Exercise walk-through

2.4
Climate and biomes

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

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.

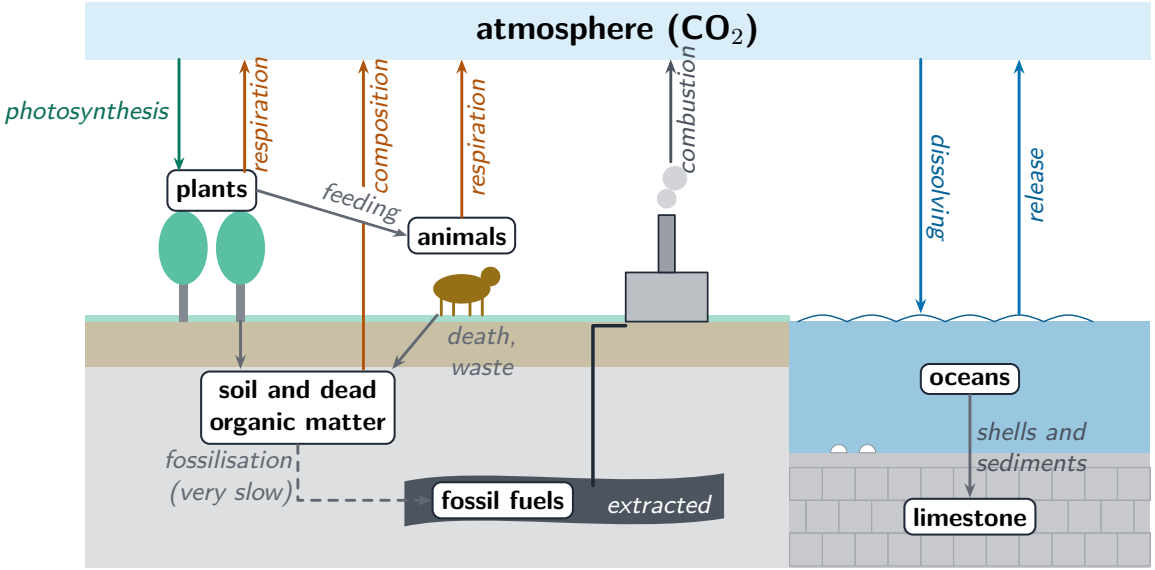
$$D = \frac{N(N-1)}{\sum n(n-1)}$$

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

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

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

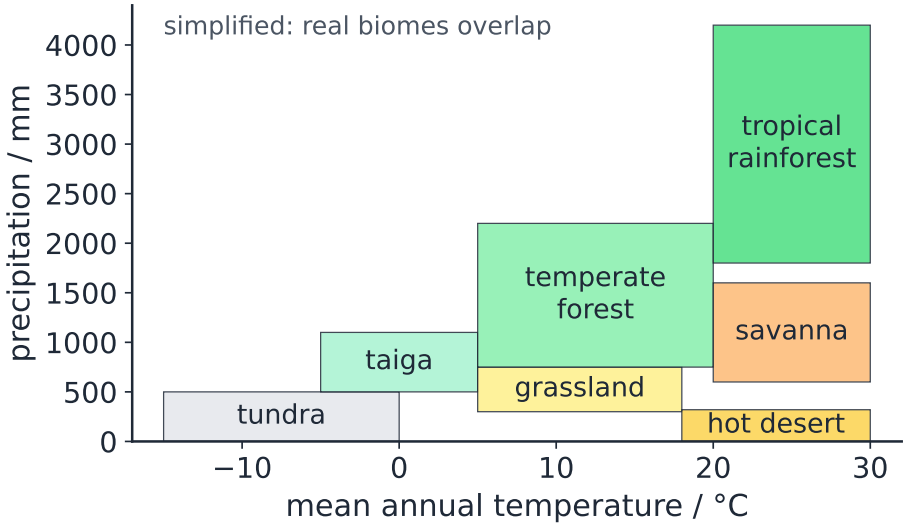
The carbon cycle



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.

Biomes



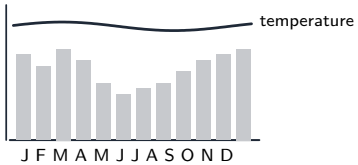
Climate envelopes describe broad influences, not every local land cover.

Exercises 2.1·2.2

2.1 State the **two** climate factors that most control the distribution of biomes. [2]



2.2 The climograph shows monthly temperature (line) and precipitation (bars). Identify the biome, and give **two** reasons from the data. [3]



exercises.lol exercises.com.cn

Exercises 2.1·2.2

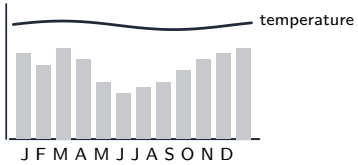
2.1 State the **two** climate factors that most control the distribution of biomes. [2]



2.1

temperature; precipitation

2.2 The climograph shows monthly temperature (line) and precipitation (bars). Identify the biome, and give **two** reasons from the data. [3]



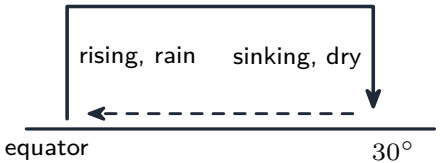
2.2

tropical rainforest; high temperature all year, about 26–28 °C; high rainfall every month, so no dry season

exercises.lol exercises.com.cn

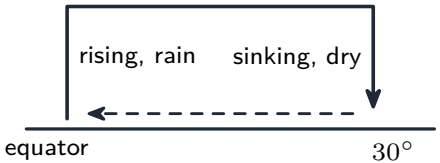
Exercise 2.3

2.3 Use the tricellular model to explain why many hot deserts lie near 30° N and S. [3]



Exercise 2.3

2.3 Use the tricellular model to explain why many hot deserts lie near 30° N and S. [3]



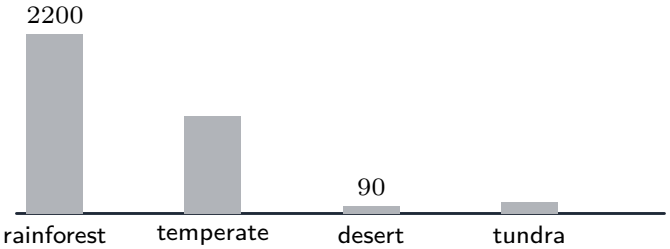
2.3

air heated at the equator rises, cools and loses its moisture as rain; the dry air moves towards the poles and sinks at about 30°; sinking air warms and creates high pressure, so clouds and rain rarely form

Exercise 3.1 (a)

3.1 Tropical rainforest has an NPP of about 2200 g m^{-2} yr^{-1}; hot desert has about 90 g m^{-2} yr^{-1}.

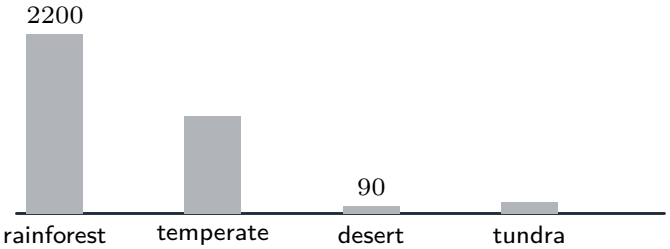
(a) Explain the difference in NPP. [2]



Exercise 3.1 (a)

3.1 Tropical rainforest has an NPP of about 2200 g m^{-2} yr^{-1}; hot desert has about 90 g m^{-2} yr^{-1}.

(a) Explain the difference in NPP. [2]



(a) rainforest has high temperature, light and water all year, so photosynthesis is fast; in the desert, lack of water limits plant growth and cover

Exercise 3.1 (b)

3.1 Tropical rainforest has an NPP of about 2200 g m^{-2} yr^{-1}; hot desert has about 90 g m^{-2} yr^{-1}.

(b) Suggest why tundra also has low NPP, although it is not dry. [2]

Exercise 3.1 (b)

3.1 Tropical rainforest has an NPP of about 2200 g m^{-2} yr^{-1}; hot desert has about 90 g m^{-2} yr^{-1}.

(b) Suggest why tundra also has low NPP, although it is not dry. [2]

(b) low temperatures slow enzyme reactions and photosynthesis; the growing season is short and soils are frozen or poor in nutrients

Exercise 3.2 (a)

3.2 Mountain plant zones are moving uphill as the climate warms.

(a) Explain why the zones move uphill. [2]

Exercise 3.2 (a)

3.2 Mountain plant zones are moving uphill as the climate warms.

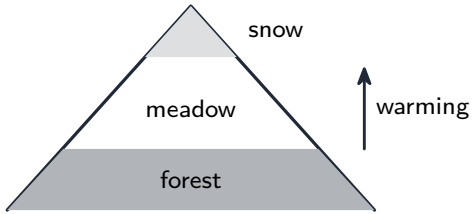
(a) Explain why the zones move uphill. [2]

(a) temperature falls with height; as the climate warms, each species' suitable temperature range is found higher up

Exercise 3.2 (b)

3.2 Mountain plant zones are moving uphill as the climate warms.

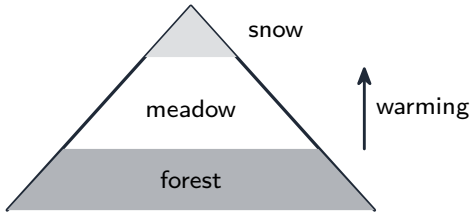
(b) Explain why species at the top of the mountain are most at risk. [3]



Exercise 3.2 (b)

3.2 Mountain plant zones are moving uphill as the climate warms.

(b) Explain why species at the top of the mountain are most at risk. [3]

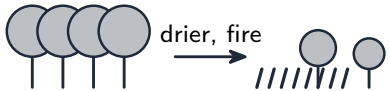


(b) the area of land gets smaller towards the top, so populations shrink; they cannot move higher than the summit; species moving up from below compete with them

Exercise 3.3

3.3 Scientists warn that parts of the Amazon rainforest may change to savanna.

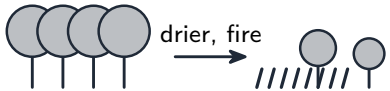
Discuss whether the Amazon rainforest is approaching a tipping point. [6]



Exercise 3.3

3.3 Scientists warn that parts of the Amazon rainforest may change to savanna.

Discuss whether the Amazon rainforest is approaching a tipping point. [6]



3.3

award up to [6]: the forest recycles much of its own rain through transpiration; deforestation and warming reduce this, so dry seasons get longer; drier forest burns more easily, and fire kills trees: positive feedback; past a threshold, savanna may become a new stable state that does not return to forest; but the size and timing of the threshold are uncertain, and protection and regrowth can slow the change; conclusion supported by the evidence, e.g. parts of the south-east already lose more carbon than they take in, so the risk is real