

Purpose

To build a model of a beetle using coded instructions.

To identify the different effects that mutations may have on an organism (positive, negative or neutral).

Background

DNA is a set of coded instructions for making all the proteins in our bodies. It uses 4 bases, represented by A, T, C and G, to code all the information contained in our DNA. There are several steps to breaking the code. **DNA** is stuck in the nucleus, therefore it first needs to be written into a form that can be read outside the nucleus. This step is called **transcription**. This new form, **RNA**, leaves the nucleus where it is read to make proteins. This is called **translation**. The code is read in 3 letter segments (**codons**) to create amino acids, the smallest part of **proteins**.

Sometimes mutations occur in the DNA. These are permanent changes to the DNA sequence and may have different effects on the organism. There are three major kinds of mutations:

Substitution - Usually one base is changed in the sequence. The sequence around the change is the same.

Insertion - Extra bases are added to the sequence. The surrounding sequence is the same after the insertion ends.

Deletion - Some bases are removed. The surrounding sequence is the same after the insertion ends.

An example of each kind of mutation follows. The mutation's impact on the sequence is underlined.

Original: AMY GOT HER RED HAT
Substitution: AMY GOT HER RAD HAT
Insertion: AMY GOT HIS ERR EDH AT
Deletion: AMY OTH ERR EDH AT

In this activity, you will be given codons and the instructions that correspond to each codon. Your task is to follow each set of instruction to build your own beetle. Beware, your neighbour may not have the same set of instructions as you!

Materials for each group

- 2 brown pipe cleaners
- 1 and ¼ pieces of black pipe cleaners
- 1 black pom pom (1 inch)
- 2 googly eyes
- white glue
- scissors

Procedure

Codon	Instructions
ATG	1. Twist two brown pipe cleaners together.
TCA	2. Swirl the brown pipe cleaners in a spiral (this will look like a cinnamon bun). Tuck in the outside edges so that they don't stick out.
TTG	3. Cut one black pipe cleaner into 6 equal pieces. Thread one piece through the outer edge of the brown spiral, hook over and twist to secure each "leg". Do this three times on each side. Bend the bottom of each "leg" to create feet.
CTG	4. Glue the pom pom to one end of the spiral to create a head.
CAA	5. Cut the quarter piece of black pipe cleaner into 2 equal pieces. Form one piece into a V-shape and glue to the top of the head as antennae.
TGA	6. Glue on 2 googly eyes.
CGG	7. Take the other small piece of black pipe cleaner and cut it in half. Shape one of these pieces into a "C" to make the mouthparts. Glue the middle of the "C" onto the lower front part of the head so that the two ends of the "C" stick out.

Beetle # 1

Purpose

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Materials for each group

- 2 brown pipe cleaners
- 1 and ¼ pieces of black pipe cleaners
- 1 black pom pom (1 inch)
- 2 googly eyes
- white glue
- scissors

Procedure

Codon	Instructions
ATG	1. Twist two brown pipe cleaners together.
TCA	2. Swirl the brown pipe cleaners in a spiral (this will look like a cinnamon bun). Tuck in the outside edges so that they don't stick out.
TTG	3. Cut one black pipe cleaner into 6 equal pieces. Thread one piece through the outer edge of the brown spiral, hook over and twist to secure each "leg". Do this three times on each side. Bend the bottom of each "leg" to create feet.
CTG	4. Glue the pom pom to one end of the spiral to create a head.
TAA	5. Cut the quarter piece of black pipe cleaner into 2 equal pieces. Cut one piece in half again and glue to the top of the head as antennae.
TGA	6. Glue on 2 googly eyes.
CGG	7. Take the other small piece of black pipe cleaner that you cut in step 5 and shape it into a "C" to make the mouthparts. Glue the middle of the "C" onto the lower front part of the head so that the two ends of the "C" stick out.

Beetle # 2

Purpose

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Materials for each group

- 2 brown pipe cleaners
- 1 and ¼ pieces of black pipe cleaners
- 1 black pom pom (1 inch)
- 4 googly eyes
- white glue
- scissors

Procedure

Codon	Instructions
ATG	1. Twist two brown pipe cleaners together.
TCA	2. Swirl the brown pipe cleaners in a spiral (this will look like a cinnamon bun). Tuck in the outside edges so that they don't stick out.
TTG	3. Cut one black pipe cleaner into 6 equal pieces. Thread one piece through the outer edge of the brown spiral, hook over and twist to secure each "leg". Do this three times on each side. Bend the bottom of each "leg" to create feet.
CTG	4. Glue the pom pom to one end of the spiral to create a head.
CAA	5. Cut the quarter piece of black pipe cleaner into 2 equal pieces. Form one piece into a V-shape and glue to the top of the head as antennae.
TGA	6. Glue on 2 googly eyes.
TGA	7. Glue on 2 more googly eyes.
CGG	8. Take the other small piece of black pipe cleaner and cut it in half. Shape one of these pieces into a "C" to make the mouthparts. Glue the middle of the "C" onto the lower front part of the head so that the two ends of the "C" stick out.

Beetle # 3

Purpose

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Materials for each group

- 2 pieces of brown pipe cleaners
- 1 and ¼ pieces of black pipe cleaners
- 1 black pom pom (1 inch)
- 2 googly eyes
- white glue
- scissors

Procedure

Codon	Instructions
ATG	1. Twist two brown pipe cleaners together.
TCA	2. Swirl the brown pipe cleaners in a spiral (this will look like a cinnamon bun). Tuck in the outside edges so that they don't stick out.
TTG	3. Cut one black pipe cleaner into 6 equal pieces. Thread one piece through the outer edge of the brown spiral, hook over and twist to secure each "leg". Do this three times on each side. Bend the bottom of each "leg" to create feet.
CTG	4. Glue the pom pom to one end of the spiral to create a head.
CAA	5. Cut the quarter piece of black pipe cleaner into 2 equal pieces. Form one piece into a V-shape and glue to the top of the head as antennae.
TGA	6. Glue on googly eyes.

Beetle # 4

Purpose

To build a model of a beetle using coded instructions.

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Background

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Materials for each group

- 2 brown pipe cleaners
- 1 red pipecleaner
- ¼ piece of black pipe cleaner
- 1 black pom pom (1 inch)
- 2 googly eyes
- white glue
- scissors

Procedure

Codon	Instructions
ATG	1. Twist two brown pipe cleaners together.
TCA	2. Swirl the brown pipe cleaners in a spiral (this will look like a cinnamon bun). Tuck in the outside edges so that they don't stick out.
TCG	3. Cut one red pipe cleaner into 6 equal pieces. Thread one piece through the outer edge of the brown spiral, hook over and twist to secure each "leg". Do this three times on each side. Bend the bottom of each "leg" to create feet.
CTG	4. Glue the pom pom to one end of the spiral to create a head.
CAA	5. Cut the quarter piece of black pipe cleaner into 2 equal pieces. Form one piece into a V-shape and glue to the top of the head as antennae.
TGA	6. Glue on 2 googly eyes.
CGG	7. Take the other small piece of black pipe cleaner and cut it in half. Shape one of these pieces into a "C" to make the mouthparts. Glue the middle of the "C" onto the lower front part of the head so that the two ends of the "C" stick out.

Beetle # 5