

SAMPLE Keystone Questions (from Biology IA course)

1. A trait in cows is determined by two alleles of a single gene: allele R is dominant, and allele r is recessive. What is the probability of the dominant trait being expressed in the offspring of one RR parent and one rr parent?

 - A. 25%
 - B. 50%
 - C. 75%
 - D. 100%
2. Which form of genetic engineering was used by humans for many years before the discovery of DNA?

 - A. gene splicing
 - B. gene insertion
 - C. animal cloning
 - D. selective breeding
3. Overuse of antibiotics has caused antibiotic resistance in some bacteria in a population. Which statement describes the **most likely** impact of natural selection on the bacterial population?

 - A. Beneficial mutations have decreased, resulting in a larger population than normal.
 - B. Only the genes for antibiotic resistance are now expressed, eliminating other genes.
 - C. More antibiotic-resistant bacteria have survived, resulting in more offspring with this trait.
 - D. The bacteria have become genetically isolated, resulting in decreased reproductive rates.
4. Which statement is a hypothesis?

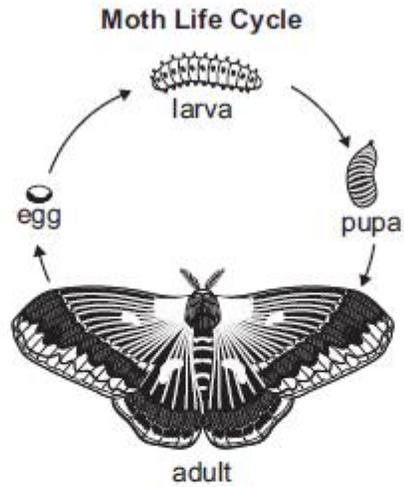
 - A. The presence of an enzyme increased the reaction rate.
 - B. The reaction rate increased 100% once the enzyme was introduced.
 - C. Introducing an enzyme into a reaction did not increase the rate of the reaction.
 - D. When an enzyme is introduced into a reaction the reaction rate will increase by 100%.
5. A student studying the biosphere makes a list of biotic and abiotic characteristics of various biomes. Which characteristic is considered a biotic factor?

 - A. dry, sandy, nutrient-poor soil in a desert
 - B. less than 25 cm of precipitation in a desert
 - C. evergreen trees present in a coniferous forest
 - D. temperature range of -40 to 40°C in a grassland

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6. Which example describes a mutualistic relationship between organisms?
- A. Young wasps prey on caterpillars.
 - B. Crabs eat the remains of dead fish.
 - C. Ants protect a tree on which they feed.
 - D. Tapeworms feed on food in the intestines of cats.
7. Most of the water on Earth is located in the oceans and has a salinity of about 3.5%. Which statement **best** explains why rain is fresh water and has a very low salinity?
- A. When water precipitates from oceans, most of the salt remains in the oceans.
 - B. When water evaporates from oceans, most of the salt remains in the oceans.
 - C. When water precipitates from clouds, most of the salt remains in the clouds.
 - D. When water evaporates from clouds, most of the salt remains in the clouds.
8. Why are nonnative species often considered a disturbance in an ecosystem?
- A. They increase mutations.
 - B. They compete for resources.
 - C. They have special growth needs.
 - D. They cause increased biodiversity.
9. A jackrabbit has large ears containing blood vessels that help it maintain a constant body temperature by adjusting heat exchange with the surrounding environment. Which characteristic of life is **best** described by this example?
- A. growth
 - B. energy use
 - C. organization
 - D. homeostasis

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10. Which characteristic of life is **best** shown by this diagram?
- A. DNA is the genetic code in an organism.
 - B. An organism is made of one or more cells.
 - C. An organism responds to changes in its environment.
 - D. Changes occur in an organism as it grows and develops.

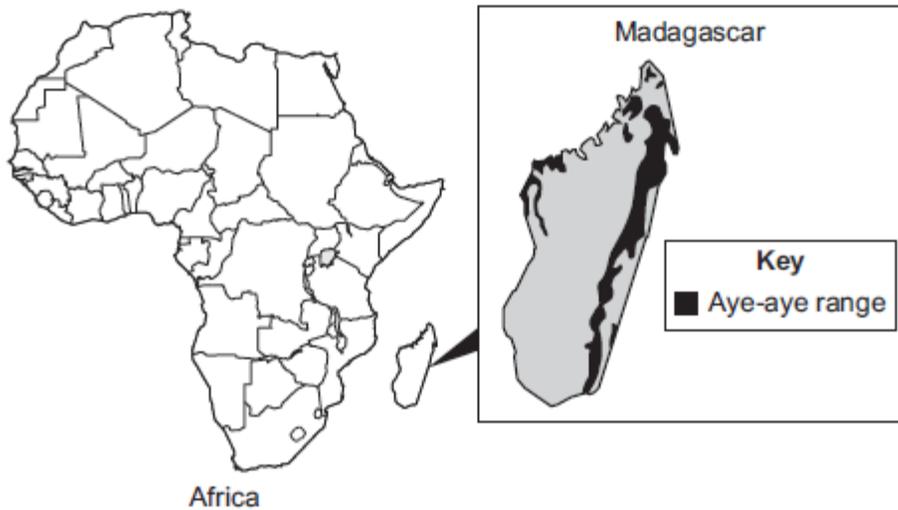
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Aye-aye



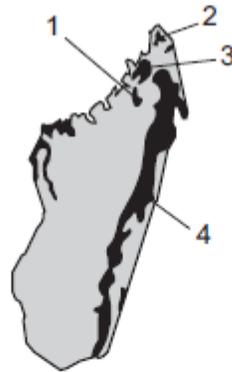
An aye-aye is a small nocturnal lemur that weighs about four pounds. This endangered species is found in Madagascar, a large island off the east coast of southern Africa. The main food for aye-ayes is larvae that live in wood. Aye-ayes find the larvae by tapping on tree branches. They also eat nuts and fruit. Aye-ayes spend most of their time alone. Each animal occupies about 15 acres and marks the territory, which alerts other aye-ayes of the boundary.

Aye-aye Range



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Four Locations of Aye-Ayes

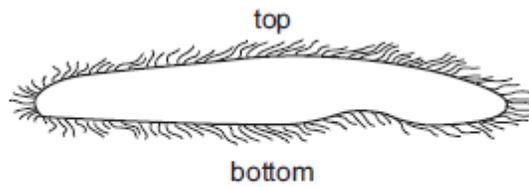


Madagascar

11. The map indicates four locations of aye-aye populations. Which location would **most likely** have an aye-aye population with the greatest variation in allele frequencies?
- A. location 1
 - B. location 2
 - C. location 3
 - D. location 4
12. For the aye-aye species, what is **most likely** the primary value of individuals living alone?
- A. decreased space needs for the species
 - B. increased survival rates with habitat loss
 - C. reduced competition for natural resources
 - D. greater genetic variability within the species

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Side View of *Trichoplax*



13. A *Trichoplax* is a simple multicellular animal that lives in water. This animal can reproduce asexually by simply dividing into two organisms.

Part A: Describe a cellular division process that could be used by *Trichoplax* when it reproduces asexually.

Part B: Describe one benefit and one limitation of how the *Trichoplax* can reproduce by simply dividing.

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Organism Relationships in an Ecosystem

Animal	Food Sources	Predators
beaver	tree bark, twigs, leaves, and roots; pond lilies	coyote, wolf, eagle, black bear
warbler birds	insects, earthworms, fruit	eagle, coyote, hawk
black bear	fish, insects, fruit, small mammals, eggs, carrion	brown bear, wolf

14. An ecosystem includes the organisms listed in the table.

Part A: Identify the initial source of energy for the ecosystem.

Part B: Using the table, complete a food chain that includes a producer, a primary consumer, and a secondary consumer.

_____ → _____ → _____

Part C: The number of beavers in this ecosystem suddenly decreases. Describe the effect this may have on one other organism.

15. During physical education class, some students ran one mile. After their run, the students recorded changes they experienced.

Changes Experienced

- sweating
- muscle cramps
- decreased energy
- increased heart rate
- increased breathing rate
- increased thirst
- increased body temperature

Select three changes experienced by the students and explain how each change can represent a homeostatic mechanism.