

Direction, width and packing HL

60 minutes • A1.2.11 to A1.2.13 • Chapters 8, 9, 10

Directionality, purine with pyrimidine, and the nucleosome, modelled and seen in molecular visualisation software

BY THE END, STUDENTS CAN

- ☐ Explain what the 5' and 3' ends are, and why nucleotides are only ever added at the 3' end A1.2.11
- ☐ Explain why a purine always pairs with a pyrimidine, and what that does for the helix A1.2.12
- ☐ Describe a nucleosome, and use molecular visualisation software to see how histones hold DNA A1.2.13

TIMING

0-5	5 min	Do now	
5-17	12 min	Which end is which	
17-25	8 min	A big base with a small one	
25-40	15 min	Plasticine nucleosome	
40-55	15 min	Nucleosome on screen	
55-60	5 min	Exit	
60 min		One lesson	

STARTER

5 min **Do now**
 Chapter 8's predict box, 5'-ATGC-3', on mini whiteboards.

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.

08 Every strand has a direction

CHAPTER 08 IN THE SLIDES

Step through the figure (5 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. Carbons **1' to 5'**.
2. Each phosphate links a **5'** carbon to the **3'** carbon before it.
3. New nucleotides join only at the **3' end**.
4. The strands are **antiparallel**: one runs 5' to 3', the other 3' to 5'.
5. So DNA is copied, transcribed and read in **one direction**.

Predict box: One DNA strand reads 5'-ATGC-3'. Written 5' to 3', what is its partner? Hands up or mini whiteboards first.

Answer C: 5'-GCAT-3'

09 A big base with a small one

CHAPTER 09 IN THE SLIDES

Switch the figure through A with T, G with C, A with G, C with T and A with C, and have the class say what will change before each.

Predict box: 30% of the bases in a sample of double-stranded DNA are adenine. What percentage are purines?
Hands up or mini whiteboards first.

Answer B: 50%

Remember it: Pure As Gold CUT (Purines, Adenine, Guanine, Pyrimidines).

10 Wound on a spool

CHAPTER 10 IN THE SLIDES

Step through the figure (5 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. DNA and **histone** proteins.
2. **Eight** histones form a core.
3. The DNA wraps round the core, just under **two turns**.
4. A **ninth** histone, on the linker DNA, holds it in place.
5. **Nucleosomes** along the DNA, like beads on a string.

Predict box: A chemical is added that cancels the negative charges on DNA's phosphate groups. What would you expect to happen to the nucleosomes? Hands up or mini whiteboards first.

Answer C: The DNA would come away from the histones more easily

THE LESSON

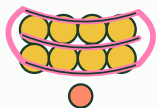
12 min **Which end is which**
Chapter 8's figure. Students add 5' and 3' to their lesson 1 drawing, and an arrow for each of replication, transcription and translation.

8 min **A big base with a small one**
Chapter 9's states, Pure As Gold, and the 30% adenine predict box.

15 min **Plasticine nucleosome**
Build the model (activity below), label it, and photograph it for notes.

15 min **Nucleosome on screen**
Pairs work through [chapter 10's](#) "Try it" list on laptops, then report which part of the DNA the histones touch, and why.

ACTIVITIES

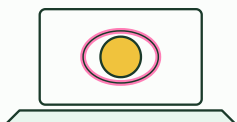


MODEL · HL

Plasticine nucleosome

Press eight equal balls of plasticine (about 1 cm) into a cube. Twist two pipe cleaners into a double helix and wind it just under two turns round the cube. Pin the two ends where they leave with a small ninth piece. Label it, and take a photo for notes.

Needs: plasticine in two colours, pipe cleaners, labels.



SOFTWARE · HL

Nucleosome on screen

Pairs work through [chapter 10's](#) "Try it" list on laptops, then report which part of the DNA the histones touch, and why. The 3D viewer is poor on phones.

Needs: laptops.

5

min

Exit

Describe a nucleosome, three marks' worth.

WHAT STUDENTS GET WRONG

5' and 3' are positions on a gene. They are sugar carbons.

Purine pairs with purine because they are the same size. Big pairs with small.

Eight histones plus DNA is the whole story. The ninth sits on the linker DNA.

STRETCH AND SUPPORT

Support: use the three mnemonics (Apples in the Tree, Some Bananas Split, Pure As Gold) as a starter in each lesson.

IN THE GUIDE

- 8** [Every strand has a direction](#)
- 9** [A big base with a small one](#)
- 10** [Wound on a spool](#)
- A11** [The whole guide, with the figures that play](#)
- PPTX** [This lesson's slides, in the order of this plan](#)

PRACTISE AND REVISE**BUILD FOR YOUR CLASS**

- [Tarsia puzzle](#), [dominoes](#) and [picture reveal](#) on A1.2, built from its key terms and ready to print
- A [pub quiz](#) with rounds on A1.2, to present or run with no projector
- An [escape room](#) built from the [question bank](#) on A1.2

ALREADY ON THE SITE FOR A1.2

- Lesson: [Nucleic Acids](#)
- Quiz: [Nucleic Acids \(HL\)](#)
- Quiz: [Nucleic Acids](#)
- Revision map: [A1.2 Nucleic acids](#), to fill in
- Exam questions: [A1.2 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.
- [A1.2 Nucleic Acids](#)

EXAM PRACTICE**Check yourself**

Set it for homework: a fresh paper of exam-bank questions on A1.2 at higher level each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?topics=A1.2&level=HL&paper=quiz&marks=15&src=ep



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.