Sequence Bracelets

Activity Guide

In this activity, learners make a bracelet of DNA sequence from organisms including a human, chimpanzee, butterfly, carnivorous plant or flesh-eating bacteria.

Suitable for: age 8+
Estimated duration: 20-30 minutes

You will need (per bracelet):

- 44 coloured beads in four colours: red, yellow, green, blue
- printed sequence cards
- elastic thread, cut to size
- printed pairing rules

Introduction

DNA contains a chemical code that is made up of four bases: adenine, cytosine, guanine and thymine (A, C, G and T for short). These bases always pair together in the same way: A with T, and C with G. This code guides the growth, development and health of organisms.

This activity is an enjoyable way of exploring the basics of DNA sequences and complementary base pairing. Learners are given a DNA sequence for an organism, and use this to make once strand of your bracelet and then create the other strand using the basic rules of base pairing.

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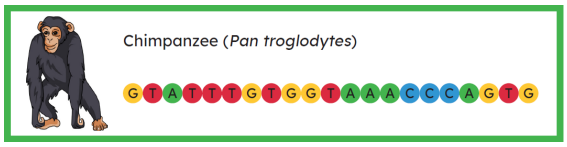
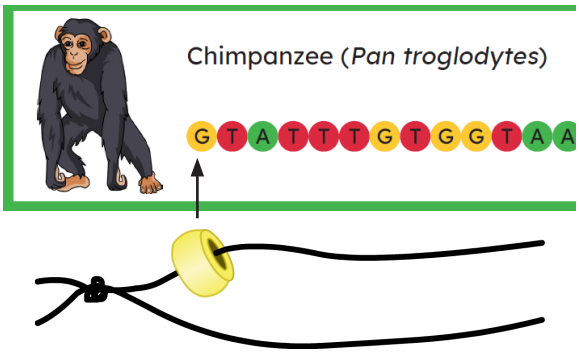
Instructions

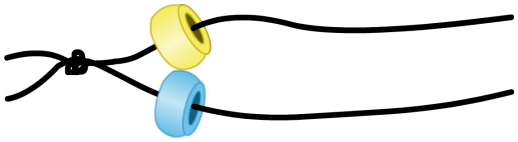


1. Choose one DNA sequence to make.

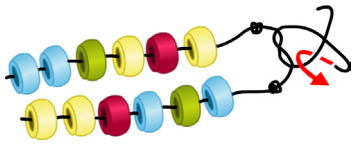
2. Take two pieces of elastic and tie them together at one end.



3. Look at the first letter in your sequence and find the right bead to thread onto your elastic.



4. Use the base pair rules to find and add the first bead colour on your second elastic. Continue until you've finished the full sequence.

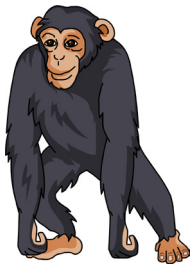


5. Knot each string after the last bead, and then tie the two together.

6. Now tie the ends of your double-stranded sequence together. Congratulations - you've now completed your sequence bracelet!

Further information

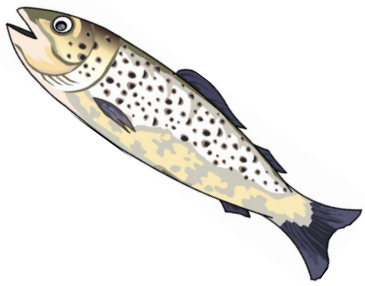
Information about each DNA sequence:



Chimpanzee (*Pan troglodytes*)

GTATTTGTGGTAAACCCAGTG

Sequence from the gene that codes for granulysin. Granulysin is a toxic protein that is released by immune cells in response to infection, to kill pathogens like bacteria.



Brown Trout (*Salmo trutta*)

TACATCAGCACTAACTCAAGG

From trout mitochondrial DNA; variation in this sequence can be used to trace trout populations and evolution. Mitochondria are small energy factories within eukaryotic cells that have their own genome of about 16,000 base pairs.

Human (*Homo sapiens*)

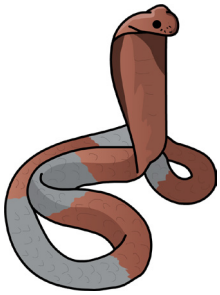
TCTGAGTTCTTACTTCGAAGG

Part of the OCA2 gene sequence. The OCA2 gene codes for a protein involved in pigmentation and variation in its sequence is a major influence on whether we have brown or blue eye colour.

Butterfly (*Danaus plexippus*)

ATGATCCCGACTATTACTATG

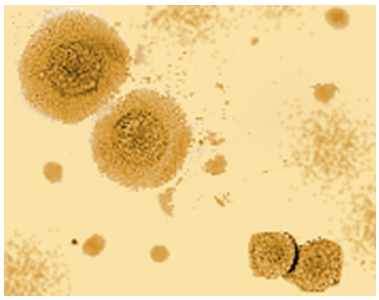
Sequence from a gene that codes for an ‘opsin’ protein. This particular opsin reacts to ultraviolet (UV) light, which the butterfly uses to navigate.



Malayan spitting cobra (*Naja sputatrix*)

AACCGACCGCTGCAACAACTG

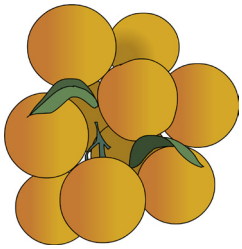
Sequence from a gene that codes for a toxin protein. This toxin is a component of the cobra’s venom, and blocks signals between the nerve and muscle cells of the cobra’s prey, paralysing it.



Flesh-eating microbe (*Mycoplasma alligatoris*)

CAACAGTGATTTAGGTTACAC

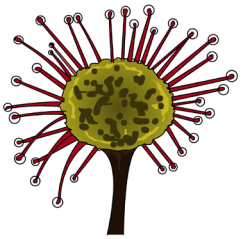
Part of the gene that codes for an enzyme called sialidase. When these bacteria infect an alligator they secrete sialidase to break-down the alligator's tissues, enabling them to spread through its body.



Sweet orange (*Citrus sinensis*)

TGCTACAGTTGCTGTTGTTGG

Sequence from the gene that codes for pectinesterase. Pectinesterase is an enzyme that helps to break down the cell walls of the orange when it ripens, making the flesh soft.



Carnivorous plant (*Drosera rotundifolia*)

GTAGCCACAGACTCAGTCATC

Part of a gene that codes for a chitinase enzyme. The plant secretes this enzyme to break down the chitin-rich body casing of any insect that gets trapped on its tentacles.

Giant Madagascar hissing cockroach (*Gromphadorhina portentosa*)

GATTCGCCGCTATCAGAAGAG

From the gene that codes for histone 3. Histone 3 is one of eight histone proteins that combine to form nucleosomes, the bundles around which DNA is wrapped in the nucleus.

Corpse flower (*Amorphophallus titanium*)

TCGAACCCGTTGTTGGGGAGG

This sequence is from the gene that codes for ribulose-1,5-bisphosphate carboxylase/oxygenase (RuBisCO), an enzyme that is involved in plantphotosynthesis and respiration.

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Pairing Rules

DNA is made up of four units or ‘bases’, known as A, C, G and T.

Each of the bases binds with one partner: A with T; C with G.

Your sequence bracelet should follow the same rules: look in the circles below to work out which coloured beads you should use.