

# 7.1 Introduction to Natural Selection

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

Total: 11 marks

**KEY WORDS** natural selection 自然选择 • variation 变异 • fitness 适合度 • evolution 进化

## Objective

Build the skills to answer exam questions on **natural selection** — the core idea.

**You must be able to:**

- state the conditions for **natural selection** 自然选择 (variation, heritability, overproduction, differential survival)
- explain **fitness** 适合度 as reproductive success
- link selection to changes in a population

## 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.

### ■ The conditions for natural selection

Natural selection requires:

1. **Variation** — individuals differ.
2. **Heritability** — some variation is inherited.
3. **Overproduction** — more offspring are made than can survive.
4. **Differential survival/reproduction** — those better suited survive and reproduce more.

### ■ Fitness

**Fitness** is an organism's **reproductive success** — how many surviving offspring it produces, not its strength or size. High-fitness traits become more common.

### ■ How the population changes

Individuals with advantageous heritable traits leave more offspring, so those alleles increase in the population over generations — the population **adapts**.

### ■ A worked example

In a population of beetles, darker ones are better camouflaged, survive more, and reproduce more; over generations the dark allele becomes more common.

## 2 Practice

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Now apply the methods above.

**2.1** State two of the conditions required for natural selection. [2]

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**2.2** Define fitness in evolutionary terms. [1]

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**2.3** Why must the variation be heritable for selection to change a population? [1]

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## 3 Exam-style questions

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**3.1** In evolutionary terms, fitness means an organism's [1]

- **A** physical strength
  - **B** reproductive success
  - **C** body size
  - **D** lifespan only
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**3.2** Dark beetles survive better than light ones on dark soil.

(a) Explain how natural selection changes the population over generations. [3]

(b) State the condition that ensures the change is passed on. [1]

**3.3** Explain why overproduction of offspring is important for natural selection. [2]

## Solutions

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**2.1** Any two: variation, heritability, overproduction, differential survival/reproduction.

**2.2** An organism's reproductive success (number of surviving offspring).

**2.3** Only heritable traits can be passed to offspring, so only they can change the population's makeup over generations.

**3.1 B** — reproductive success.

**3.2** (a) Dark beetles are better camouflaged, so more survive; survivors reproduce more, passing on the dark allele; over generations the dark allele becomes more common. (b) The trait (color) is heritable.

**3.3** More offspring are produced than can survive, so there is competition; this lets the better-suited individuals survive and reproduce, driving selection.