NAME _____ CLASS _____ DATE _____

IB BIOLOGY · B4.1

Adaptation to environment

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 habitat of a species by its place, its physical conditions and its type of ecosystem B4.1.1
- [ ] Explain the adaptations of marram grass to sand dunes and of a mangrove tree to salt swamps B4.1.2
- [ ] Give abiotic variables that affect the distribution of plants and of animals B4.1.3
- [ ] Explain a range of tolerance, and use transect data to link a species' distribution to an abiotic variable B4.1.4
- [ ] State the conditions a coral reef needs: depth, pH, salinity, clarity and temperature B4.1.5
- [ ] Explain how temperature and rainfall decide which biome develops, using a climate graph B4.1.6
- [ ] Describe the climates of six biomes, and explain their similar communities by convergent evolution B4.1.7
- [ ] Explain adaptations of named plants and animals to hot deserts and tropical rainforest B4.1.8

01 A place to live

B4.1.1 B4.1.2

CUES

Predict: On a dry, windy day, a marram leaf rolls up tightly. Why does this cut its water loss?

What is meant by habitat?

What is meant by adaptations?

NOTES

1 A _____ is where an organism lives.

2 Each habitat has its own _____ (non-living) conditions, and the organisms that live there have _____ that suit them to it.

3 _____ (*Ammophila arenaria*) grows on the dunes behind a beach, where the sand is dry, salty and blowing.

4 _____ (*Rhizophora mangle*) grows between the tides on tropical coasts, in salt water over soft mud that has almost no oxygen.

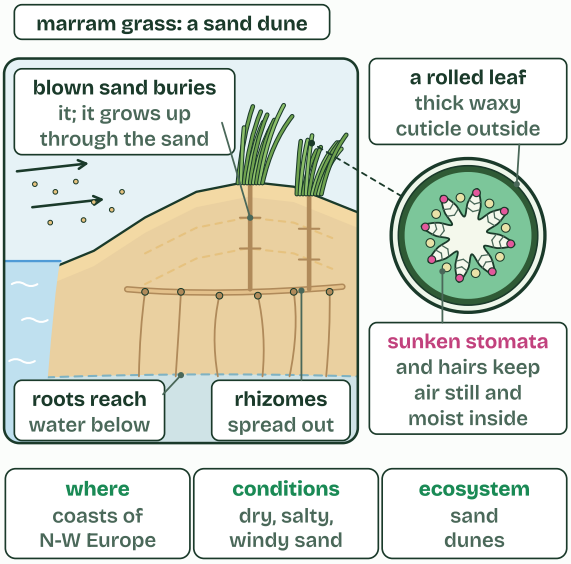
5 Arching _____ brace it in the mud, and pores in them (lenticels) take in air when the tide is out.

6 _____: location, physical conditions and ecosystem type.

Your own notes

ANNOTATE THE FIGURE

The figure shows it as Marram grass and Red mangrove. Note what changes each time.



SUMMARY

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

02 Only so far, and no further

B4.1.3 B4.1.4

CUES

Predict: On the dune transect (the Dry lab), which plant would you expect to grow nearest the sea?

What is meant by range of tolerance?

What is meant by transect?

NOTES

1 That span is its _____.

2 In the middle is the _____, where the population is largest.

3 Either side are _____, where individuals survive but grow and reproduce less.

4 Beyond the lower and upper _____ are the _____, where the species cannot survive at all.

5 The factor that sets the edge of a species' range is a _____.

6 To see this in the field, ecologists run a _____: a line across a habitat where conditions change, such as from a beach inland.

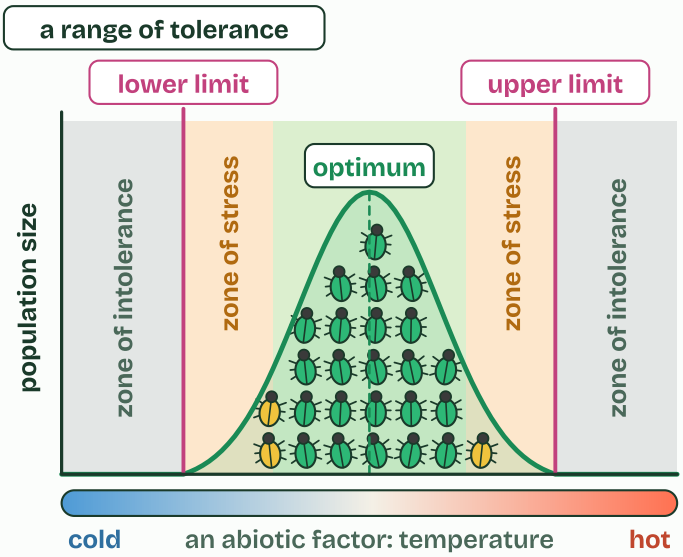
7 _____: optimum, zones of stress, limits, zones of intolerance.

8 _____: sample at intervals along a line; plot species as a kite diagram.

Your own notes

ANNOTATE THE FIGURE

Number the 3 steps on the figure and note what happens at each: 1 optimum; 2 zones of stress; 3 lower and upper limits, zones of intolerance.



SPOT THE MISTAKE

What do students often get wrong about abiotic variables affecting species distribution Range of tolerance of a limiting factor? 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 What a reef needs

B4.1.5

CUES

Predict: Why do coral reefs not grow in the warm, shallow water at the mouth of the Amazon?

What is meant by ocean acidification?

NOTES

1 Inside their cells live _____, algae that photosynthesise and give the coral most of its food.

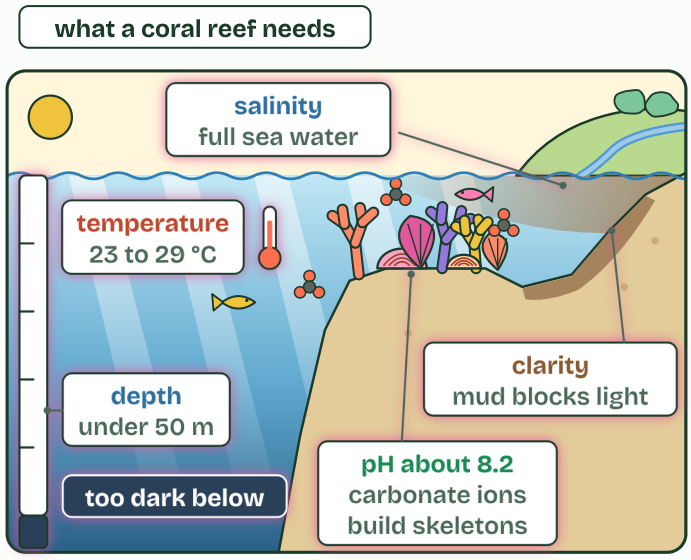
2 The oceans have taken up about a quarter of the carbon dioxide released by burning fossil fuels. It reacts with water to make carbonic acid, so the sea's pH falls: _____.

3 Less carbonate: _____.

Your own notes

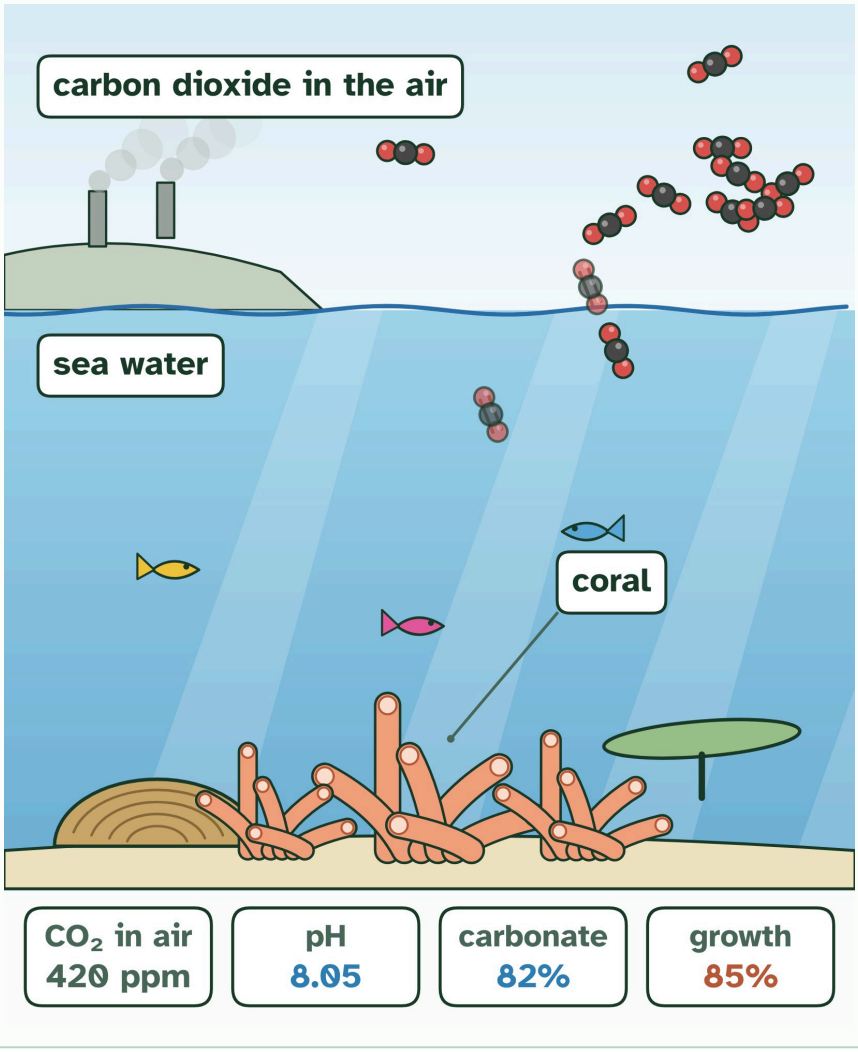
ANNOTATE THE FIGURE

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



ANNOTATE THE FIGURE

Annotate this still from the animation (Watch it happen: carbon dioxide and coral): what is happening, and why?



SUMMARY

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

04 Climate decides the biome

B4.1.6 B4.1.7

CUES

Predict: A place has a mean temperature of 12 °C and 500 mm of rain a year. In the biome finder below, which biome do you expect?

What is meant by biomes?

What is meant by convergent evolution?

NOTES

1 On land, two abiotic factors matter more than any others: _____ and _____ (precipitation).

2 Plot mean yearly temperature against yearly precipitation and the world's ecosystems fall into regions: these are _____.

3 The same conditions select for the same solutions: _____.

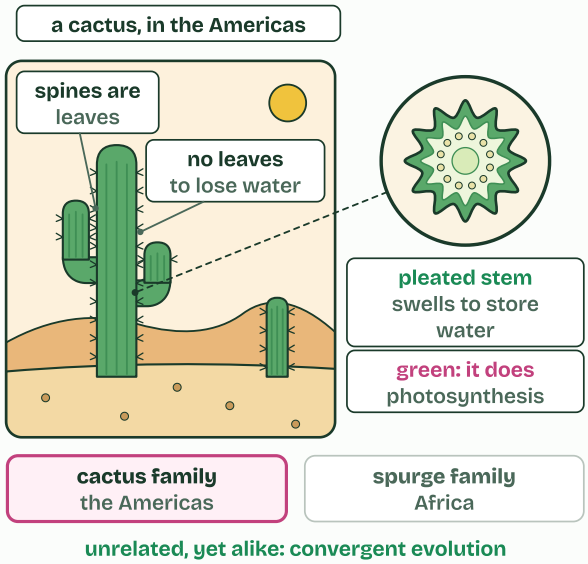
4 Six _____: tropical forest, temperate forest, taiga, grassland, tundra, hot desert.

5 Similar conditions select similar adaptations: _____.

Your own notes

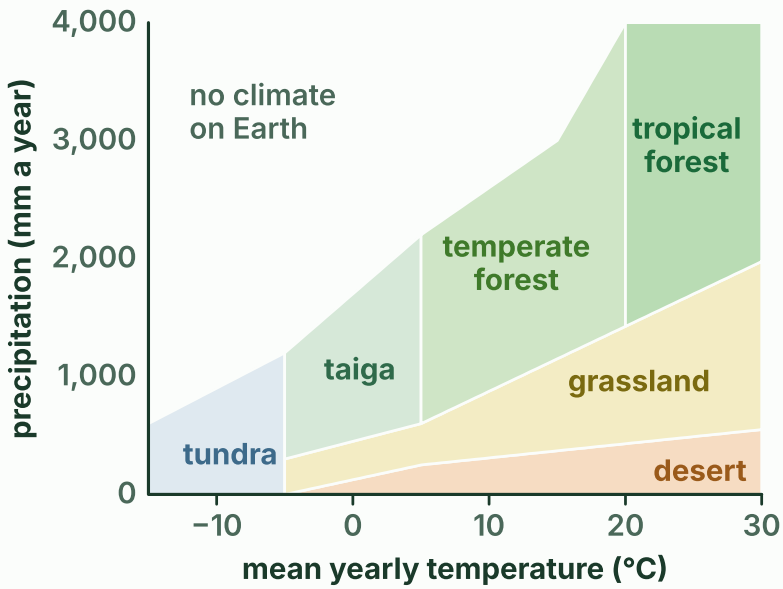
ANNOTATE THE FIGURE

The figure shows it as Cactus and Euphorbia. Note what changes each time.



ANNOTATE THE FIGURE

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



SUMMARY

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

05 Too dry, too wet

B4.1.8

CUES

Predict: A saguaro opens its stomata at night and closes them by day. How does this help it in the desert?

NOTES

1 In a _____ the problem is water, and heat.

2 The _____ (*Carnegiea gigantea*) of the Sonoran Desert stores water in a stem that swells like a concertina after rain; its leaves are spines, so it loses little water and is protected from animals that would drink from it.

3 Its shallow roots spread wide to catch rain before it evaporates. It photosynthesises by _____, opening its stomata only in the cool night to take in carbon dioxide.

4 The _____ (*Vulpes zerda*) of the Sahara loses heat through its huge ears, hunts at night and spends the day in a burrow, has fur on the soles of its feet against hot sand, and its kidneys make very concentrated urine, so it can go without drinking.

5 In a _____ water and warmth are plentiful; the competition is for light, and the rain is heavy.

6 The _____ (*Ceiba pentandra*) grows up above the canopy into full sun, held up in thin soil by huge buttress roots.

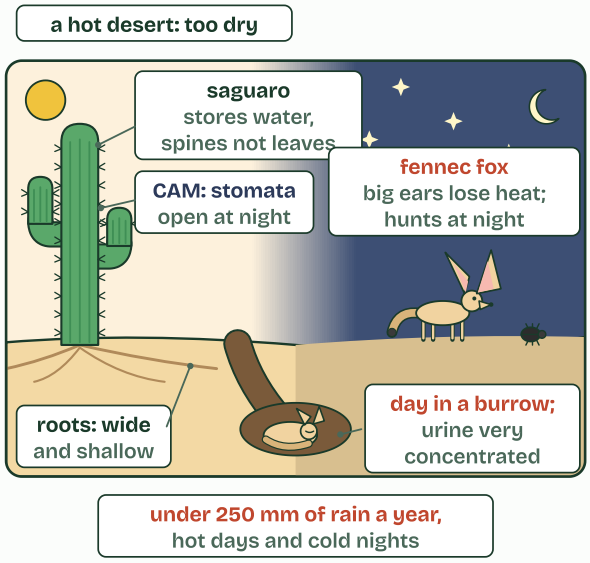
7 Many rainforest leaves end in a _____ that sheds water quickly, so a film of water does not cut gas exchange or grow fungi.

8 The _____ (*Bradypus*) lives on leaves, a poor food, with a very slow metabolism; it hangs from branches by long curved claws, and green algae grow in its fur, hiding it from eagles.

Your own notes

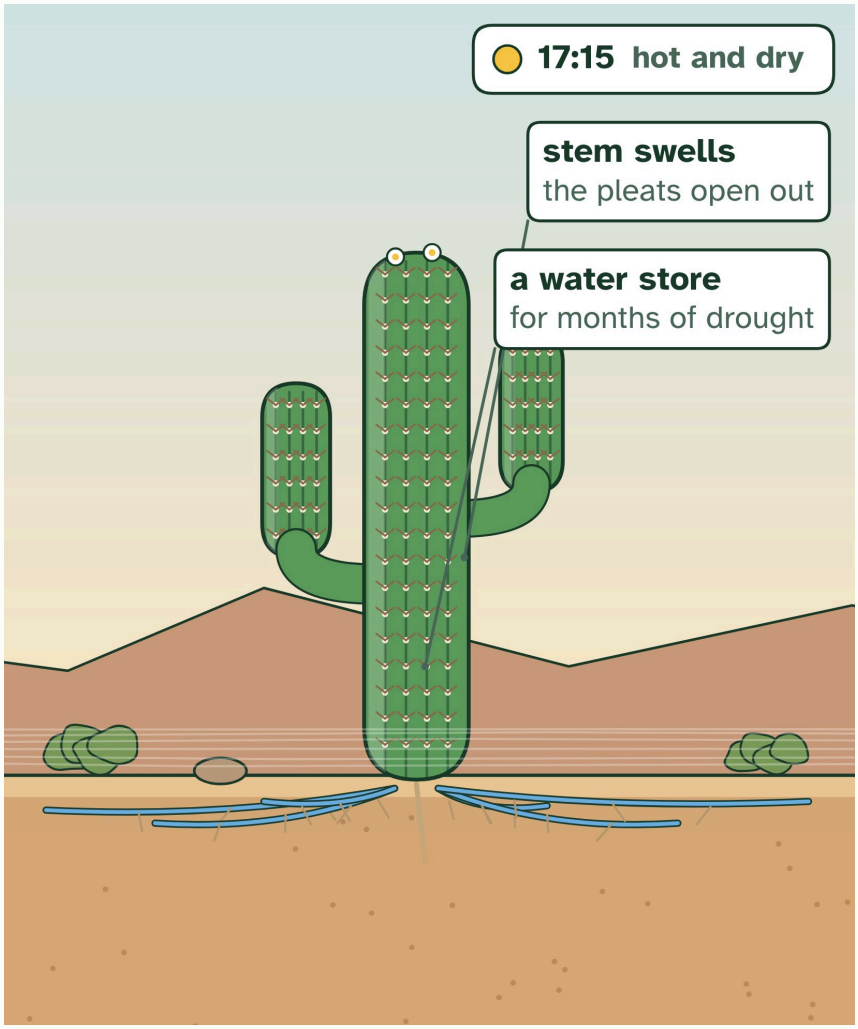
ANNOTATE THE FIGURE

The figure shows it as Hot desert and Rainforest. Note what changes each time.



ANNOTATE THE FIGURE

Annotate this still from the animation (A day in two biomes): what is happening, and why?



SUMMARY

Sum up section 05 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 B4.1 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?topics=B4.1&level=SL&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.