

# What is Natural Selection?

## Worksheet

Natural selection is the process by which organisms with favorable heritable traits have higher relative fitness, so those traits become more common in a population over successive generations.

## Questions

1. What does 'relative fitness' measure?

- A) An organism's physical strength
- B) Reproductive success compared to the fittest genotype
- C) Body size compared to average
- D) Speed of movement

2. Which of these is NOT a requirement for natural selection?

- A) Heritable variation
- B) Differential reproduction
- C) Conscious choice by organisms
- D) Limited resources/environmental pressure

3. 'Survival of the fittest' really means an organism that...

- A) Is the strongest in the group
- B) Leaves the most surviving offspring
- C) Lives the longest life
- D) Grows the largest

4. A genotype has  $w = 0.4$ . What is its selection coefficient  $s$ ?

- A) 0.4
- B) 0.6
- C) 1.4
- D) 0.04

5. In a population, individuals with genotype AA produce an average of 4 offspring, while the fittest genotype BB produces 8 offspring on average. What is the relative fitness of AA?

6. A moth form has relative fitness  $w = 0.7$ . What is its selection coefficient  $s$ ?

7. Before industrial pollution, the dark allele frequency in a moth population was 0.05. After 50 years of selection favoring dark moths on soot-covered trees, it rose to 0.95. How many percentage points did the frequency change?

8. Define: What is natural selection?

9. Define: What is relative fitness?

10. Define: What are the requirements for natural selection to occur?

## Answer Key

1. B) Reproductive success compared to the fittest genotype - Relative fitness  $w = W_i/W_{max}$  compares an individual's offspring output to the best-performing genotype.
2. C) Conscious choice by organisms - Natural selection is not a conscious or directed process - it results from differential survival and reproduction.
3. B) Leaves the most surviving offspring - Fitness in evolution is measured by reproductive success, not strength or lifespan.
4. B)  $0.6 - s = 1$   $w = 1$   $0.4 = 0.6$ .
5. Relative fitness  $w = \text{individual's offspring} / \text{max offspring}$   $w(AA) = 4 / 8$   $w(AA) = 0.5$
6. Selection coefficient  $s = 1 - w$   $s = 1 - 0.7$   $s = 0.3$  (a 30% reduction in reproductive success versus the fittest form)
7. Change = final frequency - initial frequency Change =  $0.95 - 0.05$  Change =  $0.90$  a 90 percentage-point increase
8. The process where individuals with favorable heritable traits survive and reproduce more, making those traits more common over time.
9. An individual's reproductive success (offspring number) compared to the most successful genotype in the population:  $w = W_i/W_{max}$ .
10. Variation, heritability, differential survival/reproduction, and an environmental pressure (limited resources).

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