# What are Adaptation and Speciation?

Worksheet

Adaptation is a trait (anatomical, behavioural, physiological) that improves fitness in an environment through natural selection. Speciation occurs when populations accumulate enough genetic differences that they can no longer produce viable, fertile offspring together-creating new species.

## Questions

1. Which is NOT an adaptation?

A) A bear's thick fur in winter
B) A snake's venomous fangs
C) An animal's favourite food
D) A bird's streamlined wings

2. What is the main requirement for speciation?

A) Adaptation to new environments
B) Reproductive isolation between populations
C) Mutation
D) Migration

3. Two bird species live in the same forest but sing different mating calls. This is an example of:

A) Adaptation
B) Reproductive isolation
C) Speciation
D) All of the above

4. A population of fish is divided by a dam. 1000 years later, they have different coloration and cannot interbreed. This is:

A) Microevolution
B) Allopatric speciation
C) Artificial speciation
D) Gene flow

5. Darwin's finches in the Galpagos: ancestral finches colonized islands, beak size adapted to local food sources, populations diverged. Explain speciation.

6. Polar bears and grizzly bears share a common ancestor. How did speciation occur?

7. A plant species populates a new island. Over 1000 years, seed size evolves to match local seed-eating birds. Is this speciation?

8. Define: What is adaptation?

9. Define: What is speciation?

10. Define: What is reproductive isolation?

# Answer Key

1. C) An animal's favourite food - Favourite food is a preference, not a heritable trait that evolved via selection. The other three are heritable traits that improve survival.

2. B) Reproductive isolation between populations - Speciation requires reproductive isolation-populations must be unable to interbreed. Adaptation and mutation are part of the process, but isolation is key.

3. D) All of the above - Different mating calls are adaptations that prevent interbreeding (reproductive isolation), which allowed speciation to occur.

4. B) Allopatric speciation - Geographic isolation (dam) prevented gene flow, allowing divergence into reproductive isolation-classic allopatric speciation.

5. Initial: single finch species colonizes Galpagos Geographic isolation: different islands isolate populations Divergent adaptation: large seeds (large beak favored), small seeds (small beak favored), insects (thin beak favored) Reproductive isolation: beak differences become prezygotic barrier (different beak shapes prevent successful mating) Speciation: 14+ finch species evolved; cannot interbreed Conclusion: adaptation to local resources drove speciation

6. Initial: ancestral bear population in Arctic region Geographic barrier: cooling climate pushes bears into Arctic; some remain in forests Divergent selection: Arctic bears adapted white fur, thick fat, marine hunting (seals) Forest bears retain brown fur, omnivorous diet Reproductive isolation: different habitats, seasons, and mating signals evolve Speciation: ~5 million years of separation; now cannot produce fertile hybrid offspring Conclusion: environmental isolation + different selective pressures = new species

7. Adaptation: smaller seeds selected (match bird beak size) But: same island, no geographic barrier Gene flow: different seed-size individuals still interbreed Conclusion: this is adaptation, NOT speciation (no reproductive isolation) Speciation requires isolation from gene flow + reproductive incompatibility

8. A heritable trait that increases an organism's survival or reproductive success in a specific environment, usually evolved via natural selection.

9. The evolutionary process by which one population diverges into two or more populations that are reproductively isolated-they can no longer produce viable, fertile offspring together.

10. A barrier (prezygotic or postzygotic) that prevents two populations from interbreeding and producing fertile offspring. Examples: geographic isolation, behavioral differences, genetic incompatibility.