Key Terms for this Unit

**Mutation:** Any change that occurs in a gene or chromosome (DNA)

**Variation:** Any difference between individuals of the same species

**Adaptation:** A genetic trait that helps an organism survive and reproduce
Genetics Review

• Genetic material (DNA/genes/chromosomes) is held in the nucleus of a cell

• Genetic material controls inherited traits such as eye color, height, ear shape, etc.

• If the genetic material changes, the traits change as well!!
Mutations: Causes

Mutation: Any change that occurs in the DNA of a gene or chromosome (genetic material)

What causes mutations?

- Mutagens: things in the environment that cause mutations (radiation, chemicals, etc.)

- Cell division: when your cells divide the genetic material is sometimes changed by accident
Practice Questions:

1. Which of the following could cause a mutation inside your DNA?
   
   a. Sunlight
   b. Mistake in cell division
   c. Cigarette Smoke
   d. All of the above
What are the effects of mutations?

Mutations change the traits of organisms and causes variation (differences) within a species.

Example: Difference in eye color is caused by differences in DNA (mutations).
Mutations: Effects

Most mutations cause changes to traits that have little or no effect on the survival of an organism!!! (neutral)
- Example: eye color, hair color, color blindness etc.

Some mutations are bad (favorable or negative) and cause changes to traits that can kill the organism or stop it from reproducing!
- Example: cancer, Down syndrome, Cystic fibrosis, etc.
Mutations: Effects

• Some mutations are good (favorable or positive) and can cause changes to traits that help the organism survive and reproduce (adaptations)

• Example: peacock tail feathers, tiger stripes, colorful flowers (no superpowers!!)
Practice Question #2

Most mutations are bad

• True

• False
Inheriting Mutations

• Mutations (changes in DNA) can only passed on to an organism's offspring if the mutation takes place in the sex cells (sperm or eggs)

• Examples:
  • Radiation from the sun causes cancer in your skin cells; your kids will NOT be born with skin cancer
  • Chemicals in plastic water bottles cause a mutation in an egg cell; your child is born with only one arm
  • As your body forms sperm cells a mistake is made in copying the DNA; your child is born with Down syndrome
Variation

- Variation: any difference between individuals of the same species
- Caused by genetic mutations and sexual reproduction!
- Examples: fur color, stem height, number of toes, ear lobe shape, beak size, etc.
Variation

Some variations have little effect on the survival/reproduction of an organism
-Example: Ear lobe shape, eye color, etc.

Some variations have a negative effect on the survival/reproduction of an organism
-Example: genetic diseases, brown fur in the arctic, etc.
Review Question #3

Variations in a population are caused by mutations and sexual reproduction.

True          or          False
Adaptations

Some variations have a positive effect on the survival/reproduction of an organism.
- Example: gills in fish, hollow bones in birds, xylem in plants, etc.

Variations that help an organism survive and reproduce are called **adaptations**.
Adaptations: Structures

- Birds have hollow bones which make them lighter so they can fly

- Plants have hollow tubes in their stems called xylem which allow water to flow from the roots to the leaves

- Fish have gills which allow them to breathe underwater
Adaptations and the Environment

• Whether or not a trait is an adaptation depends on the environment in which the organism lives!

• Example: Gills on fish would be an adaptation for living underwater, but it would be an unfavorable trait for living on dry land.
Review Question #4

• Which of the following is an adaptation that could help an organism survive in the desert?

A. Gills
B. Thin Fur
C. Large Eyes
D. Green Skin
Adaptations: Behaviors

• Migration: populations travel to a different area to find food or avoid bad weather (birds, butterflies, wildebeests)

• Some plants (such as tulips) store food in bulbs so they can survive the winter

• Hibernation: Some small mammals sleep through the winter when it is cold/no food (bears do not hibernate)
Mutation

Variations cause variation within a species.

Variation

Variations that help an organism survive are called adaptations.

Adaptation