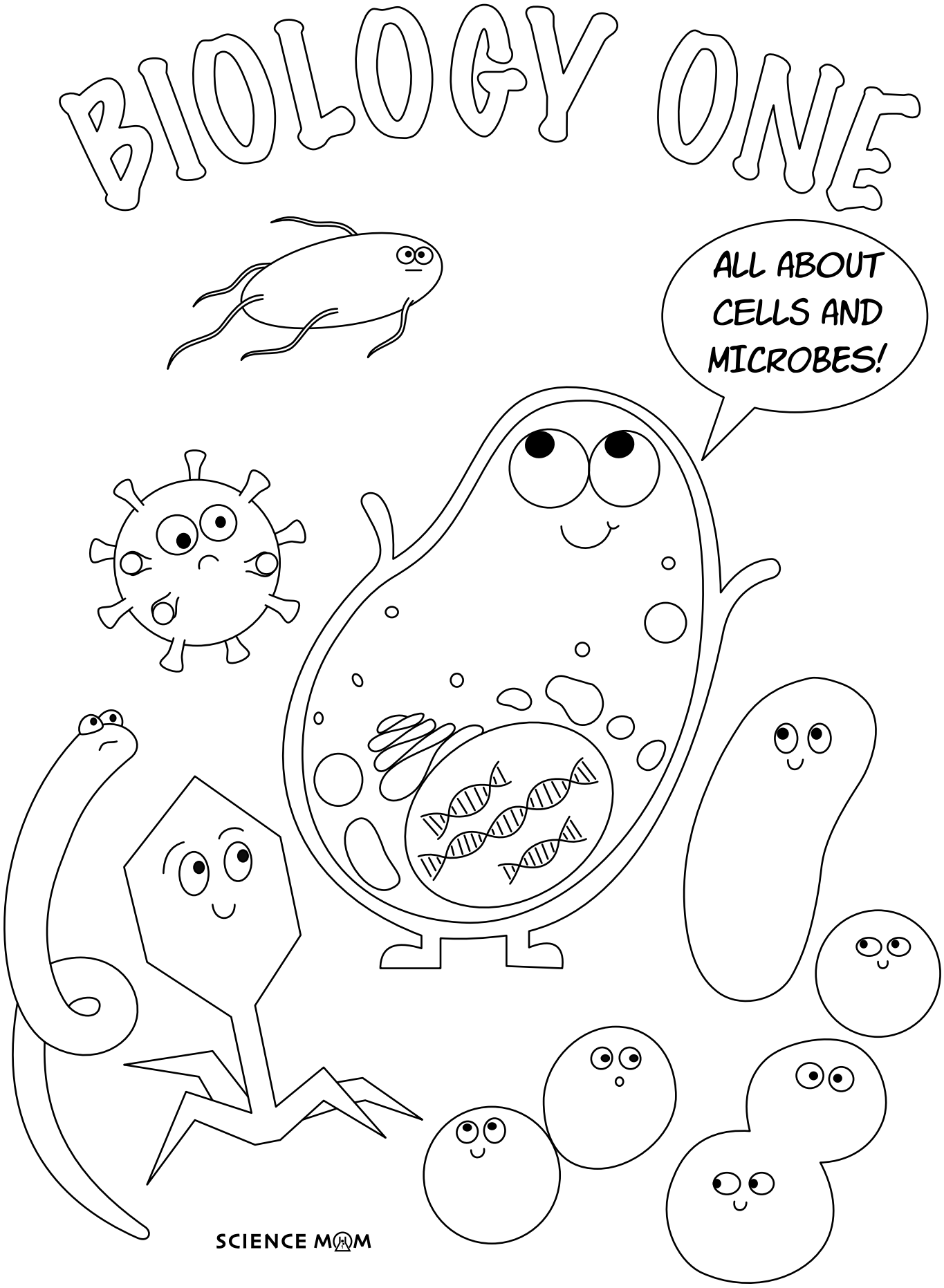
BIOLOGY ONE

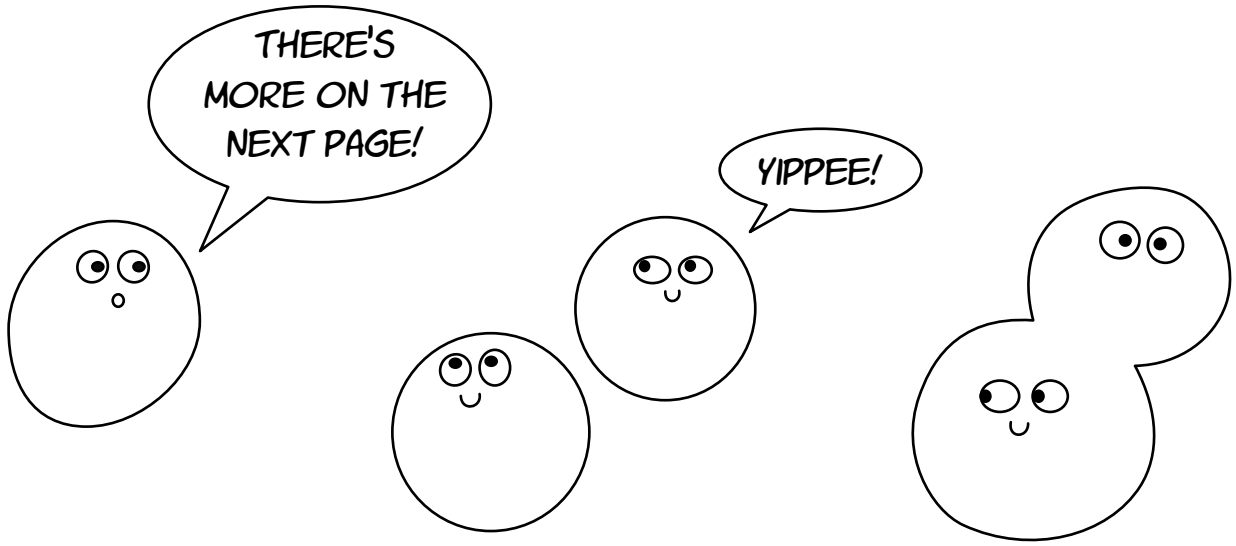


BIOLOGY ONE

~ FALL 2021 ~

	Date	Topic	Page(s)
Week 1	Monday, Aug 30 - Friday, Sep 3	*Small-group meetups! Watch the welcome video explaining how the class works, and then join us for an optional zoom meeting to meet some of your classmates and chat with us face-to-face!*	-
			-
			-
Week 2	*Monday, Sep 6*	*Holiday - no class*	
	Wednesday, Sep 8	It's alive! Or is it? *Characteristics of living things and why we study biology*	6-7
	Friday, Sep 10	The discovery of the cell *The smallest living things*	8-9
Week 3	Monday, Sep 13	**Laser Pointer Microscope** ***Hands-on science project to observe living cells.***	10-11
	Wednesday, Sep 15	The Parts of the Cell *Meet the organelles. Prokaryotes & Eukaryotes*	12-15
	Friday, Sep 17	Unicellular vs Multicellular life *A look at the incredible diversity of cellular life!*	16-17
	Science Vocabulary Crossword and Word Search! *Reinforce the new words we've learned with two word games*		
Week 4	Monday, Sep 20	Practice Quiz 1 ***Cell Quiz Show***	
	Wednesday, Sep 22	Osmosis! *All about cell membranes and why we salt our food*	
	Friday, Sep 24	Proteins and Enzymes *A deeper look at enzymes and cell proteins*	
Week 5	Monday, Sep 27	**Extract DNA from fruit** ***Hands on science project***	
	Wednesday, Sep 29	DNA *The instructions for the cell*	
	Friday, Oct 1	Mitosis and cell division *How one cell becomes two*	
Week 6	*Monday, Oct 4*	Sugars and Energy	
	Wednesday, Oct 6	Practice Quiz 2 ***Biomolecules Quiz Show***	
	Friday, Oct 8	Where does energy come from? *Eating vs making food*	

	Date	Topic	Page(s)
Week 7	Monday, Oct 11	Animals & Fungi *Diversity of the consumers*	
	Wednesday, Oct 13	Cellular Respiration *Making energy in the mitochondria*	
	Friday, Oct 15	Plants *The big producers*	
Week 8	Monday, Oct 18	Photosynthesis *Making sugars in the chloroplast*	
	Wednesday, Oct 20	The Single-Celled Archaea *The most diverse groups of all*	
	Friday, Oct 22	**DIY Petri Dishes** ***Discover just how germy various surfaces are by culturing your own microorganisms***	
Week 9	Monday, Oct 25	Practice Quiz 3 ***Diversity of Life Quiz Show***	
	Wednesday, Oct 27	Systems of the human body *The body is made of different systems of cells*	
	Friday,Oct 29	What is blood? *Introduction to circulatory system and different blood cells*	
Week 10	Monday, Nov 1	Why we need to breathe *An introduction to the respiratory system*	
	Wednesday, Nov 3	How nerves work *Introduction to the nervous system and the longest cells!*	
	Friday, Nov 5	There's more of us than you! *Introduction to the digestive system and the microbiome*	



	Date	Topic	Page(s)
Week 11	Monday, Nov 8	The Immune System *An introduction to the body's most fascinating system*	
	Wednesday, Nov 10	How Antibodies Work *The basic defenses and fighters against infections*	
	Friday, Nov 12	You're Allergic to What? *How a misbehaving immune system causes allergies*	
Week 12	Monday, Nov 15	What makes things poisonous? *What happens when things go wrong in the cell*	
	Wednesday, Nov 17	Practice Quiz 4 ***Immune System Quiz Show***	
	Wednesday, Nov 19	Disease-causing Microbes *An overview of viruses, fungi, bacteria, and parasites*	
Week 13	Nov 22 - Nov 26	*Thanksgiving Break - no class*	
Week 14	Monday, Nov 29	Pre-industrial Medicine *A look at common 16th century treatments*	
	Wednesday, Dec 1	Placebos and Trials *The evolution of modern medicine*	
	Friday, Dec 3	The Story of Smallpox *How a deadly disease led to the first vaccine*	
Week 15	Monday, Dec 6	Tetanus & Rabies *Two of the most fearsome microbes*	
	Wednesday, Dec 8	Malaria *Not a bacteria!*	
	Friday, Dec 10	Candida and Black Mold *Fungi can be both friend or foe*	
Week 16	Monday, Dec 13	Penicillin & the discovery of antibiotics *How a moldy dish led to medicine*	
	Wednesday, Dec 15	MRSA and antibiotic resistance *How overuse of a good tool is breeding superbugs*	
	Friday, Dec 17	Practice Quiz 5 ***Microbiology Quiz Show***	

This is the current draft of our syllabus as of July 30th, 2021. Some minor changes to content may occur before the class starts. Dates and times will not change. Classes will be taught at 1:00 pm Eastern (10:00 a.m. PDT) with the Monday class repeated at 4:00 p.m. EDT.

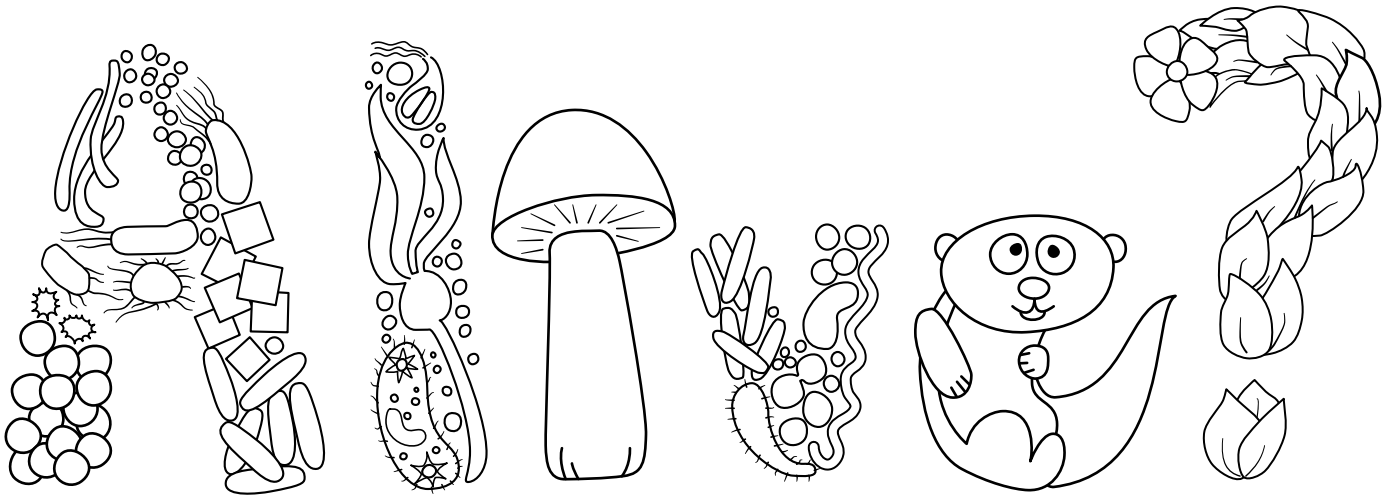
Correlation with Next Generation Science Standards (in progress)

How to get the most from this course:

This course can be used in a variety of ways! You can participate passively (just watch the videos), or actively by filling out the notes and completing the projects. You can do the entire course at once or participate in one lesson or section at a time.

For BEST learning, we recommend the following:

- ☑ Read the pages that go with each lesson before watching the video. Take 10-15 minutes to see if you can fill in the blanks.
- ☑ On “gameshow review” days, take the quiz before you watch the class!
- ☑ In each of the science activities, make predictions before you conduct the experiments.
- ☑ Download the answer key for the notes, but don’t look at the answers until after you give things a try yourself!



What makes something alive? This is not an easy question to answer! Most definitions agree that living things are made of cells and include all the following qualities or abilities:

METABOLISM

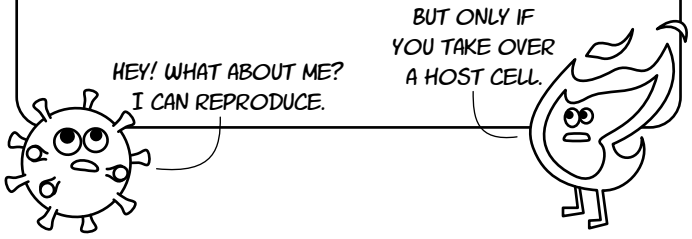
HOMEOSTASIS

GROWTH

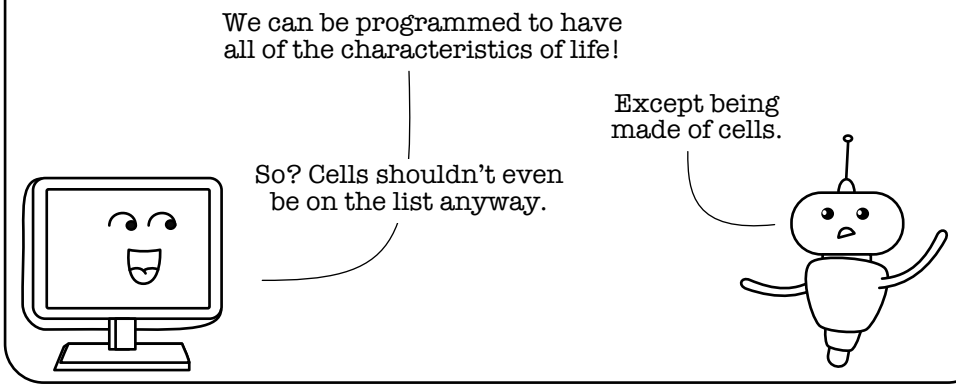
RESPONDS TO STIMULI

MADE OF CELLS

REPRODUCTION



COULD ARTIFICIAL INTELLIGENCE (AI) BE CONSIDERED ALIVE?



The question of whether or not AI is alive is currently being debated, and will be one of the more important questions of the century!

Write down three of the best reasons for each side of the argument and then share your opinion. What do *you* think?

*What are 3 of the best arguments for technology or AI to be considered **alive**:*

1.

2.

3.

*What are 3 of the best arguments for technology or AI to be considered **nonliving**:*

1.

2.

3.

What is your opinion?

The Discovery of the Cell

FOR THOUSANDS OF YEARS, PEOPLE KNEW THAT CURVED GLASS MAGNIFIED DETAILS.

I WROTE ABOUT IT WAY BACK IN 160 BCE!

CLAUDIUS PTOLEMY
Famous philosopher

THEN, IN 1590, TWO SPECTACLE MAKERS CREATED THE FIRST COMPOUND MICROSCOPE.

IF WE PUT LENSES ON BOTH SIDES OF A TUBE, THE OBJECTS ON THE OTHER SIDE ARE EXTRA MAGNIFIED!

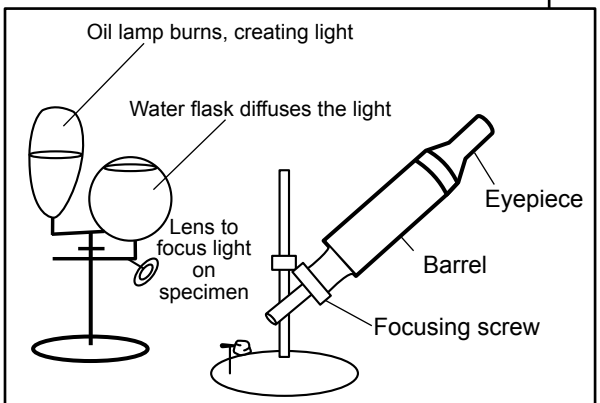
LENS
LENS

WE CAN SEE EVEN MORE! YIPPEE!

HANS & ZACHARIAS JANSSEN
Dutch glassmakers

THE NEXT CENTURY SAW HUNDREDS OF **EXPERIMENTS ON** *IMPROVING THE* **MAGNIFICATION** *OF* **MICROSCOPES** *AND MANY* **PUBLICATIONS** *ABOUT WHAT WAS* **OBSERVED** *UNDER THE LENS.*

THE MOST FAMOUS OBSERVATIONS WERE MADE BY ROBERT HOOKE…



ROBERT HOOKE'S MICROSCOPE 1665

THIS SPECIMEN OF CORK PLANT IS FULL OF PORES! THEY LOOK LIKE THE PLAIN UNFURNISHED ROOMS OF MONKS.

YOU'RE RIGHT. THEY DO LOOK LIKE EMPTY ROOMS! WHAT WILL YOU CALL THEM?

CELLS.

CELLS? THE SAME NAME FOR EMPTY ROOMS?

WHY NOT? THEY LOOK LIKE HONEYCOMB CELLS TOO.

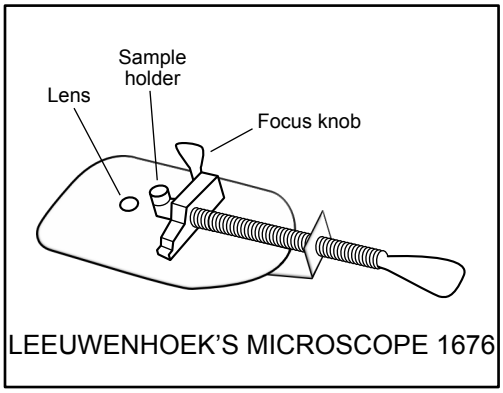
AND LOOK! THERE ARE EVEN CELLS IN FOSSILS!

I THOUGHT FOSSILS WERE JUST ROCKS.

ROCKS THAT USED TO BE ALIVE!

BLIMEY!

…AND DUTCH SCIENTIST ANTON VON LEEUWENHOEK.



LEEUWENHOEK'S MICROSCOPE 1676

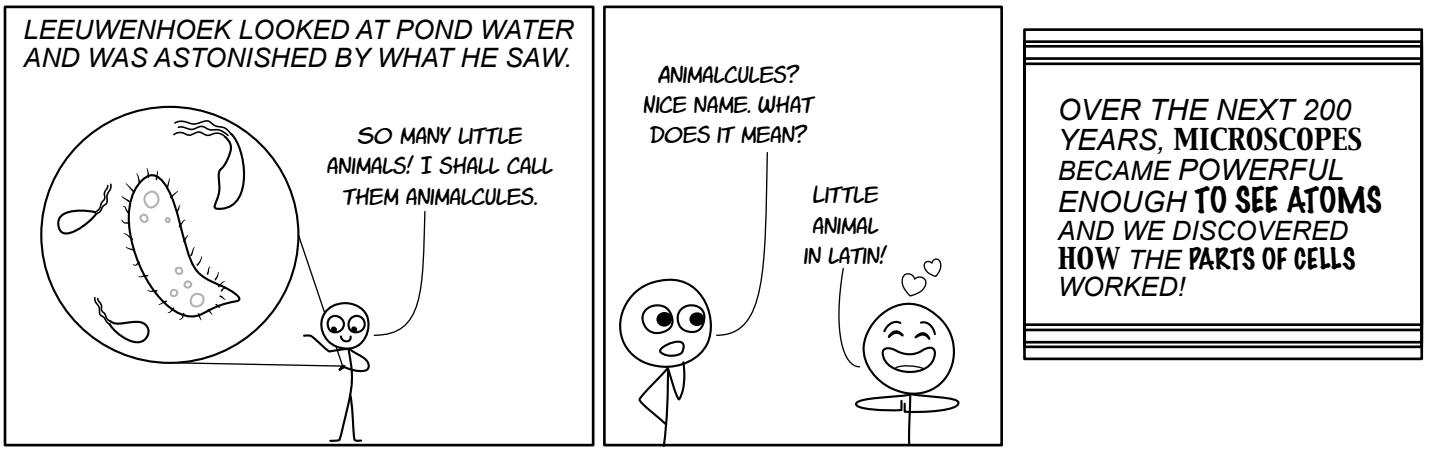
I MADE INCREDIBLY TINY LENSES BY MELTING, GRINDING, AND BLOWING GLASS.

THERE IS ONLY ONE LENS IN THIS MICROSCOPE, BUT THE QUALITY IS SO GOOD I CAN SEE WITH 200 TIMES MAGNIFICATION!

MICROSCOPE

MY MICROSCOPE HAS BETTER MAGNIFICATION THAN HOOKE'S!

#1



IS IT MADE OF CELLS OR NOT? *Write the words below in the correct oval:*

salt tomato wood cement mold sand cabbage
pepper water onion platypus plastic yogurt grass

Made of cells or came from cells

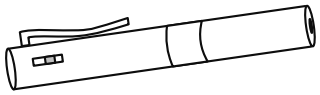
NOT made of cells or derived from cells

Your notes:

Hands-on Science Project

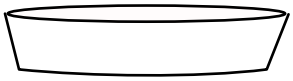
LASER POINTER MICROSCOPE

MATERIALS:


Laser Pointer

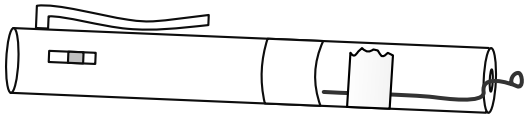

Paperclip


Tape


Water from a pond, dog dish, aquarium, or other source that will have microbial life.

SAFETY WARNING

NEVER POINT A LASER BEAM AT ANYONE'S EYES. LOOKING DIRECTLY AT A LASER BEAM CAN PERMANENTLY DAMAGE YOUR EYES.



1. Straighten out a large paper clip and then bend one end so that it forms a small loop.

2. Test the loop to be sure that It holds a water droplet. When you dip it in water and then lift it out again, a drop of water should stay inside the loop. If the loop does not hold water then bend it again and make it smaller.

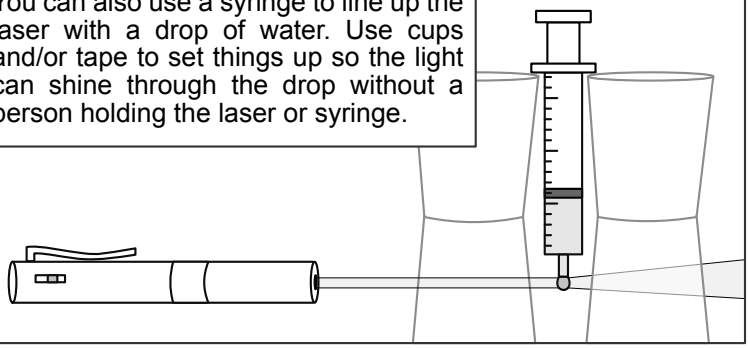
3. Attach the paperclip to the laser pointer with tape so that the loop is directly in front.

4. Carefully dip the wire loop into a water source that will have bacteria and other microbial life. Pond water, aquarium water, or water from a pet drinking dish are all good choices.

5. Shine the laser toward a white surface. For best results, conduct this activity in a darkened room.

6. Observe your results and experiment with different sources of water.

AN ALTERNATIVE APPROACH:
You can also use a syringe to line up the laser with a drop of water. Use cups and/or tape to set things up so the light can shine through the drop without a person holding the laser or syringe.



For BEST results

Choose a source of water that is chlorine free and exposed to sunlight.

Observe multiple drops of water from different sources.

Set up the laser in a dark room and shine it on a flat white surface.

Arrange the laser so that no one is touching it. The less it moves, the better you'll see the microbes in the water.

Adjust the distance between the laser and flat white surface to see which distance gives you the best view.

SAFETY WARNING

WASH YOUR HANDS AFTER HANDLING SAMPLES OF WATER THAT COULD CONTAIN MICROBES.

Which source of water had the most microbes?

It's time to go exploring! Gather some clean containers or plastic bags and collect water from several sources. Be sure to use different paper clips OR to clean out your paperclip before testing each sample in your laser pointer microscope. If you gather a saliva sample, do NOT put the paperclip in your mouth! Spit into a container and sample the saliva from there. Before you gather your samples, make a prediction about which water will have the most microbes. Then, after observing each sample put a **check mark** by the type of water that had microbes, and a **zero** by water that was microbe-free. Put a **double check mark** by the water that had the MOST microbes. Write NA if you didn't test that type of water.

YOUR PREDICTION:

The water with the most microbes will be _____.

- ☐ Water from the kitchen sink.
- ☐ Water from a natural outdoor source that looks clean like a lake or river.
- ☐ Water from a natural outdoor source that looks dirty or scummy like a puddle, swamp, or pond.
- ☐ A drop of saliva.
- ☐ Water from a pet's water dish.
- ☐ Water from the tank (not the bowl!) of a toilet.
- ☐ Other: _____

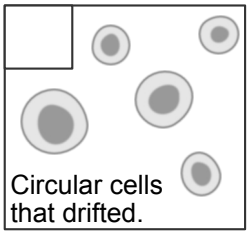
YOUR RESULT:

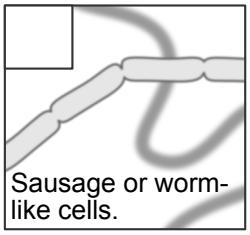
The water with the most observed microbes was _____.

Which of these did you observe using your laser pointer microscope?

Check all that apply.

☐ Clean water with no microbes.

☐  Circular cells that drifted.

☐  Sausage or worm-like cells.

☐  A swimmer! A cell that is moving itself through the water rather than drifting.

☐  Something with a tail or flagella.

Your notes:

<footer>SCIENCE MOM 11</footer>

The Parts of a Cell

FILL IN THE BLANKS USING THESE WORDS:

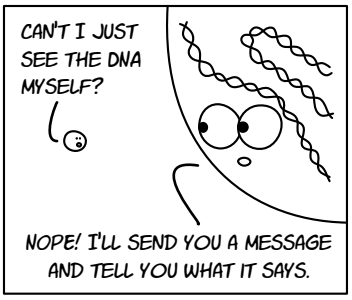
DNA	proteins	living	organelles
plasma membrane	dead	cytoplasm	diversity

The cells that Robert Hooke saw in the bark of a cork tree were actually _____. This is why they looked so empty. _____ cells contain several important parts or _____ that help them survive. Ribosomes build _____. The nucleus, if a cell has one, contains the _____. Mitochondria or chloroplasts are involved in digesting or creating food for the cell, and all of this activity is contained within a cell wall or _____ _____. The liquid inside a cell is called the _____. Not every type of cell will contain all of these parts because there is incredible _____ between different types of cells!

DRAW LINES TO CONNECT THE NAME & DESCRIPTION WITH THE CORRESPONDING PICTURE

Cytoplasm

The liquid inside the cell. It's mostly water.

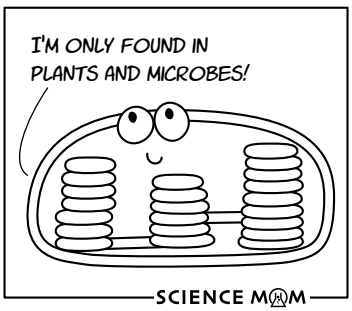


Nucleus

Keeps the DNA separate from the rest of the cell.

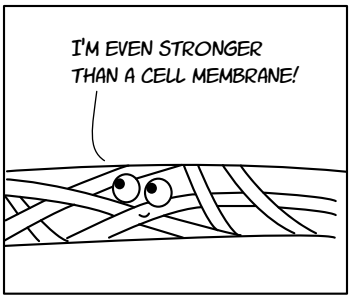
Chloroplast

Uses CO_2 and sunlight to create sugars.



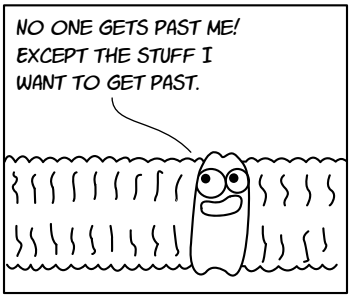
Plasma Membrane

Keeps the cytoplasm inside the cell.



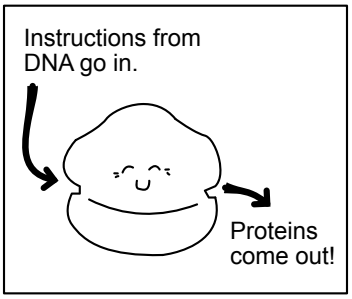
Cell Wall

Keeps the cytoplasm inside the cell.



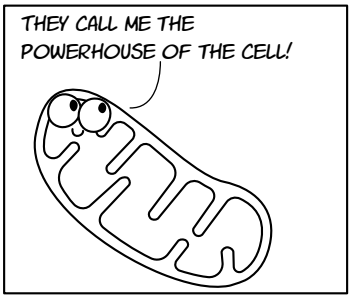
Flagella

Helps the cell move. Works like a little paddle or tail to push it through the water.



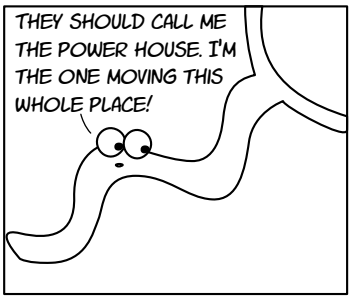
Ribosome

The thing that makes the proteins.



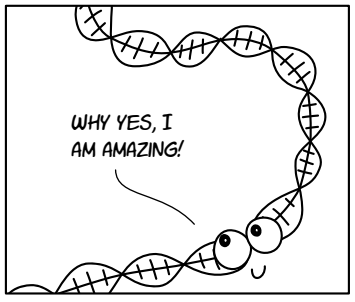
DNA

The instructions for making proteins and other stuff for the cell.

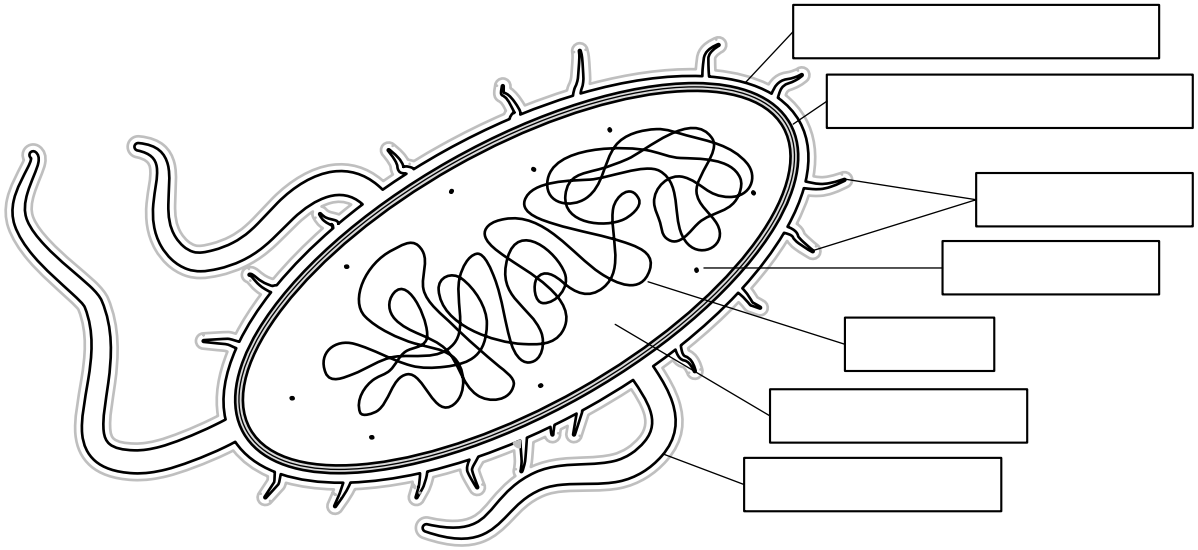


Mitochondria

Uses oxygen and sugar to create energy for the cell.



Prokaryotic Cells



Example: Salmonella
Size: 2-5 Microns long

FILL IN THE LABELS ABOVE USING THESE WORDS:

PLASMA MEMBRANE | DNA | CYTOPLASM | CELL WALL | FLAGELLUM | RIBOSOME

Your notes:

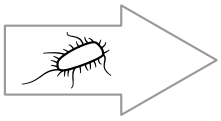
IS SOMETHING AS SMALL AS A SALMONELLA BACTERIUM REALLY *ALIVE*? LET'S CHECK:

METABOLISM ✓

IT EATS FOOD AND PRODUCES WASTE.

SUGARS GO IN.
TOXINS COME OUT.

RESPONDS TO STIMULI ✓



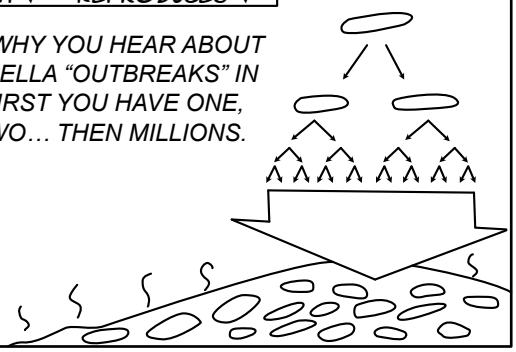
WILL MOVE TOWARD A WETTER AND BETTER ENVIRONMENT

*WHEN IT FINDS A GREAT LOCATION IT FORMS A **BIOFILM**, A COLONY OF CELLS STUCK TOGETHER WITH SLIME.*

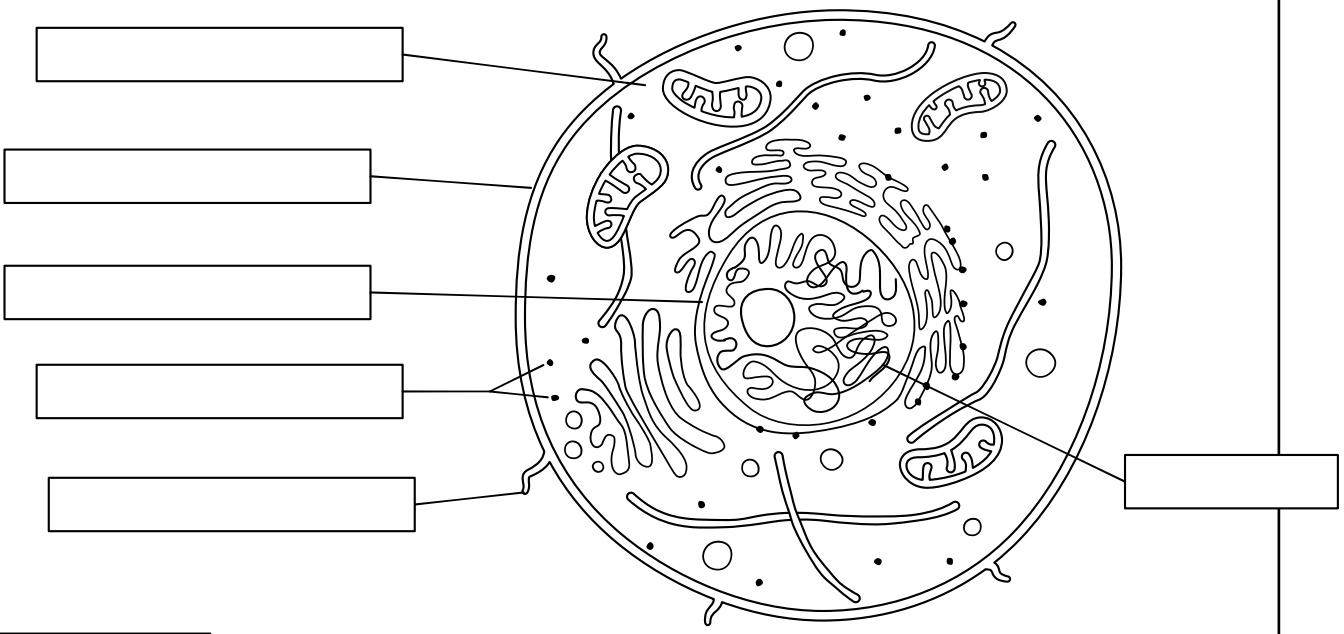
HA HA! THEY'LL NEVER GET RID OF US NOW! TEAM WORK MAKES THE DREAM WORK!

GROWTH ✓ REPRODUCES ✓

THIS IS WHY YOU HEAR ABOUT SALMONELLA "OUTBREAKS" IN FOOD. FIRST YOU HAVE ONE, THEN TWO… THEN MILLIONS.



Eukaryotic Cells



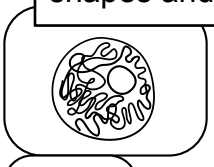
FILL IN THE LABELS ABOVE USING THESE

MITOCHONDRIA | DNA | RIBOSOMES | PLASMA MEMBRANE | CILLIA | NUCLEUS

Example: Animal cell
Size: 10-20 Microns long

Your notes:

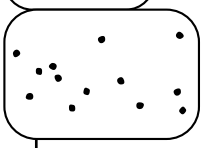
Eukaryotic cells can have incredibly different shapes and parts, but they will always contain:



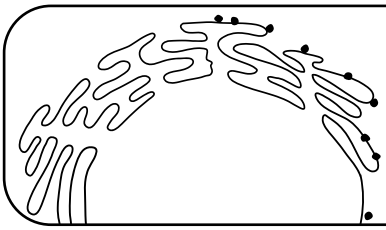
A NUCLEUS which holds the DNA

MITOCHONDRIA which provide energy

MEMBRANE which surrounds the cell



RIBOSOMES which make proteins

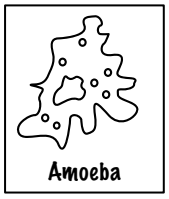


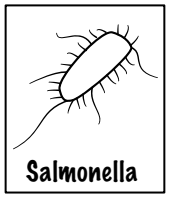
BONUS ORGANELLE!

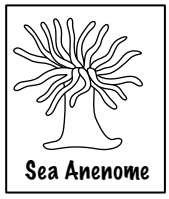
What is the crazy-shaped thing around the nucleus with ribosomes stuck to it? It's called the ***endoplasmic reticulum*** and it helps make proteins. We won't be talking about it more in this class, but of all the organelles, it has one of the coolest names!

Unicellular vs Multicellular

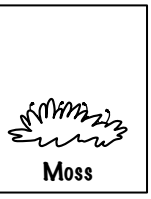
Can you place these organisms in their matching category?

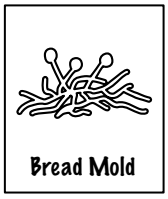

Amoeba


Salmonella


Sea Anenome

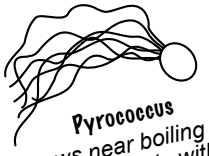

Haloquadratum

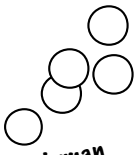

Moss

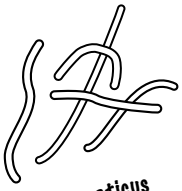

Bread Mold

ARCHAEA
(or Archaebacteria)

all prokaryote single-celled organisms


Pyrococcus
Grows near boiling hot deep sea vents with no oxygen


Arman
Grows in extremely acidic mine drainage


Thermus aquaticus
Heat-loving. Lives in hotsprings.

FUNGI


Candida albicans


Bakers Yeast

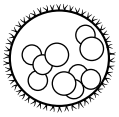

Giant Puffball


Bracket Fungus

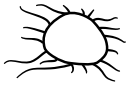

Button mushroom

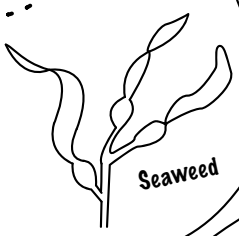
PROTISTS


Malaria

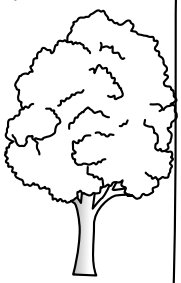

Volvox


Slime mold


Paramecium


Seaweed

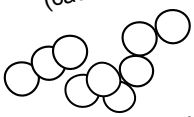
PLANTS


Trees

EUBACTERIA

all prokaryote single-celled organisms

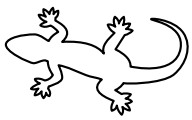

Borrelia Burgdofen
(causes lyme disease)

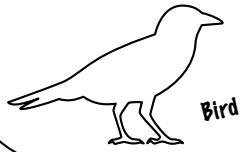

Staphylococcus


Lactobacilis

ANIMALS


Octopus


Lizard


Bird

Taxonomy *is the study of classifying groups of organisms based on shared characteristics. Classification systems have changed a lot in recent years thanks to the ability compare DNA sequences. We'll learn more about taxonomy in Biology 2.*

Five misclassified marvels

Scientists group things into categories to better understand them, but some organisms don't exactly fit! This page is dedicated to five organisms that people often mistake for something else. One is already filled out as an example. Choose 4 more from these lists to fill in the remaining blocks!

Plant or Fungus? *Caloplaca marina (Orange Sea Lichen), Sarcodes sanguina (Snow Flower), Monotropa uniflora (Ghost Pipe), or Clathrus archeri (Octopus Stinkhorn);*

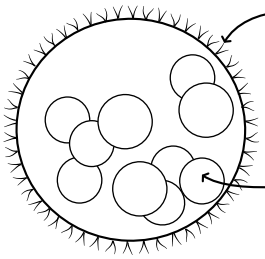
Animal or Plant? *Diploria labyrinthiformis (Brain Coral), Xestospongia muta (Giant barrel sponge), Elysia chlorotica (Emerald Elysia), or Pseudocolochirus violaceus (Sea Apple)*

What in the world? *Caulerpa taxifolia, Acetabularia, and Volvox.*

Volvox!

Volvox barberi

AN ALGAE COLONY MADE OF THOUSANDS OF COOPERATING CELLS!



THOUSANDS OF CELLS ARRANGE THEMSELVES SO THAT THEY FORM A SPHERE WITH WITH FLAGELLA FACING OUT.

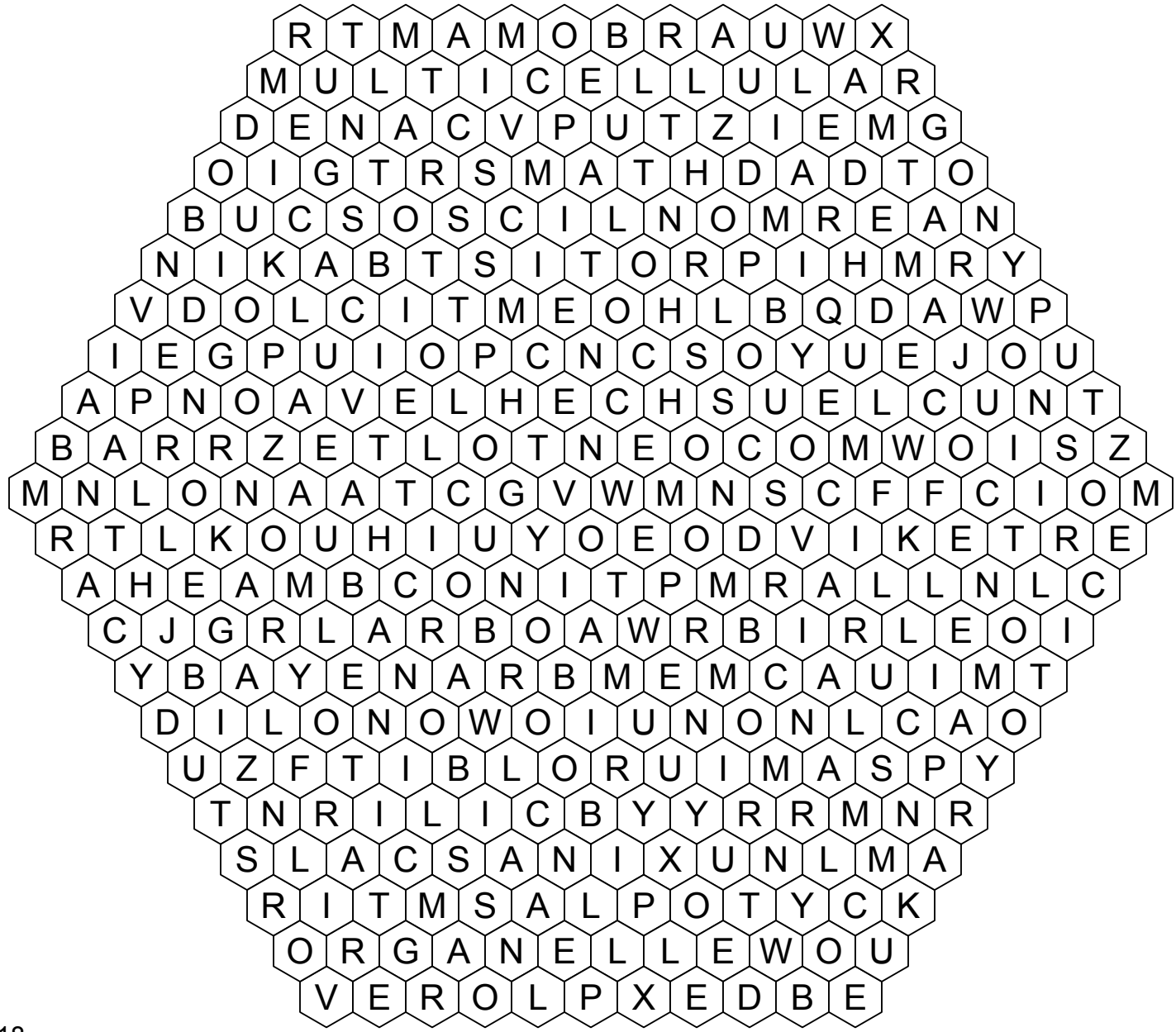
THE DAUGHTER COLONIES INSIDE HAVE THEIR FLAGELLA FACING TOWARD THE INSIDE AND WILL TURN THEMSELVES INSIDE OUT WHEN THEY GROW UP!

THE FIRST PEOPLE WHO WROTE ABOUT VOLVOX THOUGHT IT WAS A TINY ANIMAL, PERHAPS RELATED TO A JELLYFISH!

Cellular Word Search

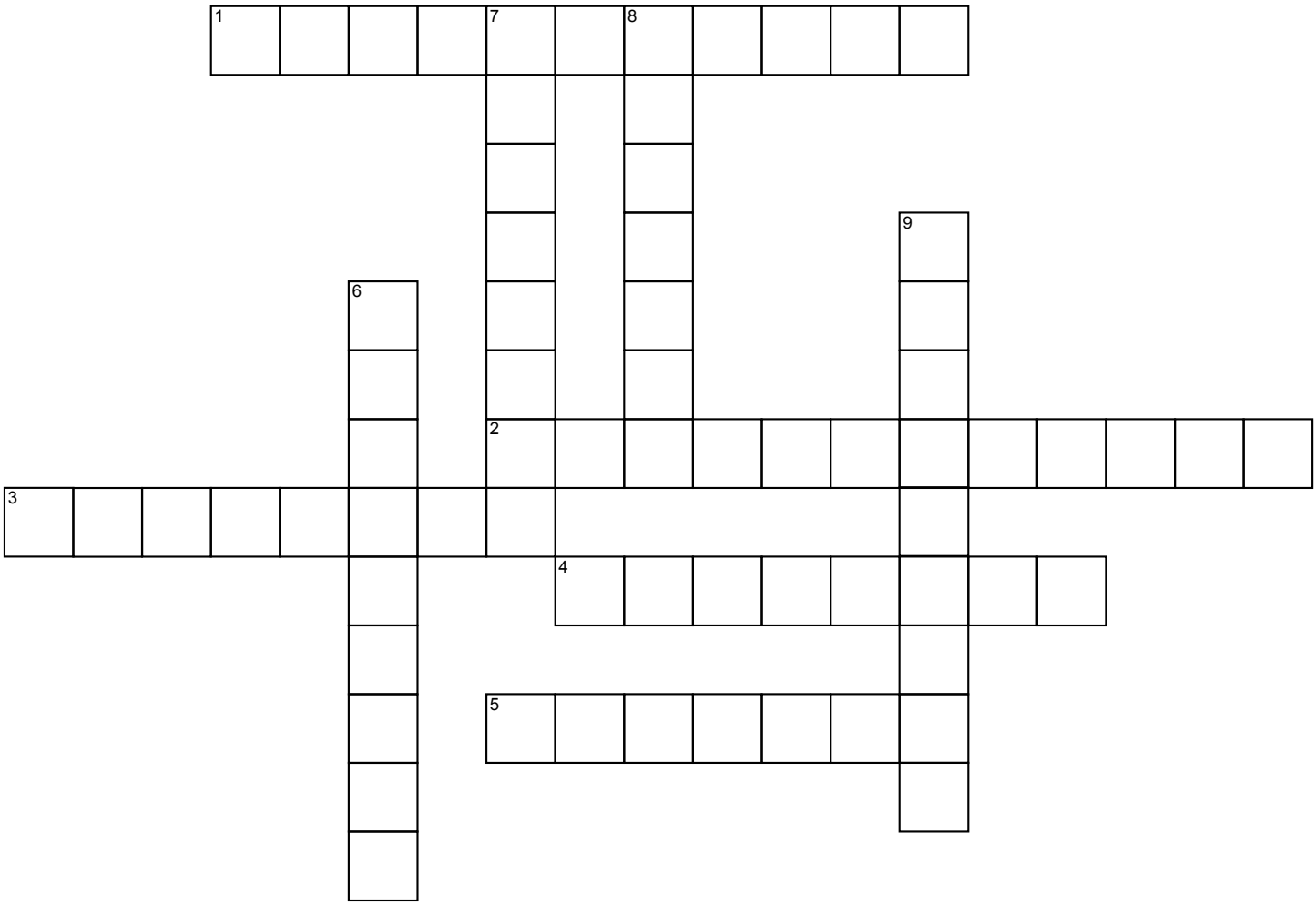
There are a lot of new words to learn when studying biology. Repetition is the best way to learn them, and word games can be part of that! Find each of the hidden words in the word-search. The words can run in any direction: horizontal or diagonal, and the letters might go left to right or right to left!

METABOLISM
MEMBRANE
RIBOSOME
MITOCHONDRIA
DEOXYRIBONUCLEIC ACID
CYTOPLASM
NUCLEUS
CHLOROPLAST
FLAGELLA
ARCHAEA
PROKARYOTIC
UNICELLULAR
MULTICELLULAR
EUKARYOTIC
PROTIST
CILLIA
ORGANELLE



Biology Crossword

Use the clues below to fill in the crossword puzzle.

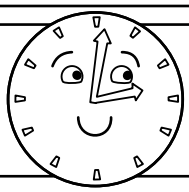


Horizontal Words

1. The organelle that performs photosynthesis.
2. The ‘powerhouse’ of the cell.
3. Keeps the cell intact by surrounding the cell.
4. A tail that some cells use to travel through fluid.
5. The central feature of most plant, fungus, or animal cells.

Vertical Words

6. A structure within a living cell.
7. Organelles that assist the function of DNA, very common throughout the cell.
8. An organism that is eukaryotic but not a fungus, animal, or plant.
9. Contains all of the organelles.



Quiz Time!

ANSWER THE QUESTIONS TO SEE WHAT YOU LEARNED!

1. Which of these is the best simple definition for the word homeostasis?
   A. The ability to regulate internal conditions.
   B. The ability to use energy.
   C. The ability to reproduce.
   D. The ability to respond to a stimulus.

2. What are two characteristics of living things?

   _____ , _____

3. When did humans invent a microscope that can see structures inside a cell that are smaller then the wavelength of light (< 500 nanometers)?
   A. 1665
   B. 1850
   C. 1903
   D. 1951

4. No cell is large enough to be viewed without the help of a microscope.
   A. True
   B. False

5. Which type of cell has a nucleus?
   A. Prokaryotic
   B. Eukaryotic

6. There are bacteria and fungi spores floating in the air.
   A. True
   B. False

7. Which domains of life have both single-celled and multicelled organisms?
   A. Only protists
   B. Archaea and eubacteria
   C. Fungi and protists
   D. Only archaea
   E. Only fungi

8. Which of the following are prokaryotic?
   A. Bacteria and archaea
   B. Fungi, animals, and plants

9. Protists are which type of cell?
   A. Prokaryotic
   B. Eukaryotic

10. A cell can only have one nucleus.
    A. True
    B. False

11. The average prokaryotic cell is _____ than the average eukaryotic cell.
    A. 2 to 5 times smaller
    B. 20 to 100 times smaller
    C. More than 1,000 times smaller

12. Which organelle is responsible for making proteins in the cell?
    A. Mitochondria
    B. Ribosome
    C. Plasma membrane
    D. Endoplasmic reticulum

13. A single drop of pond water will likely contain:
    A. Bacteria only.
    B. Bacteria and protists only.
    C. Bacteria, archaea, protists, and fungi.

14. Which organelle uses oxygen and sugar to create energy for the cell?
    A. Mitochondria
    B. Chloroplast
    C. Nucleus
    D. Flagella

15. Why do bacteria grow better in a petri dish than on a countertop?
    A. The air above the petri dish is more humid than the air above the countertop.
    B. The petri dish surface has sugars and proteins built into it.
    C. The Petri dish is not cleaned with soap or disinfectant.
    D. All of the above.

16. Which organelle is only found in plants or protists?
    A. Chloroplasts
    B. Mitochondria

17. Eukaryotic cells are bigger than prokaryotic cells.
    A. True
    B. False

18 Which of these is the best simple definition for the word metabolism?

A. The ability to regulate internal conditions
B. The ability to use energy
C. The ability to reproduce
D. The ability to respond to a stimulus

19 Draw a simple bacterial cell. Label the plasma membrane, DNA, ribosomes, and flagella.

20 Draw a simple animal cell. Label the plasma membrane, DNA, ribosomes, mitochondria, and nucleus.

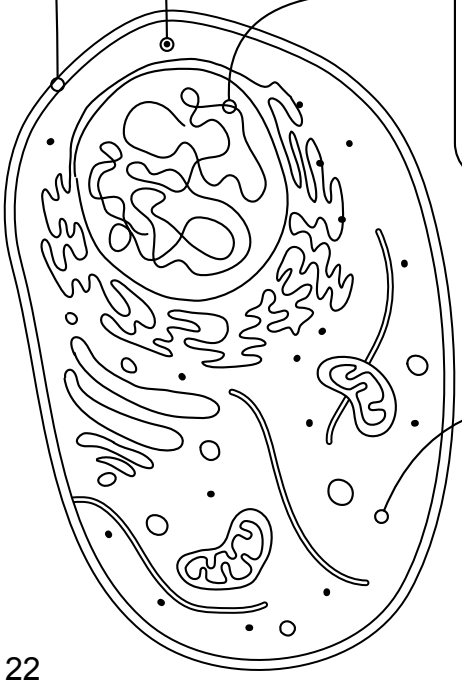
BIOMOLECULES

The molecules that make living things! After completing each topic, return to this page and draw or write a favorite fact you learned about each biomolecule.

LIPIDS

PROTEINS

DNA

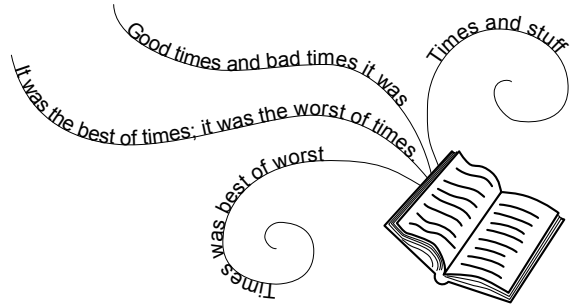


SUGARS

Polymers and Monomers

USE THE WORDS BELOW TO FIILL IN THE BLANKS WITH THE CORRECT MONOMER AND POLYMER FOR EACH PICTURE:

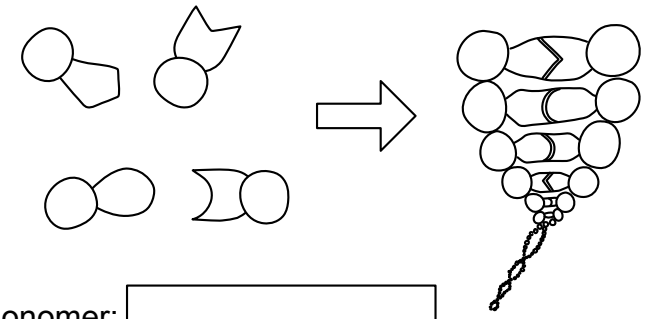
DNA	beads	letters	amino acids
stories	proteins	nucleotides	nucleus



Monomer: _____

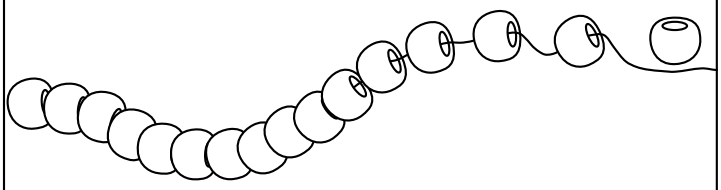
Polymer: _____

Clue: This polymer has the shape of a spiral or helix



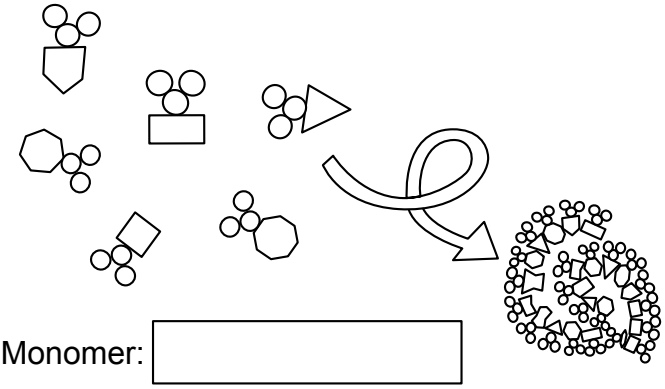
Monomer: _____

Polymer: _____



Monomer: _____

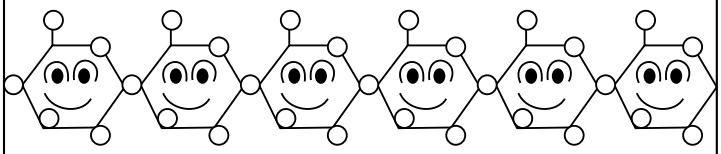
Polymer: _____



Monomer: _____

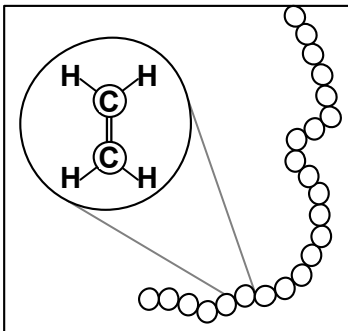
Polymer: _____

Clue: This polymer is used to store energy.

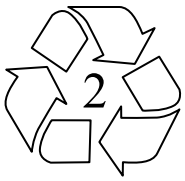


Monomer: _____

Polymer: _____



Clue: One name for this polymer is High Density Polyethylene. It's one of the more common plastics.



Monomer: _____

Polymer: _____

Osmosis

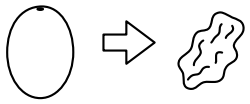
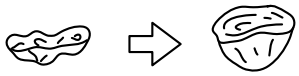
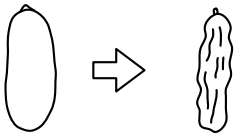
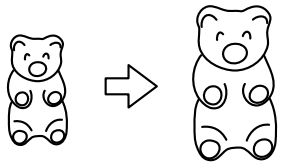
FILL IN THE BLANKS USING THESE WORDS:

osmosis	impermeable	semipermeable

A substance that nothing will pass through is called _____. You could think of it as a solid closed door. Something that is _____ is like a screen door; it lets the air through but keeps the bugs outside.

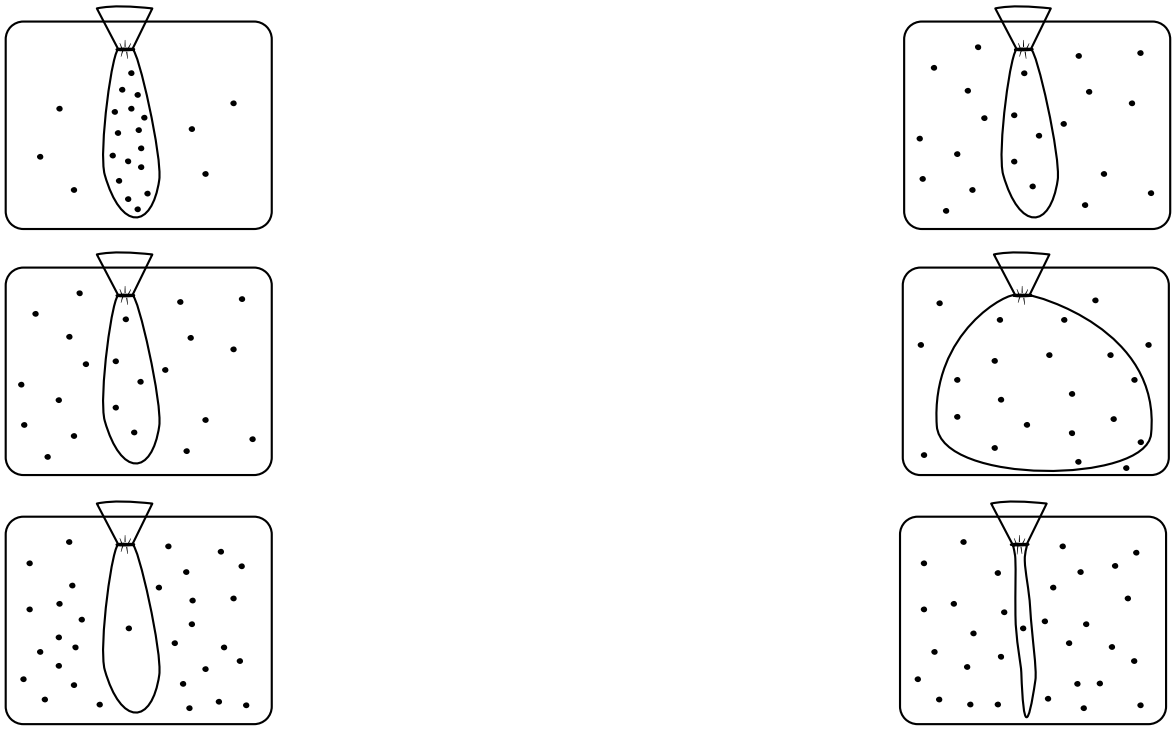
Grape skins, gummy candy, and cell membranes are all semipermeable. They allow water and other small molecules to pass through them. This movement of water through a semipermeable membrane is called _____.

Which examples of osmosis have you seen?

☐ A grape left in the sun shrivels into a raisin.	☐ A dried cranberry soaked in water becomes plump.	☐ A cucumber soaked in brine becomes a pickle.	☐ A gummy bear left in water expands.
			

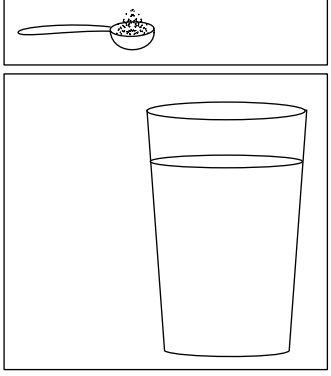
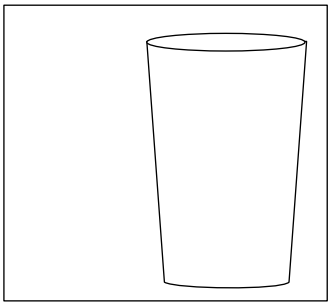
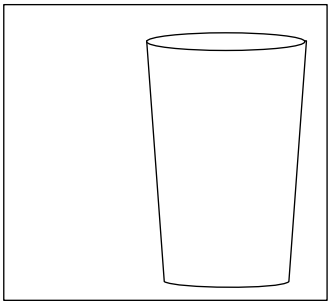
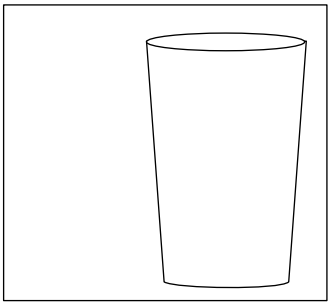
Why does water move out of a cucumber or into dried fruit? Whenever there is something like salt or sugar (**the solute**) dissolved in water (**the solvent**), water will always move toward the area with a high concentration of solutes.

DRAW LINES TO SHOW WHAT WOULD HAPPEN IF A SEMIPERMEABLE BAG OF SALTY WATER WAS PLACED IN ANOTHER CONTAINER OF SALTY WATER. THE DOTS REPRESENT THE AMOUNT OF SALT, OR SOLUTE.

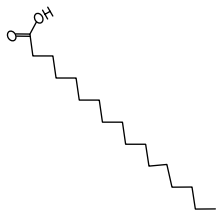


Lipids Make Membranes

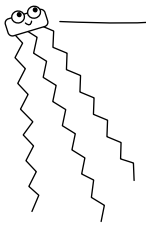
If you mixed a large spoonful of each of the biomolecules into a glass of water, would it dissolve or not? Color in the cup with your prediction. Sugar has already been completed as an example.

Sugar	Protein Powder	DNA	oil
			
Dissolves			

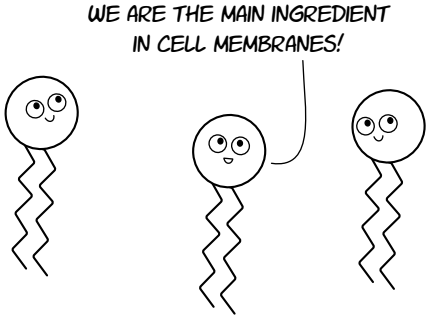
Lipid: a hydrophobic (water fearing) molecule.



Some, like oil, are just long chains of carbon with a couple of oxygen atoms at the top.



Some have multiple chains stuck together.



Some have a water-loving top or "head" called a phosphate group. We call these phospholipids.

FILL IN THE BLANKS USING THESE WORDS:

phospholipids	channel	
cholesterol	hydrophobic	hydrophilic

The membranes of animal cells are made of _____. These molecules have a "head" that is _____(attracted to water) and a "tail" that is _____ (repelled by water). _____ molecules stabilize the membrane and _____ proteins can open to allow molecules to pass through and enter the cell.