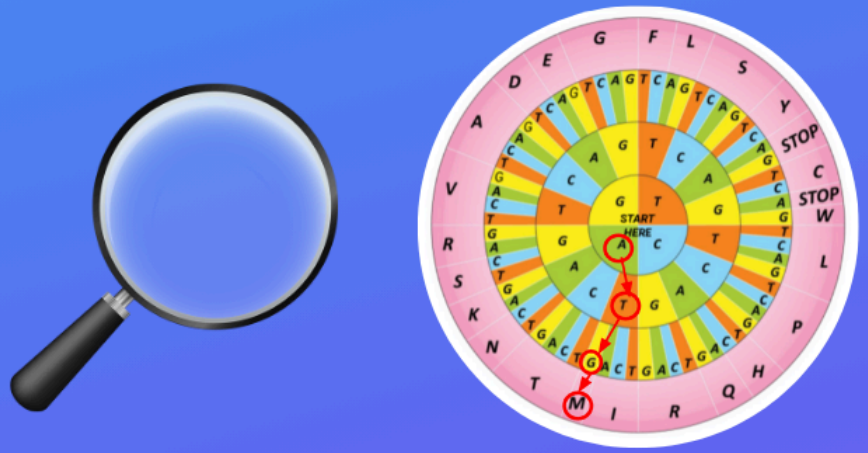
3.7: SUPER ANIMAL DNA DECODER

It's time to

rock by rock

Crack the DNA Code



Introduction

Spies study and break codes. Heroes can use code to communicate. To learn how scientists might change our DNA to make superheroes, we have to unlock our own DNA code to figure out how scientists might change it. We use these codes to see the directions given to our bodies and the bodies of other species. Have you ever wondered what would happen if a code from a jellyfish or spider were put into a human?

DNA is like a secret code that living things use to build proteins, and proteins are the tiny machines that give organisms their powers. In this activity, you'll decode DNA sequences to reveal proteins found in some of the most amazing animals on Earth. From glowing jellyfish to regenerating axolotls, your job is to figure out which protein goes with which animal ability — using clues, logic, and your own decoding skills. As you work, think about whether or not any of the amazing animals have power you think people could or should have someday.

PART 1: Using a DNA Codon Wheel

This DNA codon wheel is a tool that you can use to help you translate a DNA sequence into a string of amino acids that makes up a protein.

Let's learn how to use a DNA codon wheel to decode the following DNA sequence:

ATG GCC GAC GGG TGA

Remember that one codon is made of 3 bases, and each codon corresponds to 1 amino acid. Let's find out which amino acid corresponds to our first codon: **ATG.**

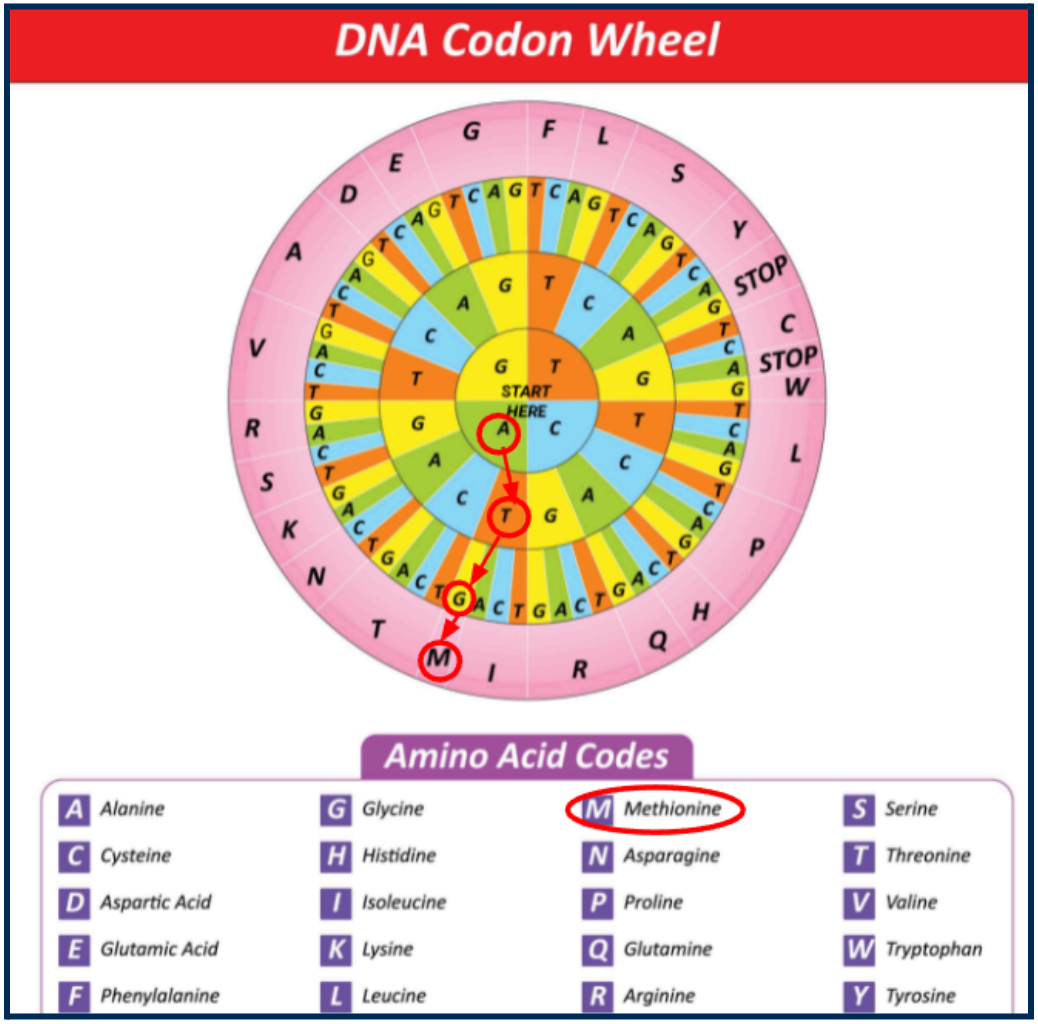
1. **Locate the first base in the codon.** Begin at the center of the codon wheel. Look for the base **A** at the center of the circle–it has a red circle around it.

2. **Locate the second base in the codon.** Notice that this **A** touches four bases in the next ring: G, A, C, and T. **T** is the next base in our codon, so you'll see a circle around the **T.**

3. **Locate the third base in the codon.** You'll see that the **T** we've circled touches 4 bases in the next ring: G, A, C, and T. **G** is the next base in the codon, so you'll see a circle around the **G.**

4. **Identify the amino acid that corresponds to this codon.** Look at the outermost ring (the reddish-pink ring). The **ATG** codon corresponds to the letter **M.** This corresponds to an amino acid named **methionine.** This means that methionine is the first amino acid in our protein string. For this activity, you won't need to use the full names of the amino acids. We'll just stick to the one-letter code for the amino acids.

You Try It! Now that you know how to decode codons, use the codon wheel to decode the rest of the protein. You can check your answer on the next page.



Codon	ATG	GCC	GAC	GGG	TGA
Amino Acid Code	M				

Check your work! How did you do?

Codon	ATG	GCC	GAC	GGG	TGA
Amino Acid Code	M	A	D	E	STOP

Think About It: What do you think "stop" means at the end of the string of amino acids?

Let's try decoding some more DNA, and we'll see if you're right.

PART 2: Decoding Animal DNA

It's time to use your decoding skills to crack the code for some proteins that give certain animals their superpowers. Let's start by refreshing your memory on the super animals you learned about in Module 1 and their superpowers.

Super Animal	Super Power
Jellyfish	**Bioluminescence**: Has the ability to glow at night.
Saharan Silver Ant	**Heat Resistance**: Can survive and function in scorching temperatures up to 140°F (60°C).
Archerfish	**Precision Water Jets**: Shoots streams of water out of their mouths with pinpoint accuracy to knock insects out of the air.
Octopus	**Shapeshifting**: Can change its color, texture, and shape to mimic other animals or hide in plain sight.
Tardigrade	**Extreme Survival**: Can survive in extreme temperatures, radiation, and even the vacuum of space.
Mantis Shrimp	**Super Punch**: Delivers one of the fastest and most powerful punches in the animal kingdom, strong enough to break glass.
Axolotl	**Regeneration**: Can regrow entire limbs, spinal cords, and even parts of their heart and brain.
Electric Eel	**Electric Shock**: Can generate powerful electric shocks to stun prey or defend against predators.

Now, let's decode some DNA to figure out which super DNA belongs to which super animal! You'll need the following resources to complete

the activity.

Resources:

- Resource A: DNA Codon Wheel
- Resource B: Protein Information Sheet

Directions:

1. Use the DNA Codon wheel to decode the DNA and figure out the corresponding amino acid sequence.
2. Use the Protein Information Sheet to learn the name of the protein and find out its function of the protein.
3. Look back at the list of super animals to figure out which animal this DNA sequence is from.
4. **You choose:** Follow the directions above to code **five** out of the eight DNA sequences.

DNA Sequence 1	ATG	AAG	TCC	GCC	GGA	TCA	GAA	TGA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

DNA Sequence 2	ATG	GAT	TAC	AGA	CGC	TCC	GCC	TAA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

DNA Sequence 3	ATG	CCG	GAG	TGG	GTT	AAG	GGA	TGA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

DNA Sequence 4	ATG	AGA	CTC	CCG	TGG	CAG	GGA	TAA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

DNA Sequence 5	ATG	GGA	GCA	GCT	GGC	AAG	GGT	TAA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

DNA Sequence 6	ATG	CGG	GAA	TGG	GCT	GAA	CCT	TGA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

DNA Sequence 7	ATG	ACT	GGT	CGG	TCT	GGC	GAT	TAA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

DNA Sequence 8	ATG	GGC	CAA	CTC	AGG	AAT	TGG	TAA
Amino Acid Sequence								
What protein does this DNA sequence code for?								
Which animal does this DNA belong to? Why do you think this?								

Investigation Reflection

1. How does a DNA sequence lead to a specific trait in an animal? Try to explain the process in your own words.

2. What patterns did you notice about how all of the animal DNA sequences in this activity start and end? How do you think this helps DNA perform its function?

3. Do you think some DNA sequences can be found in more than one kind of animal? For example, could the DNA sequence that codes for myosin be found in the DNA of other animals? Why or why not?

4. Imagine you could "edit" an animal's DNA. What might happen if you changed just one codon in the DNA sequence for one of the animal superpower proteins?

Bonus Challenge: Create your own new superpower protein for a plant, animal or human.

A. What is the DNA sequence for your protein?

B. What is the amino acid sequence for your protein?

C. What is the name of the protein?

D. What superpower would this protein give — and to which organism?