AP BIOLOGY • EXERCISE SHEET

# 7.11 Variations in Populations

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

## 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

**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]

## 4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **7.11 Variations in Populations** lesson on the **Learn** page;
- read the **Variations in Populations** section of the AP Biology handout on the **Know** page.

## 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.