

Building blocks

60 minutes • B1.1.1 to B1.1.4 • Chapters 1, 2, 3

Carbon skeletons, condensation and hydrolysis, and telling the sugars apart

BY THE END, STUDENTS CAN

- ☐ Explain how carbon's four covalent bonds let it build chains, branches and rings B1.1.1
- ☐ Describe how condensation joins monomers into polymers and hydrolysis splits them, saying where the water goes B1.1.2, B1.1.3
- ☐ Tell pentoses from hexoses and alpha from beta glucose in ring diagrams, and link glucose's properties to its uses B1.1.4

TIMING

0-6	6 min	Do now	
6-14	8 min	Carbon's four bonds	
14-29	15 min	Build α-glucose	
29-39	10 min	Condensation by hand	
39-54	15 min	Pentose, hexose, two or many?	
54-60	6 min	Exit	
	60 min	One lesson	

STARTER

6
min

Do now

Define monomer and polymer. Then name the reaction in [chapter 2's](#) figure at step 3 and say what it releases.

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.

01 Chains, branches and rings

CHAPTER 01 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. A **covalent bond** is a pair of electrons shared by two atoms.
2. Carbon has four electrons to share, so it makes **four** bonds.
3. A **double bond** shares two pairs: it uses two of carbon's four.
4. Carbon bonds to carbon, so it builds **chains**, straight or branched,
5. and **rings**, one or several fused together.

Tap the parts of the figure in turn: kilo (k), × 1000, centi (c), ÷ 100, milli (m), ÷ 1000, micro (μ), ÷ 1 000 000 and nano (n), ÷ 1 000 000 000.

Predict box: A drawing shows a carbon atom with a double bond to an oxygen, a single bond to another carbon and single bonds to two hydrogens. What is wrong with it? Hands up or mini whiteboards first.

Answer B: It has **five bonds**' worth: the double bond counts as two

02 Water out to build, water in to break

CHAPTER 02 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. Two **monomers**: alpha glucose. Watch the OH groups that face each other.
2. **Condensation**: an OH and an H leave together as a molecule of water.
3. A covalent **glycosidic bond** now joins them.
4. Repeat it and a chain grows: a **polymer**. Polysaccharides, polypeptides and nucleic acids are all built like this.
5. **Hydrolysis** runs it backwards: water is split, its H to one monomer and its OH to the other.

Step through the figure (4 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. Two **alpha glucose** molecules, their carbons numbered.
2. The OH on **carbon 1** of one and the H from the OH on **carbon 4** of the other face each other.
3. They leave as **water**, and a **1,4 glycosidic bond** joins the rings: **condensation**, making maltose.
4. Add water and the bond splits again, the H to one sugar and the OH to the other: **hydrolysis**.

Predict box: Ten glucose molecules are joined into one unbranched chain. How many water molecules were released? Hands up or mini whiteboards first.

Answer C: 9

03 Glucose: small, soluble and stable

CHAPTER 03 IN THE SLIDES

Switch the figure through α -glucose, β -glucose and Both, and have the class say what will change before each.

Switch the figure through Plain and Number the carbons, and have the class say what will change before each.

Predict box: Sugar C in the second figure has a five-sided ring. Is it a pentose or a hexose? Hands up or mini whiteboards first.

Answer A: A hexose: four ring carbons and two outside it make six

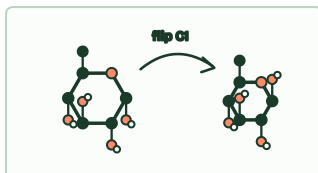
Remember it: Alpha Beta (Below, Above).

Remember it: Sweet Treats Stay Energetic (Soluble, Transportable, Stable, Energy yield).

THE LESSON

- | | |
|------------------|---|
| 8
min | Carbon's four bonds
Chapter 1's figure. Pairs build methane and ethene with model kits and check that every carbon has four bonds. Then the chapter 1 predict box. |
| 15
min | Build α-glucose
The model kit activity below. Pairs build α -glucose, then swap the H and OH on carbon 1 to make β -glucose. |
| 10
min | Condensation by hand
Two pairs join their α -glucose: pull off an OH and an H, make a water molecule from them and link the rings with the oxygen. Then reverse it. The bond builder on the board, then the chapter 2 predict box. |
| 15
min | Pentose, hexose, two or many?
The card sort below. Check it with chapter 3 's second figure, then the chapter 3 predict box. |

ACTIVITIES

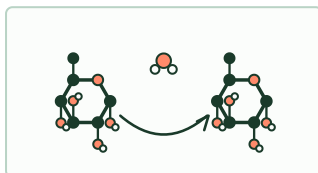


MODEL

Build α -glucose

Students build α -glucose with a molecular model kit, as they would draw it: the ring of five carbons and one oxygen, the sixth carbon above carbon 5, an OH and an H on each ring carbon, and four bonds on every carbon. Then they swap carbon 1's H and OH to make β -glucose and compare with a partner. This is physical molecular modelling (Tool 1).

Needs: model kits (one per pair), the ring diagram on the board.

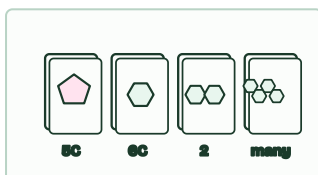


MODEL

Condensation by hand

Two pairs join their glucose models: remove an OH from one and an H from the other, build a water molecule from them, and link the rings through the remaining oxygen. Then reverse it with a water molecule, for hydrolysis.

Needs: the models from the first activity.



CARD SORT

Pentose, hexose, two or many?

Cards of α - and β -glucose, fructose, ribose, deoxyribose, maltose, sucrose, a piece of amylose and a glycogen branch. Sort them into pentose, hexose, disaccharide and polysaccharide. Fructose is the trap card: count carbons, not corners.

Needs: printed cards, one set per pair.

PLENARY

6
min

Exit

Turn over the ABBA tiles. Then draw α -glucose from memory and ring carbon 1's OH.

WHAT STUDENTS GET WRONG

A double bond is one bond. It uses two of carbon's four.

Condensation and hydrolysis swapped, or hydrolysis as "adding water" with no idea where the H and OH go.

Counting corners, not carbons: fructose called a pentose.

α - and β -glucose as different sugars. They have the same formula and differ only in carbon 1's OH.

STRETCH AND SUPPORT

Support: [chapter 3's](#) second figure with **Number the carbons** on.

Support: the tiles as a starter in each lesson (ABBA, Sweet Treats Stay Energetic, Double Kinks Leave Liquids).

Support: the key terms (tap the dotted words) as a glossary, and the bond builder's tap mode on a tablet.

IN THE GUIDE

- 1 [Chains, branches and rings](#)
- 2 [Water out to build, water in to break](#)
- 3 [Glucose: small, soluble and stable](#)
- 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 B1.1, built from its key terms and ready to print
- A [pub quiz](#) with rounds on B1.1, to present or run with no projector
- An [escape room built from the question bank](#) on B1.1

ALREADY ON THE SITE FOR B1.1

- [Quiz: Biological Molecules](#)
- Revision map: [B1.1 Carbohydrates and lipids](#), to fill in
- Exam questions: [B1.1 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.

- [B1.1 Carbohydrates](#)
- [B1.1b Lipids](#)

EXAM PRACTICE

Check yourself

Set it for homework: a fresh paper of exam-bank questions on B1.1 each time, marked as students go and saved to their Exam practice when they are signed in.

biologybybradford.com/exam-maker/sit?topics=B1.1&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.