in-the-blank OR guided 2-column.
Choose what works best for you!

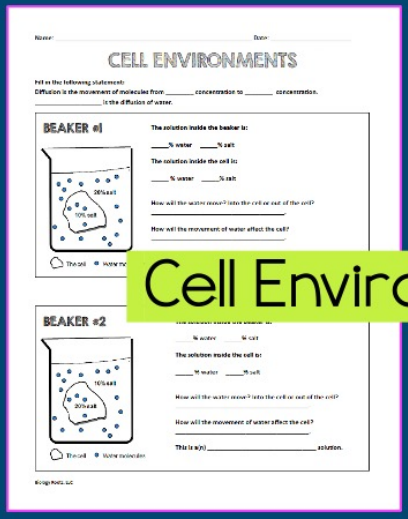
# Classwork

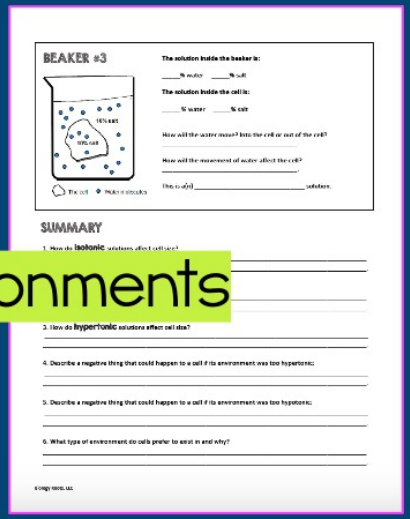


Diffusion of Gases through the Respiratory Membrane Reading Exercise

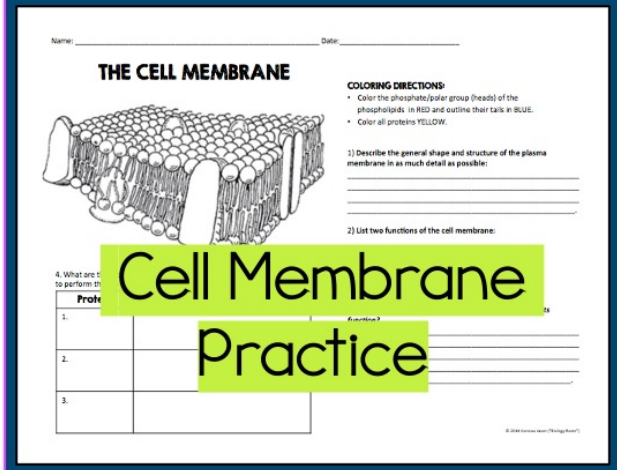


Cell Transport Graphic Organizer





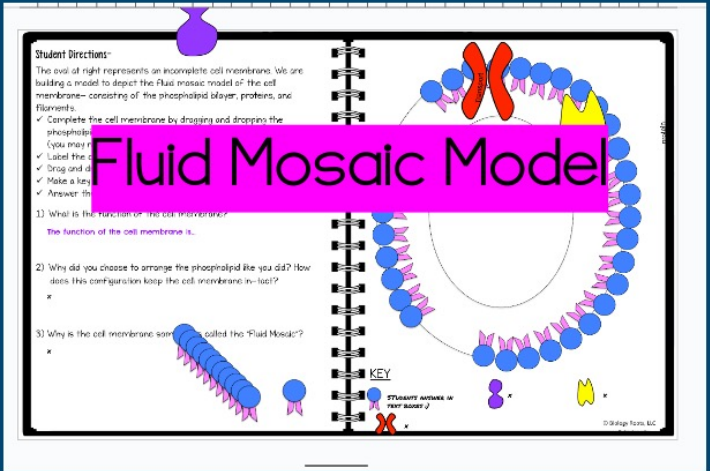
Cell Environments

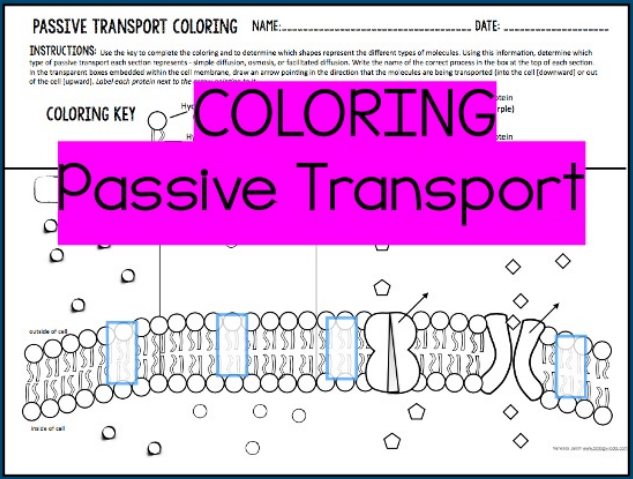


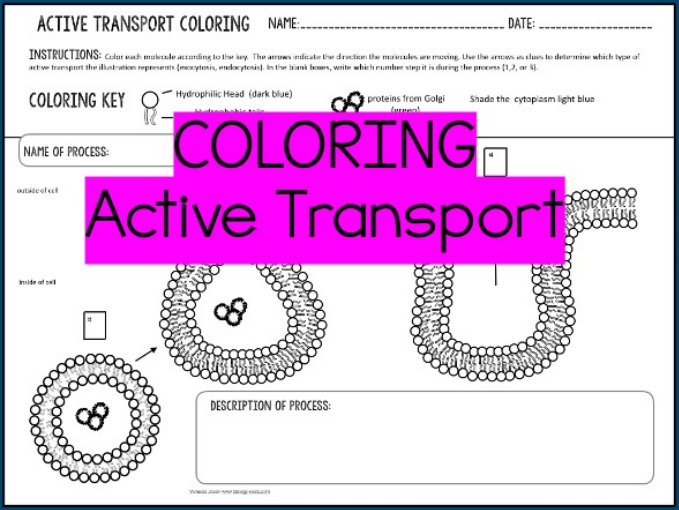
Cell Membrane Practice

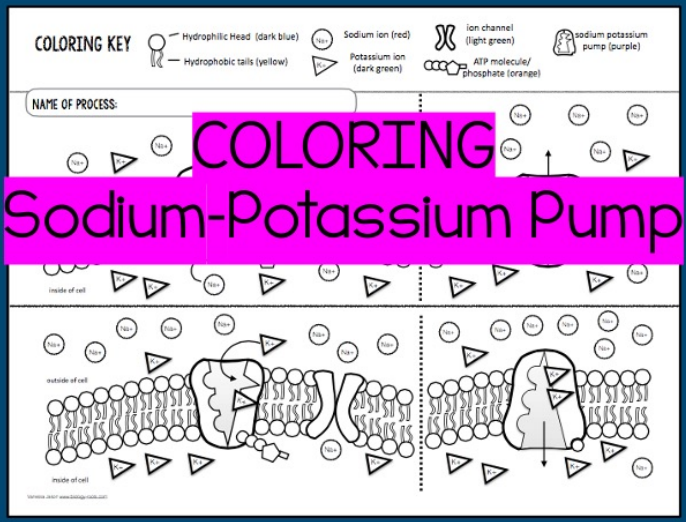
Can be used as classwork or homework

# Classwork



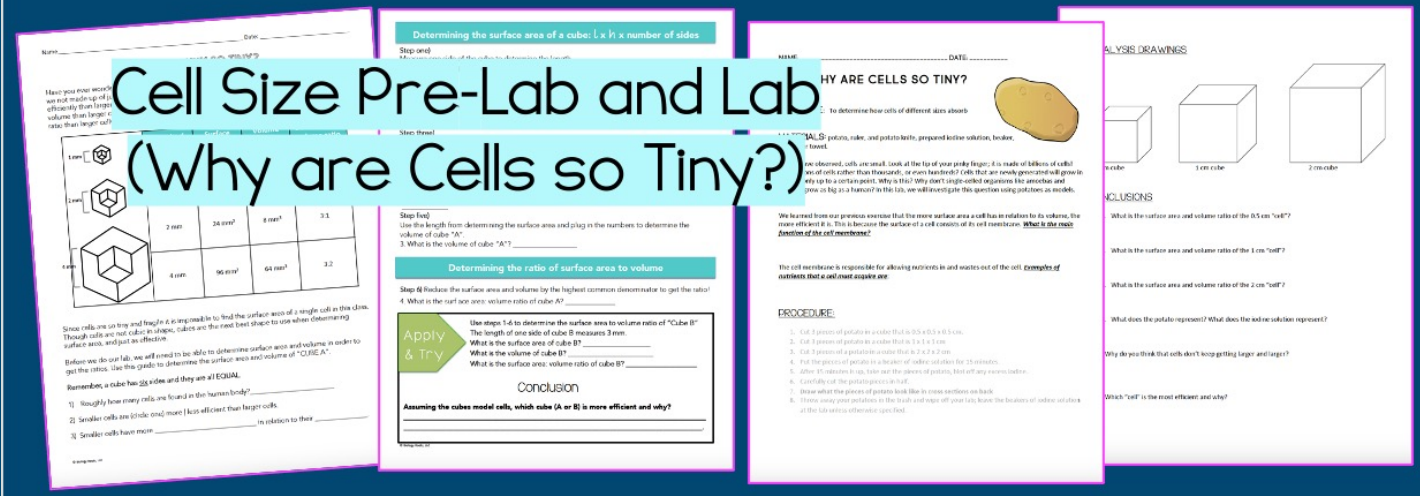



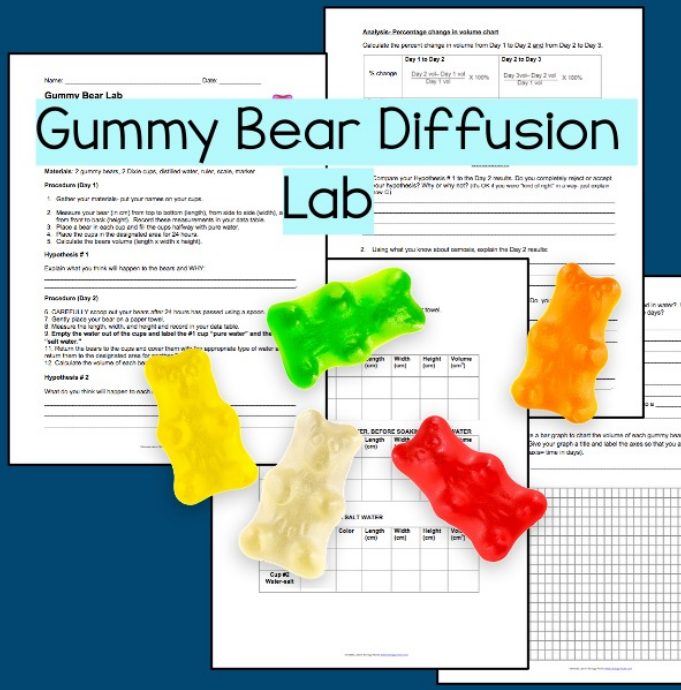



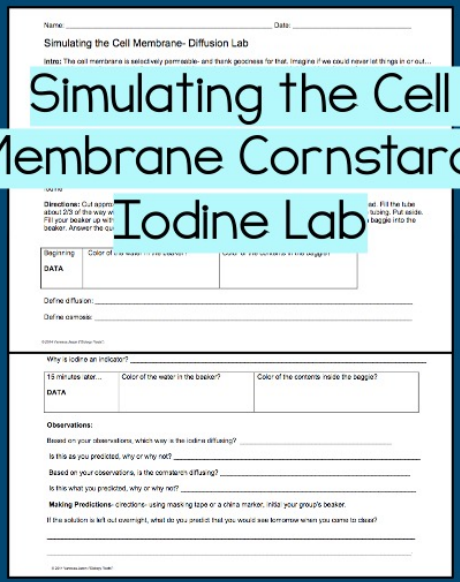




Can be used as classwork or homework

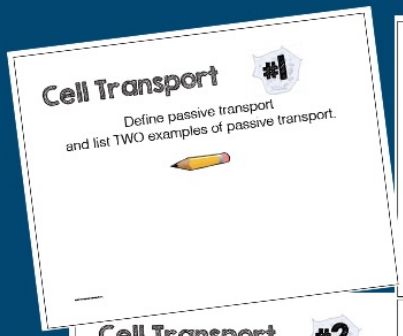
# Lab simulations and models

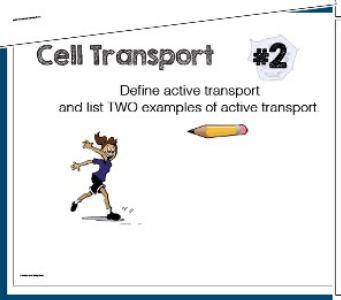


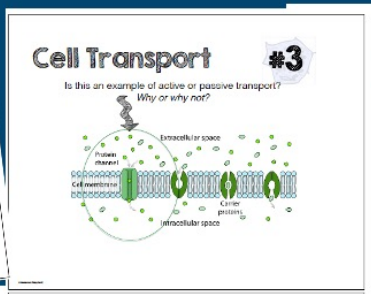



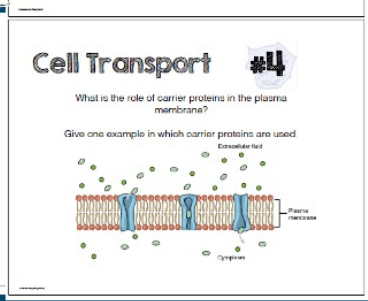



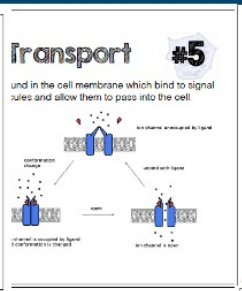
# Cell Transport Task Cards Stations

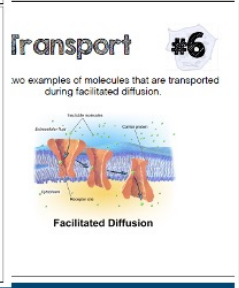


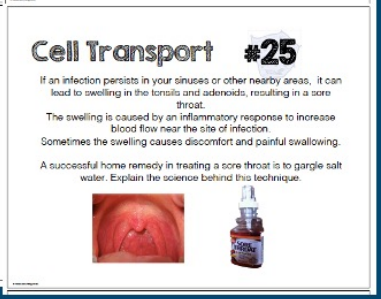



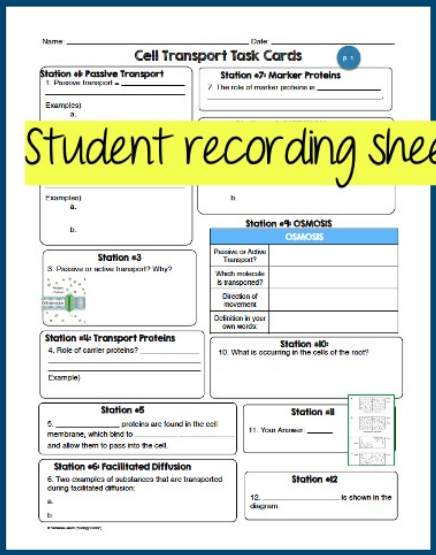



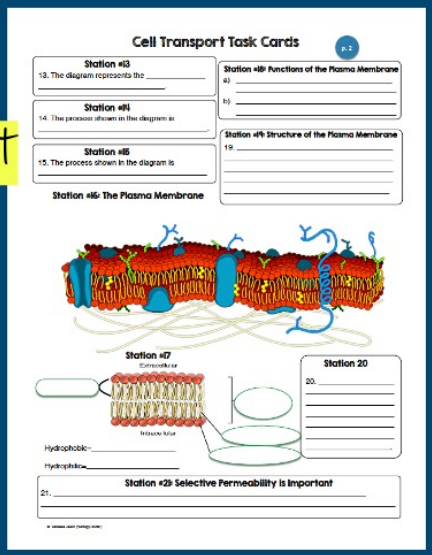


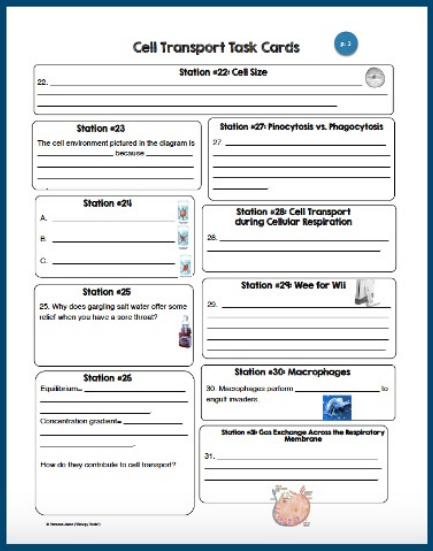




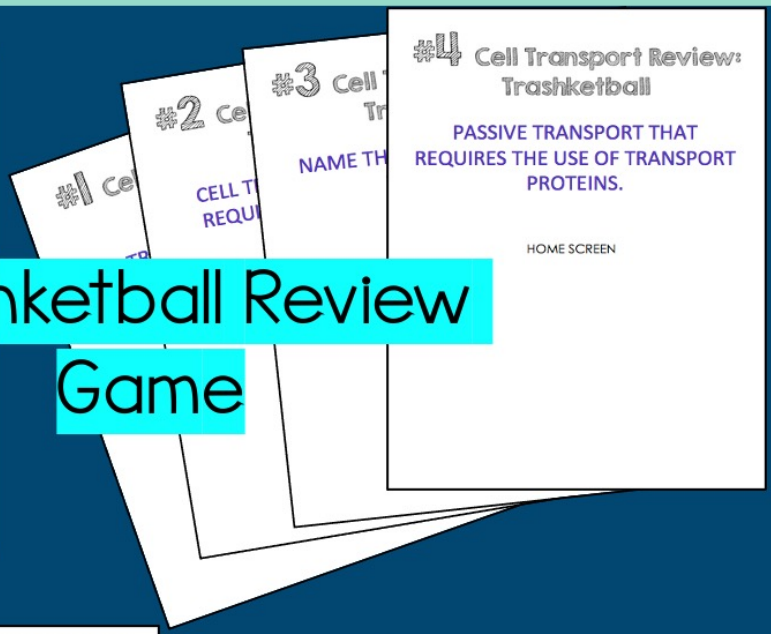

Student recording sheet



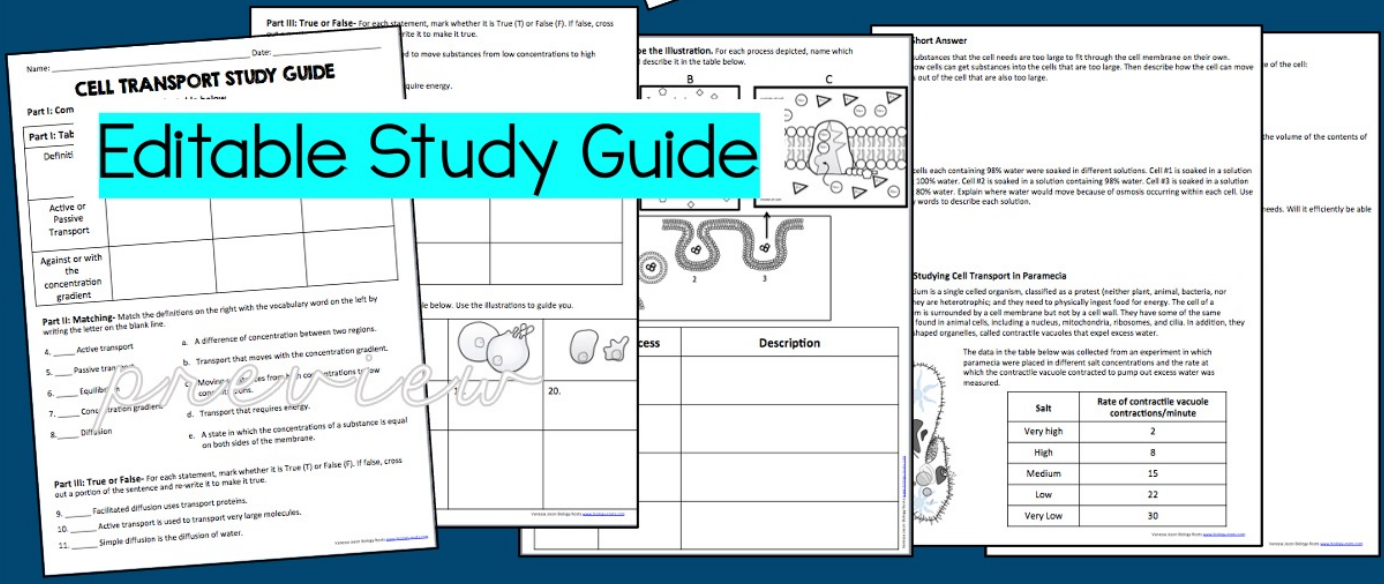



# ...Plus more




## Trashketball Review Game




## Editable Study Guide

Test and quiz also included (not pictured)

| CELL TRANSPORT UNIT BUNDLE ~50 MINUTE BLOCKS | | |
|---|---|---|
| DAY/DATE | STUDENT ACTIVITY AND TEACHER NOTES | LEARNING TARGET |
| (BEFORE) | ATLAS JOURNAL IS OPTIONAL. SEE TEACHER GUIDE FOR MORE INFORMATION AND LEARNING TARGETS. | |
| 1 _____ | Bellringer: Diffusion Demo<br>Cell Transport Notes 1-15<br>Homework: Diffusion Across the Respiratory Membrane | To demonstrate that diffusion is a simple process that requires to energy and is necessary for life processes.<br>[GOAL: Students will recognize cell transport as an important cell process.] |
| 2 _____ | Lab: Simulate the Cell Membrane (if you did this during the optional ATLAS inquiry, you can do a quick demo to revisit it and have students apply their new knowledge for a quick discussion). If skipping, feel free to give 30 minutes for Passive Transport Coloring and then move onto the Notes for the remainder of class.<br>Passive Transport Coloring (Homework if not finished) | To investigate passive transport.<br>[Goal: Students will establish a basic understanding of passive transport.] |
| 3 _____ | Notes up to review slide 22 (unless finished last class)<br>Open note quiz<br>Cell Environments Coloring<br>Heads up: Lab tomorrow | To analyze how different cell environments affect the movement of water across cell membranes. [Goal: Students will be able to identify hypotonic, hypertonic, and isotonic solutions.] |
| 4 _____ | Bellringer: Cell Environments Practice Sheet<br>Begin Gummy Bear lab - set up and day 1- You may substitute the virtual cell transport lab for the gummy bear lab, or save the virtual lab for another day, a sub plan, etc. If you choose to swap, bump everything forward by one day). You will need to print the virtual lab separately. | To investigate how different cell environments can influence osmosis.<br>[Goal: Students will have an understanding of how hypotonic and hypertonic solutions can impact cells.] |
| 5 _____ | Gummy Bear Lab day 2 measurements (should take ~15 min.)<br>Notes up to sodium potassium pump | |
| 6 _____ | Finish Gummy Bear Lab<br>(early finishers start endocytosis coloring) | |
| 7 _____ | COLORING DAY<br>Endocytosis, Exocytosis, Sodium Potassium Pump coloring<br>(if you do not want as much coloring, you may substitute with an online simulation of your choice).<br>You may have students finish coloring for homework, or if that is not a viable option you may give them an additional 10 minutes for coloring during the next class period (pro tip: don't tell them that until a few minutes before the bell rings!) | To outline different types of active transport and how they relate to cells.<br>[Goal: Students will establish a basic understanding of active transport.] |

A pacing guide with learning targets is provided to guide you with lesson planning throughout the entire unit.

Includes both 50 and 90 minute blocks.

Covers both learning targets and learning goals.
Adaptable - use it as is, or make your own!

# More information:

Digital versions are hosted on Google Slides.

Supports NGSS (ATLAS activities particularly).

Tests and quizzes included (not pictured).

LM

Laura M.

Aug 17, 2024

★★★★★ Extremely satisfied

We can't get enough of these units. Each one delivers the same quality and consistency of content, as well as a wide selection of activities. Super-easy to implement too.

# Still not sure if you need this resource?

**This unit is for any teacher who is looking for a truly no-prep evolution unit from start to finish, or simply a large bank of cell transport activities to use in the classroom! If your school is using an online curriculum (such as OpenSciEd) and you are finding that you need to supplement to reach your learners, my unit bundles are compatible and help prevent student burn out – because I know what sparks students! Reach out with questions :)**

**-Vanessa vanessa@biology-roots.com**