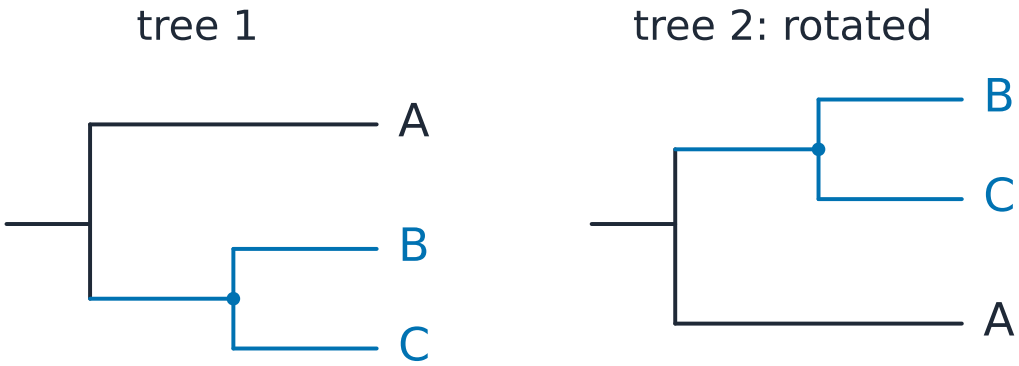
Exercise walk-through

# 2.5
# Zonation, succession and change

International Baccalaureate · IB Diploma · Environmental Systems and Societies · HL

# AHL: Classify by ancestry




same ancestry: B and C share
a more recent ancestor
invented taxa; branch lengths do not encode time

A **clade** contains an ancestor and all its descendants; node rotation preserves ancestry.

# Simpson's reciprocal index

- Site A has 10, 6 and 4 individuals; site B has 18, 1 and 1.
- Same richness, but A is shared more evenly.

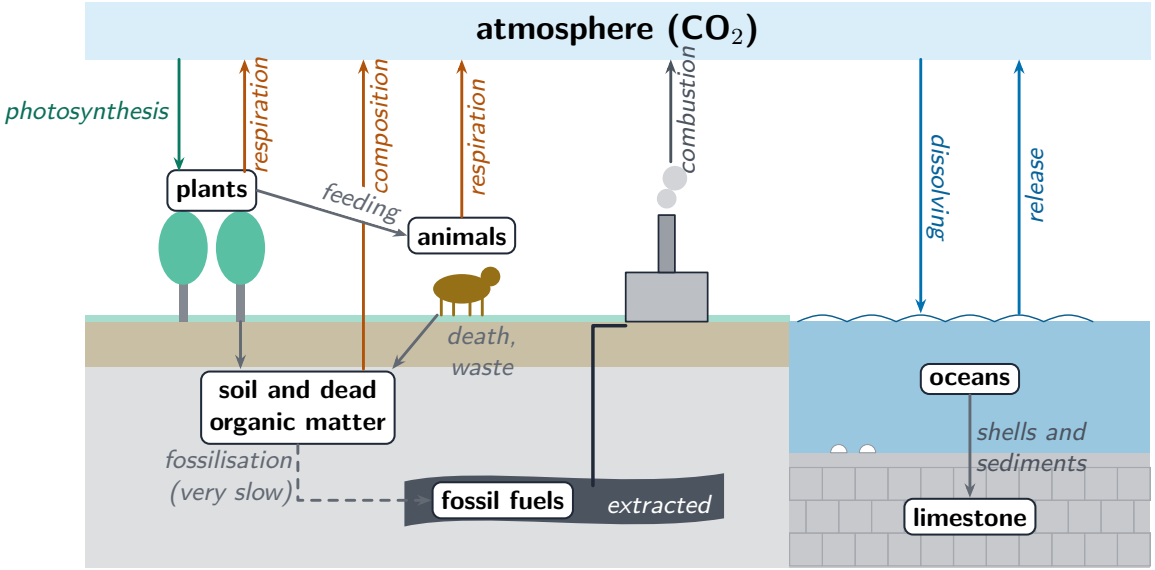
$$D = \frac{N(N-1)}{\sum n(n-1)}$$

$$D_A = \frac{380}{132} = 2.88$$

$$D_B = \frac{380}{306} = 1.24$$

These invented samples have equal richness and different evenness; compare like sampling.

# The carbon cycle

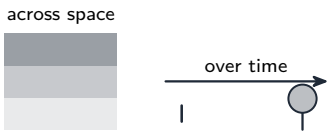



storages in boxes, flows on arrows; not to scale

A store is an amount; a net **sink** is defined by the balance of flows over time.

# Exercises 2.1·2.2

**2.1** Distinguish between zonation and succession. [2]

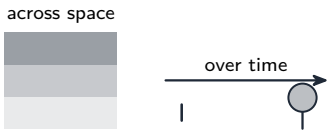



**2.2** Describe the stages of primary succession on bare volcanic rock. [3]



# Exercises 2.1·2.2

**2.1** Distinguish between zonation and succession. [2]




**2.1**

zonation: change in communities across space along a gradient; succession: change in the community at one place over time

**2.2** Describe the stages of primary succession on bare volcanic rock. [3]




**2.2**

pioneers such as lichens and mosses colonize bare rock and start weathering it; dead matter and rock particles form a thin soil, so grasses and small plants can grow; deeper soil allows shrubs, then trees, until a climax community forms

# Exercise 2.3

**2.3** Heather moorland in Scotland is burned every few years for grouse shooting. Explain why it is a plagioclimax community. [3]



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**2.3**

without burning, succession would continue to woodland (the climax); burning kills young trees and shrubs before they establish; human activity holds the community at an earlier stage

# Exercise 3.1 (a)

**3.1** The table shows changes during succession on abandoned farmland.

| **years since abandoned** | 1 | 10 | 50 | 150 |
|---|---|---|---|---|
| number of plant species | 12 | 35 | 48 | 40 |
| soil organic matter (%) | 1.2 | 2.5 | 4.8 | 6.1 |

(a) State the type of succession. [1]

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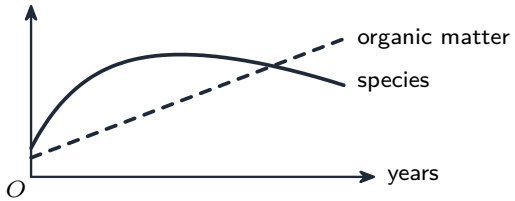
(a) secondary succession (soil already present)

# Exercise 3.1 (b)

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|---|---|---|---|---|
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(b) Describe the changes in the number of species, and suggest a reason for the change after 50 years. [3]

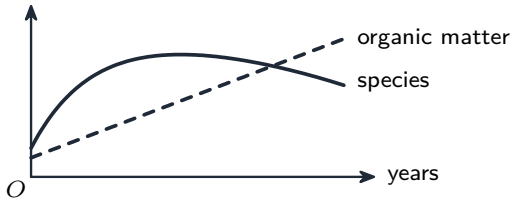


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(b) species rise from 12 to 48 by 50 years, then fall to 40; tall trees shade out smaller plants; a few K-strategist species dominate at climax and out-compete others

# Exercise 3.2 (a)

**3.2** A dandelion produces thousands of light seeds each year; an oak tree takes 40 years to produce its first acorns.

(a) Classify each as an r- or K-strategist, with a reason. [2]

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(a) dandelion: r-strategist, many small seeds, matures fast; oak: K-strategist, matures late, few large seeds

# Exercise 3.2 (b)

**3.2** A dandelion produces thousands of light seeds each year; an oak tree takes 40 years to produce its first acorns.

(b) Explain why r-strategists are common in the early stages of succession. [3]



# Exercise 3.2 (b)

**3.2** A dandelion produces thousands of light seeds each year; an oak tree takes 40 years to produce its first acorns.

(b) Explain why r-strategists are common in the early stages of succession. [3]



(b) they reach new, bare or disturbed land quickly, as many seeds spread widely; they grow and reproduce fast while resources are plentiful and competition is low; later they are out-competed by slower, larger K-strategists

# Exercise 3.3

**3.3** A forest is often burned by natural fires.

Discuss whether the idea of a single climax community is useful for managing this forest. [6]



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**3.3**

award up to [6]: useful: gives a target, e.g. the mature forest to protect or restore; helps predict how the forest will recover after a fire; limitations: fire is a normal part of this system, so a patchwork of stages is normal and diverse; some species depend on burned areas; a site may reach different stable states depending on the disturbance; conclusion: manage for a dynamic mosaic (e.g. allow or use controlled burning) rather than one fixed endpoint