

Codons and the code

60 minutes • D1.2.5 to D1.2.9 • Chapters 3, 4, 5

mRNA, ribosomes and tRNA; codons and anticodons; why the code is in threes; reading the table

BY THE END, STUDENTS CAN

- ☐ Describe what mRNA, the two ribosome subunits and tRNA each do in translation D1.2.5, D1.2.6
- ☐ Pair a codon with its anticodon, and explain how pairing brings the right amino acid D1.2.7
- ☐ Explain why the code uses threes and what degenerate and universal mean, and use a codon table to deduce a polypeptide D1.2.8, D1.2.9

TIMING

0-6	6 min	Do now	
6-16	10 min	A ribosome at work	
16-26	10 min	Dock the tRNA	
26-40	14 min	Why three, and the table	
40-54	14 min	Codon cipher	
54-60	6 min	Exit	
	60 min	One lesson	

STARTER

- 6 min** **Do now**
- "Four letters, twenty words. How long must each word be?" on mini whiteboards, then transcribe a six-base template from lesson 1 as a warm-up.

ON THE BOARD, FROM THE GUIDE

Open the guide on the projector at each chapter (the links work in this PDF). Every figure plays from its own buttons, and the lesson's slides have the same figures, step by step, in the order of this plan.

03 Three kinds of RNA build a protein

CHAPTER 03 IN THE SLIDES

Tap the parts of the figure in turn: Small subunit, mRNA, Large subunit, rRNA, tRNA, Amino acid and Polypeptide.

Predict box: The large subunit holds two tRNAs at the same moment. Why two, and not one? Hands up or mini whiteboards first.

Answer B: So one amino acid can be joined to the next

04 Codon meets anticodon

CHAPTER 04 IN THE SLIDES

Switch the figure through Three codons, a rack of tRNAs, One tRNA docked and Each codon has found its tRNA, and have the class say what will change before each.

Predict box: A codon reads U G G. Which anticodon pairs with it? Hands up or mini whiteboards first.

Answer A: A C C

05 A code written in threes

CHAPTER 05 IN THE SLIDES

Slide the figure through Bases in each codon 1, Bases in each codon 2 and Bases in each codon 3, and have the class say what will change before each.

Step through the figure (3 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. The **genetic code**: 64 codons, read from the first base to the third.
2. Find the **first** base, then the **second**, then the **third**: GCU is alanine.
3. The **wheel** holds the same code, read from the centre out.

Predict box: Why can the code not use pairs of bases for each amino acid? Hands up or mini whiteboards first.

Answer C: Pairs give only 16 codons for 20 amino acids

THE LESSON

10

min

A ribosome at work

Chapter 3's explore figure on the board, with students tapping the parts in pairs. Then chapter 3's predict box.

10

min

Dock the tRNA

Chapter 4's figure, one student at the board, then chapter 4's predict box (UGG).

14

min

Why three, and the table

Chapter 5's first predict box, then figure 5.1's slider. Then the codon tool, The genetic code: find the amino acid with six codons and the ones with one, and define degenerate and universal from what the class found. Its Practise with the chart drill sets rounds of ten for homework, and Share this round gives the whole class the same ten questions.

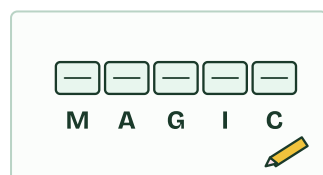
14

min

Codon cipher

Pairs decode and write messages with the codon table (activity below).

ACTIVITIES



PUZZLE

Codon cipher

Pairs decode mRNA messages whose amino acids' one-letter codes spell words (print the table with one-letter codes: the codon tool, The genetic code, shows three-letter names). Every message starts with the start codon, so every word begins with M: AUG GCU GGU AUU UGU UAA reads Met-Ala-Gly-Ile-Cys, M A G I C. Words can use only the letters A, C, D, E, F, G, H, I, K, L, M, N, P, Q, R, S, T, V, W and Y, and each message ends with a stop codon. Then each pair writes a message for another pair as a coding strand (harder: as a template strand). The teacher's key: check each message with the codon tool's converter.

Needs: the codon tool or printed tables, and paper.

PLENARY

6

min

Exit

Chapter 5's second predict box: deduce the chain, using the table.

WHAT STUDENTS GET WRONG

tRNA carries the codon. Codons are on mRNA; anticodons are on tRNA.

Anticodons contain T. tRNA is RNA: U.

Degenerate means a codon can code for two amino acids. It means an amino acid can have several codons.

The stop codon is an amino acid. It codes for none and ends the chain.

Reading the anticodons or the template in the codon table. The table is of mRNA codons.

STRETCH AND SUPPORT

Support: cut the figures' captions into cards to put in order, use the dotted key terms as a glossary, and give a codon table with the reading path printed on it (row, column, line).

Stretch: the code would work with fewer stop codons, or with more. Why might three stops, and degeneracy in the third base, make the code tolerant of mistakes? (Silent changes: the guiding question on reliability.)

IN THE GUIDE

3 [Three kinds of RNA build a protein](#)

4 [Codon meets anticodon](#)

5 [A code written in threes](#)

A11 [The whole guide, with the figures that play](#)

PPTX [This lesson's slides, in the order of this plan](#)

EXAM PRACTICE

Check yourself

Set it for homework: a fresh paper of exam-bank questions on D1.2 at standard level each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?

[topics=D1.2&level=SL&paper=quiz&marks=15&src=ep](https://biologybybradford.com/exam-maker/sit?topics=D1.2&level=SL&paper=quiz&marks=15&src=ep)



PRACTISE AND REVISE

BUILD FOR YOUR CLASS

- [Tarsia puzzle, dominoes and picture reveal](#) on D1.2, built from its key terms and ready to print
- A [pub quiz](#) with rounds on D1.2, to present or run with no projector
- An [escape room built from the question bank](#) on D1.2

ALREADY ON THE SITE FOR D1.2

- Quiz: [Protein Synthesis \(HL\)](#)
- Quiz: [Protein Synthesis](#)
- Revision map: [D1.2 Protein synthesis](#), to fill in
- Exam questions: [D1.2 in the exam maker](#), a paper with its markscheme

CARD SETS ON SPLYCR

Open a set to host it as a class game, or make a copy to edit.

- [D1.2 Protein Synthesis \(SL\)](#)
- [D1.2 Protein Synthesis \(HL\)](#)

How this was made. The course structure, the activities and the teaching choices come from my own classroom, my presentations and my years of teaching IB and AP Biology. I use Claude, an AI, to help write and build the interactive guides, lesson plans, slides and practice questions, and to draw the diagrams and code the interactives. I direct the work and review it against the IB and AP specifications before it goes live.