

Coding for Amino Acids and Proteins

Primary Learning Outcomes:

Students will understand how protein codes from DNA dictate characteristics or specific job functions in a living organism. Students will learn the importance of the ribosome in protein synthesis. Students will learn how genetic mutations can occur.

High School Georgia Performance Standards

- SB1 Students will analyze the nature of the relationships between structures and functions in living cells.
- SB2 Students will analyze how biological traits are passed on to successive generations.
-

Middle School Georgia Performance Standards

- S7CS5 Students will use the ideas of system, model, change and scale in exploring scientific and technological matters.
- S7L2 Students will describe the structure and function of cells, tissues, organs, and organ systems.
- S7L3 Students will recognize how biological traits are passed on to successive generations.
-

Materials:

Kit will not provide any materials

- Mini-Snickers, Mini Milky Way and single Reese Cups
- The attached lab-sheet

Additional Tips:

- This mini-lab is a whole class activity with the teacher as the facilitator.
- Give each group a laminated index card or half-sheet of paper with the base-pair code in step 2
- Make a transparency of the sentence in step 3
- If the teacher wishes to perform a lab on transcription one is available in the DNA model kit.

1. Ask the students to retrieve the DNA models they constructed on Day 1 (if done) or randomly hand out papers containing one of the following sequences.

ATGCCGTCGTTACAA

ATGCCGCGATCGTTA

ATGCCGCGACAAATT

Teach the students that every three bases in the DNA model codes for a specific amino acid. Perhaps have a transparency of all amino acids and their codes. Students can "translate" their code sequence as a group, finding the appropriate amino acid for each codon.

2. From their DNA sequence, tell the students that the following base pairs code for the following amino acids:

CAA -Glutamine (peanuts)	TTA - Leucine (caramel)
CCG - Proline (chocolate)	TCG - Serine (nougat)
CGA - Arginine (sugar)	ATG - Methionine (milk)
ATT - Isoleucine (butter)	

3. Teach the students that sequences of amino acids form specific proteins. Also teach the students about mutations. Use this:

The sentence below contains all three-letter words but has experienced a mutation. Can you find the mutation?

THE IGR EDC ATA TET HEB IGB ADR AT

(The mutation is a deletion-mutation: THE BIG RED CAT
ATE THE BIG BAD RAT)

(Emphasize that the mutation changed all the amino acids in the sequence.)

4. Provide each group of students with a Snickers Bar, a 3-Muskateers bar, or a Reese cup.
5. Have each group figure out their base sequence by simply matching, in order, their candy bar's simple ingredients.
6. Use the base sequence to determine the amino acid sequence, such as CAA codes for glutamine (peanuts).
7. Lead the students to understand this is how each cell's ribosome uses the code from DNA to string amino acids together in certain combinations to make protein.

Coding for Amino Acids

1. From our studies, we know that every _____ bases codes for an amino acid, and amino acids are strung together to form _____.
2. We also learned that there are _____ different proteins in your body.
3. What is a mutation?
4. The 3 kinds of mutations are _____, _____, and _____.
5. The sentence below contains all three-letter words but has experienced a mutation. What kind of mutation has it experienced? _____

THE IGR EDC ATA TET HEB IGB ADR AT

6. Write the corrected sequence below:

Use the information in the box for your lab activity:

CAA - Glutamine (peanuts)	TTA - Leucine (caramel)
CCG - Proline (chocolate)	TCG - Serine (nougat)
CGA - Arginine (sugar)	ATG - Methionine (milk)
ATT - Isoleucine (butter)	

The ribosome in every cell uses the code from DNA to string amino acids together in certain combinations to make protein.

6. What kind of candy bar did you have?

7. What is the protein sequence for your candy bar?

**Coding for Amino Acids and Proteins
Answers**

1. From our studies, we know that every 3 bases codes for an amino acid, and amino acids are strung together to form Proteins.

2. We also learned that there are 50,000 different proteins in your body.

3. What is a mutation? **Any change in the order of an organism's DNA base sequence**

4. The 3 kinds of mutations are insertion, deletion, and substitution.

5. The sentence below contains all three-letter words but has experienced a mutation. What kind of mutation has it experienced? Deletion (B)

THE IGR EDC ATA TET HEB IGB ADR AT

6. Write the corrected sequence below:

THE BIG RED CAT ATE THE BIG BAD RAT

Use the information in the box for your lab activity:

CAA - Glutamine (peanuts)	TTA - Leucine (caramel)
CCG - Proline (chocolate)	TCG - Serine (nougat)
CGA - Arginine (sugar)	ATG - Methionine (milk)
ATT - Isoleucine (butter)	

The ribosome in every cell codes DNA for amino acids and strings them together in certain combinations to make protein.

7. What kind of candy bar did you have? Answers will vary

8. What is the protein sequence for your candy bar?

Answers will vary
