

## Altered Genes And New Inheritable Characteristics

- 1 Some bacteria are unable to survive unless a certain nutrient is present in their food supply. After exposure to ultraviolet radiation, some of these bacteria are able to synthesize this nutrient. This change is most likely due to
- (1) increased respiration
  - (2) exposure to an antigen
  - (3) an alteration in a gene
  - (4) gamete formation
- 2 Which factor has the greatest influence on the development of new, inheritable characteristics?
- (1) combinations of genes resulting from mitosis
  - (2) mutations of genes in reproductive cells
  - (3) sorting of genes during asexual reproduction
  - (4) recombining of genes during differentiation
- 3 Which situation results in a characteristic that is inheritable?
- (1) A limb is lost when two marine organisms fight.
  - (2) A puppy learns to beg for food by watching an older dog perform tricks.
  - (3) A gene is inserted into a bacterium, allowing the organism to produce insulin.
  - (4) A random mutation causes the immediate death of a microbe.

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- 4 Many domestic plants that are currently used for food by humans share a wild plant ancestor. The changes that have occurred in four common plants and the results are shown in the chart below.

Wild Plant Ancestor	Change That Occurred	Resulting Modern Plant
wild mustard	reduced flower development	broccoli
wild mustard	sterile flowers	cauliflower
wild mustard	enlargement of leaves	kale
wild mustard	shortened stem length	cabbage

What event most likely produced the changes that occurred in the wild plant ancestor?

- (1) Mutations in wild mustard sex cells were passed on to offspring.
- (2) Humans did not like to eat wild mustard.
- (3) Competition for survival occurred in all ecosystems of the world.
- (4) Ancient herbivores overgrazed wild mustard.

- 5 The fruit fly represented in the diagram below has unusual, curled wings that formed after exposure to radiation.



In order for the fly to pass this trait on to its offspring, a change had to occur in

- (1) the blood cells of the fly
  - (2) the gametes of the fly
  - (3) all the body cells of the fly
  - (4) the muscles of the fly
- 6 Some variation must be present in a population in order for natural selection to take place. These variations arise from mutations in the DNA and
- (1) sorting of chromosomes during sexual reproduction
  - (2) combining of chromosomes during organ development
  - (3) changing of chromosomes during cloning
  - (4) removal of chromosomes during selective breeding

- 7 The variations that exist in a population of wild giraffes are usually a result of events that occur during
- (1) mitotic division
  - (2) genetic engineering
  - (3) asexual reproduction
  - (4) sexual reproduction
- 8 Which processes lead to the greatest variety of genetic combinations?
- (1) asexual reproduction and cloning
  - (2) meiosis and fertilization
  - (3) meiosis and mitosis
  - (4) cloning and mitosis
- 9 Which statement best describes how a new human trait develops and can be passed on to future generations?
- (1) A mutation in a stomach cell results in the inability of a woman to produce a certain digestive enzyme.
  - (2) A mother consumes alcohol during pregnancy, causing the fetus to have a low birth weight.
  - (3) During meiosis, a new combination of DNA subunits is formed.
  - (4) During mitosis, DNA does not divide correctly and the cells die.
- 10 Finches on the Galapagos Islands express a variety of traits. Variability in the offspring of these finches is a result of
- (1) mutation and cloning
  - (2) meiosis and mutation
  - (3) mitosis and asexual reproduction
  - (4) mitosis and genetic recombination

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Base your answers to questions 11 on the passage below and on your knowledge of biology.

Inherited instructions control the color patterns of snakes. Some snakes that are not poisonous have colors that resemble the patterns on poisonous snakes. Predators avoid eating harmless snakes that have color patterns similar to those of the poisonous snakes. The results of a recent study indicate that predators in areas that have only harmless snakes do not avoid attacking snakes that have color patterns similar to poisonous snakes.

- 11 Identify the structure that contains the inherited instructions that determine the different color patterns in these snakes. [1]

Base your answers to questions 12 on the information and chart below and on your knowledge of biology.

Scientists studied the distribution of a species of pocket mouse that lived in the sandy desert regions of the southwestern United States. They are eaten by a variety of predators. Pocket mice are active at night, and feed on seeds and grasses. A single female mouse can reproduce several times each year, producing a litter of 3 to 13 offspring each time. Each new litter is considered a generation.

A volcanic eruption that resulted in lava flows changed the color of the area that the mice inhabit from light brown to black. Data from the scientist's research of the population are shown in the chart below.

**Changes in Pocket Mouse Fur Color after a Volcanic Eruption**

Number of Generations	Percentage of Pocket Mice with Light Brown Fur	Percentage of Pocket Mice with Black Fur
10	95%	5%
25	90%	10%
50	75%	25%
100	5%	95%

- 12 State the role of mutation or recombination in the appearance of the trait for black fur color in the pocket mouse population. [1]

Base your answers to questions 13 on the illustration and information below and on your knowledge of biology.

**The Little Brown Bat**



Source: <http://knatolee.blogspot.com/2011/09/not-ducklings.html>

The illustration is of a species commonly called the little brown bat. It has 38 teeth and usually lives near bodies of water. The animal is considered beneficial by many people because it eats mosquitoes and many types of garden pests. They feed at night, detecting their prey by echolocation—a form of sonar similar to what is used on ships. They can determine the location and size of their prey by listening to the return echo.

- 13 If a mutation occurs in some of these bats, it may result in a new inheritable trait that makes them better able to catch insects than other bats in the population. Describe what will most likely happen to the frequency of the original trait in the population. Support your answer. [1]

Base your answers to questions 14 on the information below and on your knowledge of biology.

Guppies are small, tropical freshwater fish that display wide variation in coloration. Some have bright splotches of blue, red, and orange, while others are quite drab and dull. Research has shown that females prefer to mate with brightly colored males; however, this trait makes them more likely to be seen. Guppies, like all species, must be able to both survive and reproduce in order to avoid extinction.

14 Identify one process that is responsible for the variations in coloration observed in guppies. [1]

Base your answers to questions 15 on the information below and on your knowledge of biology.

Female mosquitoes need a meal of blood from a person or other animal in order to produce eggs. It has been discovered that mosquitoes have cells on their antennae that can detect the insect repellent known as DEET. The repellent is not harmful to mosquitoes, but when mosquitoes detect DEET, they will not land on the surface where the DEET has been applied. This protects people from being bitten by mosquitoes.

Recently, scientists found some mosquitoes that are resistant to DEET because they do not detect its presence. They bred these mosquitoes and eventually produced a population consisting of about 50% DEET-resistant insects.

15 Identify the process most likely responsible for a mosquito initially becoming resistant to DEET. [1]

## Answer Keys

1 3

2 2

3 3

4 1

5 2

6 1

7 4

8 2

9 3

10 2

11 Allow 1 credit. Acceptable responses include, but are not limited to:

- — gene
- — chromosome
- — nucleus
- — DNA molecule

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- — A mutation resulted in the initial color change.
- — Recombination provides genetic variability for fur color in offspring.

13 Allow 1 credit for describing what will most likely happen to the frequency of the original trait in

- the population and supporting the answer. Acceptable responses include, but are not limited to:
- — The frequency of the original trait will decrease because these bats will not be as
- successful at obtaining food. They will be less likely to produce offspring than the bats with the new mutation.
- — Since they will not be able to compete successfully with the bats with the mutation, they
- will produce fewer offspring, and the trait will decrease.
- — The trait would decrease in that population because those bats would be less successful.
- — The original trait will decrease due to natural selection for the new trait, which is
- beneficial.
- — There could be no change if there's plenty of food.

14 Allow 1 credit. Acceptable responses include, but are not limited to:

- — mutation
- — sexual reproduction
- — meiosis/crossing-over
- — recombination of genes
- — natural selection
- — sexual selection

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- — mutation
- — recombination during fertilization
- — sexual reproduction

