AP BIOLOGY • EXERCISE SHEET

7.1 Introduction to Natural Selection

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

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

Now apply the methods above.

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

2.2 Define fitness in evolutionary terms. [1]

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

3 Exam-style questions

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

- **A** physical strength
- **B** reproductive success
- **C** body size
- **D** lifespan only

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]

4 Go further

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

- work through the **7.1 Introduction to Natural Selection** lesson on the **Learn** page;
- read the **Introduction to Natural Selection** section of the AP Biology handout on the **Know** page.

Solutions

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.