NAME _____ CLASS _____ DATE _____

AP BIOLOGY · 1.7

Proteins

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

- [ ] Describe the parts of an amino acid and explain how dehydration synthesis joins them by peptide bonds into a chain with an amino (N) end and a carboxyl (C) end 1.7.A
- [ ] Explain how the chemistry of R groups, hydrophobic, hydrophilic, charged or polar, gives each amino acid its properties 1.7.A
- [ ] Describe primary, secondary, tertiary and quaternary structure and the bonds or interactions that hold each 1.7.A
- [ ] Explain how a change in the sequence of amino acids can change the shape, and so the function, of a protein 1.7.A
- [ ] Explain how heat, pH and solvents denature a protein, and why a denatured protein no longer works 1.7.A

01 Twenty monomers, one pattern 1.7.A

CUES

Predict: Two amino acids have the same amino group, carboxyl group and hydrogen. What has to be different for them to be two kinds of amino acid?

What is meant by amino acids?

What is meant by amino group?

What is meant by carboxyl group?

What is meant by r group?

NOTES

1 Every one is built from the same monomers, _____.

2 A central carbon carries four things: an _____ (NH_2), a _____ (COOH), a hydrogen atom, and a side chain called the _____.

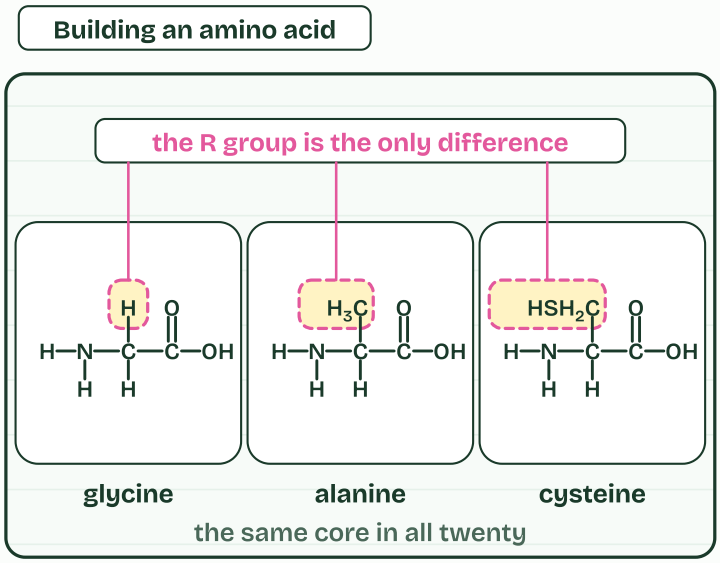
3 Same in every amino acid: _____, carboxyl group, hydrogen.

4 Different: the _____.

Your own notes

ANNOTATE THE FIGURE

Number the 6 steps on the figure and note what happens at each: 1 alpha carbon; 2 amine group; 3 carboxyl group; 4 hydrogen; 5 R group; 6 R group.



SPOT THE MISTAKE

A student writes: "Amino acids contain only C, H, O and N." 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 A chain with a beginning and an end

1.7.A

CUES

Predict: A polypeptide of 120 amino acids is made in a cell. How many peptide bonds does it have, and how many water molecules were released?

What is meant by peptide bond?

What is meant by polypeptide?

What is meant by amino (N) terminus?

What is meant by carboxyl (C) terminus?

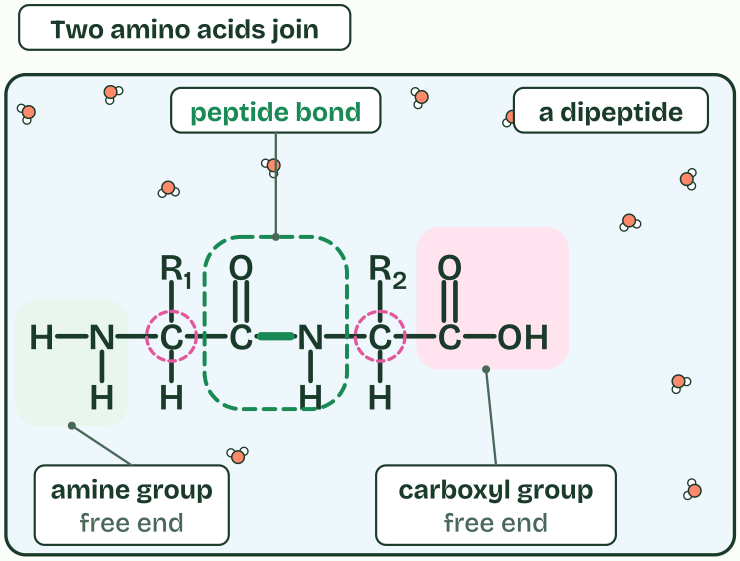
NOTES

1. The carboxyl group of one meets the amino group of the next; an OH and an H leave as water, and a covalent _____ forms between them.
2. Two amino acids make a dipeptide; many make a _____.
3. Its first amino acid has a free amino group, the _____, and its last a free carboxyl group, the _____.
4. Two amino acids, _____ _____ and _____ _____, with the carboxyl group of the first facing the amine group of the second.
5. The _____ from the carboxyl group and one _____ from the amine group are lit: they will leave as _____.
6. The carbon bonds to the nitrogen and the water drifts away. The new C-N bond is a _____.

Your own notes

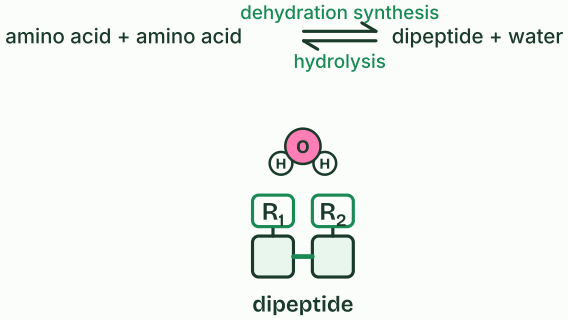
ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each: 1 R1, R2; 2 OH, H, water; 3 peptide bond; 4 dipeptide.



ANNOTATE THE FIGURE

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



SPOT THE MISTAKE

What do students often get wrong about peptide bonds and direction? Write 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 Hydrophobic, hydrophilic, charged

1.7.A

CUES

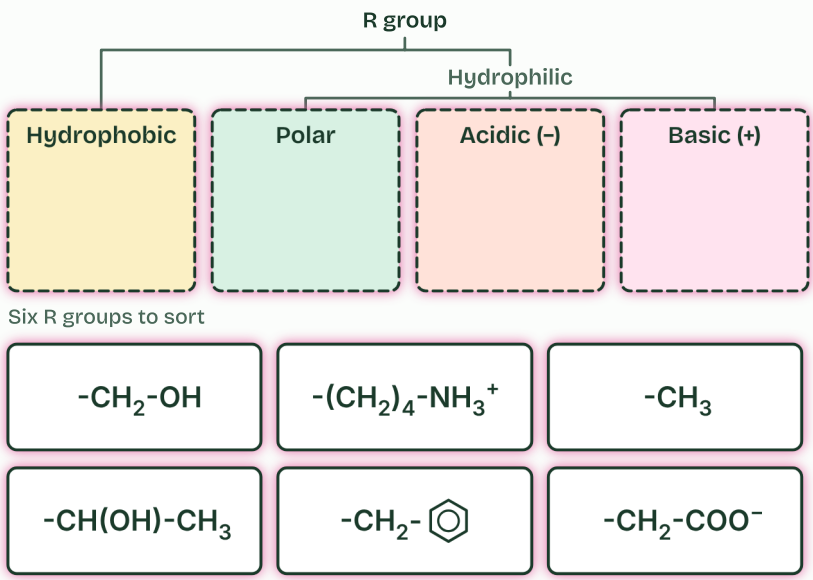
Predict: A protein dissolves in the cytoplasm. Where in its folded shape would you expect to find most of its hydrophobic R groups?

NOTES

Your own notes

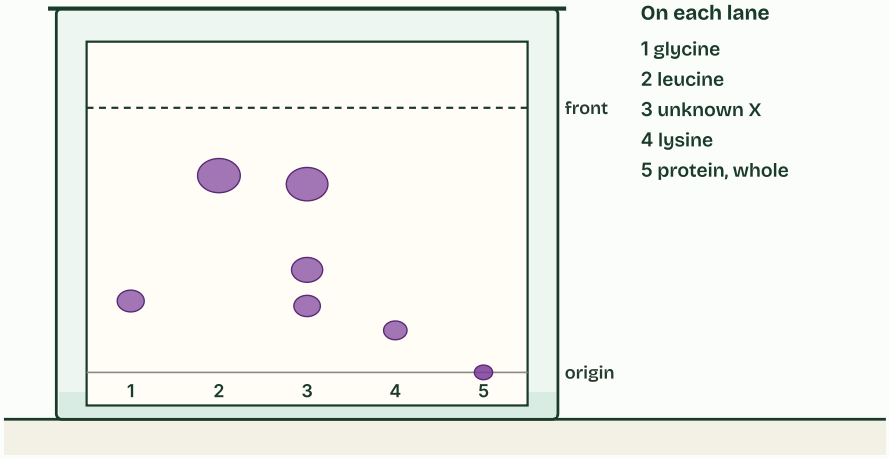
ANNOTATE THE FIGURE

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



ANNOTATE THE FIGURE

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



SPOT THE MISTAKE

What do students often get wrong about r groups? 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 The sequence, then the first folds

1.7.A

CUES

Predict: A protein is heated until its folds come undone. Which level of its structure is still there?

What is meant by primary structure?

What is meant by secondary structure?

What is meant by alpha helix?

What is meant by beta pleated sheet?

NOTES

1 The _____ is the sequence of amino acids, held by peptide bonds.

2 The _____ is local folding of the backbone into two regular shapes: an _____, a coil, and a _____, stretches lying side by side.

3 _____ structure: a sequence of amino acids, each joined to the next by a peptide bond.

4 _____ structure: one stretch coils and another pleats beside itself, held by dashed hydrogen bonds.

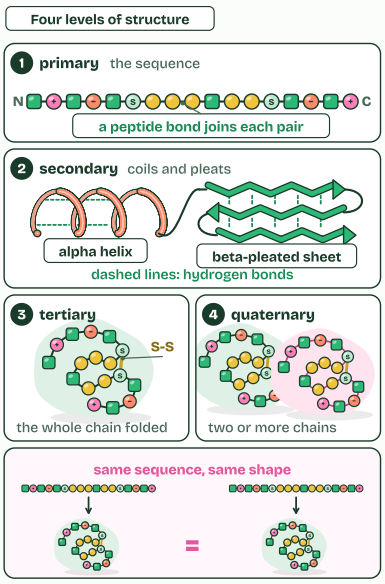
5 _____ structure: the whole chain folded into a compact shape.

6 _____ structure: two or more folded chains together. Not every protein has one.

Your own notes

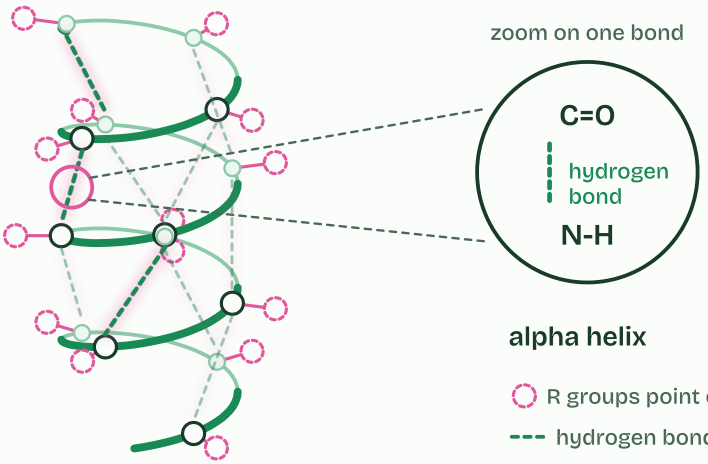
ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each: 1 Primary; 2 Secondary; 3 Tertiary; 4 Quaternary; 5 same shape.



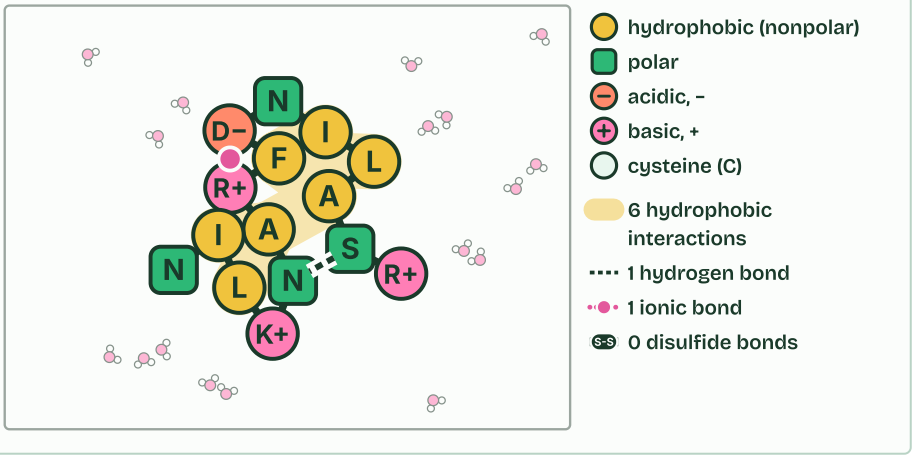
ANNOTATE THE FIGURE

Label each part and say what it does: hydrogen bond, hydrogen bond, hydrogen bond, hydrogen bond, hydrogen bond, hydrogen bond, hydrogen bond, hydrogen bond, hydrogen bond.



ANNOTATE THE FIGURE

Number the 2 steps on the figure and note what happens at each: 1 ROSALIND FRANKLIN; 2 nonpolar.



SPOT THE MISTAKE

What do students often get wrong about primary and secondary structure? Write 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 R groups pull the chain into shape

1.7.A

CUES

Predict: In one protein, a positively charged R group sits next to a negatively charged one in the folded shape. A mutation swaps the negative one for a hydrophobic R group. What is most likely?

What is meant by tertiary structure?

What is meant by disulfide bridge?

What is meant by quaternary structure?

NOTES

1 The _____ is the whole chain's three-dimensional shape, and it is set by the R groups.

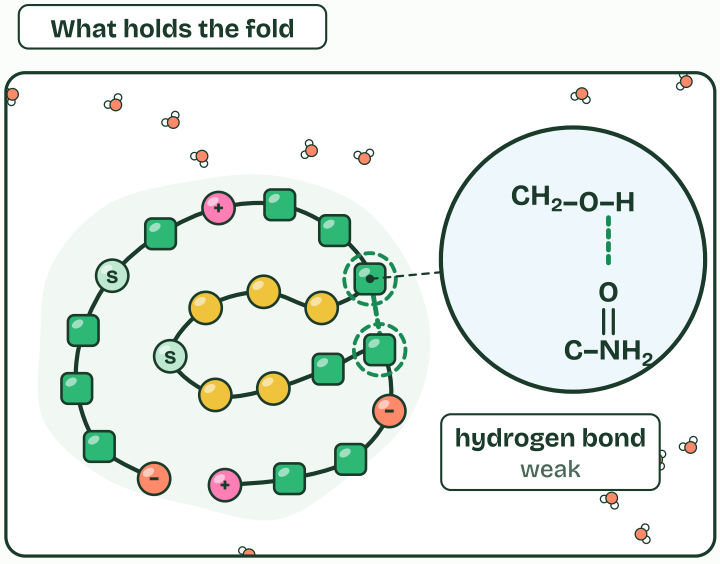
2 Polar R groups form hydrogen bonds, opposite charges form ionic bonds, and the sulfur atoms of two cysteines can join in a covalent _____.

3 Some proteins are made of more than one polypeptide, and how the chains fit together is the _____.

Your own notes

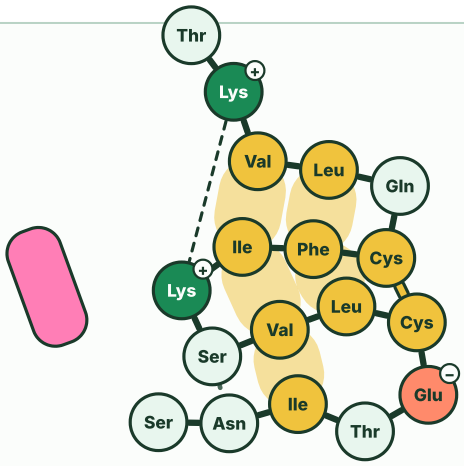
ANNOTATE THE FIGURE

The figure shows it as Hydrogen, Ionic, Disulfide, Hydrophobic, All and Lower the pH. Note what changes each time.



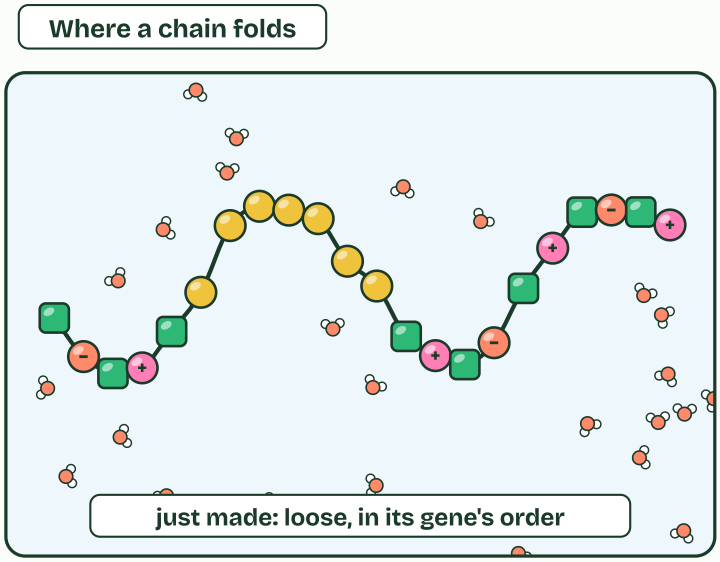
ANNOTATE THE FIGURE

Number the 2 steps on the figure and note what happens at each: 1 R groups, substrate; 2 distorted.



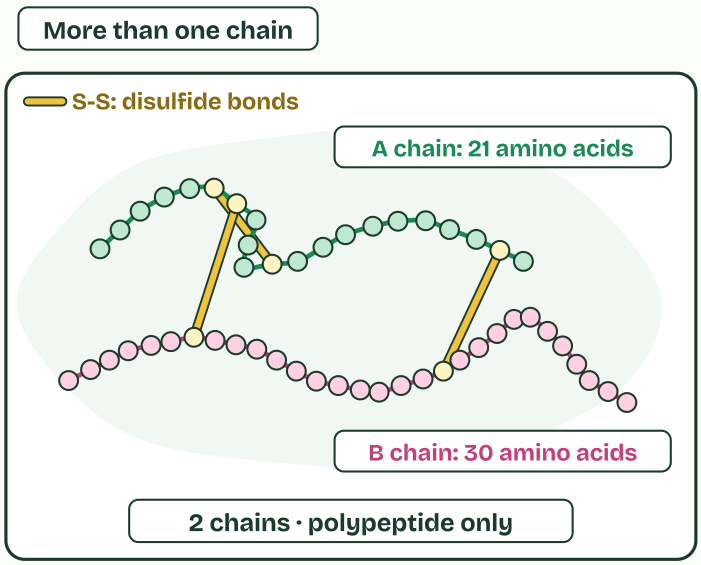
ANNOTATE THE FIGURE

The figure shows it as Unfolded, In water and In a membrane. Note what changes each time.



ANNOTATE THE FIGURE

The figure shows it as Insulin, Collagen and Hemoglobin. Note what changes each time.



REMEMBER IT

Four levels of structure

P Pretty	S Super	T Tidy	Q Quilt
P	S	T	Q

SPOT THE MISTAKE

What do students often get wrong about tertiary and quaternary structure? 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 Unfold it and it stops working

1.7.A

CUES

Predict: Raw egg white is clear. Cooked, it is white and firm, and it stays white when it cools. Why does it not go back?

What is meant by denatured?

NOTES

1 Any of them can unfold a protein: it is _____.

2 Raw egg white: clear and runny. Magnified, the proteins are _____, each on its own among the water molecules.

3 _____ makes the molecules jiggle harder and breaks the bonds that hold the folds.

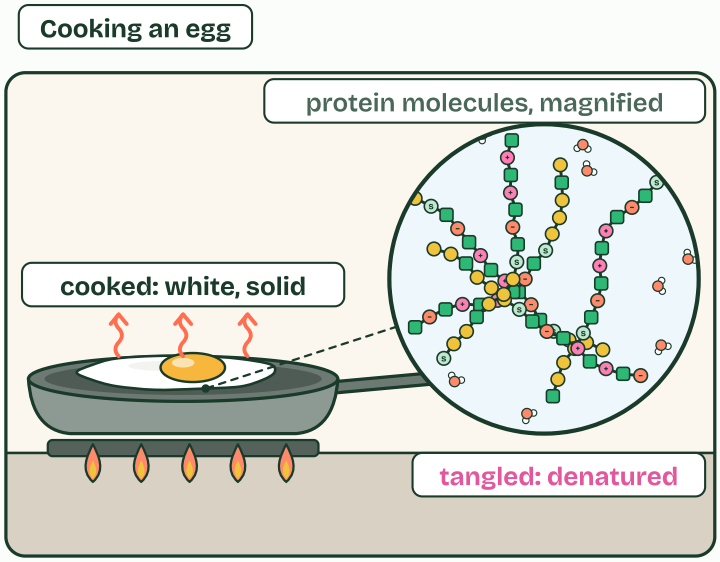
4 The chains _____: with the bonds gone, their shape is gone.

5 Unfolded chains _____ together and the egg white sets, white and solid. The proteins are _____.

Your own notes

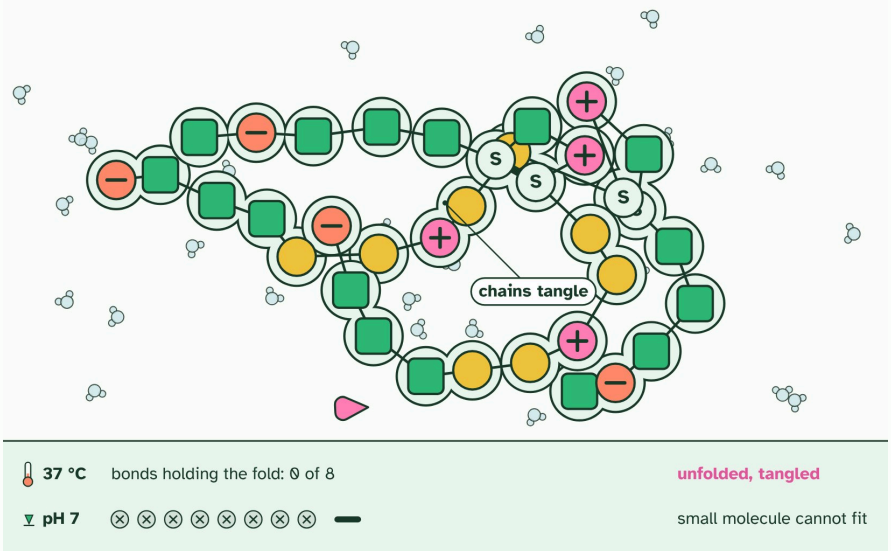
ANNOTATE THE FIGURE

Number the 4 steps on the figure and note what happens at each: 1 folded; 2 Heat; 3 unfold; 4 tangle, denatured.



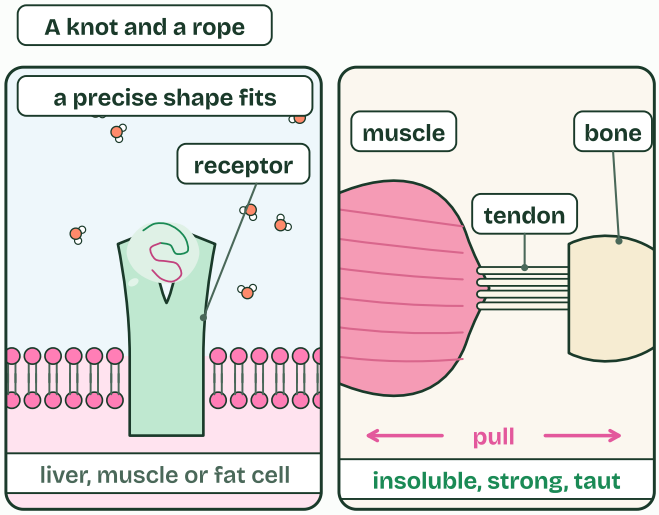
ANNOTATE THE FIGURE

Annotate this still from the animation (Heat it, change the pH): what is happening, and why?



ANNOTATE THE FIGURE

Number the 5 steps on the figure and note what happens at each: 1 insulin, collagen; 2 soluble; 3 precise shape; 4 cross-linked; 5 insoluble.



SPOT THE MISTAKE

A student writes: “Denaturing breaks a protein into amino acids.” Spot 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 1.7 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.

biologybybradford.com/exam-maker/sit?program=ap&units=U1&ced=1.7&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.