

Carbohydrates and lipids

Four one-hour lesson plans

Four one-hour lessons cover the thirteen statements, which is the four hours the IB gives B1.1. The plan follows the chapters, so a class can read the guide for homework and use the lesson for the activities. B1.1 has no higher level content. Every figure plays on a projector: step through it with the arrow keys and stop on each caption.

LESSON	COVERS	FOCUS	CHAPTERS
1 Building blocks	B1.1.1 to B1.1.4	Carbon skeletons, condensation and hydrolysis, and telling the sugars apart	1, 2, 3
2 Stores, fibres and name tags	B1.1.4 to B1.1.7	Starch and glycogen as stores, cellulose as a fibre, and sugar name tags on cells	4, 5, 6
3 Lipids	B1.1.8 to B1.1.12	Why lipids avoid water, how fats and phospholipids are built, and how fats store and insulate	7, 8, 9, 10
4 Steroids, the dry lab and review	B1.1.10 and B1.1.13	Steroids crossing the bilayer, the melting points of fats, and a review of the whole subtopic	11, lab

The guide, for the class to read and play: biologybybradford.com/guides/ib-biology-b1-1-carbohydrates-and-lipids

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), $\times 1000$, centi (c), $\div 100$, milli (m), $\div 1000$, micro (μ), $\div 1\,000\,000$ and nano (n), $\div 1\,000\,000\,000$.

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

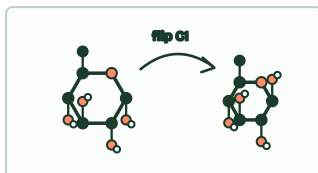
Remember it: Alpha Beta (Below, Above).

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

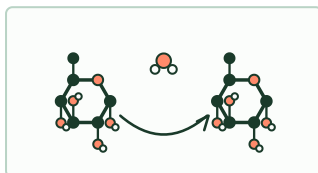


MODEL

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.

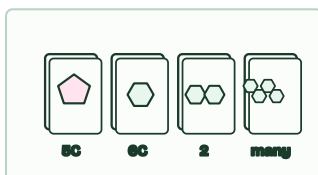


MODEL

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



Stores, fibres and name tags

60 minutes • B1.1.4 to B1.1.7 • Chapters 4, 5, 6

Starch and glycogen as stores, cellulose as a fibre, and sugar name tags on cells

BY THE END, STUDENTS CAN

- ☐ Tell pentoses from hexoses and alpha from beta glucose in ring diagrams, and link glucose's properties to its uses B1.1.4
- ☐ Explain how coiling, branching and size suit starch and glycogen to storing energy B1.1.5
- ☐ Explain how alternating beta glucose gives cellulose straight chains, bundled by hydrogen bonds B1.1.6
- ☐ Explain how glycoproteins let cells recognise each other, using the ABO blood groups B1.1.7

TIMING

0-5	5 min	Do now	
5-17	12 min	Packed tight	
17-29	12 min	Turn it over	
29-39	10 min	Name tags	
39-54	15 min	Molecule speed dating	
54-60	6 min	Exit	
	60 min	One lesson	

STARTER

- 5 min** **Do now**
- "Bread, cotton and liver: what do they have in common?" (Starch, cellulose and glycogen: all glucose.) Then the Sweet Treats Stay Energetic tiles.

ON THE BOARD, FROM THE GUIDE

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04 Starch and glycogen: energy packed tight

CHAPTER 04 IN THE SLIDES

Switch the figure through Amylose, Amylopectin and Glycogen, and have the class say what will change before each.

Play the animation, Watch it happen: building and using a store. It loops; pause it on each moment below and ask what is happening (in the lesson slides it is a video).

- Glucose units join one at a time; a **water** molecule leaves at each link.
- Amylose **coils** into a helix: a lot of glucose in a small space.
- Amylopectin and glycogen **branch**, so they have many ends.
- Enzymes take glucose off the **ends**, using a water molecule each time.

Predict box: An amylose molecule and a glycogen molecule hold the same number of glucose units. A sprinter's muscles suddenly need glucose. Which store can release it faster? Hands up or mini whiteboards first.

Answer C: Glycogen: its many branches give enzymes many ends to work on

05 Turn every other glucose over and the chain runs straight

CHAPTER 05 IN THE SLIDES

Step through the figure (6 steps, the arrow keys on a projector). Stop on each caption and ask what changed before you go on.

1. Two **beta glucose** molecules. Their OH groups point opposite ways.
2. Turn one **over** and they can join: water leaves and a bond forms.
3. Every other unit is turned over, so the chain runs **straight**.
4. Neighbouring chains are linked by many **hydrogen bonds**.
5. Bundles of chains form **microfibrils**.
6. Layers of microfibrils give the **cell wall** its strength.

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 **beta glucose** molecules, their carbons numbered.
2. The OH on **carbon 1** of one points up, and the OH on **carbon 4** of the other points down: they cannot meet.
3. Turn the second over and they meet. They leave as **water**, and a **1,4 glycosidic bond** joins the rings, as in **cellulose: condensation**.
4. Add water and the bond splits again, the H to one sugar and the OH to the other: **hydrolysis**.

Predict box: Cellulose chains lie side by side in bundles. What holds neighbouring chains together? Hands up or mini whiteboards first.

Answer B: Hydrogen bonds between OH groups on neighbouring chains

06 Sugar name tags on the cell surface

CHAPTER 06 IN THE SLIDES

Switch the figure through O, A, B and AB, and have the class say what will change before each.

Predict box: What makes a group A red blood cell different from a group B one? Hands up or mini whiteboards first.

Answer C: One different sugar at the tip of each sugar chain

THE LESSON

12 Packed tight

min

Chapter 4's figure and the polymers scene. Students sketch the three shapes and count the ends. Then the chapter 4 predict box.

12 Turn it over

min

Chapter 5's bond builder first: students try to join two β -glucose before anyone explains. Then chapter 5's figure. Fill in a table: starch, glycogen, cellulose; monomer, shape, branches, where, job.

10 Name tags

min

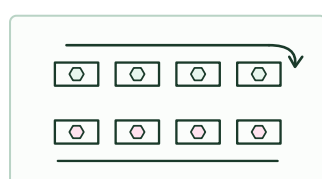
Chapter 6's figure with the O, A, B, AB switch, then the chapter 6 predict box. One minute on why transfused blood must match (forward to C3.2).

15 Molecule speed dating

min

The speed dating game below, with the carbohydrate cards only.

ACTIVITIES



GAME

Molecule speed dating

Each student holds a card with one molecule: a drawing, its name and two facts. Pairs meet for one minute to find one thing their molecules share and one difference, then one row moves along. Six rounds. Lesson 2 uses carbohydrate cards; add lipid cards for a review of the whole topic.

Needs: one card per student.

6

min

Exit

One sentence each: why starch barely dissolves, and why cellulose is strong.

WHAT STUDENTS GET WRONG

"Insoluble because hydrophobic." Starch and glycogen are insoluble because each molecule is huge.

Cellulose as a store. It is structural.

"Group O has no antigens." It has the base chain, without A or B.

STRETCH AND SUPPORT

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.

Stretch: how can cellulose made by plants end up as a carbon sink for thousands of years? (The linking question on carbon sinks; forward to C4.2.)

IN THE GUIDE

- 4** [Starch and glycogen: energy packed tight](#)
- 5** [Turn every other glucose over and the chain runs straight](#)
- 6** [Sugar name tags on the cell surface](#)
- 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

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

**EXAM PRACTICE****Check yourself**

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biologybybradford.com/exam-maker/sit?topics=B1.1&level=HL&paper=quiz&marks=15&src=ep

Lipids

60 minutes • B1.1.8 to B1.1.12 • Chapters 7, 8, 9, 10

Why lipids avoid water, how fats and phospholipids are built, and how fats store and insulate

BY THE END, STUDENTS CAN

- ☐ Explain why lipids are hydrophobic, and how condensation builds triglycerides and phospholipids B1.1.8, B1.1.9
- ☐ Compare saturated, monounsaturated and polyunsaturated fatty acids and explain their melting points B1.1.10
- ☐ Explain why triglycerides suit long-term energy storage and insulation, and compare them with carbohydrates as stores B1.1.11
- ☐ Explain how amphipathic phospholipids form a bilayer in water B1.1.12

TIMING

0-8	8 min	Do now: the salted butter puzzle	
8-15	7 min	Oil and solvents	
15-25	10 min	Make a fat, make a phospholipid	
25-40	15 min	Fats from the fridge	
40-50	10 min	Store and insulate	
50-60	10 min	Half loves water	
	60 min	One lesson	

STARTER

8
min

Do now: the salted butter puzzle

The [chapter 7](#) predict box. Then start melting the butter (the demo below) and leave it to settle.

ON THE BOARD, FROM THE GUIDE

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07 Lipids keep their distance from water

CHAPTER 07 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. Shake oil with **water**,
2. and it separates and floats: it does not dissolve.
3. In a **non-polar solvent** such as hexane, it dissolves.
4. Butter is mostly fat, with some water and, in salted butter, salt.
5. Melted, the **fat** separates from the watery layer, and the salt stays dissolved in the water.

Switch the figure through Triglyceride and Phospholipid, and have the class say what will change before each.

Predict box: You have salted butter but need it unsalted. What could you do? Hands up or mini whiteboards first.

Answer B: Melt it, leave it to settle, then pour the fat off the water

08 Every double bond puts a kink in the tail

CHAPTER 08 IN THE SLIDES

Switch the figure through Saturated, Monounsaturated and Polyunsaturated, and have the class say what will change before each.

Predict box: Olive oil's fatty acids are mostly monounsaturated, and ordinary sunflower oil's are mostly polyunsaturated. Both are liquid at room temperature. You put a bottle of each in the fridge at 5 °C. Which turns cloudy and thick? Hands up or mini whiteboards first.

Answer B: Olive oil: fewer double bonds per chain, so a higher melting point

Remember it: Double Kinks Leave Liquids (C=C double bond, Kinked chain, Loose packing, Lower melting point).

09 Fat: the lightest way to carry energy

CHAPTER 09 IN THE SLIDES

Show the figure: Assumes 10 000 kJ a day, 37 kJ g⁻¹ for fat, 17 kJ g⁻¹ for glycogen, and 3 g of water stored with every gram of glycogen.

Switch the figure through Tropical sea 28 °C, Temperate sea 12 °C and Polar sea -2 °C, and have the class say what will change before each.

Predict box: A seal and a cod swim in the same polar sea. Which needs a thick layer of fat to insulate it? Hands up or mini whiteboards first.

Answer A: The seal: its body stays near 37 °C, much warmer than the water

10 Half loves water, half does not

CHAPTER 10 IN THE SLIDES

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. One molecule, two natures: **amphipathic**.
2. Mixed into water,
3. the tails turn away from water and the heads face it,
4. forming a **bilayer**, with water on both sides.

Play the animation, Watch it happen: a bilayer builds itself. It loops; pause it on each moment below and ask what is happening (in the lesson slides it is a video).

1. Phospholipids stirred into water point every which way.
2. The tails cannot form hydrogen bonds with water, so water crowds the **tails** together.
3. No enzyme placed them and no energy was spent: **water** arranged them.

Predict box: Phospholipids are stirred into a beaker of water, well below the surface. What do they form? Hands up or mini whiteboards first.

Answer C: A double layer: tails inside, heads facing the water on both sides

THE LESSON

7 Oil and solvents

min

The demo below, then [chapter 7's](#) first figure. Come back to the settled butter.

10 Make a fat, make a phospholipid

min

The paper model below. Count the waters: three for a triglyceride and three for a phospholipid. The lipid bond builder on the board.

15 Fats from the fridge

min

The practical below. Then turn over the Double Kinks Leave Liquids tiles and set the [chapter 8](#) predict box.

10 Store and insulate

min

[Chapter 9's](#) figures. Think, pair, share on the guiding question "How do carbohydrates and lipids compare as energy stores?", building [chapter 9's](#) table on the board. Then the [chapter 9](#) predict box.

ACTIVITIES



DEMO

The salted butter puzzle

Melt about 50 g of salted butter in a small beaker standing in hot water and leave it to settle for 10 minutes: foam on top, clear golden fat, a cloudy watery layer below. Ladle off the fat. Ask where the salt went, and how to show it without tasting (no tasting in a lab): evaporate a drop of each layer on a watch glass and look for crystals.

Needs: salted butter, a beaker, a pan or beaker of hot water, a ladle, watch glasses.



DEMO

Oil and solvents

Two tubes: a few drops of vegetable oil shaken with water, which gives two layers, and with hexane in a fume cupboard, which gives one clear layer.

Needs: oil, water, hexane (fume cupboard, no flames), stoppered tubes.



MODEL

Make a fat, make a phospholipid

Paper pieces: a glycerol strip with three OH tabs, three fatty acid strips with COOH ends, one pink phosphate circle and small water cut-outs. Students cut off an H and an OH for each join and stick them together as water. They count three for a triglyceride and three for a phospholipid. The [biomolecules lab](#) has the same task on screen.

Needs: printed pieces, scissors, glue.



PRACTICAL

Fats from the fridge

Small samples of butter, lard, coconut oil, olive oil, sunflower oil and a margarine, straight from the fridge, in labelled dishes. Warm each in a gloved hand, or float the dishes on a tray of warm water, and record the order in which they soften and melt. Then read each label and rank the fats by their saturated, monounsaturated and polyunsaturated content. Does the order fit? Which one does not (coconut oil), and why ([chapter 8, the dry lab](#))? Safety: **no nut oils** (allergy: use rapeseed instead), no tasting, wash hands. Margarine is a blend of plant oils made spreadable by processing: use its label.

Needs: the fats, small dishes, gloves, a tray of warm water, a thermometer, labels or photos of labels.

PLENARY

10
min

Half loves water

[Chapter 10's](#) figure and predict box. Students draw and label a bilayer section with the hydrophilic and hydrophobic regions and the word amphipathic.

WHAT STUDENTS GET WRONG

Lipids as polymers. A triglyceride is one glycerol and three fatty acids.

"Melting breaks the double bonds." Melting separates whole molecules.

"Saturated with fat." Saturated with hydrogen.

"Fat has more energy because its molecules are bigger." It is per gram: more C–H, less oxygen, and no water stored with it.

"Carbohydrates are always short-term stores." Plants keep starch for months.

"Cells build the bilayer with enzymes." Water arranges it.

STRETCH AND SUPPORT

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

Support: a writing frame for "explain why oils are liquid", built on the four tiles in order.

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

Stretch: why do lipids release more energy per gram than carbohydrates? Compare the oxygen in glucose and in a fatty acid chain (the linking question on oxidation and reduction).

Stretch: why might fat in the lower legs of an Arctic mammal be more unsaturated than fat near its body?

Stretch: design a fair test of the fridge fats using a water bath and a thermometer instead of hands.

IN THE GUIDE

- 7 [Lipids keep their distance from water](#)
- 8 [Every double bond puts a kink in the tail](#)
- 9 [Fat: the lightest way to carry energy](#)
- 10 [Half loves water, half does not](#)
- All [The whole guide, with the figures that play](#)
- PPTX [This lesson's slides, in the order of this plan](#)

PRACTISE AND REVISE

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CARD SETS ON SPLYCR

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

EXAM PRACTICE

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Steroids, the dry lab and review

60 minutes • B1.1.10 and B1.1.13 • Chapter 11 • The dry lab

Steroids crossing the bilayer, the melting points of fats, and a review of the whole subtopic

BY THE END, STUDENTS CAN

- ☐ Compare saturated, monounsaturated and polyunsaturated fatty acids and explain their melting points B1.1.10
- ☐ Identify a steroid from its four rings and explain how oestradiol and testosterone cross the bilayer B1.1.13

TIMING

0-8	8 min	Spot the steroid	
8-33	25 min	The dry lab: Fats on the bench	
33-45	12 min	Codenames-style keyword game	
45-57	12 min	Exam question, timed	
57-60	3 min	Exit: form and function	
	60 min	One lesson	

STARTER

- 8 min** **Spot the steroid**
- Chapter 11's first figure on the board. The class votes A to F before each tap. Then the chapter 11 predict box.

ON THE BOARD, FROM THE GUIDE

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11 Four rings, and straight through the membrane

CHAPTER 11 IN THE SLIDES

Tap the parts of the figure in turn: Testosterone, α -glucose, A steroid skeleton, Part of an amylose chain, Oestradiol and A triglyceride.

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. The bilayer's core is **hydrophobic**.
2. Non-polar **testosterone** dissolves into the core,
3. and diffuses out the other side.
4. **Oestradiol** crosses the same way.
5. Polar glucose and charged ions cannot cross the core: they need proteins (B2.1).

Predict box: Testosterone crosses a membrane with no transport protein. Glucose cannot. Why? Hands up or mini whiteboards first.

Answer B: Testosterone is non-polar, so it dissolves in the bilayer's core

THE LESSON

25

min

The dry lab: Fats on the bench

In pairs, on the pure fatty acids bench at 1 °C a minute, stirred: the double-bond series (stearic, oleic, linoleic and α -linolenic acid) and the chain-length series (lauric to arachidic acid), three runs each. Pool the means on the board, then answer the three questions under the lab.

12

min

Codenames-style keyword game

The game below, with the key terms of this guide.

12

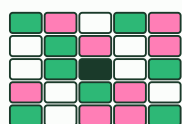
min

Exam question, timed

A written question on carbohydrate and lipid stores, or on fatty acids, from the B1.1 exam maker (in Practise and revise, below): 9 minutes, then peer-marked. For homework, [the Check step](#).

Homework or extension: the reaction GIF, the polymer clay keyring, Tarsia or dominoes on B1.1, and the Check step. A note for the board in lesson 3: a triglyceride has three fatty acids, three ester bonds, and released three waters.

ACTIVITIES



GAME

Codenames-style keyword game

A 5 by 5 grid of key terms from this guide; two teams. Each team's clue-giver gives one word and a number that link several of their team's terms. Use the key terms in the chapters (anabolism and catabolism belong to C1.1, so leave them out).

Needs: a printed or projected grid, two colours of counters.

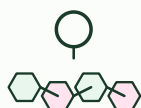


MAKE

A reaction in motion

Students make a short GIF or stop-motion film of one condensation or hydrolysis (glucose, a triglyceride or a dipeptide), showing which atoms leave as water or where the water's H and OH go. Any GIF maker or a phone's stop-motion app. Homework, or 20 minutes in class.

Needs: devices, paper or model pieces.



MAKE

Polymer clay keyring

Each student models one monomer or a short polymer in polymer clay with a consistent colour code (C black, H white, O red, N blue, and P in the kit's own colour), on a keyring, and bakes it as the clay's packet says. End of the unit, or homework.

Needs: polymer clay, keyring loops, an oven.

DRY LAB

Fats on the bench

Freeze fatty acids and kitchen fats, warm them in a bath and catch the moment each one melts. [The dry lab](#), with its tasks and questions under it, and its results as a CSV for a pooled class graph.

Needs: one device per pair.

PLENARY

3

min

Exit: form and function

One line each on how a change of form changes function: one OH turned over, branching, a double bond, a polar head, four non-polar rings.

WHAT STUDENTS GET WRONG

"Small molecules cross membranes and big ones do not." Polarity decides, not size.

STRETCH AND SUPPORT

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

Stretch: in [the dry lab](#), predict the mystery acid's melting point from both graphs before measuring it, and explain the size of your error.

IN THE GUIDE

11 [Four rings, and straight through the membrane](#)

Lab [Dry lab: Fats on the bench](#)

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.