

7.10 Speciation

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS speciation 物种形成 • reproductively isolated 生殖隔离 • allopatric 异域
• sympatric 同域 • gene flow 基因流

Objective

Build the skills to answer exam questions on **speciation**.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ 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.

■ Speciation needs isolation

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

■ 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).

■ A worked example

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

2 Practice

Now apply the methods above.

2.1 Define a species (biological species concept). [1]

2.2 What must happen for speciation to occur? [1]

2.3 Which type of speciation involves a geographic barrier? [1]

3 Exam-style questions

3.1 Speciation requires that populations become [1]

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

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

(a) Name this type of speciation. [1]

(b) Explain how two species can form from one. [3]

3.3 Explain how sympatric speciation can occur without a physical barrier. [2]

Solutions

2.1 A group that can interbreed and produce fertile offspring.

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

2.3 Allopatric speciation.

3.1 B — reproductively isolated.

3.2 (a) Allopatric speciation. (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.

3.3 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.