What is Evolution by Natural Selection?

Worksheet

Natural selection occurs when individuals with traits better suited to their environment survive to reproduce more often, passing advantageous genes to offspring. Over many generations, beneficial traits become common and populations evolve-changing species composition without divine intervention.

Questions

1. Which is NOT a requirement for natural selection to occur?

A) Variation in traits
B) Traits are inherited
C) Organisms want to adapt
D) Limited resources

2. In a population of beetles, 90% are brown and 10% are red. A predator hunts by sight and eats red easily. What will happen?

A) Red beetles will adapt to hide
B) Red population increases
C) Red alleles become rarer
D) No change-predator doesn't care

3. A disease kills 50% of a population with genotype aa. What is this an example of?

A) Mutation
B) Artificial selection
C) Natural selection
D) Genetic drift

4. If a beneficial mutation is rare, can natural selection spread it fast?

A) Yes, mutations spread instantly
B) No, if selection pressure is strong and generation time is short, yes
C) Only if organisms help each other
D) Never-rare mutations disappear

5. In a population of moths, dark moths survive predation better in polluted forests while light moths survive better in clean forests. Explain natural selection.

6. A disease kills some rabbits but a few have genetic resistance. What happens over time?

7. Why does antibiotic resistance in bacteria spread so quickly?

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

9. Define: Does 'survival of the fittest' mean strongest or best-adapted?

10. Define: Can natural selection create entirely new traits?

Answer Key

1. C) Organisms want to adapt - Organisms don't 'want' or 'intend' to adapt. Natural selection is a passive process: those with better-suited traits happen to reproduce more often.

2. C) Red alleles become rarer - Predation is selection pressure. Red beetles are eaten more, fewer survive to breed, so red alleles decrease over generations.

3. C) Natural selection - Disease is a selection pressure. Individuals with advantageous genotypes (not aa) survive and reproduce more-natural selection.

4. B) No, if selection pressure is strong and generation time is short, yes - If selection pressure is strong and generation time is short (like bacteria or insects), beneficial rare alleles can spread rapidly. Classic example: antibiotic resistance in bacteria.

5. Variation: dark and light moths exist Limited resources: predators eat many moths Differential survival: in polluted forest, dark moths (camouflaged) are eaten less Inheritance: dark moths breed, passing alleles for darkness Adaptation: over generations, forest population becomes darker Conclusion: population color matches environment-natural selection

6. Variation: some rabbits carry disease-resistance genes Disease pressure: many rabbits die, but resistant rabbits survive Differential survival: resistant rabbits are more likely to breed Inheritance: survivors pass resistance alleles to offspring Adaptation: in subsequent generations, more rabbits are resistant Result: population evolves higher disease resistance through natural selection

7. Variation: some bacteria carry resistance genes Antibiotic exposure: selection pressure kills non-resistant bacteria Differential survival: resistant bacteria survive and divide rapidly Inheritance: each daughter cell inherits resistance genes Adaptation: resistant population dominates in days/weeks (fast because generation time is short) Conclusion: natural selection works on any timescale with selection pressure

8. Variation (different traits), heredity (traits are inherited), competition (limited resources), and differential reproduction (some survive and breed more than others).

9. 'Fittest' means best-adapted to the environment, not necessarily physically strongest. A small, camouflaged beetle may be 'fitter' than a large, visible one.

10. No, it works with variation that already exists. New mutations create variation; selection acts on it. Selection reveals hidden traits, it doesn't invent them.