

Exercise walk-through

Speciation ■ 7.10

eXercise

You must be able to

- define a **species** by the biological species concept
- distinguish **allopatric** 异域 and **sympatric** 同域 speciation
- explain the role of **reproductive isolation** 生殖隔离

Method — What a species is

By the **biological species concept**, a species is a group that can **interbreed and produce fertile offspring**. Two groups that can no longer do so are separate species.

Method — Speciation needs isolation

New species form when populations become **reproductively isolated** — gene flow between them stops — and then diverge until they cannot interbreed.

Method — Allopatric vs sympatric

- **Allopatric** — a **geographic barrier** (mountain, river) separates populations, which diverge.
- **Sympatric** — populations diverge **without** physical separation (e.g. differences in mating time or habitat).

Method — A worked example

A river splits a population; the two sides evolve differently and eventually cannot interbreed — **allopatric** speciation.

Practice 2.1 ■ 1 mark

Define a species (biological species concept).

Solution 2.1

Method: What a species is

Worked steps

A group that can interbreed and produce fertile offspring **B1**.

Practice 2.2 ■ 1 mark

What must happen for speciation to occur?

Solution 2.2

Worked steps

The populations must become reproductively isolated (gene flow stops) **B1**.

Practice 2.3 ■ 1 mark

Which type of speciation involves a geographic barrier?

Solution 2.3

Method: Allopatric vs sympatric

Worked steps

Allopatric speciation **B1**.

Exam-style 3.1 ■ 1 mark

Speciation requires that populations become

- A** larger
- B** reproductively isolated
- C** identical
- D** extinct

Solution 3.1

Method: Speciation needs isolation

A larger

B reproductively isolated 

C identical

D extinct

Worked steps

B — reproductively isolated.

Exam-style 3.2 ■ 1 mark

A mountain range separates one population into two, which evolve differently.

- (a) Name this type of speciation.
- (b) Explain how two species can form from one.

Solution 3.2

Method: A worked example

Worked steps

(a) Allopatric speciation **B1**. (b) The barrier stops gene flow between the two groups; each accumulates different mutations and adaptations; eventually they diverge so much they can no longer interbreed — two species **M1 M1 A1**.

Exam-style 3.3 ■ 2 marks

Explain how sympatric speciation can occur without a physical barrier.

Solution 3.3

Method: Allopatric vs sympatric

Worked steps

Populations in the same area can be isolated by differences in mating time, habitat, or behavior, so they stop interbreeding and diverge without a physical barrier **M1** **A1**.