NAME _____ CLASS _____ DATE _____

AP BIOLOGY · 4.4

Feedback

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

- [ ] Explain what homeostasis is, and why a variable is held within a normal range around a set point 4.4.A
- [ ] Identify the stimulus, sensor, control center, effector and response in a feedback loop 4.4.A
- [ ] Explain how insulin and glucagon return blood glucose to its set point by negative feedback 4.4.A
- [ ] Predict what happens when part of a loop fails, as in type 1 and type 2 diabetes 4.4.A
- [ ] Explain how sweating, vasodilation, vasoconstriction and shivering hold body temperature steady 4.4.A
- [ ] Explain how positive feedback amplifies a response, in labor, lactation and fruit ripening 4.4.A
- [ ] Compare negative and positive feedback, including negative feedback at the molecular level 4.4.A

01 Keeping the inside steady 4.4.A

CUES

Predict: On a winter walk the air drops from 68 °F to 40 °F (20 °C to 4 °C). What happens to the core temperature of a healthy walker?

What is meant by homeostasis?

What is meant by set point?

What is meant by normal range?

NOTES

1 Keeping the internal environment stable while the outside changes is _____.

2 Each controlled variable has a _____, the value the body steers toward, and a _____ around it.

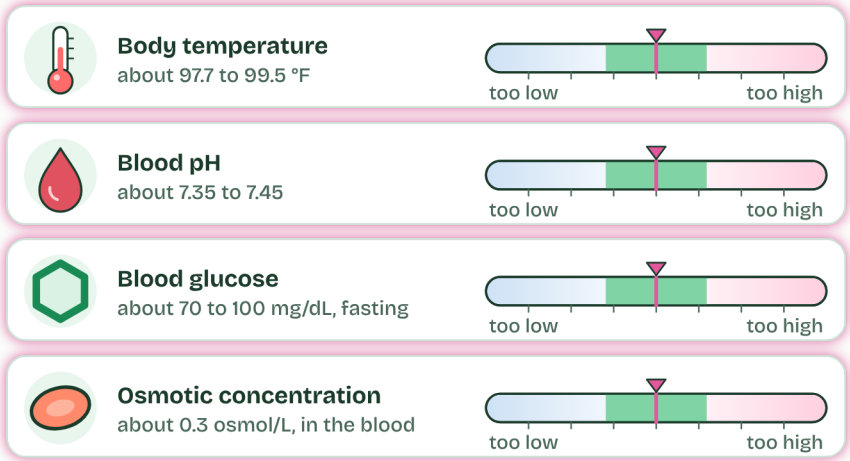
3 _____: a stable internal environment, whatever happens outside.

4 Each variable has a _____ and a normal range around it.

Your own notes

ANNOTATE THE FIGURE

Label each part and say what it does: body temperature, blood pH, blood glucose, blood osmotic concentration.



SPOT THE MISTAKE

What do students often get wrong about feedback? Write 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 Every loop has the same parts

4.4.A

CUES

Predict: A drug stops the sensors in a negative feedback loop from detecting anything. The variable then drifts above its set point. What happens next?

What is meant by stimulus?

What is meant by sensor?

What is meant by control center?

What is meant by effector?

What is meant by response?

What is meant by negative feedback?

NOTES

1 The change itself, a rise or a fall away from the set point, is the _____.

2 A _____, often called a receptor, detects it.

3 A _____ compares the reading with the set point and sends a signal, by nerve or by hormone.

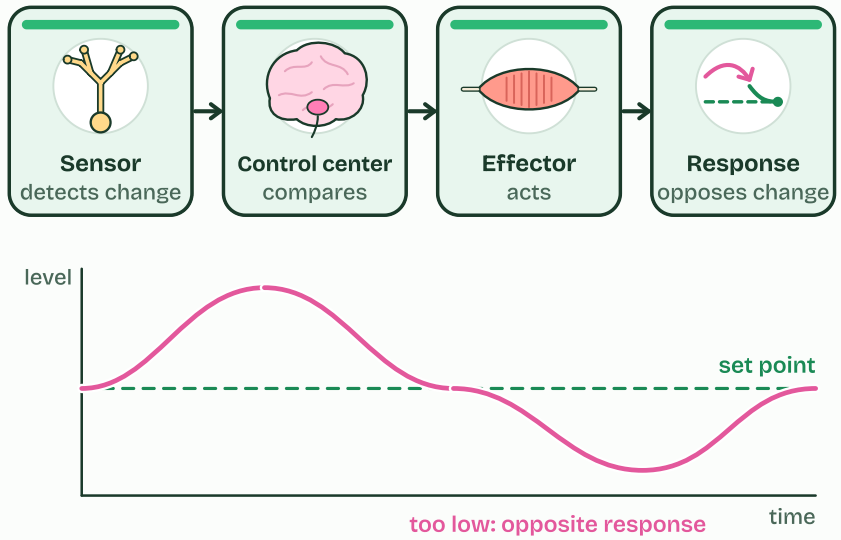
4 An _____, a muscle or a gland, carries out the _____.

5 In _____ the response opposes the stimulus: a rise brings about a fall, and a fall a rise.

Your own notes

ANNOTATE THE FIGURE

Number the 6 steps on the figure and note what happens at each: 1 stimulus; 2 sensor; 3 control center; 4 effector; 5 response, falls back; 6 too low.



REMEMBER IT

The five parts of a loop, in order

S Sly	S Snakes	C Can	E Eat	R Rats
S	S	C	E	R

SPOT THE MISTAKE

What do students often get wrong about feedback? 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 Two hormones, one level

4.4.A

CUES

Predict: You skip breakfast and then play soccer for an hour. Which change happens in your blood and your liver?

What is meant by beta cells?

What is meant by insulin?

What is meant by glycogen?

What is meant by alpha cells?

What is meant by glucagon?

NOTES

1 After a meal, glucose absorbed from the gut raises the level. _____ in the islets release _____.

2 Insulin binds receptors on liver and muscle cells, which take glucose in and join it into _____, the branched polysaccharide of Unit 1; fat cells take some in too.

3 Between meals the level falls. _____ release _____, which acts on the liver: liver cells break glycogen down and release glucose into the blood.

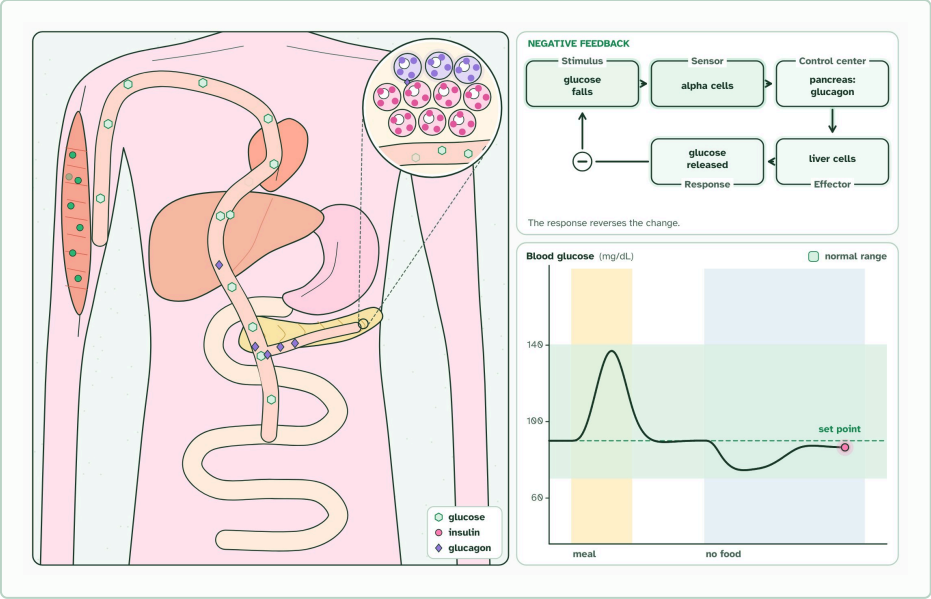
4 Glucose high: _____ release insulin; liver and muscle take glucose in and store it as glycogen.

5 Glucose low: _____ release glucagon; liver cells break glycogen down and release glucose.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Blood glucose held steady): what is happening, and why?



REMEMBER IT

Which hormone does which

I In	G Gone
I	G

SPOT THE MISTAKE

What do students often get wrong about feedback? 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 A broken loop

4.4.A

CUES

Predict: Early in type 2 diabetes, blood tests often show more insulin than in a healthy person. Why would the pancreas release extra insulin?

What is meant by diabetes mellitus?

What is meant by insulin resistance?

NOTES

1 _____ is what happens when the glucose loop fails: the level stays high after meals and often between them.

2 In _____ the immune system destroys the beta cells.

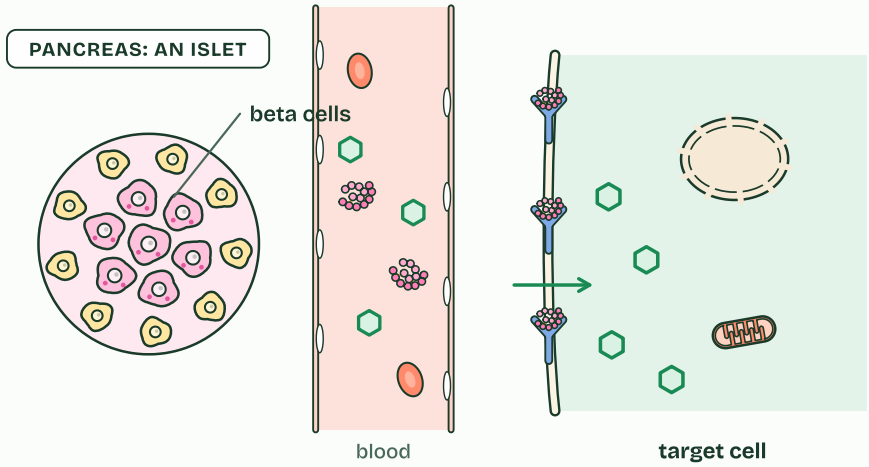
3 In _____ the beta cells still make insulin, but the target cells respond weakly: _____.

4 Type 2: insulin is released, but target cells respond poorly (_____).

Your own notes

ANNOTATE THE FIGURE

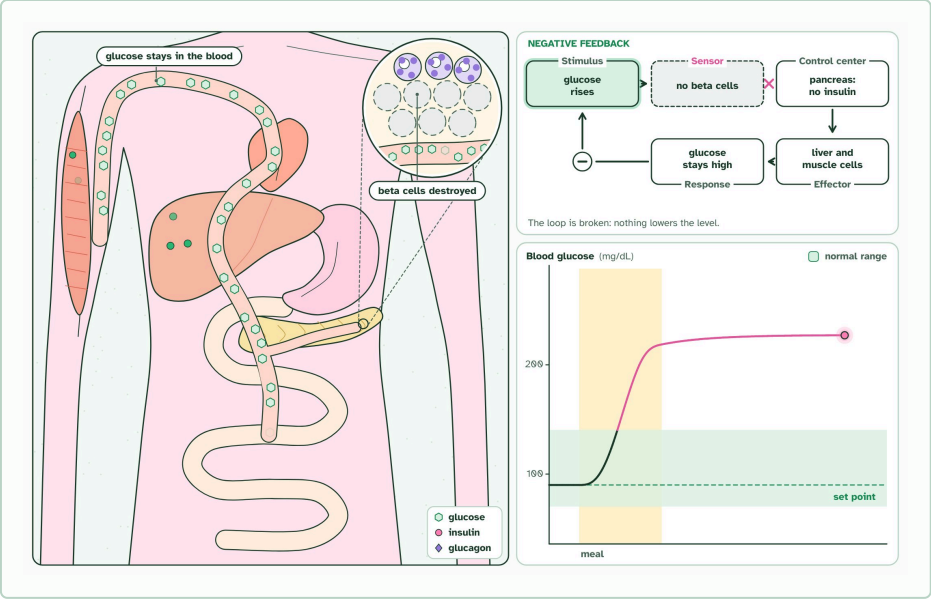
The figure shows it as Healthy, Type 1 and Type 2. Note what changes each time.



Healthy: beta cells make insulin, it binds receptors, cells take up glucose, and blood glucose stays in range.

ANNOTATE THE FIGURE

Annotate this still from the animation (No insulin: type 1 diabetes): what is happening, and why?



SPOT THE MISTAKE

What do students often get wrong about feedback? 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 Too hot, too cold

4.4.A

CUES

Predict: On a hot, humid day, sweat drips off you instead of drying. Why do you feel hotter than on an equally hot, dry day?

What is meant by hypothalamus?

What is meant by vasodilation?

What is meant by vasoconstriction?

What is meant by shiver?

NOTES

1 The control center is the _____, at the base of the brain, which signals the effectors along nerves.

2 The arterioles that supply the skin widen (_____), so more warm blood flows near the surface and loses heat to the air: that is why a hot face looks flushed.

3 When you cool down, the skin's arterioles narrow (_____), keeping warm blood deeper in the body.

4 Skeletal muscles _____, and their respiration releases heat.

5 Too hot: sweating and _____ lose more heat.

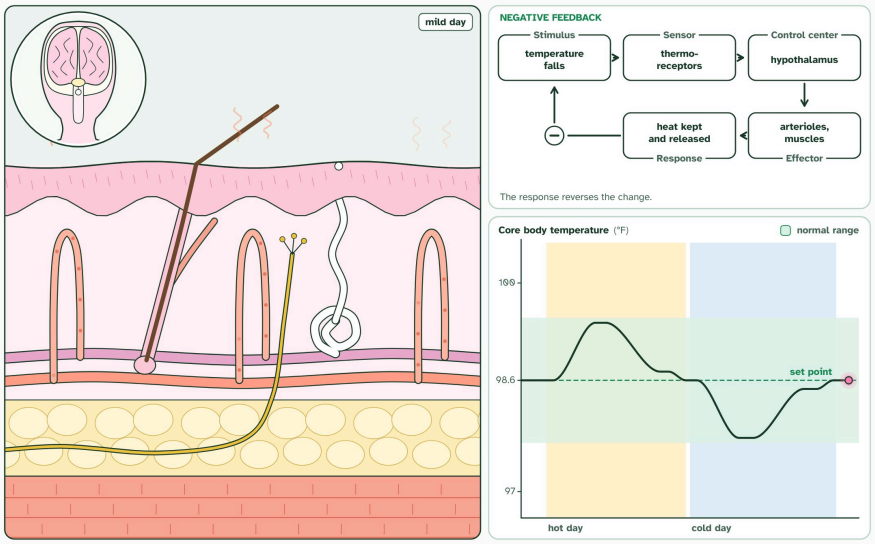
6 Too cold: _____ keeps heat in; shivering releases more.

7 The _____ is the control center; nerves carry its signals.

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (Body temperature held steady): what is happening, and why?



SPOT THE MISTAKE

What do students often get wrong about feedback? 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 A loop that runs away

4.4.A

CUES

Predict: A doctor gives a slow drip of synthetic oxytocin to a woman whose labor has stalled. Why can a small dose get contractions going strongly?

What is meant by positive feedback?

What is meant by oxytocin?

NOTES

1 In _____ the response adds to the stimulus, so the change grows, and grows faster.

2 Stretch receptors there send nerve impulses to the hypothalamus, which makes the posterior pituitary release the hormone _____ into the blood.

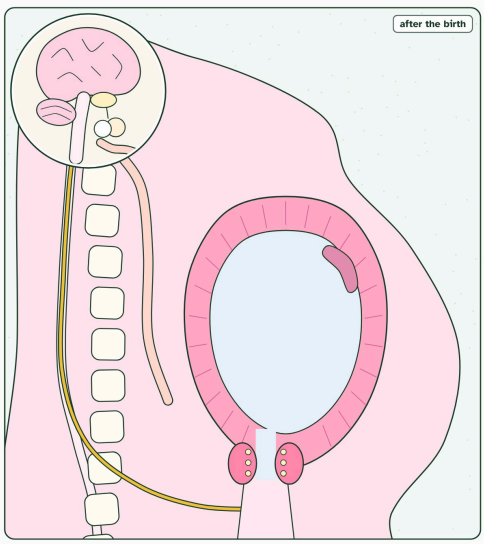
3 _____: the response amplifies the stimulus.

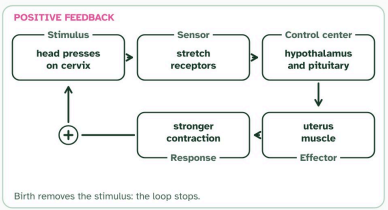
4 Labor: stretch of the cervix, the hypothalamus, _____ from the posterior pituitary, stronger contractions.

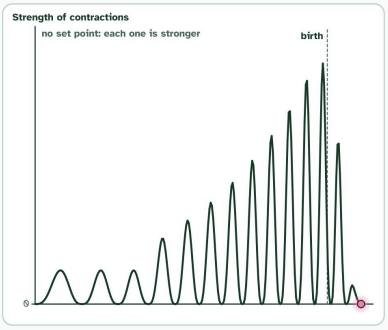
Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (A loop that runs away: birth): what is happening, and why?







SPOT THE MISTAKE

What do students often get wrong about feedback? 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.

07 Ripe fruit and full milk

4.4.A

CUES

Predict: A fruit seller puts one ripe banana in a closed box with five green ones, and adds a sachet that absorbs ethylene. Compared with a box without the sachet, what happens?

What is meant by ethylene?

What is meant by prolactin?

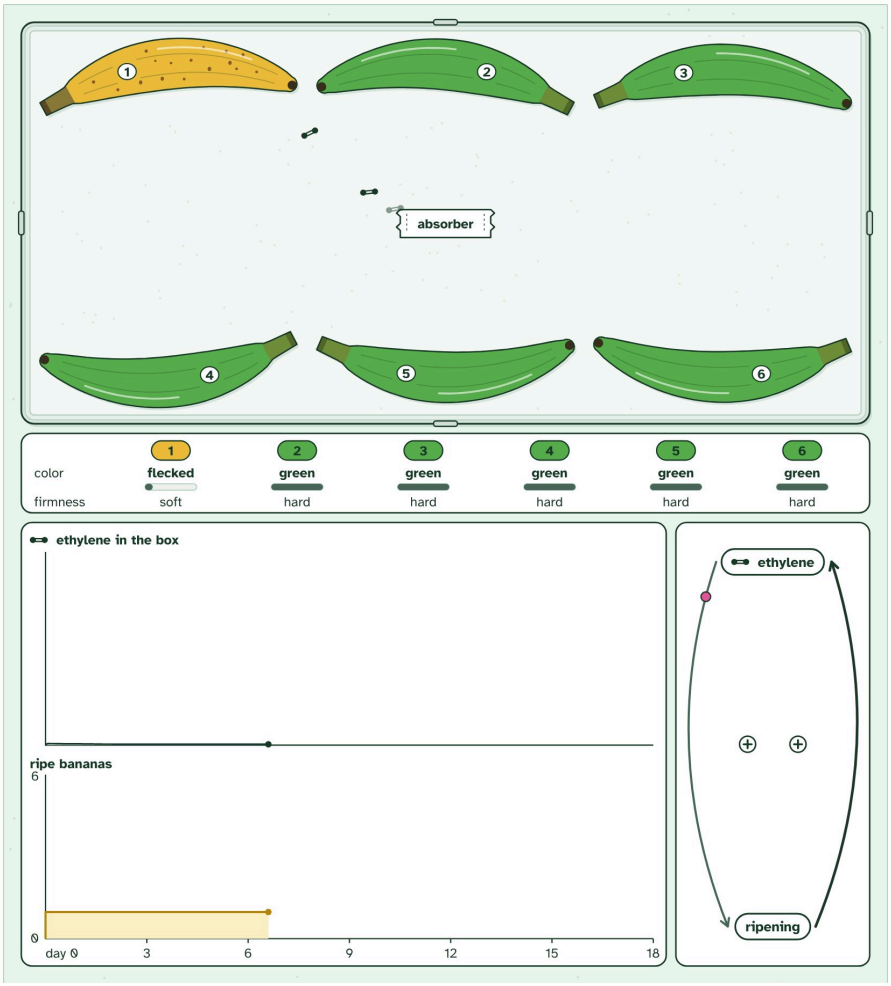
NOTES

1. A ripening fruit releases _____, a small gas that acts as a plant hormone.
2. The anterior pituitary releases _____, which drives milk production, and the posterior pituitary releases oxytocin, which squeezes milk out of the glands.
3. Ripening: _____ makes the fruit ripen and make more ethylene.
4. Lactation: suckling, then _____ (milk made) and oxytocin (milk let out).

Your own notes

ANNOTATE THE FIGURE

Annotate this still from the animation (One ripe banana): what is happening, and why?



REMEMBER IT

The AP examples of positive feedback

B Babies	L Like	R Ripe
B	L	R

SUMMARY

Sum up section 07 in two or three sentences of your own.

08 Back to the set point, or on to the end

4.4.A

CUES

Predict: A pathway is controlled by feedback inhibition. The cell suddenly starts using up the pathway's end product. What happens to the pathway's first enzyme?

What is meant by feedback inhibition?

NOTES

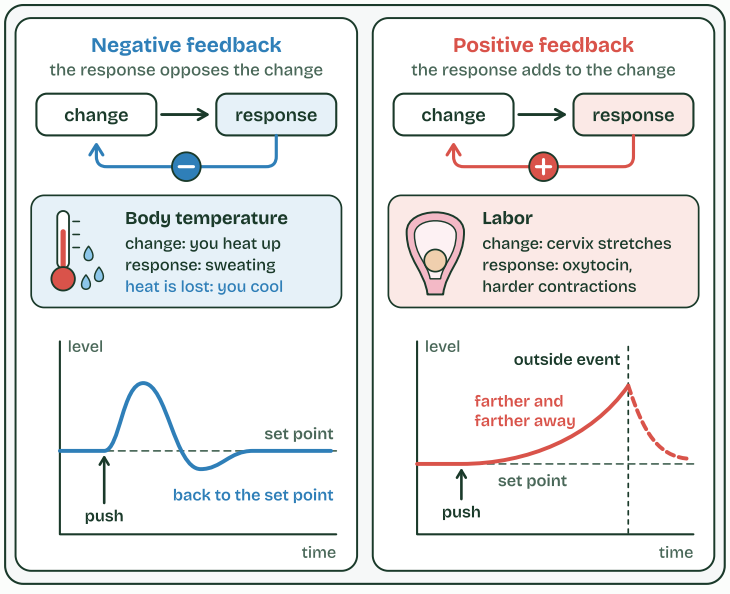
1 In _____, the end product of a pathway binds the pathway's first enzyme at an allosteric site and slows it (Unit 3, enzymes): the more product there is, the less is made.

2 _____: the end product slows its own pathway.

Your own notes

ANNOTATE THE FIGURE

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



SUMMARY

Sum up section 08 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 4.4 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.