

# 17.3 Evolution

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 12 marks

## Objective

Build the skills to answer exam questions on **evolution** —the theory of evolution, **DNA sequence** 序列 evidence, and **speciation** 物种形成 by genetic isolation.

**You must be able to:**

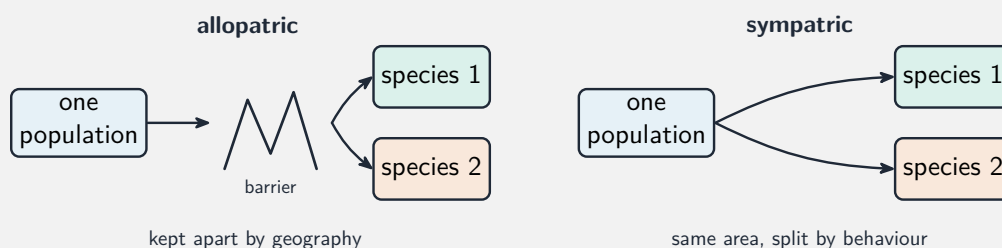
- outline evolution as the change in gene pools producing new species over time
- discuss how DNA sequence data shows evolutionary relationships
- explain allopatric and sympatric speciation

## 1 Worked examples

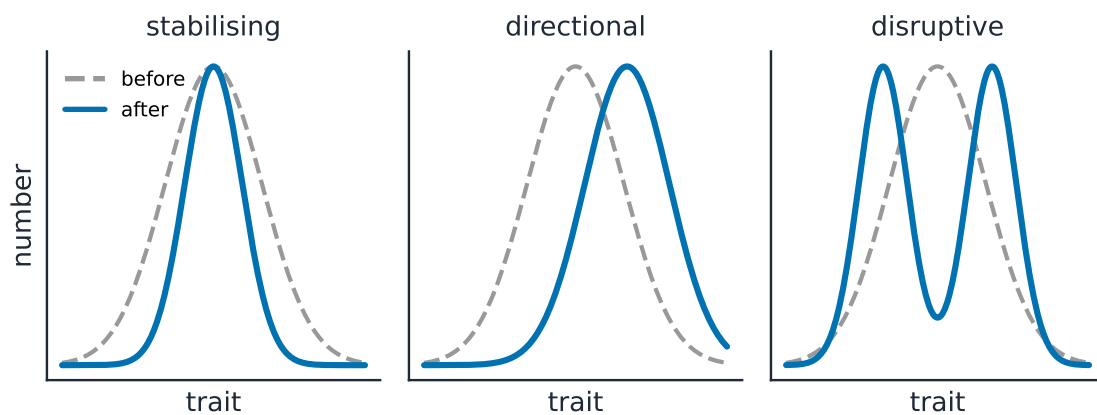
### ■ Evolution and DNA evidence

**Evolution** 进化 is the formation of new **species** 物种 from earlier ones as the **gene pool** 基因库 (all the alleles in a population) changes over generations. **DNA sequence data** shows relationships: the more similar two species' DNA, the more recently they shared a common ancestor.

### ■ Speciation



*Allopatric speciation needs a physical barrier; sympatric speciation happens in the same area*



*Selection drives evolution and speciation*

**Speciation** happens when two populations become genetically **isolated** 隔离 so they can no longer interbreed:

- **allopatric** 异域—separated by a **geographical** barrier (sea, mountain).
- **sympatric** 同域—in the same area, separated by behaviour or way of life.

## 2 Practice

**2.1** Define **evolution** in terms of the gene pool.

[2]

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**2.2** State the difference between allopatric and sympatric speciation.

[2]

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## 3 Exam-style questions

**3.1** Two species share a very similar DNA base sequence. This suggests they:

[1]

- **A** are not related
- **B** shared a recent common ancestor
- **C** live in the same habitat
- **D** have the same number of chromosomes

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**3.2** A mountain range divides a population into two, which slowly become different

species. This is: [1]

- **A** allopatric speciation
  - **B** sympatric speciation
  - **C** genetic drift
  - **D** artificial selection
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**3.3** Explain how allopatric speciation can lead to the formation of two new species. [4]

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**3.4** Explain how comparing DNA sequences can be used to show how closely related different species are. [2]

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## 4 Go further

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You are now ready for the real exam questions on this subtopic. Open the **17.3 Evolution** past-paper sheet in the Library, or try these in **Practice mode**:

- 9700/44 N25 —Q4 (evolution and speciation)
- 9700/41 J25 —Q3 (evolution, calculation)

## Solutions

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**2.1** evolution is the change in the gene pool / allele frequencies of a population over many generations, leading to new species.

**2.2** allopatric —populations separated by a geographical barrier; sympatric —populations in the same area separated by behaviour/ecology.

**3.1 B.** Very similar DNA suggests a recent common ancestor.

**3.2 A.** A geographical barrier causing speciation is allopatric.

**3.3** a geographical barrier separates the population into two; each population faces different conditions and undergoes different selection / mutations / drift; their gene pools change in different ways; eventually they are so different they can no longer interbreed to produce fertile offspring —two species.

**3.4** the more similar the DNA base sequences, the more recently the species shared a common ancestor; large differences indicate they diverged longer ago.