NAME _____ CLASS _____ DATE _____

AP BIOLOGY · 1.3 AND 1.4

Macromolecules and carbohydrates

Notes to fill in alongside the guide. Each numbered block matches a chapter of the guide, and of the lesson slides. Write in the gaps, answer the cues, annotate the figures, and sum up each section in your own words.

BY THE END YOU CAN

- [ ] Name the monomer, the polymer and the bond for carbohydrates, proteins and nucleic acids, and say why lipids are not polymers 1.3.A
- [ ] Describe dehydration synthesis: the H and OH that leave as water and the covalent bond that forms 1.3.A
- [ ] Describe hydrolysis, and explain digestion and rebuilding as catabolism and anabolism 1.3.A
- [ ] Tell monosaccharides, disaccharides and polysaccharides apart, with an example of each 1.4.A
- [ ] Explain how coiling, branching and insolubility suit starch and glycogen to storing energy 1.4.A
- [ ] Explain how the form of the glucose monomer makes cellulose straight, strong and structural 1.4.A

01 Big molecules from small parts 1.3.A

CUES

Predict: A student says DNA, starch, a protein and a fat are all polymers. Which one breaks the rule, and why?

What is meant by macromolecules?

What is meant by polymers?

What is meant by monomers?

NOTES

1 Each is huge by the standards of chemistry, which is why they are called _____.

2 Three of the four are _____: chains of small, similar units called _____, joined by covalent bonds.

3 Carbohydrates: _____.

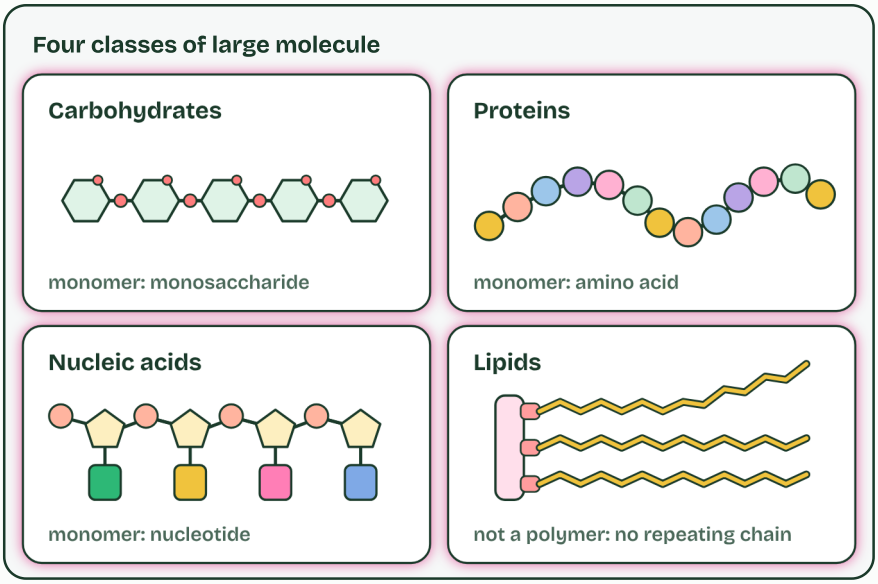
4 Proteins: _____.

5 Nucleic acids: _____.

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: carbohydrates., proteins., nucleic acids., lipids..



REMEMBER IT

Each polymer and its monomer

S Sugar	P Protein	G Gene
S	P	G

SPOT THE MISTAKE

A student writes: "All macromolecules are polymers." Spot the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 01 in two or three sentences of your own.

02 Take water out to build

1.3.A

CUES

Predict: Ten glucose molecules are joined into one unbranched chain. How many water molecules were released?

What is meant by dehydration synthesis?

NOTES

1 The reaction is _____: making something (synthesis) by taking water out (dehydration).

2 Two _____. Each has an H at one end and an OH at the other.

3 They leave as a molecule of _____, and a _____ now joins the monomers: dehydration synthesis.

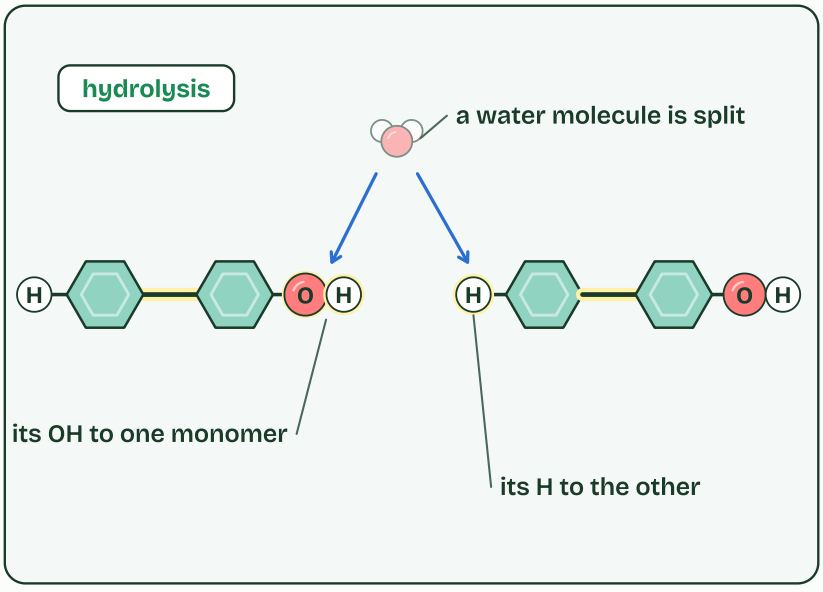
4 Repeat it and a chain grows, a _____: one water released for every bond.

5 _____ runs it backward: a water molecule is split, its H to one monomer and its OH to the other, and the bond breaks.

Your own notes

ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each.



SPOT THE MISTAKE

A student writes: “Dehydration means the molecule dries out.” Spot the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 02 in two or three sentences of your own.

03 Put water back to break

1.3.A

CUES

Predict: A starch molecule of 300 glucose units, in one unbranched chain, is digested completely to glucose. How many water molecules does that use?

What is meant by hydrolysis?

What is meant by metabolism?

What is meant by anabolism?

What is meant by catabolism?

NOTES

1 _____ runs the other way.

2 Together the two reactions are a large part of _____.

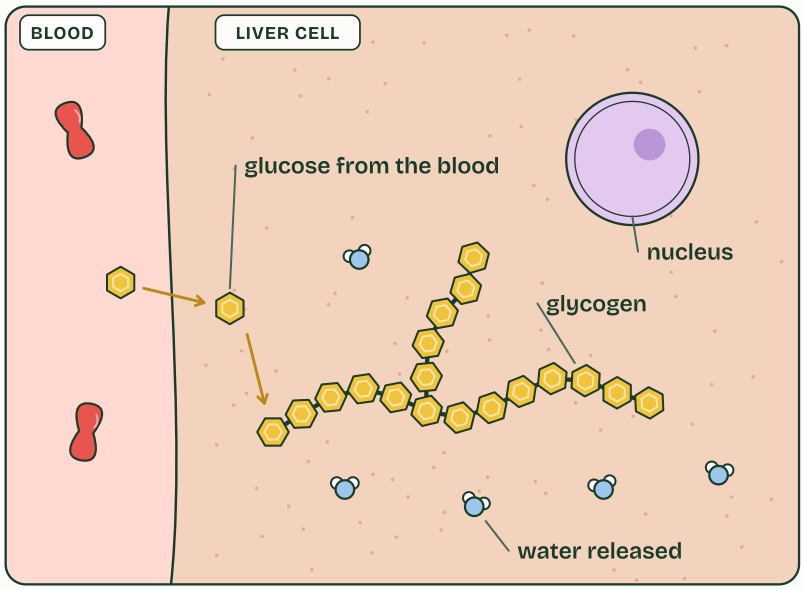
3 Building large molecules from small ones is _____; breaking them down is _____.

4 _____: polymer and water in, monomers out.

Your own notes

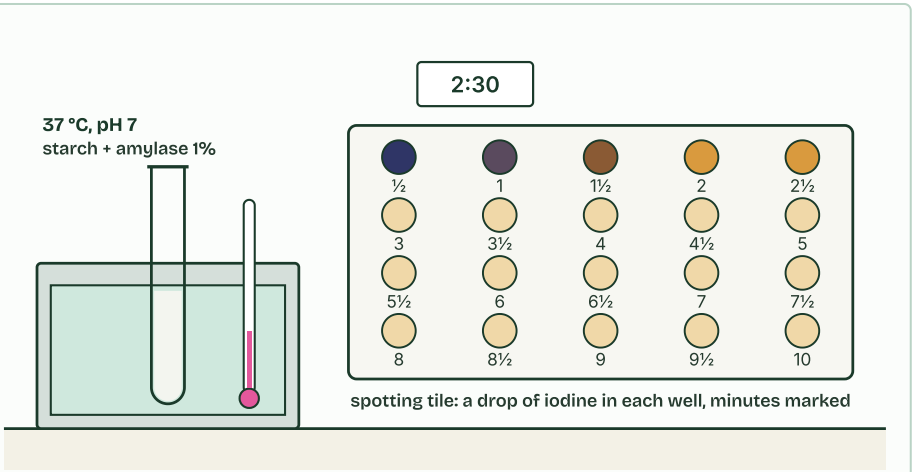
ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each.



ANNOTATE THE FIGURE

Label the key parts and add a note on what it shows.



REMEMBER IT

Which way the water goes

D Dehydrate	H Hydrolyze
D	H

SPOT THE MISTAKE

What do students often get wrong about hydrolysis? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 03 in two or three sentences of your own.

04 One unit, two units, many

1.4.A

CUES

Predict: Glucose and fructose are both C6H1206. Sucrose, made from one of each, is C12H22011. Why is it not C12H24012?

What is meant by monosaccharides?

What is meant by isomers?

What is meant by disaccharide?

What is meant by glycosidic bond?

What is meant by polysaccharide?

What is meant by reducing sugars?

NOTES

1 The monomers are _____, single sugars.

2 Glucose, fructose and galactose all have the formula $C_6H_{12}O_6$, but their atoms are arranged differently, and so they behave differently: they are _____.

3 Two monosaccharides joined by dehydration synthesis make a _____.

4 The bond between sugars is a _____.

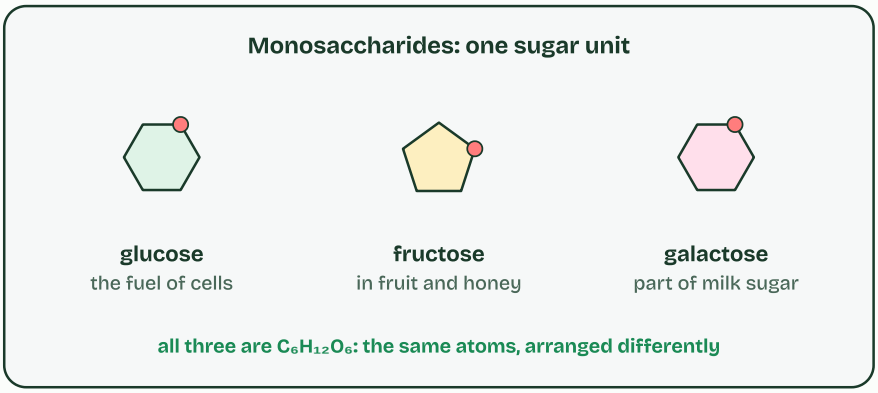
5 Hundreds to thousands joined make a _____.

6 Glucose, fructose, galactose, maltose and lactose are _____: heated with Benedict's reagent, they turn it from blue to green, orange or brick red.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as One unit, Two units and Many units. Note what changes each time.



SPOT THE MISTAKE

A student writes: “Sugar means sucrose.” Spot the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 04 in two or three sentences of your own.

05 Energy packed tight

1.4.A

CUES

Predict: An unbranched starch chain and a glycogen molecule hold the same number of glucose units. A sprinter's muscles suddenly need glucose. Which store can release it faster?

What is meant by starch?

What is meant by glycogen?

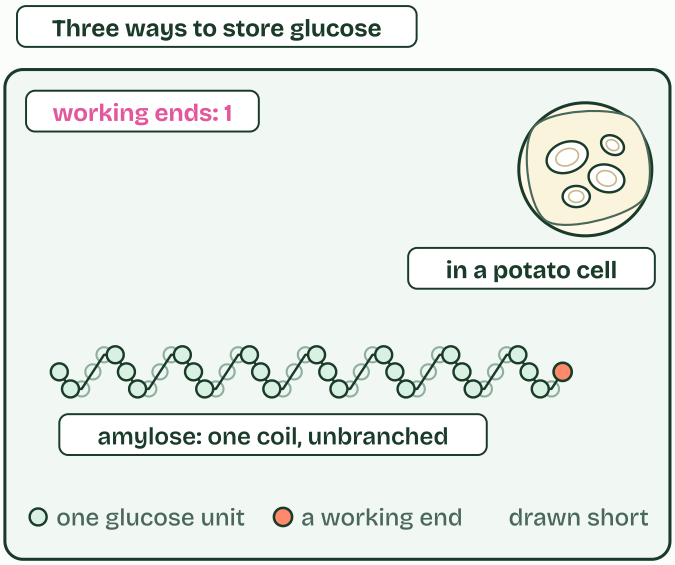
NOTES

1 Plants store glucose as _____ and animals and fungi store it as _____.

Your own notes

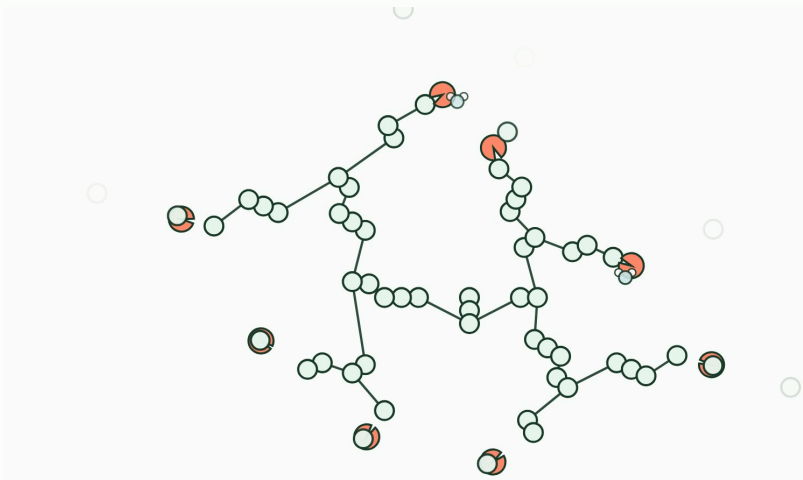
ANNOTATE THE FIGURE

The figure shows it as Amylose, Amylopectin and Glycogen. Note what changes each time.



ANNOTATE THE FIGURE

Annotate this still from the animation (Watch it happen: building and using a store): what is happening, and why?



Each bead is one glucose. Real molecules hold thousands.

SPOT THE MISTAKE

What do students often get wrong about starch and glycogen? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 05 in two or three sentences of your own.

06 Turn every other unit over and the chain runs straight

1.4.A

CUES

Predict: Cows eat grass, which is mostly cellulose, but cows make no enzyme that can hydrolyze cellulose. How do they get energy from it?

What is meant by cellulose?

What is meant by microfibrils?

What is meant by chitin?

NOTES

1 Glucose comes in two forms that differ only in which way one OH group points: alpha (α) glucose, the monomer of starch and glycogen, and beta (β) glucose, the monomer of _____.

2 Straight chains lie side by side, and the OH groups of neighboring chains form many hydrogen bonds that tie them into bundles called _____.

3 _____ is another structural polysaccharide, of a glucose that carries a nitrogen-containing group.

4 Two _____ molecules. Their OH groups point opposite ways.

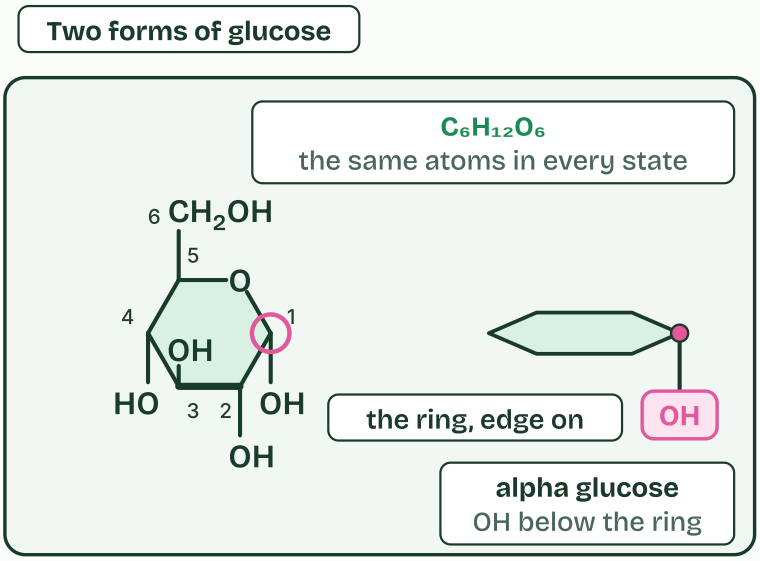
5 Turn one _____ and they can join: water leaves and a bond forms.

6 Every other unit is turned over, so the chain runs _____.

Your own notes

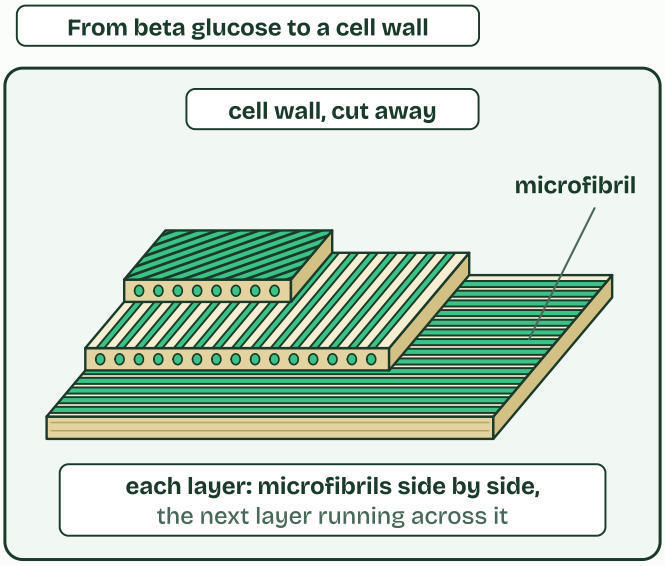
ANNOTATE THE FIGURE

The figure shows it as α-glucose, β-glucose and Both. Note what changes each time.



ANNOTATE THE FIGURE

Number the 6 steps on the figure and note what happens at each: 1 beta glucose; 2 over; 3 straight; 4 hydrogen bonds; 5 microfibrils; 6 cell wall.



SPOT THE MISTAKE

What do students often get wrong about cellulose and chitin? Write the mistake, then put it right.

The mistake

Put it right

SUMMARY

Sum up section 06 in two or three sentences of your own.

Check yourself

The check for this guide is online: a fresh paper of past-paper style questions from the exam bank on 1.3 and 1.4 each time, marked as you go, and saved to your Exam practice progress when you are signed in. Scan the code, or type the link.

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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.