DNA

Complete Unit



Topics include:

- ✅ DNA Function & Structure
- ✅ DNA replication
- ✅ Protein synthesis
- ✅ Mutations

biology roots

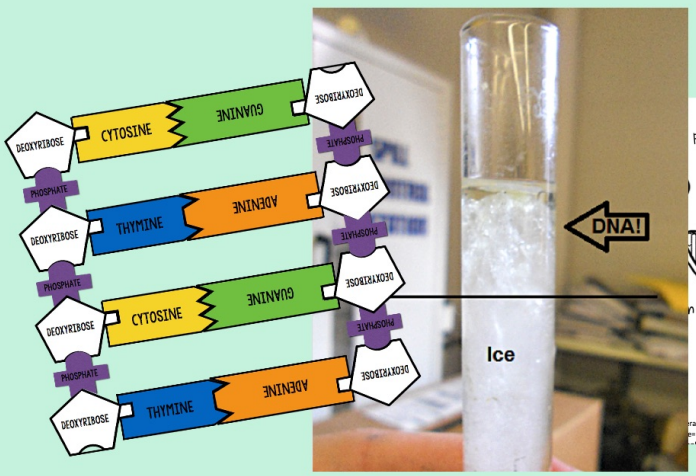
Best for high school or middle school

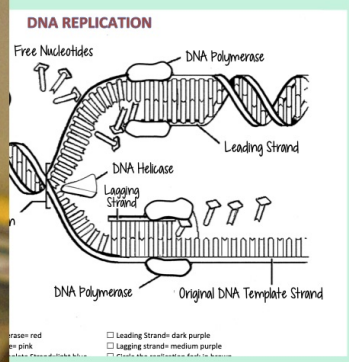
Editable, digital options, answer keys included!

Planning is done for you! Pacing guide included with learning targets. Includes <u>both</u> 50-min and 90-min blocks.

"Engaging for students and teacher friendly low prep! Thanks Biology Roots for a resource that improves outcomes!" ⭐⭐⭐⭐

-Rhonda L.





DNA UNIT BUNDLE ~ 90 MINUTES

DAY/DATE	STUDENT ACTIVITY AND TEACHER NOTES	LEARNING TARGET
(BEFORE)	INQUIRY JOURNALS (ATLAS) - RECOMMENDED FOR HONORS, OPTIONAL FOR COLLEGE PREP	
1 _____	DNA notes through structure (stop at DNA replication) DNA Paper model. If you choose to do the Class Frankenstein with it, you can pass that out and assign traits to get started.	To introduce students to the basic structure of DNA and how it stores genetic info
2 _____	Bellringer: DNA Structure Give 5–10 minutes to finish up DNA model if needed. Optional: DNA Cheek & Strawberry Extraction (this is also good to save for a half–day.) If not doing the lab, you can begin DNA structure task cards (allow 30 minutes with time to finish tomorrow.) DNA and RNA Reading and Coloring (homework if not complete.) Heads up: quiz coming soon	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.]
3 _____	DNA Structure Task Cards (begin or complete depending on prior lesson.) Notes through DNA Replication DNA Replication Coloring	To determine the steps of DNA replication. [Goal: Students will visualize

DNA UNIT BUNDLE ~50 MINUTE BLOCKS

DAY/DATE	STUDENT ACTIVITY AND TEACHER NOTES	LEARNING TARGET
(BEFORE)	INQUIRY JOURNALS (ATLAS) - RECOMMENDED FOR HONORS, OPTIONAL FOR COLLEGE PREP	
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 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, to compare and contrast DNA to RNA [Goal: Students can 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: to 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– can 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	
9 _____	Review quiz Protein Synthesis Cut and Paste	
10 _____	Study Guide	
11 _____	Test	

The purchase of this BUNDLE saves 33%

Included in the bundle:

Answer Keys

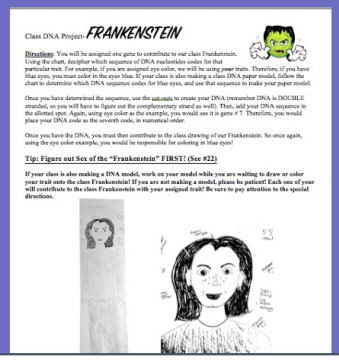
Editable resources

Digital versions

Hands-on models

Labs

Guided inquiry (build "Alien" DNA plus more)


Class DNA Project: FRANKENSTEIN

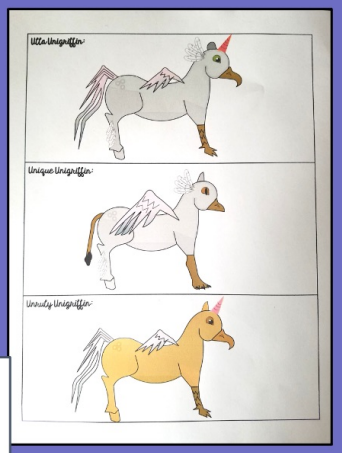
Directions: You will be assigned one gene to contribute to our class Frankenstein. Using the chart, decipher which sequence of DNA nucleotides codes for that particular trait. For example, if you are assigned eye color, we will be using your traits. Therefore, if you have blue eyes, you must color in the eyes blue. If your class is also making a class DNA paper model, follow the chart to determine which DNA sequence codes for blue eyes, and use that sequence to make your paper model.

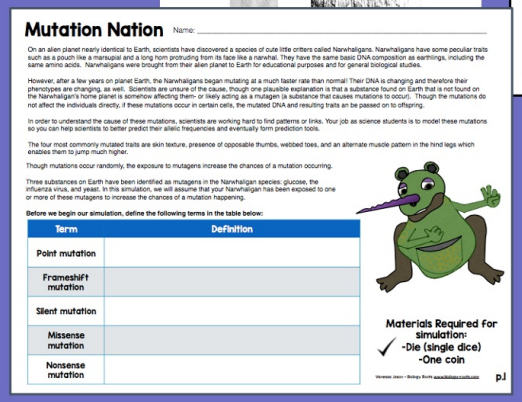
Once you have determined the sequence, use the cut-outs to create your DNA (remember DNA is DOUBLE stranded, so you will have to figure out the complementary strand as well). Then, add your DNA sequence in the allotted spot. Again, using eye color as the example, you would see it is gene # 7. Therefore, you would place your DNA code as the seventh code, in numerical order.

Once you have the DNA, you must then contribute to the class drawing of our Frankenstein. So once again, using the eye color example, you would be responsible for coloring in blue eyes!

Tip: Figure out Sex of the "Frankenstein" FIRST! (See #22)

If your class is also making a DNA model, work on your model while you are waiting to draw or color your trait onto the class Frankenstein! If you are not making a model, please be patient! Each one of your will contribute to the class Frankenstein with your assigned trait! Be sure to pay attention to the special directions.




Mutation Nation Name: _____

On an alien planet nearly identical to Earth, scientists have discovered a species of cute little critters called Narwhaligans. Narwhaligans have some peculiar traits such as a pouch like a marsupial and a long horn protruding from its face like a narwhal. They have the same basic DNA composition as earthlings, including the same amino acids. Narwhaligans were brought from their alien planet to Earth for educational purposes and for general biological studies.

However, after a few years on planet Earth, the Narwhaligans began mutating at a much faster rate than normal! Their DNA is changing and therefore their phenotypes are changing, as well. Scientists are unsure of the cause, though one plausible explanation is that a substance found on Earth that is not found on the Narwhaligan's home planet is somehow affecting them- or likely acting as a mutagen (a substance that causes mutations to occur). Though the mutations do not affect the individuals directly, if these mutations occur in certain cells, the mutated DNA and resulting traits an be passed on to offspring.

In order to understand the cause of these mutations, scientists are working hard to find patterns or links. Your job as science students is to model these mutations so you can help scientists to better predict their allelic frequencies and eventually form prediction tools.

The four most commonly mutated traits are skin texture, presence of opposable thumbs, webbed toes, and an alternate muscle pattern in the hind legs which enables them to jump much higher.

Though mutations occur randomly, the exposure to mutagens increase the chances of a mutation occurring.

Three substances on Earth have been identified as mutagens in the Narwhaligan species: glucose, the influenza virus, and yeast. In this simulation, we will assume that your Narwhaligan has been exposed to one or more of these mutagens to increase the chances of a mutation happening.

Before we begin our simulation, define the following terms in the table below:

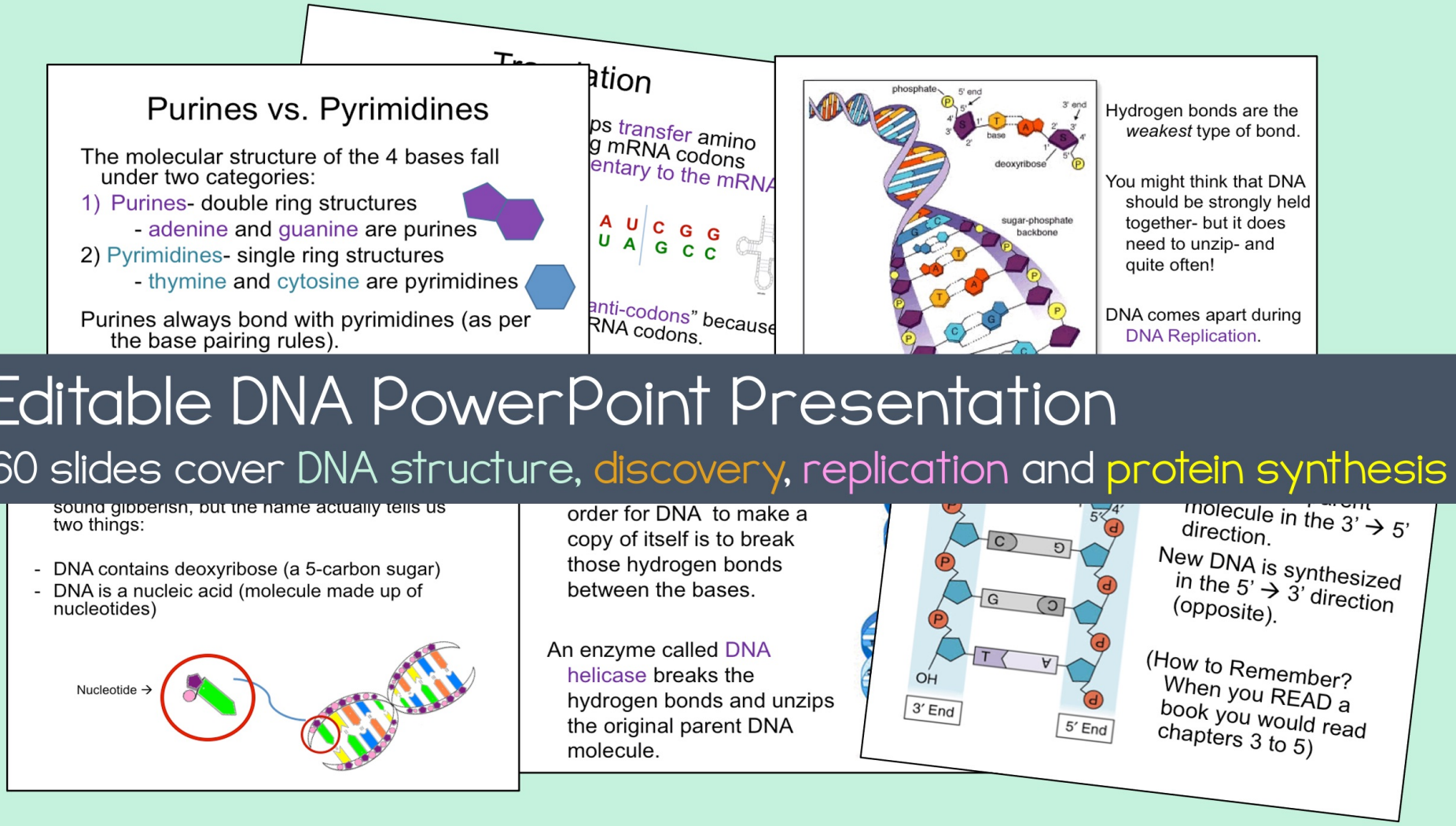
Term	Definition
Point mutation	
Frameshift mutation	
Silent mutation	
Missense mutation	
Nonsense mutation	

Materials Required for simulation:
✓ -Die (single dice)
-One coin

p.1

★★★★★

This is great! A LOT Of work went into this, don't let the price dissuade you.
There are so many varied activities in this bundle. I laminated the transcription and translation activity after I printed it in color. I will be able to use this many times …. The mutation activity is really fun.
It takes you all the way from DNA replication to mutations. The guided notes and PowerPoint are really good! -Lynda B.

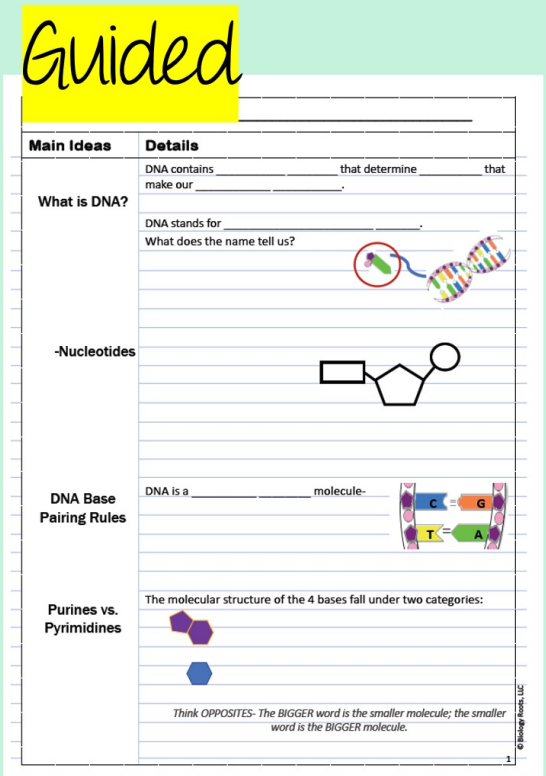


Editable DNA PowerPoint Presentation

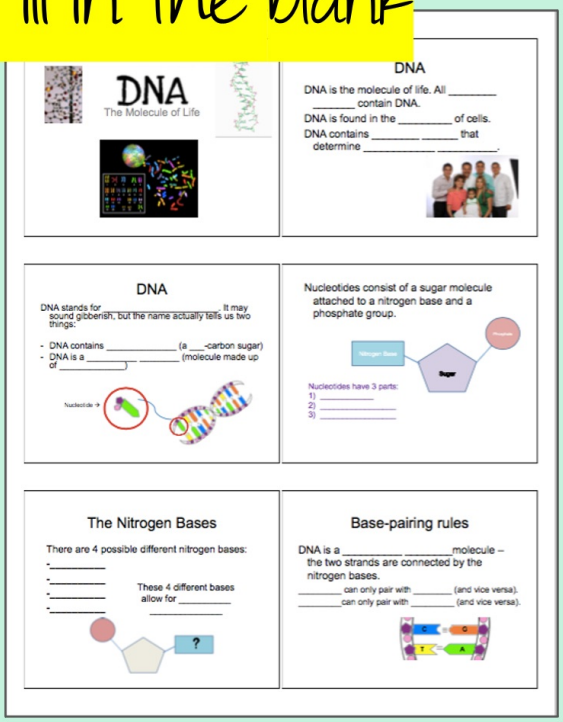
60 slides cover DNA structure, discovery, replication and protein synthesis

The PowerPoint comes with 2 types of student notes to choose from: guided or fill in the blank

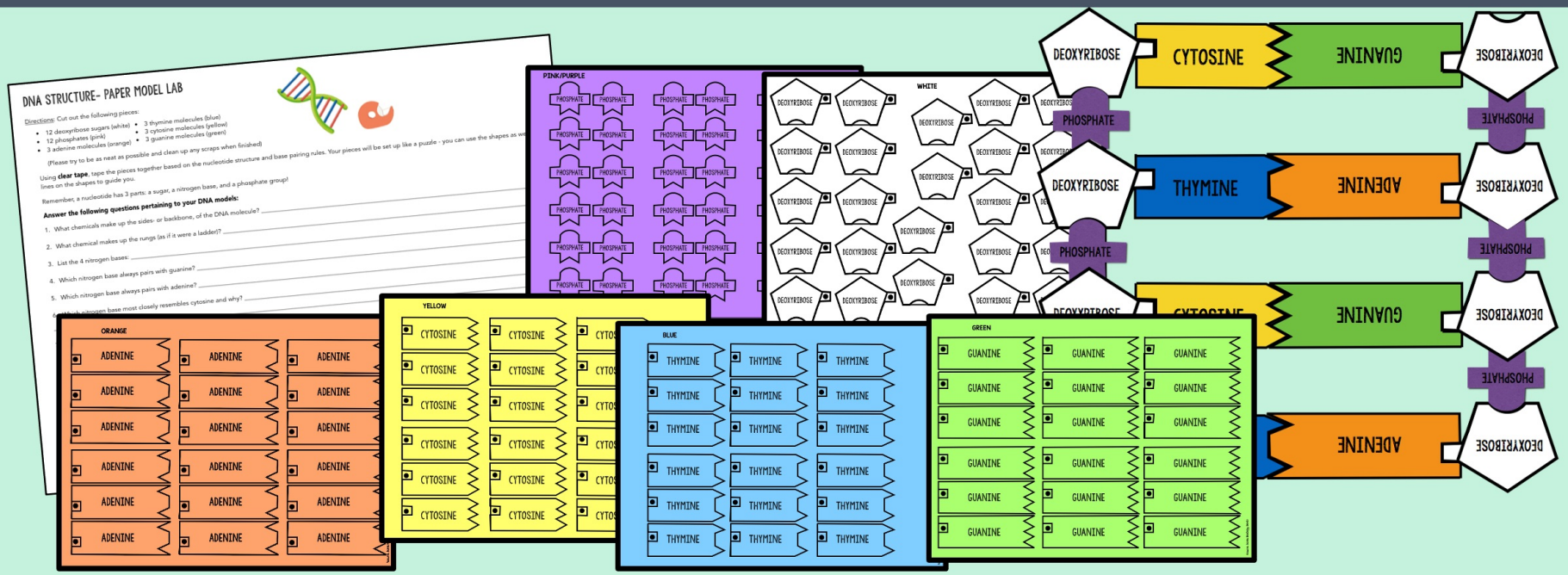
Guided



Fill in the blank



CLASSWORK (most is editable). Answer keys always included.



DNA Structure Classwork (model; class Frankenstein; reading and coloring)

particular trait. For example, if you are assigned eye color, we will be using ***your*** traits. Therefore, if you have blue eyes, you must color in the eyes blue. If your class is also making a class DNA paper model, follow the chart to determine which DNA sequence codes for blue eyes, and use that sequence to make your paper model.

Once you have determined the sequence, use the cut-outs to create your DNA (remember DNA is DOUBLE stranded, so you will have to figure out the complementary strand as well). Then, add your DNA sequence in the allotted spot. Again, using eye color as the example, you would see it is gene # 7. Therefore, you would place your DNA code as the seventh code, in numerical order.

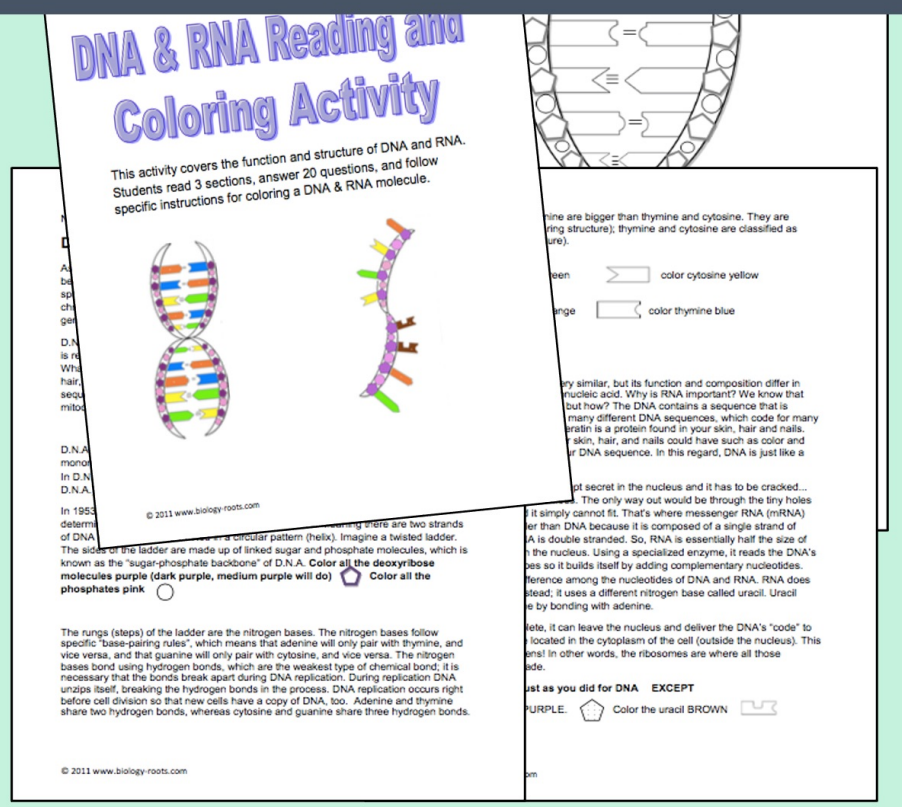
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DNA ATLAS Activities

(Analyzing and Thinking Like A Scientist)

Name: _____ Date: _____

DNA A.T.L.A.S.

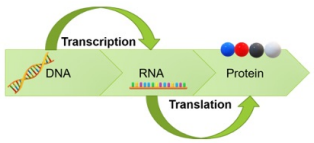
The Big Idea:

_____

_____

nucleotides, but they have slightly different chemical properties. The type of RNA that contains the information for making a protein is called **messenger RNA (mRNA)** because it carries the information, or message, from the DNA out of the nucleus into the cytoplasm.

Translation, the second step in getting from a gene to a protein, takes place in the cytoplasm. The mRNA interacts with a specialized structure called a **ribosome,** which "reads" the sequence of mRNA nucleotides. Each sequence of three nucleotides, called a **codon**, usually codes for one particular amino acid. **(Amino acids are the building blocks of proteins.)** A type of RNA called transfer RNA (tRNA) assembles the protein, one amino acid at a time.



blocks called _____.

4. Summarize transcription in 1-2 sentences:

5. What does mRNA stand for? What is its purpose?

6. Summarize translation in 1-2 sentences:

7. A codon is a sequence of _____ nucleotides.

8. What are the building blocks of proteins?

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Name: _____ Date: _____

DNA– BUILD IT "ALIEN DNA"

CAUTION: Scientists at work

Day one: Materials: string, beads, tape

Genes are segments of DNA that code for traits. Genes may contain many DNA codes, or just a few. DNA sequences are like codes; they are read in **groups of 3 (called codons).**

Put a piece of tape around one end of the string to mark that this is your ORIGINAL strand. Put your group's initials on the tape.

Compare your strand to another group's. Draw a diagram of each in the boxes below:

Your DNA strand:

Classmate's DNA strand:

When comparing your DNA strand to another group's, what is similar about the strand? What is different?

If two samples of DNA were very similar, what might that suggest?

Lastly, fill in the blank to the best of your ability: "DNA codes for _____".

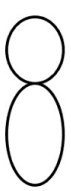
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DNA– BUILD IT "ALIEN DNA"

Let us pretend that the DNA strand you made codes for an alien trait. Your group will randomly be assigned a trait: number of antennae (2 or 3); number of arms (2 or 4); color of eyes (black or purple); length of legs (short or long); color of skin (green or blue). Though the group is assigned the trait, the group can choose the specific trait they would like their DNA to represent listed in the parentheses.

In the space below, write your trait (example, purple eyes): _____

CLASS ALIEN



Think About It...

Look at the alien gene for eye color. If a different alien had different color eyes, would the DNA be different? If so, would it be very different or just a little different? Explain your reasoning:

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Name: _____ Date: _____

Explore It! Predict

Modern whales are mammals; they give live birth and have mammary glands to produce milk for their young. Whales are related to land mammals. Milk contains proteins, and one general category of milk based proteins is beta-casein, found in the milk of all mammals. However, the protein can be slightly

Mammal	DNA Sequence for beta-casein
Right whale	ATC CAC CAC TTT TCC CAG CCA CAG CCT CTA GTC TAT TCC TAC ACT GGG
Hippo	ATC CTC CTC TTT TCC CCG CAA CAG CGT CTA GTC TAT TCC TAC ACT GAG

Name: _____ Date: _____

Mutations Extension

As you have learned, DNA codes for proteins using the letters, A, T, C, and G.
mRNA delivers the DNA code to the ribosome, where it is translated into amino acids (the building blocks of proteins.) During protein synthesis, different codes in the DNA (like the words in this

Optional and 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 use what you'd like during traditional teacher-lead instruction.

Number of differences : _____

Mammal	DNA Sequence for beta-casein
Right whale	ATC CAC CAC TTT TCC CAG CCA CAG CCT CTA GTC TAT TCC TAC ACT GGG
Mouse	GTT CAC TCC AGC ATC CAG TCA CAG CCC CAG GCC TTT CCA TAT GCT CAG

Number of differences : _____

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Base pairs courtesy of: https://www.researchgate.net/publication/14450587_Evidence_from_Milk_Casein_Genes_that_Cetaceans_are_Close_Relatives_of_Hippopotamid_Artiodactyls

_____

_____

_____

Bonus: Do you think that DNA can affect not only physical traits, but behavioral traits?

_____

_____

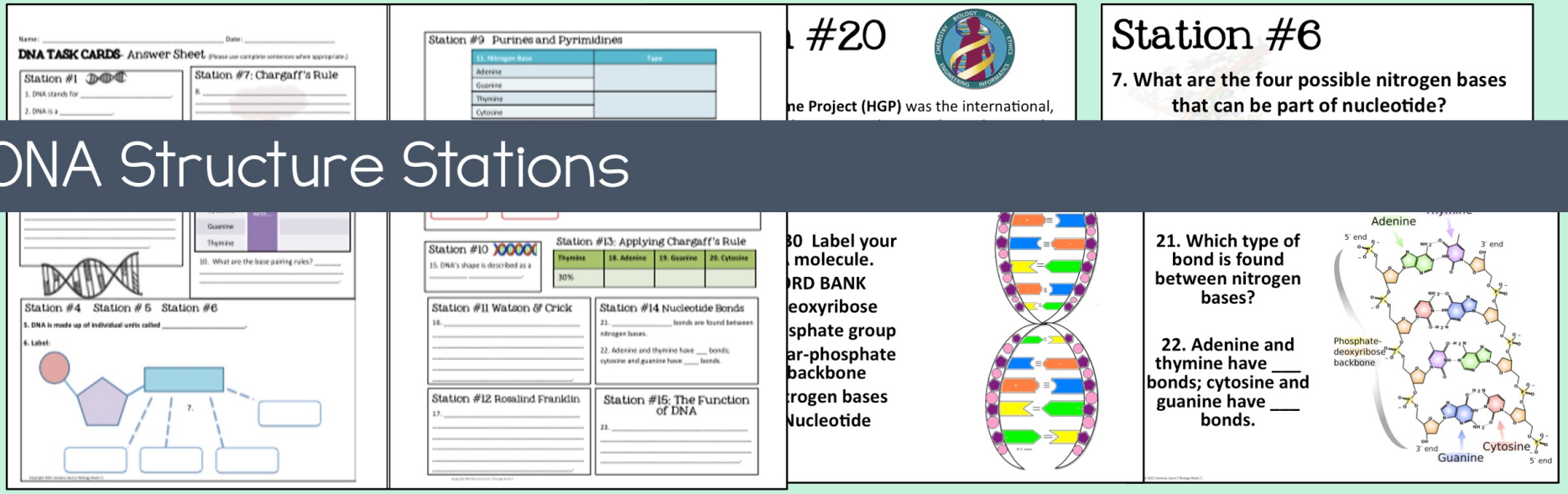
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1. How do your "mutations" affect the sentence? Which one changed the sentence the most? Was there one in particular that made little difference? Explain:

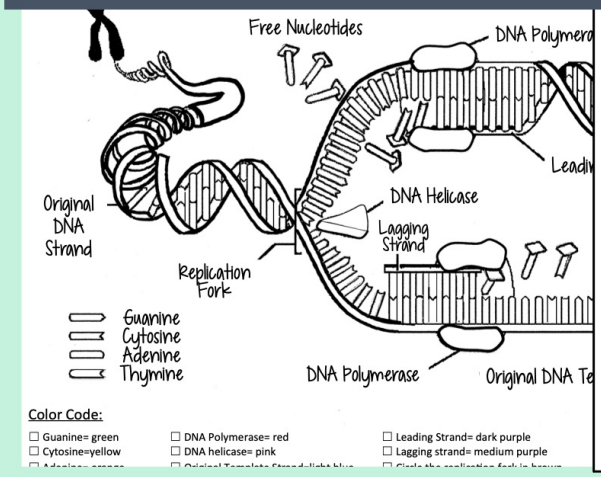
2. Were your mutations random? Explain.

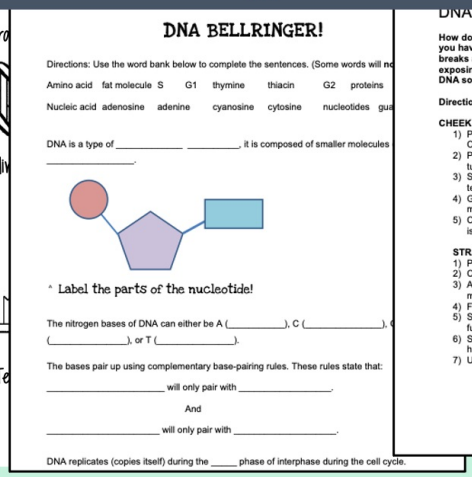
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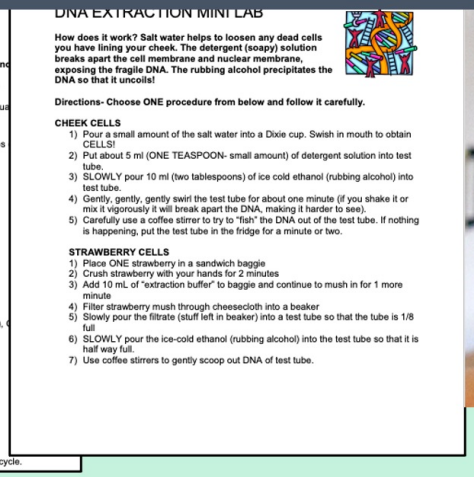
DNA Structure Stations

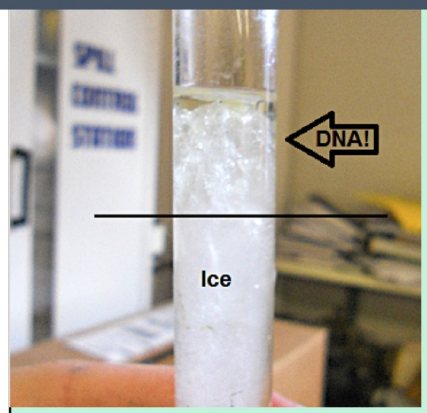


Labs, bellringers, coloring, and more!

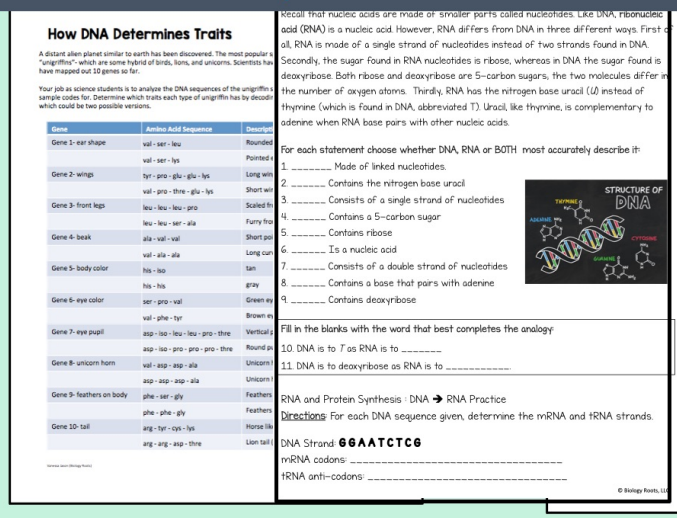


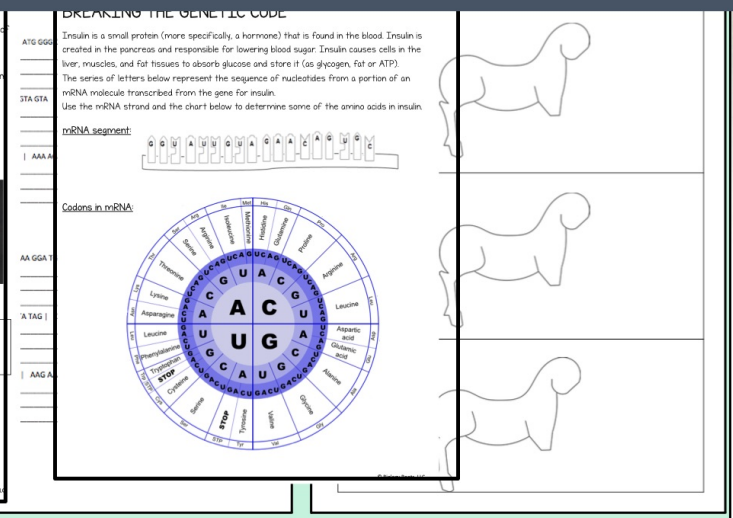


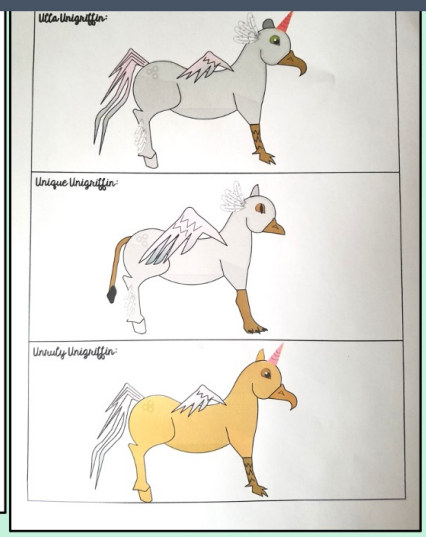




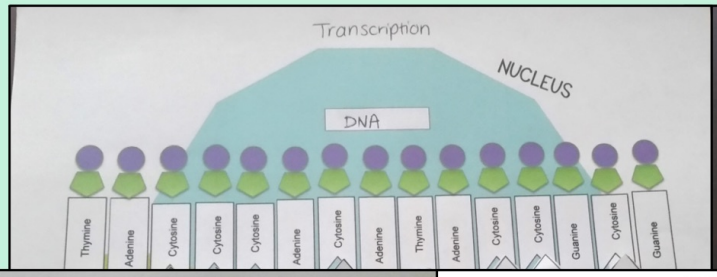
Protein Synthesis

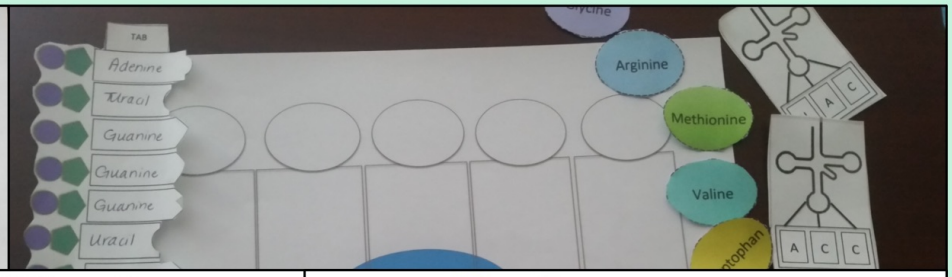


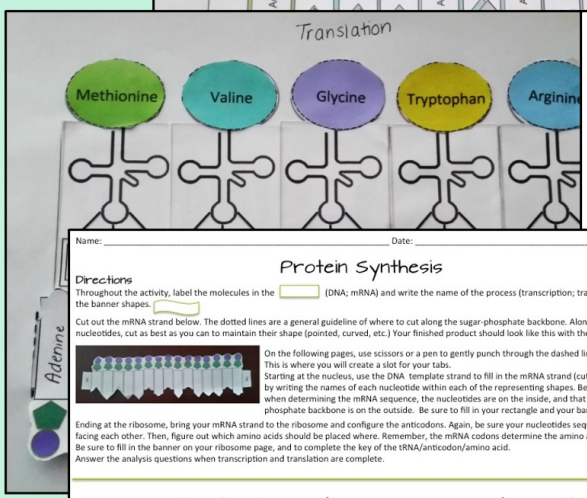


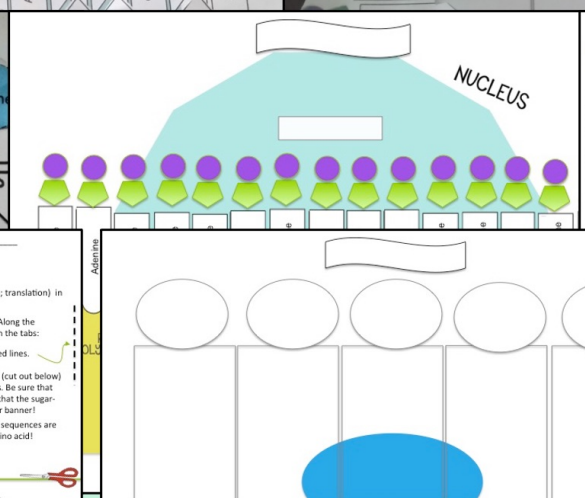


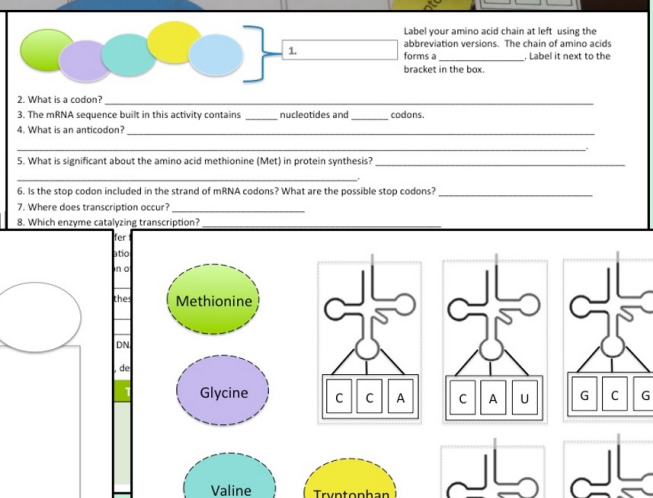
Protein Synthesis Interactive Model

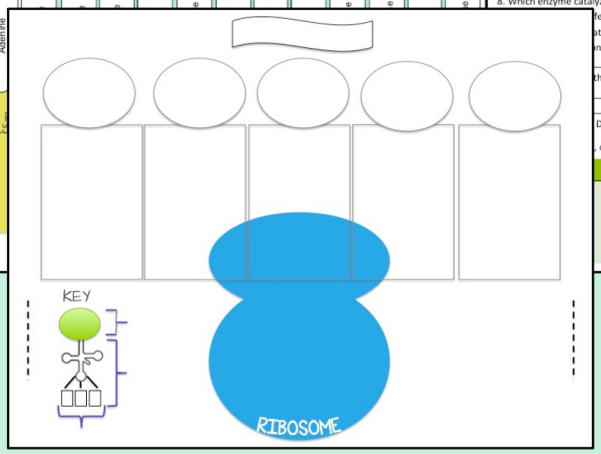




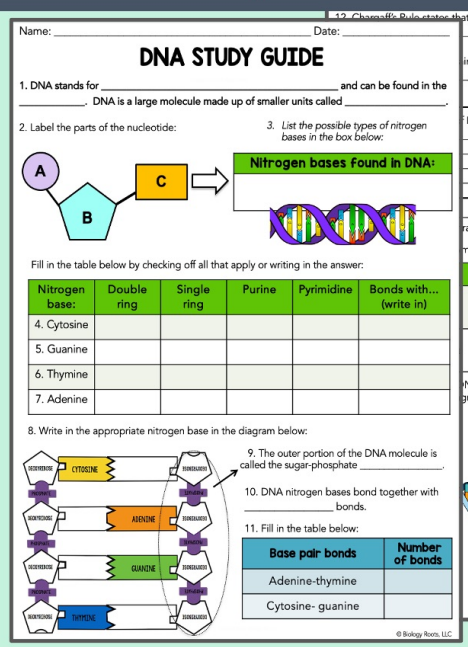


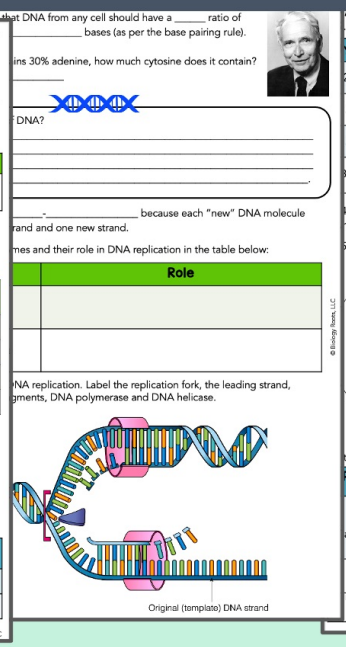


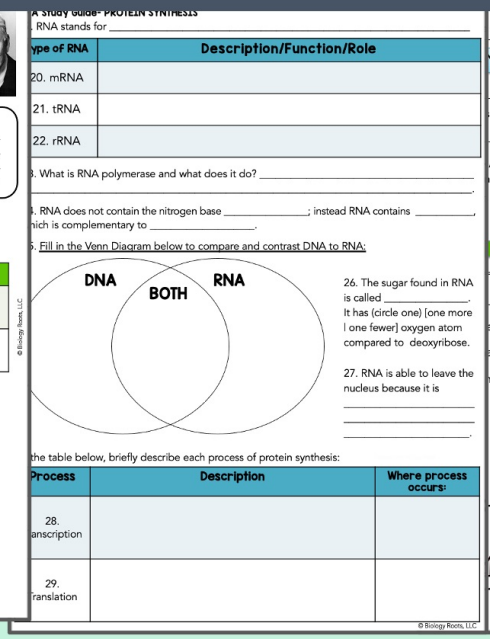


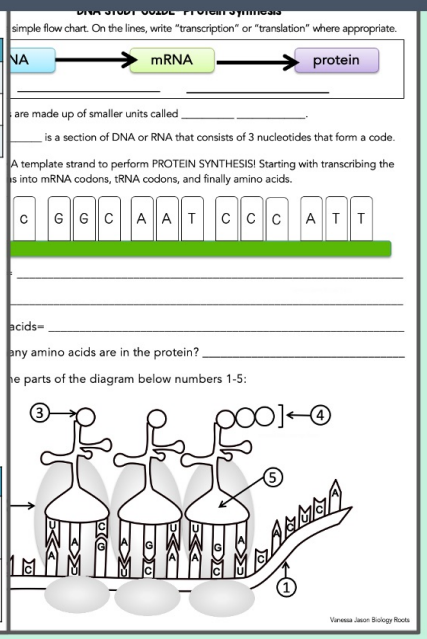


DNA Study Guide



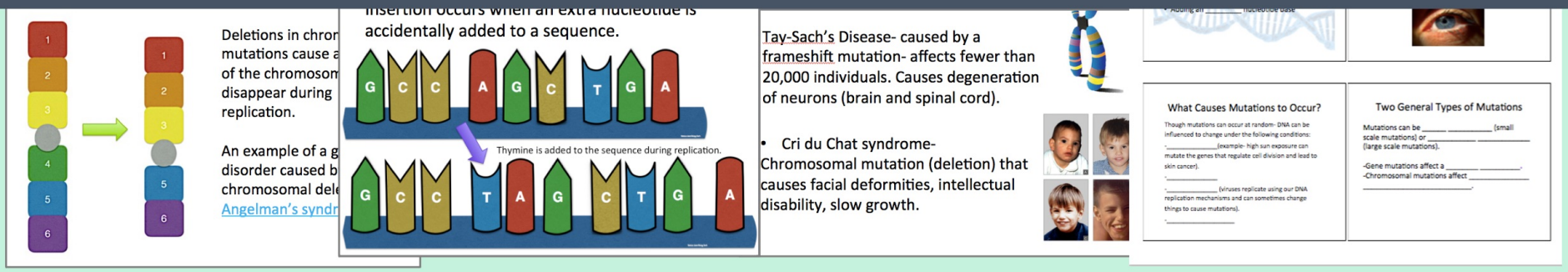




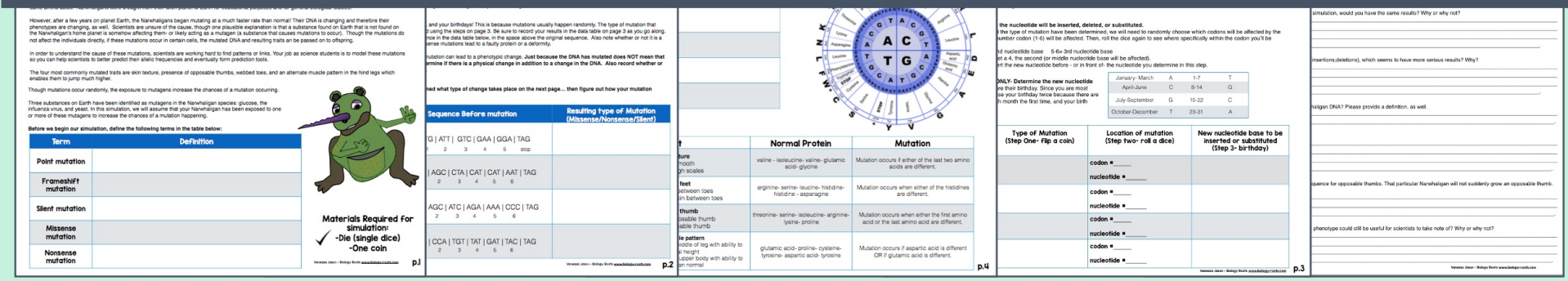


Mutations (includes notes, labs, INB, and study guide)

PowerPoint Notes



Mutation Simulation Lab



Mutations Interactive Notebook (Digital version included for easy implementation).



Still not sure if you need this resource?

This unit is for any teacher who is looking for a truly no-prep DNA unit from start to finish, or simply a large bank of DNA activities to use in the classroom! If your school is using an online curriculum, and you are finding that it is not consistently conducive to student learning, my unit bundles are compatible as supplemental material and really help prevent student burn out – because I what sparks students! I also update my material to keep it modern and fresh.

Reach out with questions ☺

-Vanessa