Code Crackers

Activity Guide

In this activity, learners discover how genes encode proteins. Using a codon wheel to translate DNA sequences into amino acid chains, they will match their sequences to Protein Profile and discover what animals have them and how they use them to survive.

Suitable for: age 7-11
Estimated duration: 30 minutes

You will need (per group of 4 learners):

- Code cracking worksheet
- Protein profiles
- Answer sheet
- Codon wheel sheet
- Pen or pencil

Introduction

A bit like a recipe book, all the biological instructions for making an organism are contained in a long molecule called DNA (deoxyribonucleic acid). All living things, from humans and mice, to plants and bacteria, have a unique set of instructions written in the four chemical letters of DNA: A, T, C and G

DNA sequence is converted into a string of amino acids that form a protein. There are 20 different amino acids and the order and combinations of amino acids that make up a protein determine the protein's unique function in the body.

In this activity, learners will use a code cracker wheel to decode sequences of DNA into protein sequences. Then, using protein profile cards they will find out what these proteins do by matching our sequences to the protein sequences on the cards. The activity can be carried out individually or in teams of four.

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Running the activity

Warm up discussion

- Begin the activity by discussing with the group that DNA contains the instructions for making all living things. Within the DNA instructions are codes for making proteins, which do lots of 'jobs' around the body. Proteins give different living things different abilities.
- You might want to show the learners this video to support this activity: https://youtu.be/1sNCtEBV7io?si=1cEb-M_nZQPxb06n

How to complete the activity

1. Crack the DNA codes by using the codon wheel.
2. Use the protein profiles to find the matching code - and write on the worksheet the answer to 'what is it?' and 'what does it do?'.
3. Reveal the correct answers.

How to use the codon wheel

1. Identify your first 'codon' - three DNA letters in a row.
2. Start in the middle of the codon wheel and work outwards, each time using the next DNA letter to guide you through the wheel.
3. For example, for the codon CAT, find C in the inner most circle, then follow out to A, then to T. This gives the letter H.

Some learners find it beneficial to use a pen, pencil or their finger to 'follow' the letters through the wheel.

Follow-on questions

- Ask the learners why each protein is useful for each animal, and whether they think humans have these proteins
- As an extension activity, use the 'peptide search' function on UniProt (www.uniprot.org/peptide-search) to search a live scientific database using the cracked codes, or make up a code out of the purple letters on the codon wheel!