What is Natural Selection?

Worksheet

Natural selection is evolution's main mechanism: individuals with heritable traits that improve survival and reproduction leave more offspring, so those traits become more common in the population over generations.

Questions

1. Which of the following is required for natural selection to occur?

A) Identical individuals
B) Heritable variation
C) No competition
D) Unlimited resources

2. The peppered moth example shows natural selection acting on

A) moth size
B) moth color camouflage
C) moth diet
D) moth migration

3. In evolutionary biology, 'fitness' refers to

A) physical strength
B) reproductive success
C) running speed
D) body size

4. Which statement about natural selection is TRUE?

A) It acts with a goal in mind
B) It creates new mutations
C) It changes allele frequencies over time
D) It affects only one generation

5. Peppered moths in industrial England: before pollution, light-colored moths were common; after soot darkened tree bark, dark moths became common. Explain using natural selection.

6. A population of 1,000 beetles has 200 with a pesticide-resistance gene. After heavy pesticide use for several generations, resistant beetles now make up 800 of 1,000. What's the change in frequency?

7. A hospital treats an infection with an antibiotic that kills 99% of bacteria, but 1% carry a resistance mutation. Explain the outcome after repeated treatment.

8. Define: What is natural selection?

9. Define: Who proposed the theory of natural selection?

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

Answer Key

1. B) Heritable variation - Natural selection needs heritable variation - differences in traits that can be passed to offspring.

2. B) moth color camouflage - Dark moths were better camouflaged against soot-darkened bark, so they survived predation better than light moths.

3. B) reproductive success - Fitness measures how successfully an organism passes its genes to the next generation, not physical strength.

4. C) It changes allele frequencies over time - Natural selection is not goal-directed or mutation-creating - it changes the frequency of existing heritable variants across generations.

5. Variation: moths came in light and dark colors (a gene mutation). Selection pressure: soot-darkened bark made light moths visible to birds. Dark moths were camouflaged and survived/reproduced more. Over generations, dark allele frequency rose in the population.

6. Initial frequency = 200/1000 = 20% Final frequency = 800/1000 = 80% Change = 80% 20% = 60 percentage-point increase This shows selection favoring the resistance allele.

7. Antibiotic acts as the selective pressure. Susceptible bacteria (99%) die; resistant bacteria (1%) survive. Survivors reproduce, passing on the resistance gene. Repeated treatment increases the resistant population's share each round.

8. The process where organisms with favorable heritable traits survive and reproduce more, increasing those traits' frequency over generations.

9. Charles Darwin (with Alfred Russel Wallace), published in On the Origin of Species (1859).

10. Variation, heritability, overproduction (more offspring than resources allow), and differential survival/reproduction.