

7.11 Variations in Populations

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS diversity 多样性 • genetic diversity 遗传多样性 • variation 变异

Objective

Build the skills to answer exam questions on **variation in populations**.

You must be able to:

- explain why **genetic diversity** 遗传多样性 helps a population survive change
- link low diversity to extinction risk
- describe how variation arises and is maintained

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.

■ Variation is raw material

A population with more **genetic variation** has more different traits, so it is **more likely** that some individuals can survive a new challenge (disease, climate change).

■ Low diversity is risky

A population with **low** genetic diversity (e.g. after a bottleneck) may have **no** individuals able to survive a new threat, raising the **extinction risk**.

■ Sources of variation

Variation comes from **mutation** (new alleles) and **sexual reproduction** (crossing over, independent assortment, random fertilization mixing alleles).

■ A worked example

A genetically diverse crop is more likely to include disease-resistant plants; a genetically uniform (monoculture) crop can be wiped out by one disease.

2 Practice

Now apply the methods above.

2.1 Why is genetic diversity useful when the environment changes? [1]

2.2 State one source of genetic variation. [1]

2.3 What is the risk of low genetic diversity? [1]

3 Exam-style questions

3.1 A population with high genetic diversity is more likely to [1]

- **A** go extinct
 - **B** survive an environmental change
 - **C** stop reproducing
 - **D** have identical individuals
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3.2 A new disease spreads through two populations of the same species.

(a) Explain why the more genetically diverse population is more likely to survive. [2]

(b) State one source of the genetic variation. [1]

3.3 Explain why a monoculture crop is vulnerable to being destroyed by a single disease. [2]

Solutions

2.1 It makes it more likely some individuals have traits that let them survive the change.

2.2 Mutation (or sexual reproduction).

2.3 A higher risk of extinction if no individuals can survive a new threat.

3.1 B — survive an environmental change.

3.2 (a) A diverse population is more likely to include individuals with resistance to the disease, so some survive and reproduce. (b) Mutation (or sexual reproduction).

3.3 A monoculture has almost identical genes, so if the disease can kill one plant it can kill them all — there are no resistant variants to survive.