

7.8 Continuing Evolution

Name: _____ Class: _____ Date: _____

Total: 10 marks

KEY WORDS antibiotic resistance 抗生素抗性 • evolution 进化 • variation 变异

Objective

Build the skills to answer exam questions on **continuing evolution**.

You must be able to:

- give evidence that evolution is **ongoing** (antibiotic and pesticide resistance)
- explain how resistance evolves by selection
- link the process to public-health concerns

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.

■ Evolution happens now

Evolution is **ongoing**, not just in the past. Fast examples: bacteria evolving **antibiotic resistance** 抗生素抗性 and insects evolving **pesticide resistance**.

■ How resistance evolves

1. A population has **variation** — a few individuals carry a resistance allele.
2. The antibiotic/pesticide **kills the susceptible** ones.
3. The **resistant** survivors reproduce.
4. Over generations the resistance allele becomes common.

■ The antibiotic does not create resistance

The drug does not **cause** the mutation; the resistant allele was already present. The drug only **selects** for it by removing the non-resistant individuals.

■ Public-health link

Overusing antibiotics speeds this selection, producing hard-to-treat “superbugs” — which is why doctors limit antibiotic use.

2 Practice

Now apply the methods above.

2.1 Give one example that shows evolution is ongoing. [1]

2.2 Does an antibiotic create the resistance allele? [1]

2.3 Which individuals survive antibiotic treatment? [1]

3 Exam-style questions

3.1 Antibiotic resistance spreads in a bacterial population because the antibiotic [1]

- **A** creates the resistance gene
 - **B** selects for pre-existing resistant bacteria
 - **C** kills all bacteria equally
 - **D** stops reproduction
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3.2 A bacterial population is repeatedly treated with an antibiotic.

(a) Describe how the population becomes resistant over time. [3]

(b) Explain why overusing antibiotics is a public-health concern. [1]

3.3 Explain why the resistance allele must already exist in the population for resistance to evolve. [2]

Solutions

2.1 Antibiotic resistance in bacteria (or pesticide resistance in insects).

2.2 No.

2.3 The resistant individuals.

3.1 B — selects for pre-existing resistant bacteria.

3.2 (a) A few bacteria already carry a resistance allele; the antibiotic kills the susceptible ones; the resistant survivors reproduce; over generations resistance becomes common. (b) It selects for hard-to-treat resistant “superbugs”.

3.3 Selection can only act on existing variation — it favors the resistant allele but cannot create it; if no bacterium carried it, none would survive to reproduce.