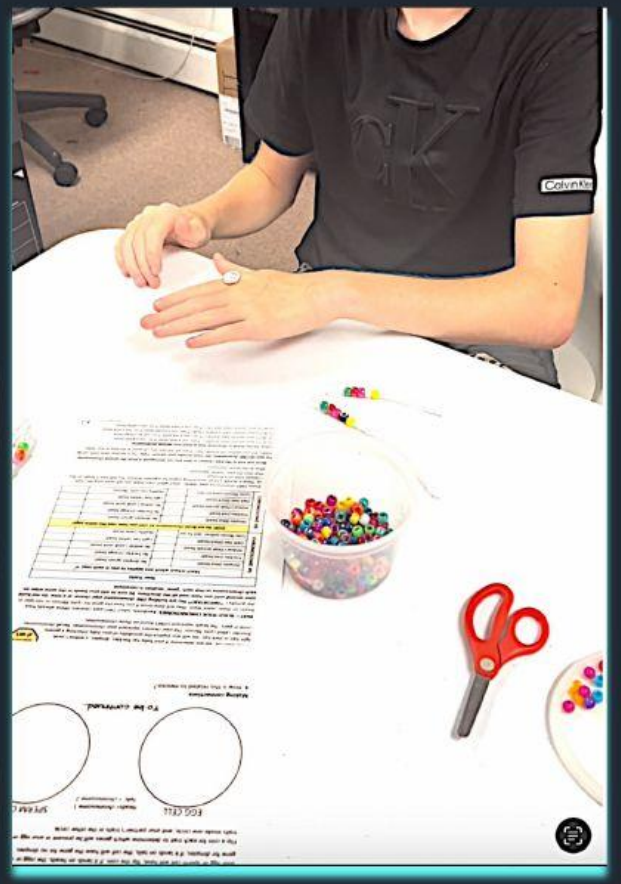
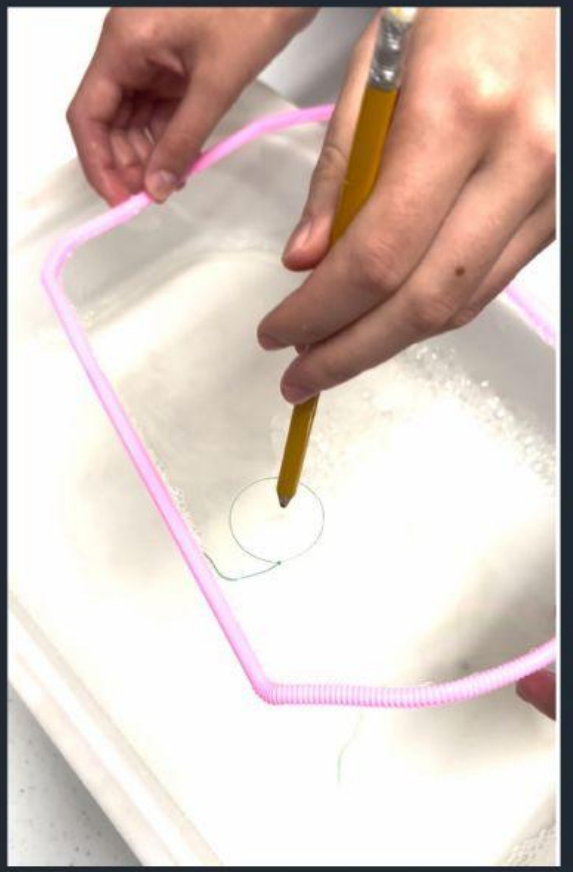
BIOLOGY CURRICULUM FULL YEAR BUNDLE









Everything you need to teach a year of biology

High School Homeschool Flipped Classrooms NGSS

What to expect from the curriculum

- Differentiation
- Editability (for most items)
- You can easily integrate other materials in case you have some all time favs you've already established.
- No textbook necessary unless you prefer to use one
- Designed for student comprehension.
- Great for new or established teachers.
- Daily pacing guide and objectives

"Very engaging curriculum for my students. I have bought three different biology curriculums and this one is by far my favorite 💗. Very thorough and plenty of resources. I finally have my time back at home instead of stressing over finding materials for my students."
- Selena P.





Example of how resources are organized once downloaded

biology roots

Biology Curriculum for the modern science class

- **Year long bundle**: **36 weeks** of thoughtfully sequenced biology instruction, complete with pacing guides.
- **15 Topics**: comprehensive coverage for a full biology course
- **2000+ pages** neatly organized into folders for optimal use.
- **No Prep**: everything you need for the entire year is in the download.
- ✓ **Standards checklist**: Meets multiple standards, including NGSS



Hi! I'm Vanessa. I have been creating high quality content as a teacher author since **2012** and have over ⭐ 20,000 5 star reviews ⭐ I have a Master's in Science Education, plus years of experience as a teacher and teacher mentor. If you have questions about the curriculum or the standards it follows in your district, please email me:

vanessa@biology-roots.com

Daily Pacing Guides included for every unit

Options for both 50 and 90 minute pacing guides included; these are purely suggestions that can be *adapted* to your own *style*, *content delivery methods*, or teaching *needs*.

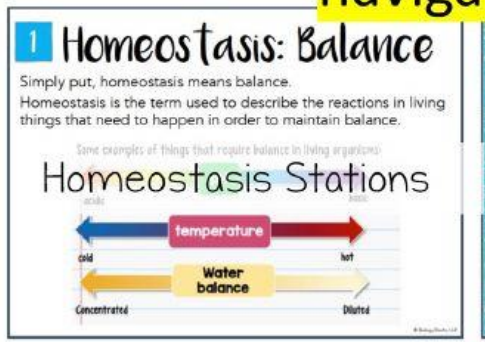
DNA UNIT BUNDLE ~50 MINUTE BLOCKS

SAMPLE PACING GUIDE

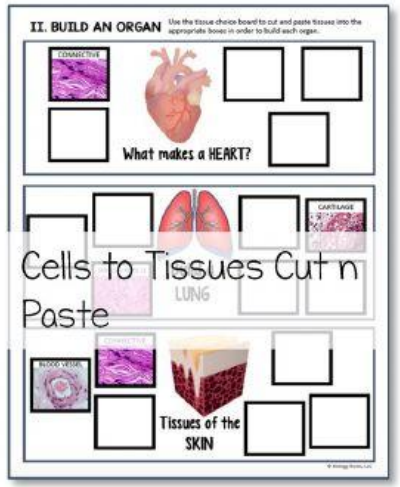
DAY/DATE	STUDENT ACTIVITY AND TEACHER NOTES	LEARNING TARGET
(BEFORE)	...RE INFORMATION AND LEARNING TARGETS.	
1 _____	DNA notes through structure (stop at DNA replication) Begin Cutting out Paper For DNA Paper model (if you choose to do the Class Frankenstein with it, assign traits).	To introduce students to the basic structure of DNA and how it stores genetic information.
2 _____	Bellringer: DNA Structure Work on DNA Paper Model (and Class Frankenstein if you choose to do that along with it).	To attribute genes to physical appearance. [Goal: Students will be able to identify the parts of a DNA molecule.]
3 _____	Give 10 minutes to finish up DNA model if needed. Optional: DNA Cheek Extraction (this is also good to save for a half-day.) DNA and RNA Reading and Coloring	To compare DNA yield of diploids to octoploids, compare and contrast DNA and RNA [Goal: Students will be able to label and explain the structure of DNA and RNA.]
4 _____	DNA Structure Task Cards (Heads up: Quiz in a couple days)	Further understanding of DNA structure.
5 _____	Notes through DNA Replication DNA Replication Coloring Heads up: Quiz next class	To determine the steps of DNA replication. [Goal: Students will visualize DNA replication and recognize its importance.]
6 _____	Quiz: DNA Structure and Replication (can be open note if you wish). Finish Notes (protein synthesis) Homework: Protein Synthesis Worksheet DNA and RNA Practice	To relate DNA and RNA to proteins. [Goal: Students will be able to form a complementary strand of mRNA in respect to DNA.]
7 _____	Review last night's homework Protein Synthesis Worksheets: Decoding the Genetic Code- feel free to do half or all as a class. BEGIN Protein Synthesis Paper Lab: Unigriffins. Do first one as a class. Time will be given next class to finish. Homework: Breaking the Genetic Code	To explore the steps of protein synthesis and depict gene expression. [Goal: Students will have an understanding how DNA determines traits.]
8 _____	Review: Breaking the Genetic Code. Finish Protein Synthesis Paper Lab: Unigriffins	*This pacing guide is merely a suggestion! If it's moving too fast for your class, no problem! Just take your time, bump things down, and plan to add a day. *If there is a resource that you do not want to use, no sweat. Skip, replace, or adapt. *Anything that is unused can be saved for an emergency sub plan.
9 _____	Review quiz Protein Synthesis Cut and Paste	
10 _____	Study Guide	
11 _____	Test	

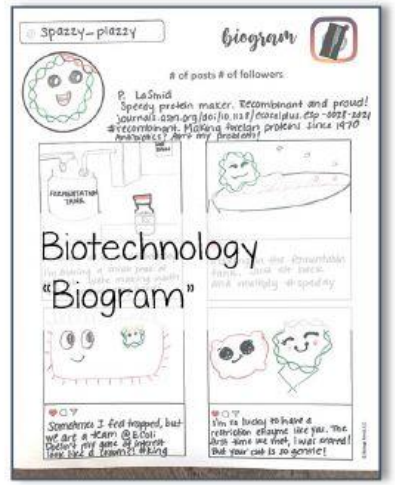
What's included in the curriculum: 2000+ pages neatly organized into easy-to-navigate folders

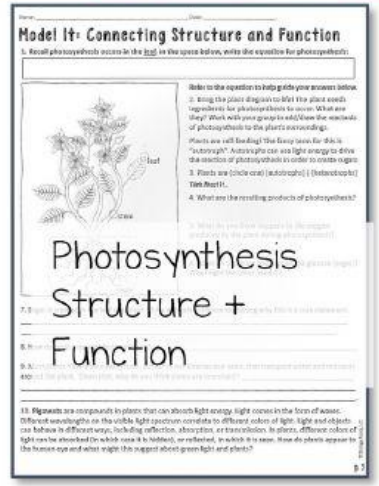
- Engaging, **visual** PowerPoints with differentiated student notes
- Project **rubrics**
- **Stations** or task cards
- Science **literacy**
- Assessments (quizzes and tests)
- Labs
- Models
- Inquiry activities
- Study guides + games
- Graphic organizers
- Paperless options hosted on Google
- Coloring|cut and paste manipulatives

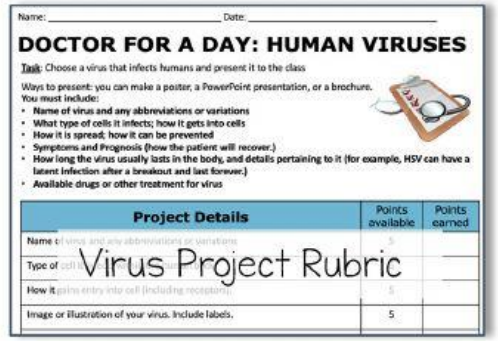


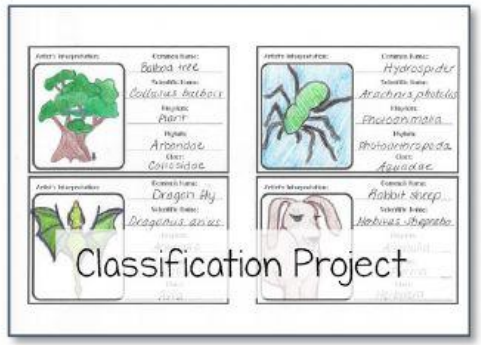












Curriculum Topics

Intro to Biology

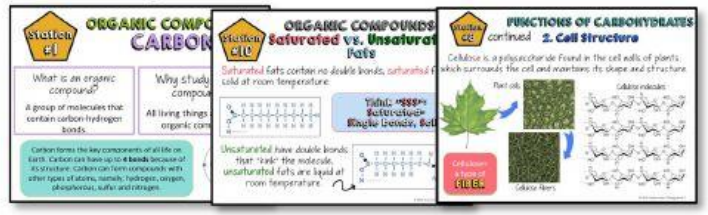
- Digital Flip Book (organization of life; properties of life, homeostasis)
- Homeostasis Stations

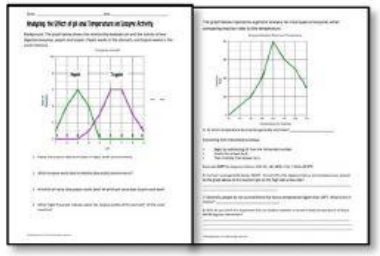




Biochemistry:

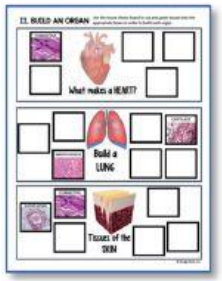
- Biomolecules
- Enzymes

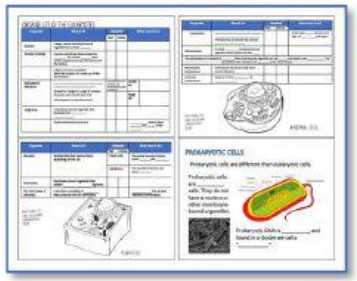


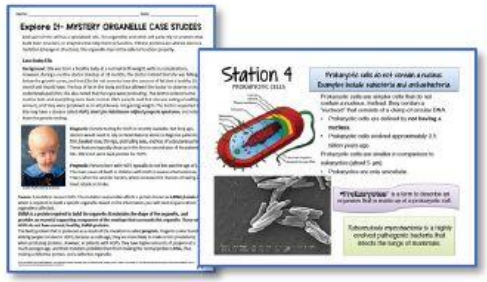


Cells:

- Cell theory
- Cell structure and function; organelles
- Eukaryotic and prokaryotic cells; plant vs animal
- Types of tissues
- Stem cells and differentiation

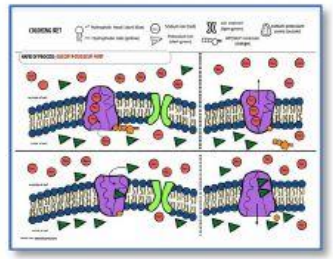


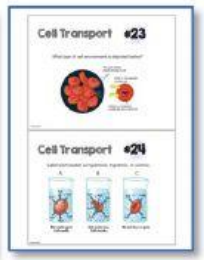


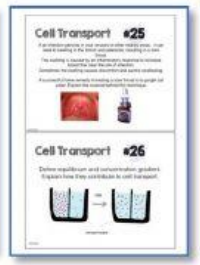


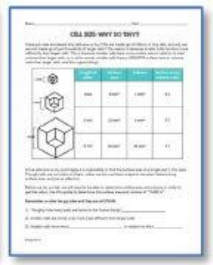
Cell Transport:

- Passive transport; Osmosis
- Facilitated diffusion
- Active transport; exocytosis, endocytosis
- Function and structure of cell membrane; phospholipid bilayer
- Surface area to volume ratio; cell size







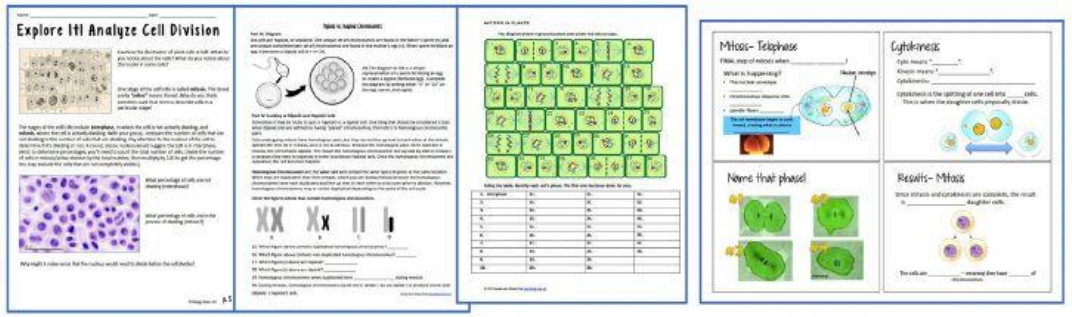


*not all activities/products are pictured for each topic

Curriculum Topics

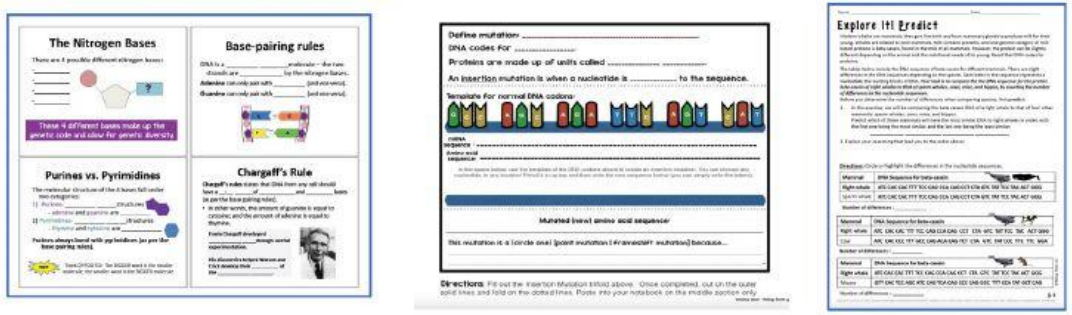
Cell Division

- Cell Cycle; regulation and cancer
- Mitosis
- Meiosis
- Haploid vs Diploid numbers



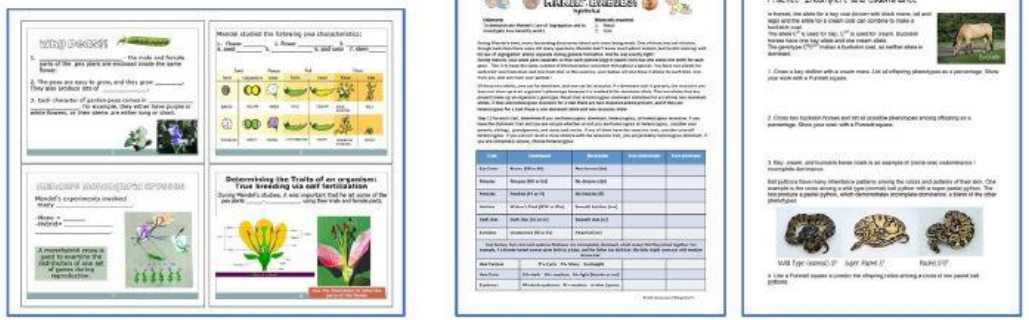
DNA

- DNA Structure and Function
- Mutations
- DNA Replication
- RNA Structure and Function
- Protein Synthesis



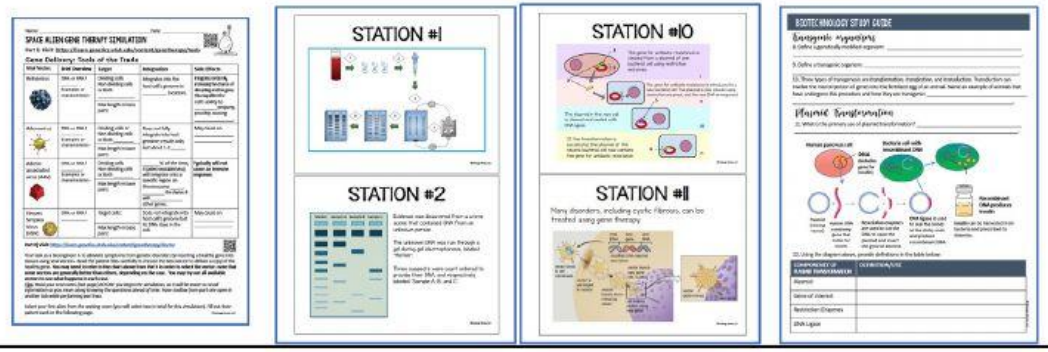
Genetics

- Monohybrid and Dihybrid crosses
- Complex and human inheritance (polygenic traits; codominance; incomplete dominance; X-linked traits)
- Pedigrees



Biotechnology

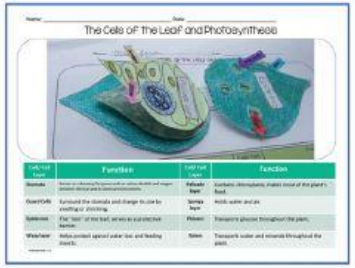
- GMOS
- Gel electrophoresis
- GMOS
- Genetic engineering (transgenic organisms; gene therapy)

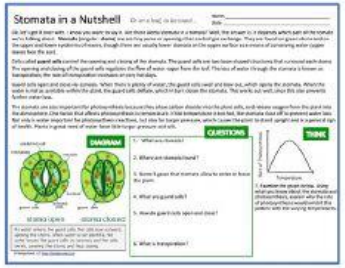


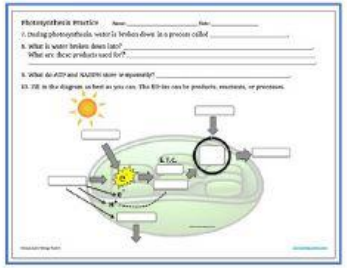
Curriculum Topics

Photosynthesis

- Breakdown of photosynthesis (electron transport chain; Calvin cycle)
- Reactants and products of photosynthesis
- Cells of the leaf and their function
- Relationship to cellular respiration

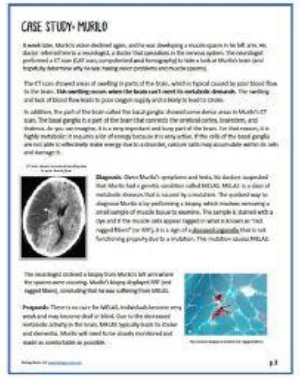


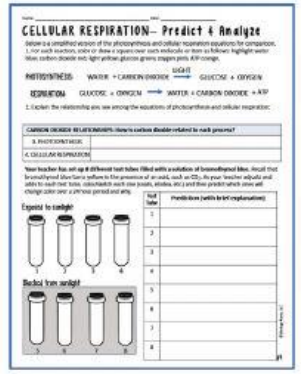


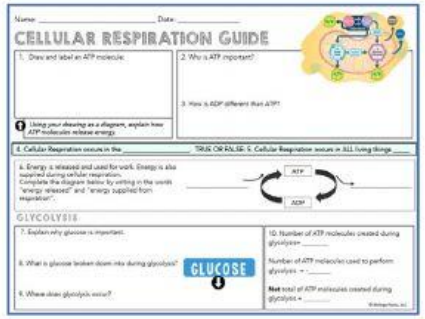


Cellular Respiration

- Structure and function of mitochondria
- Breakdown of cellular respiration
- Reactants and products
- Relationship to photosynthesis



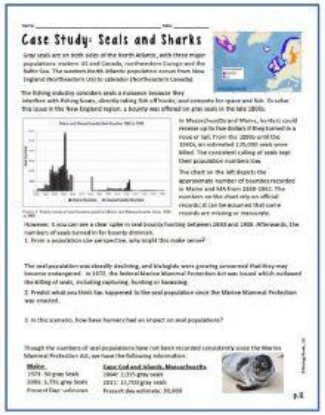


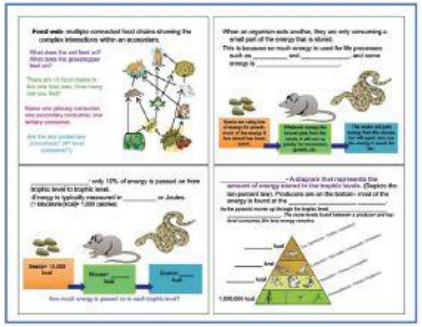


Ecology

- Biomes
- Energy Flow
- Biogeochemical cycles
- Symbiotic relationships and competition
- Populations
- Human Impact







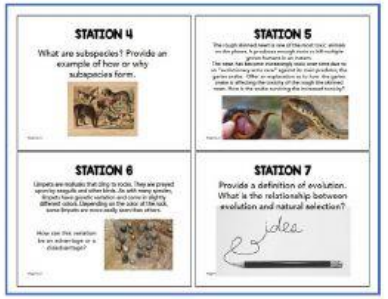
Curriculum Topics

Evolution

- Natural selection and Darwin's discovery
- Driving forces of evolution: genetic drift, mutations, gene variations, etc.
- Evidence for evolution
- Hardy Weinberg and *population genetics

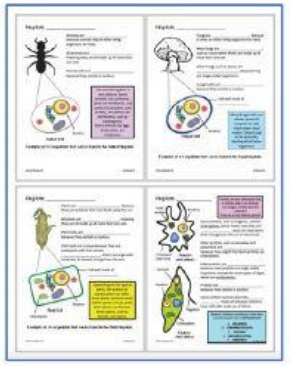


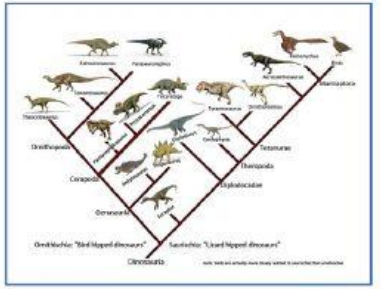


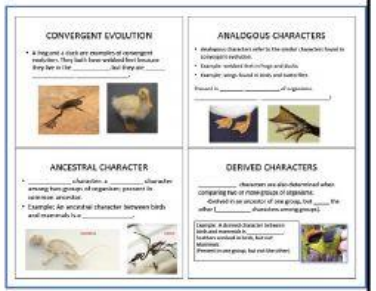


Classification

- Linnaeus
- Taxonomy
- Dichotomous Keys
- Evolutionary Trees and cladograms

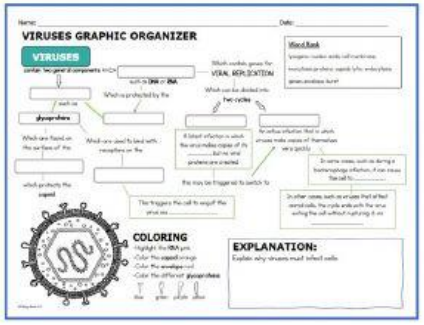


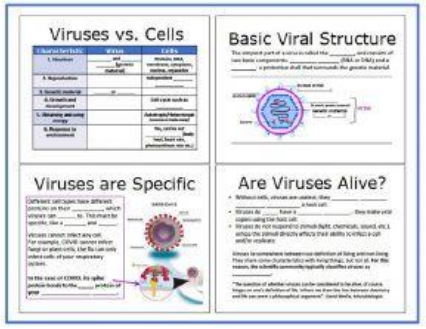


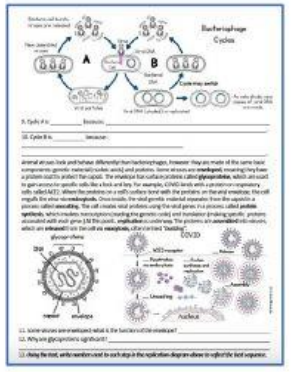


*VIRUSES mini unit

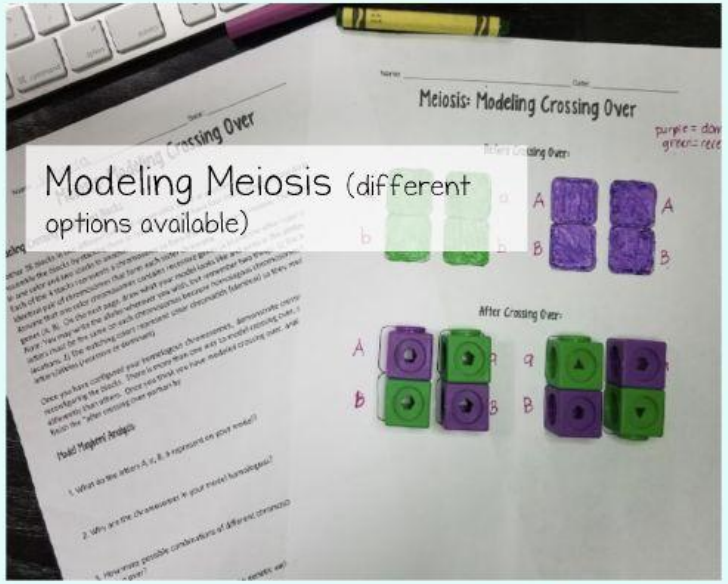
(virus structure and replication for those that are required teach viruses alongside cells.)



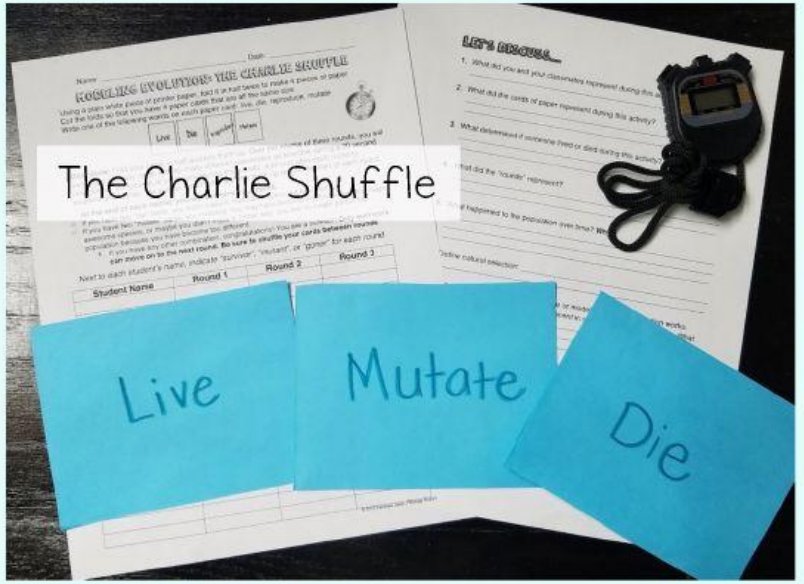




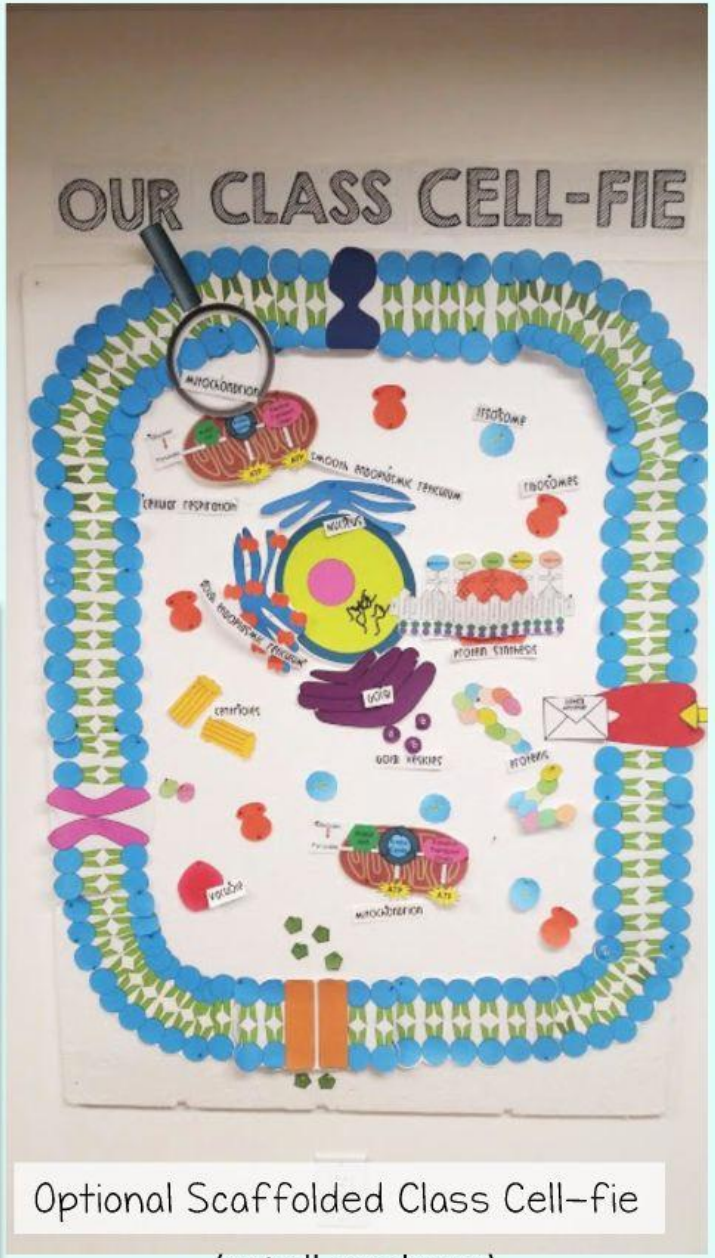
Examples of Models and Projects included



Modeling Meiosis (different options available)



The Charlie Shuffle

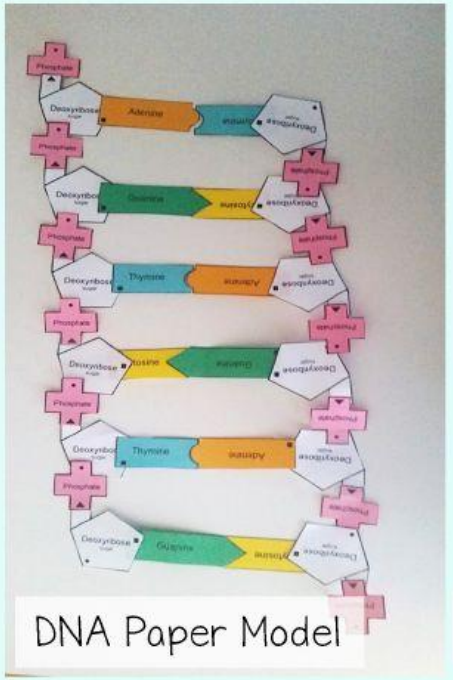


Optional Scaffolded Class Cell-fie

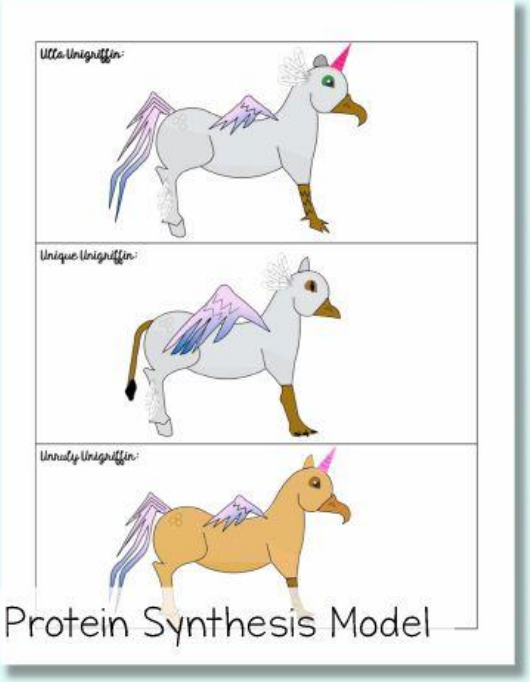
(not all are shown)



DNA Class Frankenstein



DNA Paper Model



Protein Synthesis Model

Examples of PowerPoints included in each unit

PowerPoints include two student fill-in versions to choose from and are 100% editable.

Everything in biology relates to cells. Evolution, DNA, genetics, photosynthesis (and more)- all correlate to the cell.

Why?

Because cells make life happen!

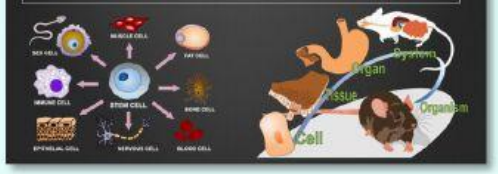
Some organisms (like us) are multicellular. Others (like bacteria) are single cells.

All the parts of the *cell* that you learn about *today* will tie in to every topic that we learn in biology throughout the *year*.

The Cell Theory

After hundreds of years of observations and the scientific input of many, we learned that all living things contain cells. From this arose the cell theory.

A few key scientists involved in the cell theory are Hooke, Schleiden, Schwann and Virchow.

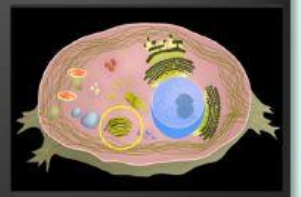


Golgi body

(sometimes called the "Golgi apparatus")

What is it?
A membrane-bound organelle that processes and packages proteins.

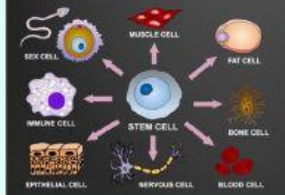
Where is it found?
The cytoplasm of all eukaryotic cells.



All cells come from preexisting cells

Over 150 years ago, Virchow discovered that cells come from preexisting cells when he witnessed cell division.

Today, we know a bit more about this concept.



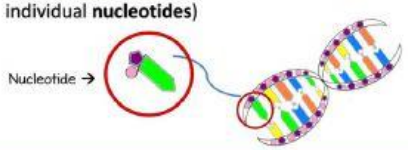
ALL cells stem from "stem cells". Stem cells can transform into a specialized type of cell.

(For example, a heart cell is very different than a bone cell- but they all start off as the same).

DNA

DNA stands for **deoxyribonucleic acid**. It may sound gibberish, but the name actually tells us two things:

- DNA contains **deoxyribose** (a 5-carbon sugar)
- DNA is a **nucleic acid** (molecule made up of individual **nucleotides**)



The Structure of DNA: Discovery

Rosalind Franklin was a very methodical and esteemed scientist.

- Franklin was offered a position at Kings College in London to help **Maurice Wilkins** perfect X-ray crystallography.
- Wilkins showed Watson and Crick Rosalind's work, namely her famous "Photo 51", which confirmed the helical structure of DNA.

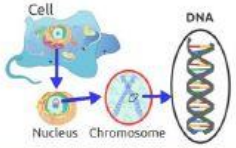


DNA Replication

Recall that DNA is found in the **nucleus** of all cells.

In order to make more cells (which you are constantly doing), you must make a **copy of DNA first!**

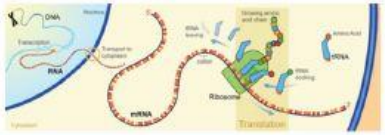
DNA replication occurs during the synthesis phase of the cell cycle (before the cell actually divides).



Recap: Putting it all together

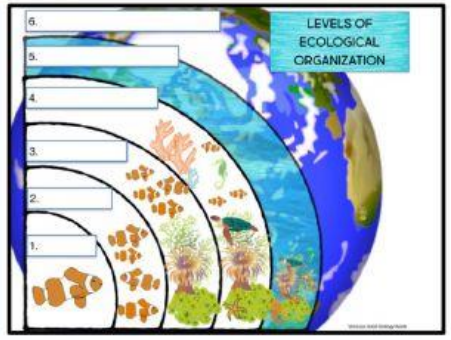
DNA codes for **proteins. Proteins** are made during **protein synthesis**, which is divided into two phases: **transcription** and **translation.**

- **Transcription** occurs in the nucleus. The final product of transcription is an **mRNA strand.**
- **Translation** occurs on the ribosomes. The final product of translation is a **protein.**



ECOLOGY



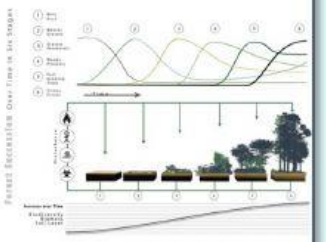


How do ecosystems form?

Though it may not appear this way, ecosystems are constantly changing.

Succession-
A regular progression of species of replacement over time
-- ecosystems evolving

Succession is typically slow, but natural disasters or human disturbances can make sudden changes.



Typically, there are 4-5 available trophic levels

Trophic Level	Type of Organism	Example
FIRST	Producer	Sunflower seeds
SECOND	Primary Consumer	Mouse
THIRD	Secondary Consumer	Snake
FOURTH	Tertiary Consumer	Hawk
FIFTH	Quaternary Consumer	Fox

Food chain= grass → mouse → snake → hawk→ fox
(arrows point in direction of energy flow).



Examples of Labs & Simulations included

Name: _____ Date: _____

Quick Lab: Cellular Respiration in Action!

Materials: Beaker; bromothymol blue solution (BTB); eye dropper, straw, stop watch (or clock)

Pre-Lab:

1. Write the equation for cellular respiration: _____
2. True or False: Cellular respiration produces carbon dioxide as a (waste) product. _____

Background: Carbon dioxide production can be measured using a solution of bromothymol blue (BTB). BTB is an **acid indicator**; it turns from blue to green-yellow when it reacts with acid. When carbon dioxide reacts with water, **carbonic acid** is formed. The more carbon dioxide you breathe into the BTB solution, the quicker it will change color to green-yellow.

Traditional style lab

4. Using a stop watch, have your partner time how long it takes for the blue solution to turn green-yellow. While your partner is timing how long the solution takes to turn colors, you will count your pulse (heart beat) over a 30 second period, then multiply that number by 2.
5. Record the time for the color change and the heart rate in the data table below.
6. Clean out your beaker (drain and rinse).
7. Repeat steps 1-2
8. *Do jumping jacks or run in place for 50 seconds* and then repeat steps 3-6.
9. Repeat steps 1-2.
10. *Do jumping jacks or run in place for 100 seconds* and then repeat steps 3-6.

(If there is time, repeat the entire lab procedure with your partner; write the data next to the existing data and calculate the average.)

11. Clean equipment and put it away neatly.

Exercise level	Carbon dioxide production rate (in seconds)	Heart rate (beats per minute)
Pre-exercise		
Jumping jacks		
Running in place		

CO_2 Quick Lab

Teacher Guide (my results)

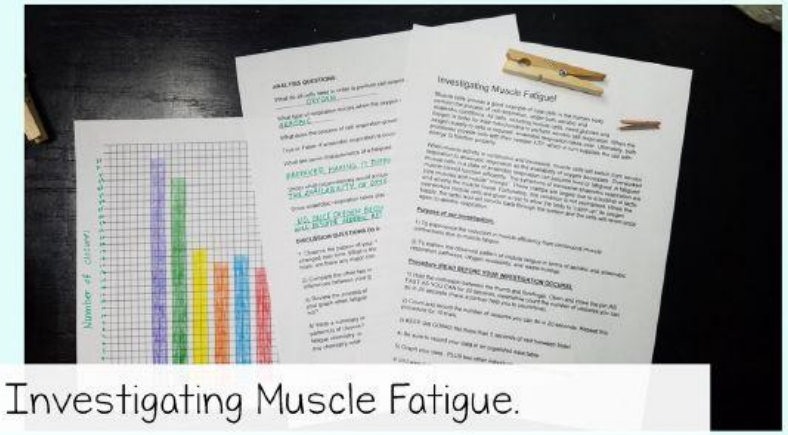
Brand used: Haribo

Gummy Bears	Ingredients	Day 1 measurements	Day 2 measurements (next day)	Day 3 measurements
Gummy bear # 1 (pure water/pure water)	Day 1- 75 ml water Day 2- 75 ml water	h = 2 cm w = 1.25 cm d = 1 cm	h = 4 cm w = 2.25 cm d = 2.75 cm	h = 4.25 w=2.25 d=2.75 *The gummy bear may have disintegrated - if this is the case, students can get their results from another group.
Gummy bear #2 (pure water/ salt water)	Day 1- 75 ml water Day 2; 75 ml water; 5 ml (1 tsp) salt	h = 2 cm w = 1.25 cm d = 1 cm	h = 4 cm w = 2.25 cm d = 2.75 cm	(salt water) h = 3.25 cm w = 2 cm d = 1.75 cm

Day 3 visual comparison

Teacher Guides provided for more in depth labs

Gummy Bear Osmosis Lab



Investigating Muscle Fatigue.

Name: _____ Date: _____

DRAGON FEATHERS
Monohybrid Crosses

Some species of dragons, such *Regalus copperus*, have feathers instead of scales on their body. This is controlled by a genetic trait. Feathers (F) are dominant, whereas lack of feathers (f) is recessive.

In the square provided, perform a monohybrid cross among a male who is heterozygous for the trait and a female who is also heterozygous for the trait.

Monohybrid Cross Sim.

The female dragon has laid 12 eggs. Using the monohybrid cross Punnett square above, *predict* how many babies will have the following traits:

How many feathered dragons? _____

How many non-feathered dragons? _____

During the next portion of the lab, we are going to simulate how traits are passed down to offspring using popsicle sticks as chromosomes. Gather 4 popsicle sticks. If different colors are available choose 2 in one color and 2 in a different color. One color will be designated for the male, and the other color for the female.

Materials:
4 Popsicle Sticks
2 Paper Bags
Basic Calculator

Write the alleles for the feather gene on the popsicle sticks. Do this for both the male and female chromosomes.
Label one paper bag "male" and the other "female". Put the corresponding popsicle sticks into each bag. It does not matter which dragon you start with.
Shake the bag and choose a popsicle stick (no peeking!). Do this 12 times. Be sure to shake the bag and not to peek between each turn. Record your results in the table on the following page.
After you've finished recording, repeat the process for the other dragon. Record in the table on the following page.



Fermentation Lab



DATA TABLE 2

Variation	Year 0 % (Initial %)	Year 1 %	Year 2 %	Year 3 %	Year 4 %	Year 5%	Year 6%	Year 7 %	Year 8 %	Year 9 %	Year 10% (Final %)
Scavenger											
Flattened molars											
Smaller body size											
Super fast											
Extra fat reserves											
Longer claws											

USE FOR GRAPH

And the winner is... _____ because their variation increased by _____ (final percentage – initial percentage).

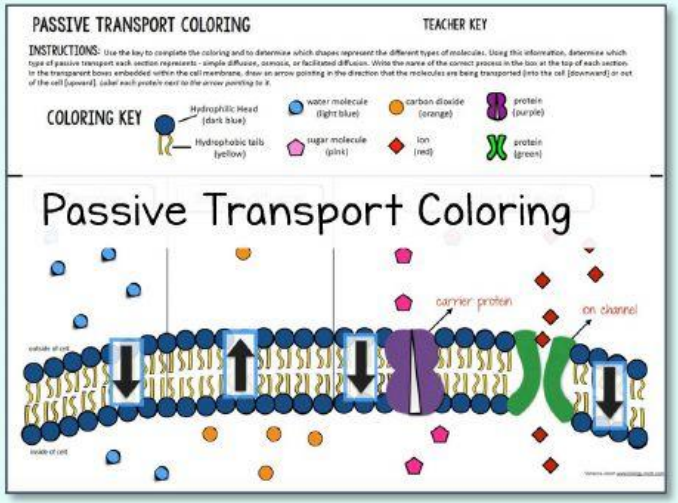
ANALYSIS AND FOLLOW UP QUESTIONS

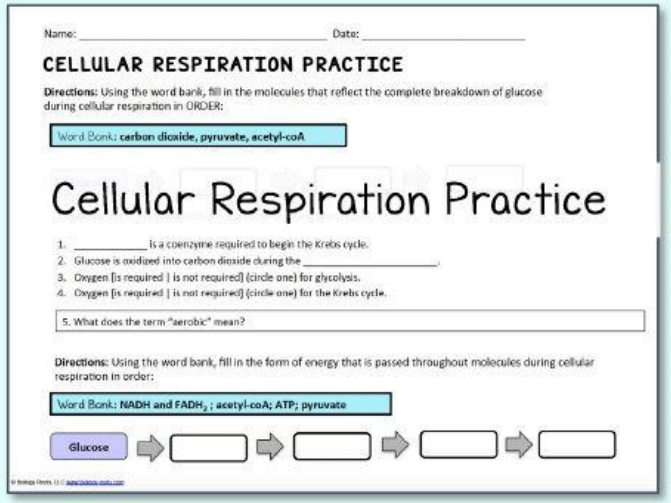
1. Comparing the initial percentage of variations to the final percentage, how did your population change over time? Did any traits become rare? Did any traits become more common? _____
2. In this exercise, what was responsible for the rise or decline of the variations? _____
3. Explain how genetic variation plays a role in natural selection: _____

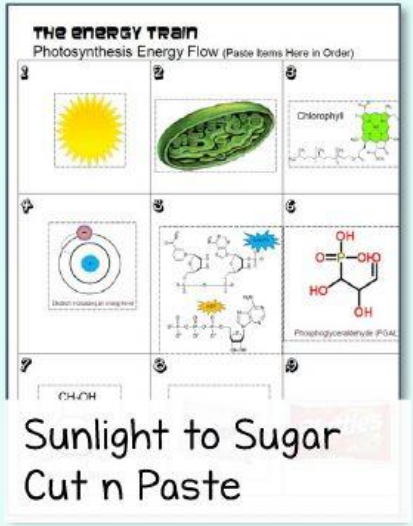
Simulation: The Hungry Games of Natural Selection

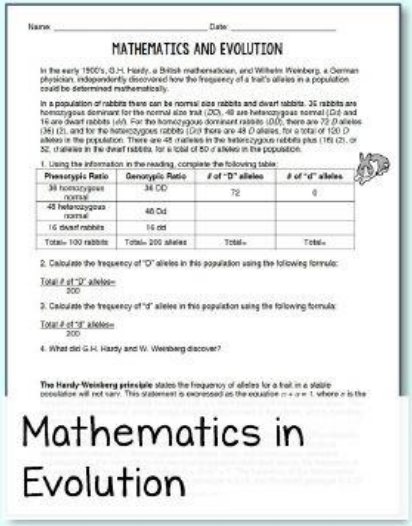
Labs may include traditional labs or simulations that model phenomena.

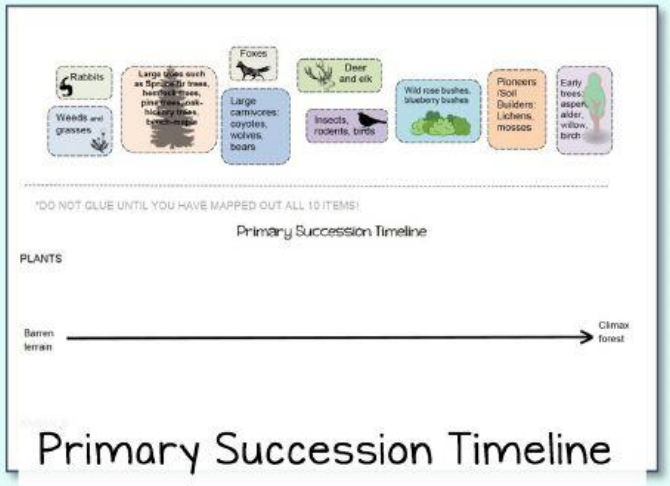
Practice and Reinforcement

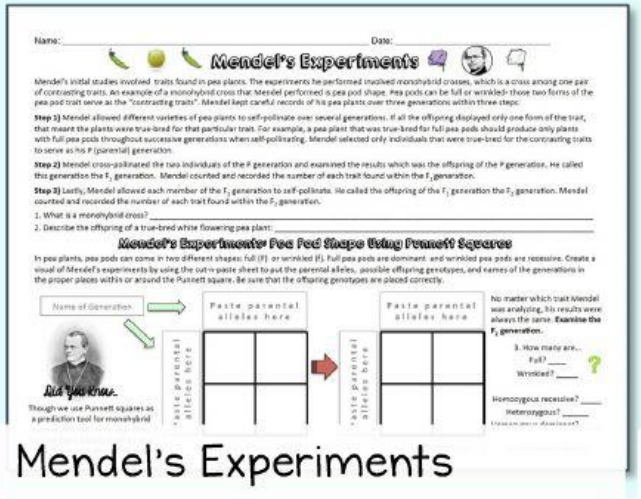


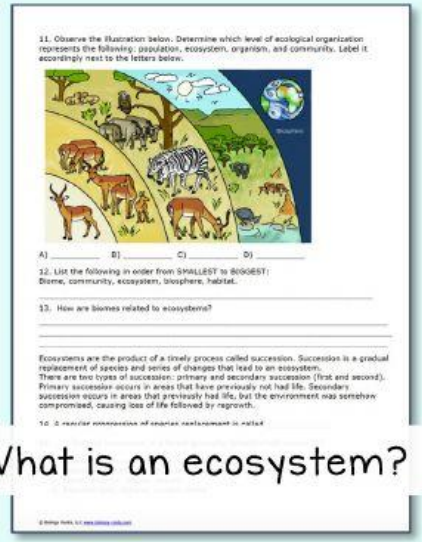


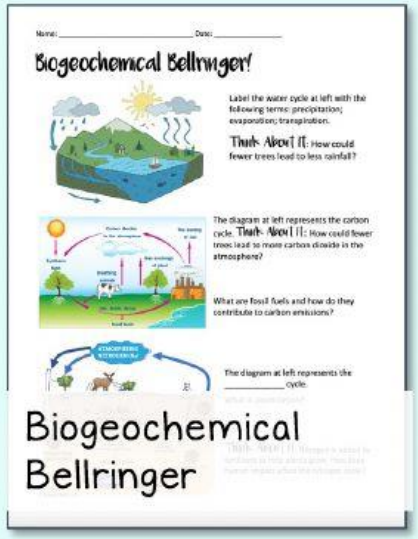






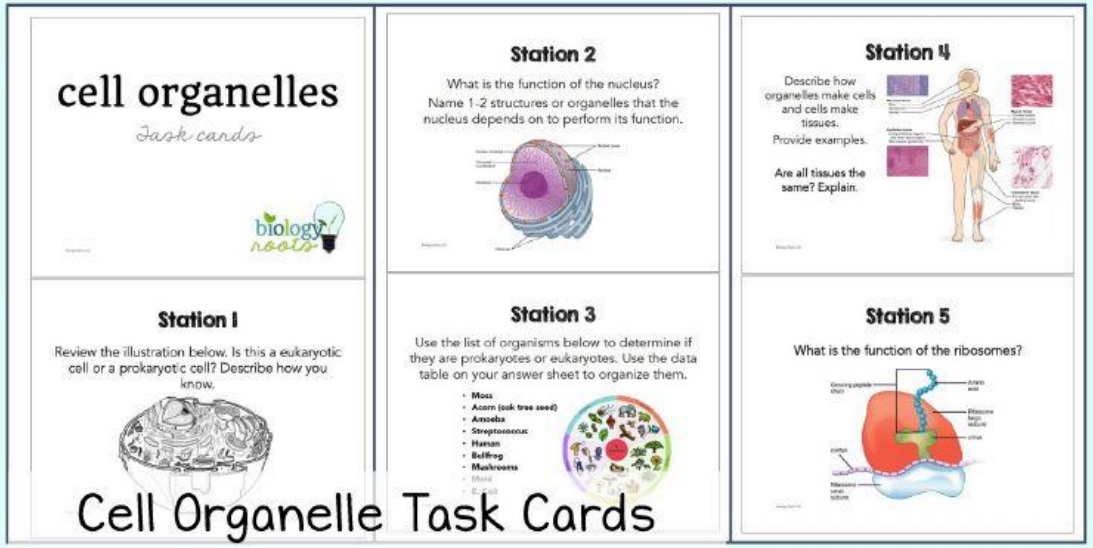




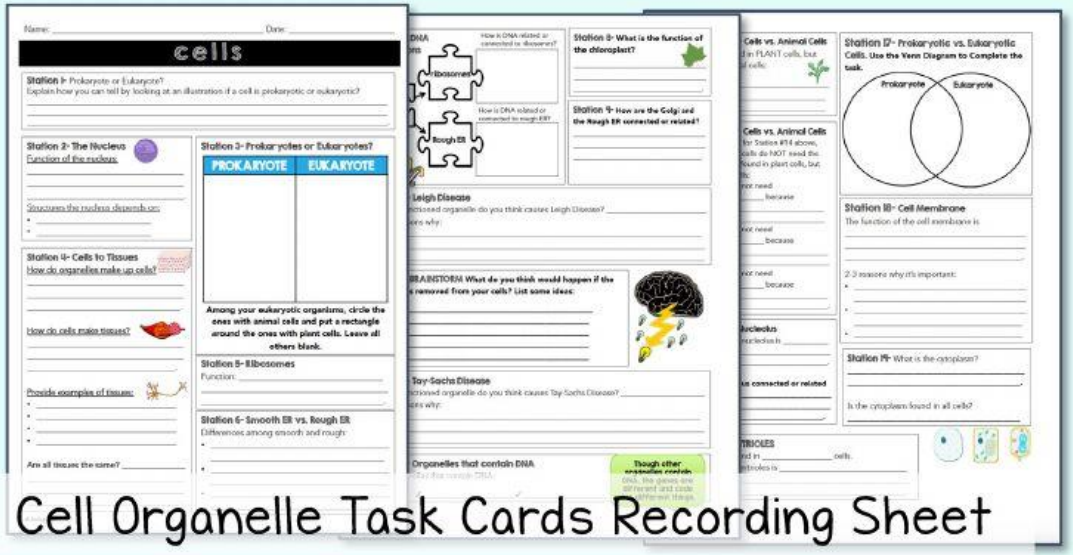


A **variety** of classwork and homework is offered and may include traditional reading exercises, graphic organizers, coloring, graphing, or cut and paste.

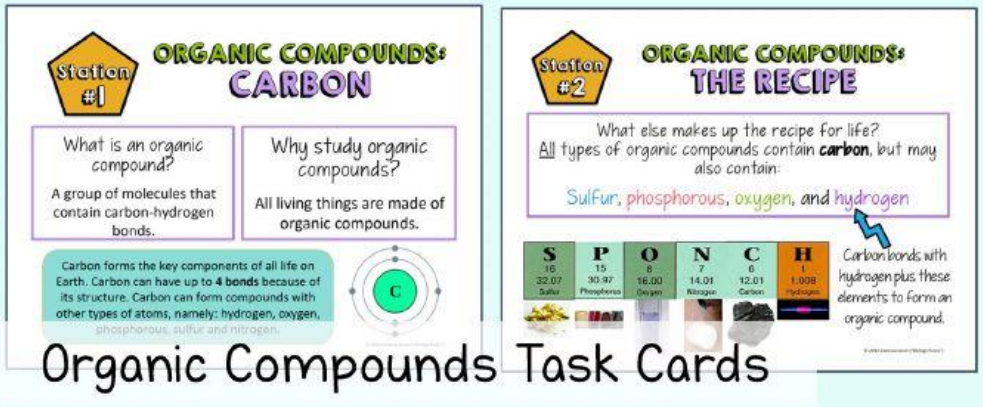
Stations or Task Cards included



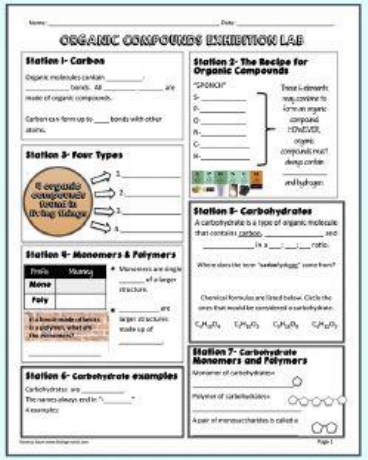
Cell Organelle Task Cards

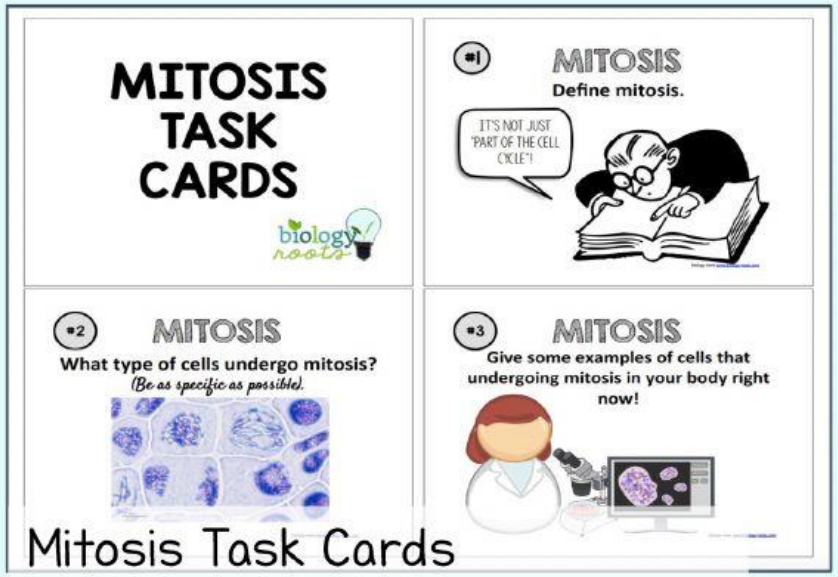


Cell Organelle Task Cards Recording Sheet



Organic Compounds Task Cards

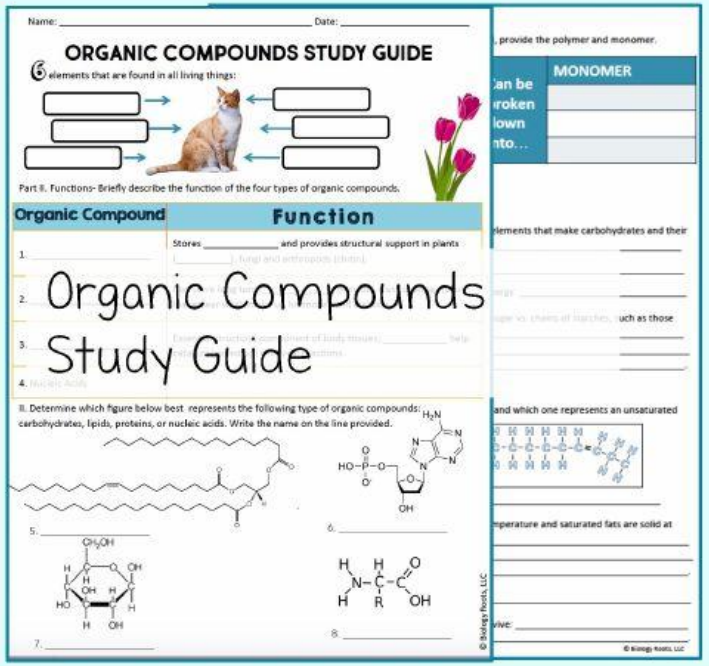


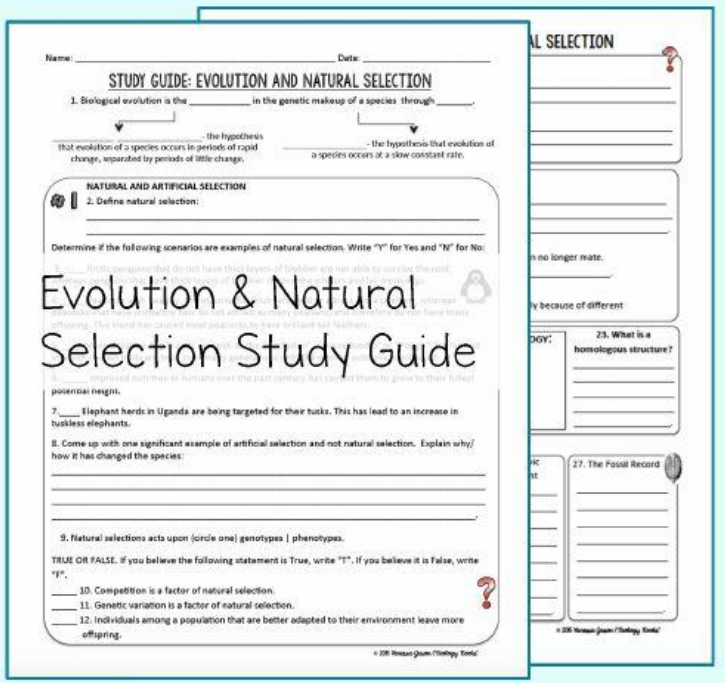


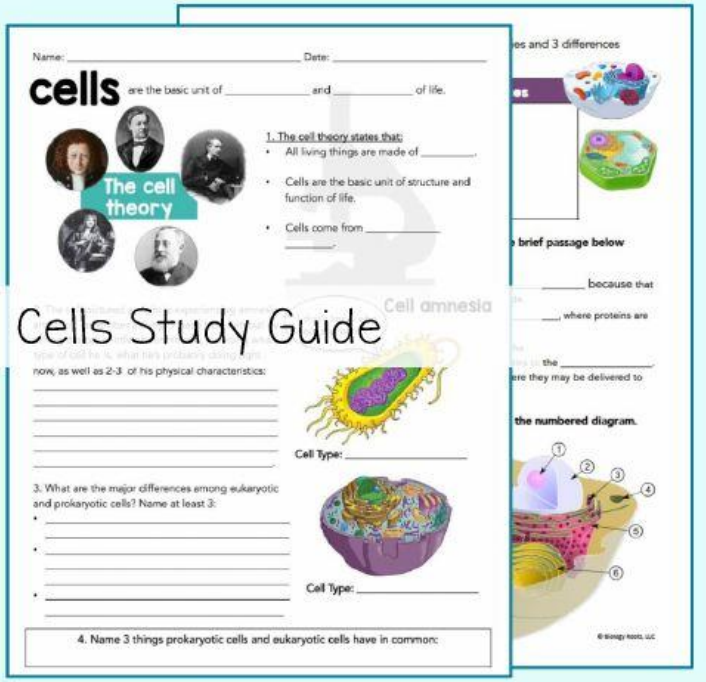
Mitosis Task Cards

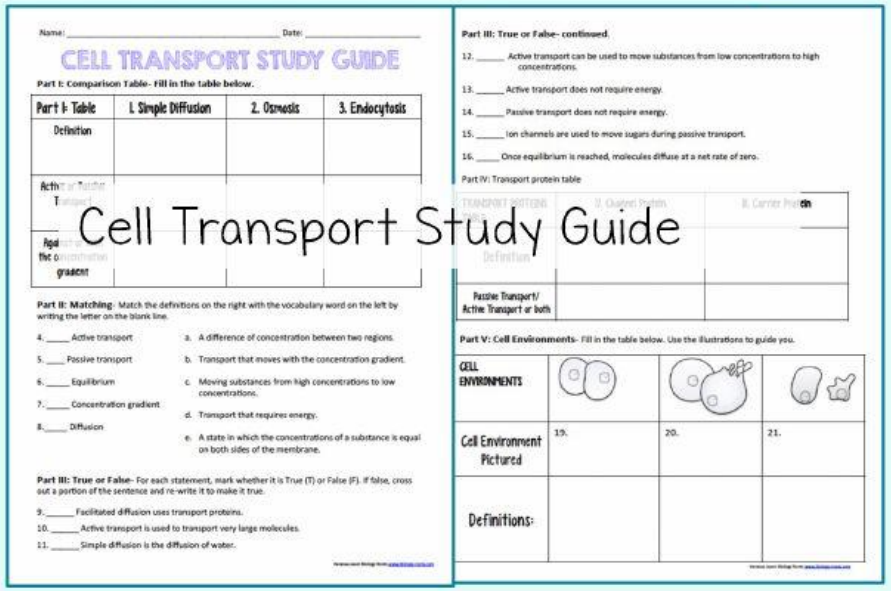
All task cards include a student answer sheet for recording answers.

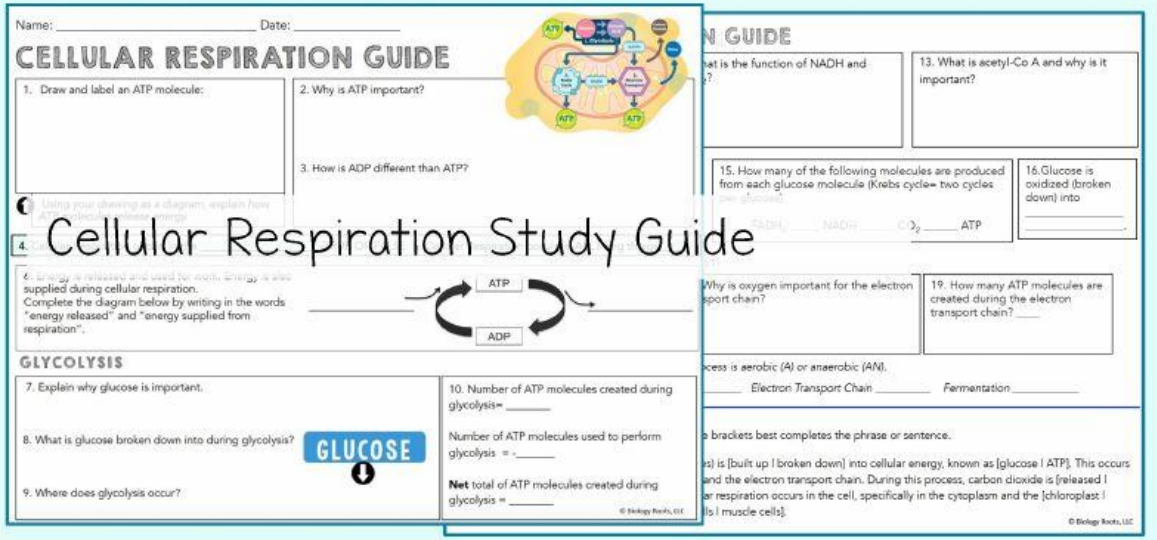
Study Guides & Quizzes included in each unit



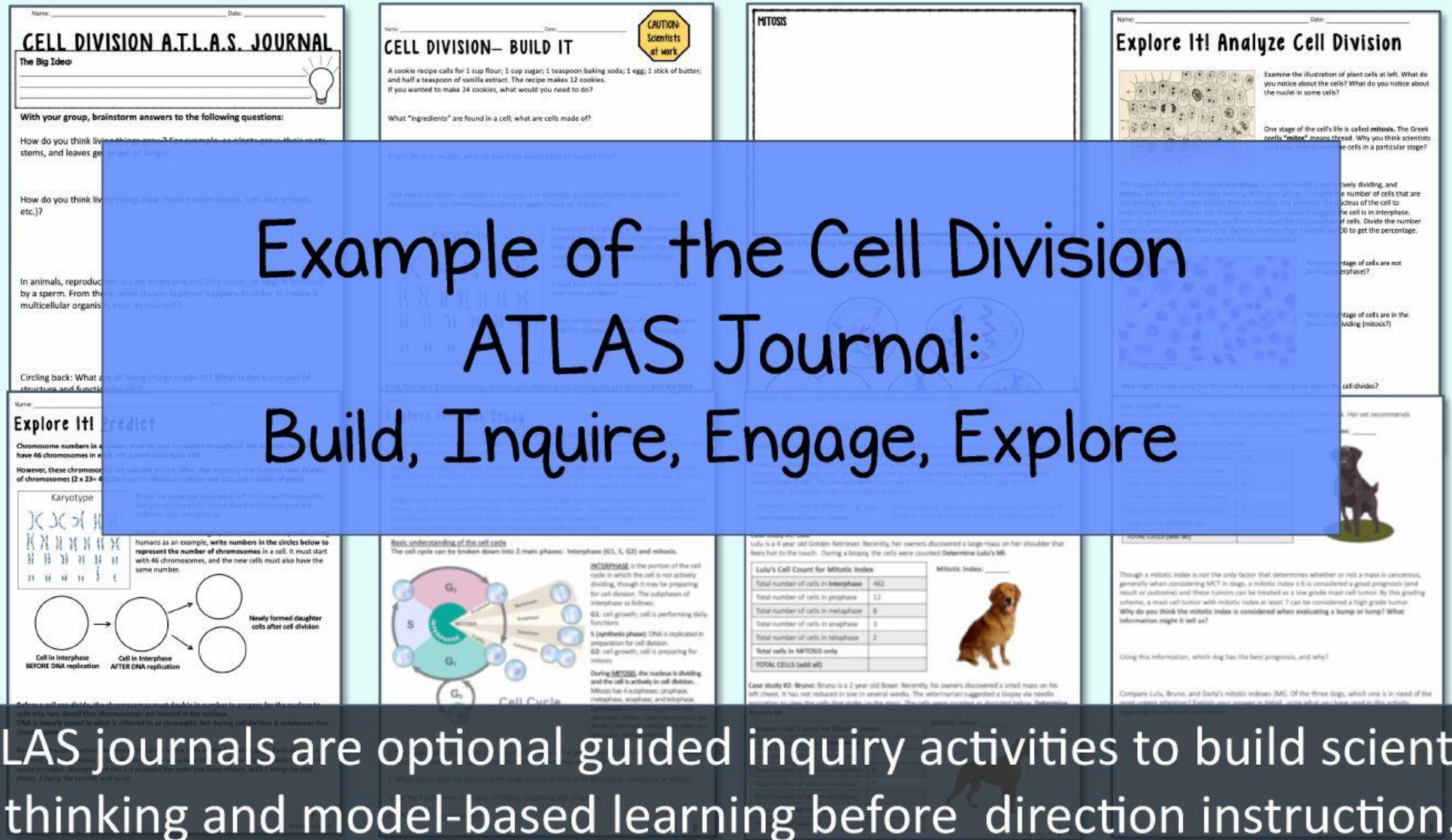








ATLAS ® Journals for Guided *Inquiry*



Example of the Cell Division ATLAS Journal: Build, Inquire, Engage, Explore

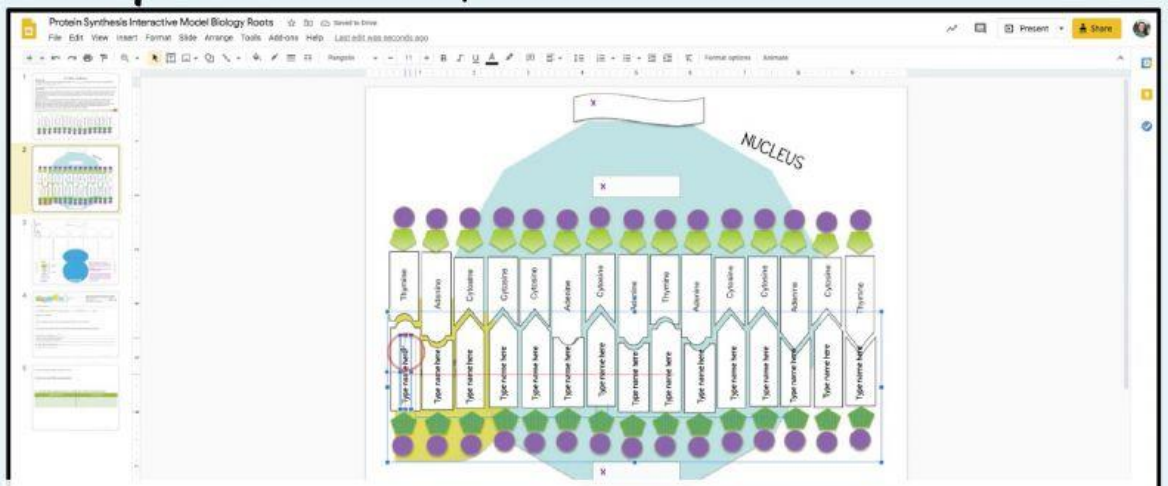
ATLAS journals are optional guided inquiry activities to build scientific thinking and model-based learning before direction instruction.

Build, Inquire, Engage, Explore

Available for the following topics: cells; cell transport; DNA; cell division; genetics; evolution; photosynthesis; cellular respiration; ecology

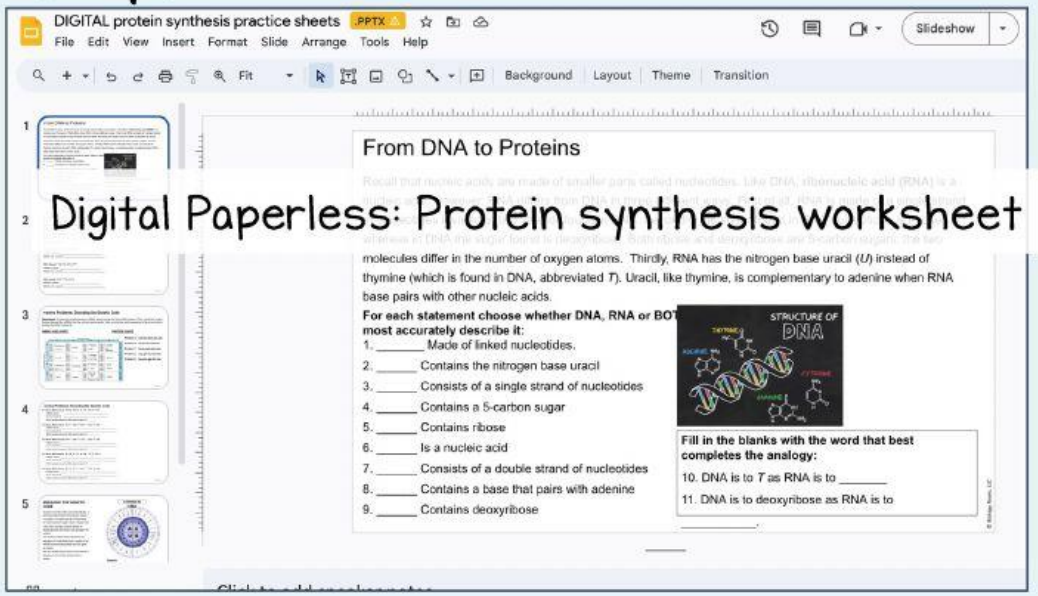
Print and Digital options available

Example: Protein Synthesis Model

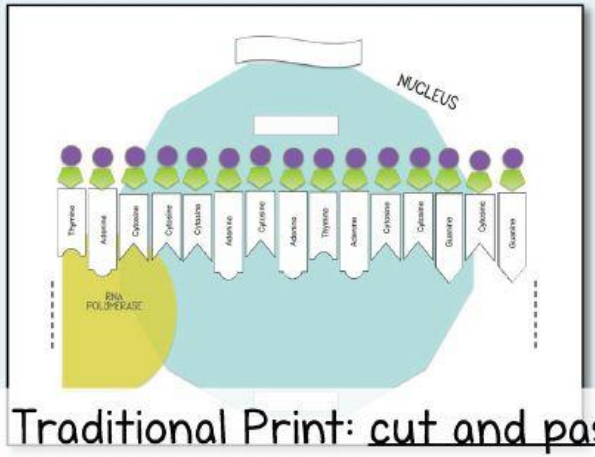


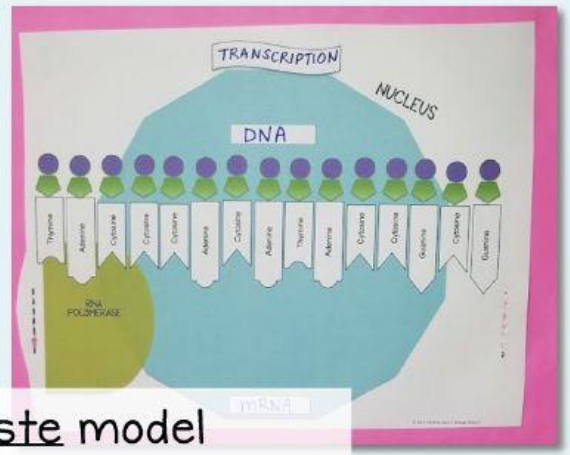
Digital Paperless: protein Synthesis Digital Model with moveable pieces hosted on Google Slides

Example: Worksheets

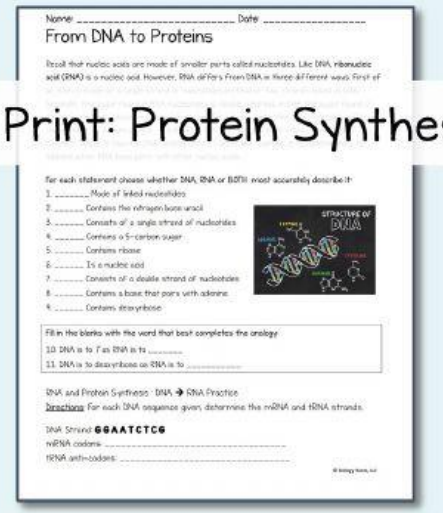


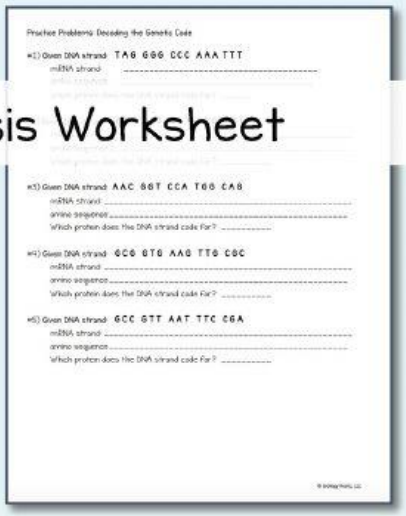
Digital Paperless: Protein synthesis worksheet





Traditional Print: cut and paste model



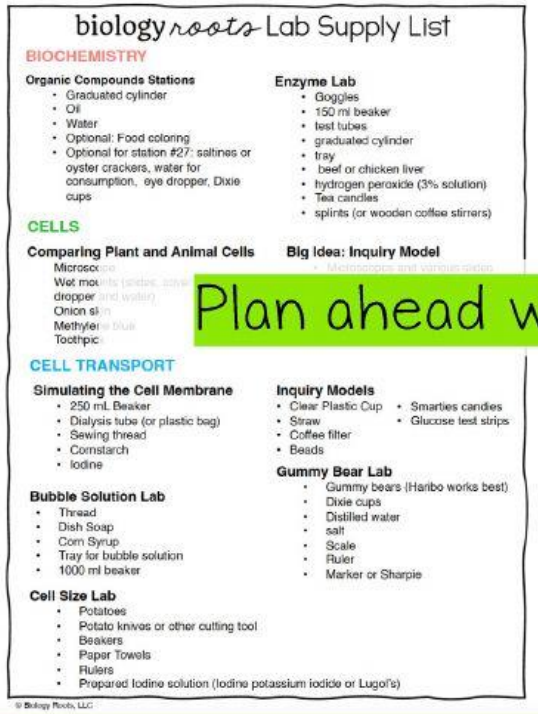


Print: Protein Synthesis Worksheet

Digital options are perfect for unexpected absences!

Master Supply List included

All labs are editable in case you need to make adjustments



biology roots Lab Supply List

BIOCHEMISTRY

Organic Compounds Stations
- Graduated cylinder
- Oil
- Water
- Optional: Food coloring
- Optional for station #27: saltines or oyster crackers, water for consumption, eye dropper, Dixie cups

Enzyme Lab
- Goggles
- 150 ml beaker
- test tubes
- graduated cylinder
- tray
- beef or chicken liver
- hydrogen peroxide (3% solution)
- Tea candles
- splints (or wooden coffee stirrers)

CELLS

Comparing Plant and Animal Cells
Microsc
Wet mo (slides, cover dropper and water)
Onion sk
Methyle blue
Toothpic

Big Idea: Inquiry Model
Microscopes and observation

CELL TRANSPORT

Simulating the Cell Membrane
- 250 mL Beaker
- Dialysis tube (or plastic bag)
- Sewing thread
- Cornstarch
- Iodine

Bubble Solution Lab
- Thread
- Dish Soap
- Corn Syrup
- Tray for bubble solution
- 1000 ml beaker

Cell Size Lab
- Potatoes
- Potato knives or other cutting tool
- Beakers
- Paper Towels
- Rulers
- Prepared Iodine solution (Iodine potassium iodide or Lugol's)

Inquiry Models
- Clear Plastic Cup
- Straw
- Coffee filter
- Beads
- Smarties candies
- Glucose test strips

Gummy Bear Lab
- Gummy bears (Haribo works best)
- Dixie cups
- Distilled water
- salt
- Scale
- Ruler
- Marker or Sharpie

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biology roots Lab Supply List

CELL DIVISION

Big Idea: Inquiry Model
Yarn or Pipe Cleaners
Paper Plates

DNA

Big Idea: Inquiry Model
- Beads
- String
- Tape for scotch

DNA Extraction: Cheek Cells and Strawberry Cells
- Test tube
- Rubbing alcohol stored in freezer beforehand
- Coffee stirrer
- Sandwich baggies (strawberry)
- Cheesecloth or strainers (strawberry)

Cheek Cell Salt water Solution= 2 tsp salt per every 1 liter of water;
Cheek Cell Detergent Solution= 1 part detergent (Dawn dish soap); 3 parts water
Strawberry Cell Extraction buffer= 900 mL water, 50 mL dish detergent, 2 tsp salt

MUTATIONS

Mutation Simulation: coins, dice

GENETICS

Big Idea: Inquiry Model
Pipe cleaners and beads

Cross Simulations (DIHYBRID AND MONOHYBRID)
Popsicle Sticks
Paper brown bags

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biology roots Lab Supply List

CELL DIVISION

Big Idea: Inquiry Model
Yarn or Pipe Cleaners
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MUTATIONS

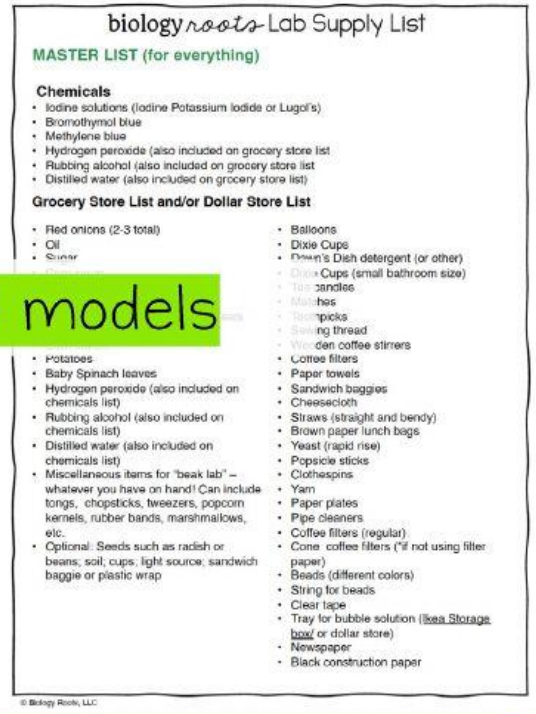
Mutation Simulation: coins, dice

GENETICS

Big Idea: Inquiry Model
Pipe cleaners and beads

Cross Simulations (DIHYBRID AND MONOHYBRID)
Popsicle Sticks
Paper brown bags

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biology roots Lab Supply List

MASTER LIST (for everything)

Chemicals
- Iodine solutions (Iodine Potassium Iodide or Lugol's)
- Bromothymol blue
- Methylene blue
- Hydrogen peroxide (also included on grocery store list
- Rubbing alcohol (also included on grocery store list
- Distilled water (also included on grocery store list)

Grocery Store List and/or Dollar Store List
- Red onions (2-3 total)
- Oil
- Sugar
- Potatoes
- Baby Spinach leaves
- Hydrogen peroxide (also included on chemicals list)
- Rubbing alcohol (also included on chemicals list)
- Distilled water (also included on chemicals list)
- Miscellaneous items for "beak lab" – whatever you have on hand! Can include tongs, chopsticks, tweezers, popcorn kernels, rubber bands, marshmallows, etc.
- Optional: Seeds such as radish or beans; soil; cups; light source; sandwich baggie or plastic wrap
- Balloons
- Dixie Cups
- Dawn's Dish detergent (or other)
- Cups (small bathroom size)
- andles
- hes
- picks
- ng thread
- den coffee stirrers
- Coffee filters
- Paper towels
- Sandwich baggies
- Cheesecloth
- Straws (straight and bendy)
- Brown paper lunch bags
- Yeast (rapid rise)
- Popsicle sticks
- Clothespins
- Yarn
- Paper plates
- Pipe cleaners
- Coffee filters (regular)
- Cone coffee filters (*if not using filter paper)
- Beads (different colors)
- String for beads
- Clear tape
- Tray for bubble solution (Ikea Storage box/ or dollar store)
- Newspaper
- Black construction paper

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Plan ahead with a master supply list for ALL labs and models

★★★★

"Outstanding product – thorough, informative, wonderfully presented, excellent accompanying resources and activities … this is the real deal. I had purchased some subunits and then realized quickly that I should go ahead and get the full year, and have happily done so. This will prove to be very helpful to both me and my students. Well done, and thank you." – Michael R.

Frequently Asked Questions

vanessa@biology-roots.com

Q: What is NOT included in the curriculum?
A: In order to keep the cost of the curriculum at an affordable price, the following items are not included: plants unit; interactive notebook bundle; body systems.

Q: Is the textbook required?
A: No textbook is required, the curriculum is self-contained, but flexible enough to use with a textbook or other materials if you choose.

Q: Are answer keys included? A: They sure are!

Q: I use Google Classroom or another online student learning platform. Can I post the materials there?
A: Yep. As long as the content is password protected/for students' eyes only, post away!

Q: Do the PowerPoint notes come with a student version? What are they like?
A: Yes, the student notes have TWO options to choose from: fill-in-the-blank style or guided two-column. You can choose to have students take their own notes instead.

Q: Which standards does the curriculum support?
A: The curriculum supports multiple standards, including NGSS, STEELS, TEKS, SOL, GSE, and more. If you need to double check the specific standards in your state before purchasing, please contact me.

Q: Do you offer purchase orders? Yes I do. Please contact me for a quote.

Want to see even more? Detailed previews for each individual unit are available on the curriculum product page below.

biology roots

★★★★ "This bundle was the great purchase for a first time teacher with zero teaching experience. Each unit comes with a planner so you know where you are at in the lesson with labeled assessments. Everything I could ask for. The seller is very responsive and extremely helpful! I love this seller and bundle." –*LW*

TERMS OF USE

It IS Okay to...	It is NOT Okay to...
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Still have questions? **No problem, happy to answer them: vanessa@biology-roots.com**