

# Amoeba Sisters Video Recap Mutations Answer Key

**Amoeba Sisters | Video Recap**  
NAME: \_\_\_\_\_

**Amoeba Sisters Video Recap: Mutations (Updated)**

1. What is a mutation?  
*A mutation is a change in the DNA sequence → change in the order of the bases (A, T, G, C)*

2. A specific part of a nucleic acid (such as DNA or RNA) experiences a mutation that could lead to a different protein produced. View the illustration below of DNA. Which part of the DNA experiences the mutation?  
*The nitrogen bases are affected.*

3. On the DNA illustration, draw an arrow to show where the answer to #2 could be located.  
*[Diagram of DNA double helix with an arrow pointing to the nitrogen bases]*

4. The mRNA codon CUU could mutate to CUA, CUG and still code for leucine.  
*mRNA codon: CUU codes for amino acid leucine*

5. Which type(s) of organism(s) can experience a mutation? Mark any that apply.  
☒ Animals (this includes humans)  
☒ Archaea  
☒ Bacteria  
☒ Fungi  
☒ Plants  
☒ Protists  
*All living things that have DNA can mutate!*

6. Even a gene mutation that is a point mutation, meaning it affects one nucleotide base, can still make a major change.  
*protein on red blood cells that carries oxygen*

Consider the below information for normal hemoglobin:

Portion of Hemoglobin DNA	mRNA	Amino Acids
GGA CTC CTC	CCU GAG GAG	Proline-Glutamic Acid-Glutamic Acid

*Transcription*  
*Translation*

Sickle Cell Anemia is caused by a point mutation known as a substitution. Show what would occur if the first T ("thymine") DNA base in the portion shown above experienced a mutation with a substitution of A ("adenine").

Sickle Cell Hemoglobin:

Portion of mutated hemoglobin DNA: GGA CAC CTC

mRNA: CCU GUG GAG

Amino Acids: proline - valine - glutamic acid

*peptide bonds: hold amino acids together*

## Amoeba Sisters Video Recap Mutations Answer Key: Understanding the Basics of Mutations

Mutations are a fundamental aspect of genetics that can lead to significant changes in organisms, influencing everything from physical traits to susceptibility to diseases. The Amoeba Sisters, a popular educational resource, have created videos that simplify complex biological concepts, including mutations. This article serves as a comprehensive recap of their video on mutations, providing an answer key to help students and educators grasp the essential points covered in the video.

# What Are Mutations?

Mutations are changes in the DNA sequence of an organism's genome. These changes can occur naturally or be induced by environmental factors, such as radiation or chemicals. Understanding mutations is crucial for several reasons:

- Evolution: Mutations are a source of genetic diversity, which is essential for evolution.
- Genetic Disorders: Some mutations can lead to genetic disorders, impacting an individual's health.
- Biotechnology: Mutations are utilized in genetic engineering and biotechnology for various applications.

## Types of Mutations

There are several types of mutations that can occur, each with different implications. The major categories include:

1. Point Mutations: Changes in a single nucleotide base pair. These can be further classified into:
  - Silent Mutations: No change in the amino acid sequence.
  - Missense Mutations: Result in a different amino acid being incorporated into the protein.
  - Nonsense Mutations: Create a premature stop codon, leading to truncated proteins.
2. Insertions and Deletions: Addition or loss of nucleotide pairs in a gene, which can lead to a frameshift mutation. This alters the reading frame and can significantly impact protein function.
3. Duplications: A section of DNA is duplicated, leading to an increase in the number of copies of a particular gene.
4. Inversions: A segment of DNA is reversed within the chromosome.
5. Translocations: A segment of DNA breaks off and attaches to a different chromosome.

## Causes of Mutations

Mutations can arise from various sources, which can be classified into two main categories: spontaneous and induced mutations.

### Spontaneous Mutations

These mutations occur naturally during DNA replication and cell division. Factors contributing to spontaneous mutations include:

- Errors in DNA Replication: Occasionally, DNA polymerase may make mistakes while copying DNA.
- Chemical Reactions: Internal cellular processes can lead to spontaneous changes in DNA.

## **Induced Mutations**

Induced mutations are caused by external factors, including:

- Radiation: Ultraviolet light and ionizing radiation can damage DNA.
- Chemicals: Certain chemicals, known as mutagens, can lead to DNA alterations.

Examples include:

- Benzene
- Formaldehyde
- Certain pesticides

## **Effects of Mutations**

The impact of mutations on an organism can vary widely, ranging from beneficial to harmful effects.

## **Beneficial Mutations**

Some mutations can enhance an organism's ability to survive and reproduce in its environment. For example:

- Antibiotic Resistance: Bacteria that acquire mutations allowing them to resist antibiotics can survive and proliferate, leading to the evolution of new strains.
- Adaptation: Mutations can facilitate adaptation to changing environments, promoting survival.

## **Harmful Mutations**

Conversely, many mutations can have detrimental effects, such as:

- Genetic Disorders: Mutations can lead to inherited conditions, such as cystic fibrosis or sickle cell anemia.
- Cancer: Accumulation of mutations in specific genes can disrupt normal cell function and lead to uncontrolled cell growth.

# Mutation and Evolution

Mutations play a crucial role in the process of evolution. They are the raw material for natural selection, leading to genetic diversity within populations. This diversity allows some individuals to adapt better to their environments, enhancing their chances of survival and reproduction.

## Natural Selection and Adaptation

- Survival of the Fittest: Mutations that offer survival advantages are more likely to be passed on to future generations.
- Speciation: Over time, accumulated mutations can lead to the emergence of new species.

## Conclusion

Understanding mutations is essential for grasping the principles of genetics and evolution. The Amoeba Sisters' video on mutations effectively breaks down these complex concepts, making them accessible to students and educators alike.

### Answer Key Recap

To assist viewers in solidifying their understanding, here's a recap of the key points covered in the video:

1. Definition of Mutation: A change in the DNA sequence.
2. Types of Mutations: Point mutations, insertions, deletions, duplications, inversions, and translocations.
3. Causes: Spontaneous (errors in replication, chemical reactions) and induced (radiation, chemicals).
4. Effects: Beneficial (antibiotic resistance, adaptation) and harmful (genetic disorders, cancer).
5. Role in Evolution: Source of genetic diversity that drives natural selection and adaptation.

In summary, mutations are a vital component of biological processes that influence genetic diversity, evolution, and the health of organisms. By engaging with resources like the Amoeba Sisters, students can better understand the significance of these genetic changes and their implications in the natural world.

## Frequently Asked Questions

## **What is the main topic covered in the Amoeba Sisters video about mutations?**

The main topic covered is the concept of mutations, including what they are, how they occur, and their implications in genetics.

## **What types of mutations are discussed in the Amoeba Sisters video?**

The video discusses several types of mutations, including point mutations, insertions, deletions, and frameshift mutations.

## **How do mutations affect protein synthesis according to the Amoeba Sisters video?**

Mutations can alter the amino acid sequence of proteins, potentially changing their function which can lead to varying effects on an organism.

## **What examples of mutations are provided in the video?**

The video provides examples such as sickle cell anemia as a result of a point mutation and color blindness related to chromosomal mutations.

## **What is a point mutation as explained by the Amoeba Sisters?**

A point mutation is a change in a single nucleotide base in the DNA sequence, which can lead to a change in the corresponding amino acid in a protein.

## **How do environmental factors relate to mutations according to the video?**

The video explains that environmental factors such as radiation, chemicals, and viruses can induce mutations in DNA.

## **What role do mutations play in evolution as discussed in the video?**

Mutations are essential for evolution as they introduce genetic variation, which can be acted upon by natural selection.

## **What is the difference between beneficial, harmful, and neutral mutations?**

Beneficial mutations provide an advantage, harmful mutations can lead to diseases or disadvantages, and neutral mutations have no significant effect on fitness.

## How can mutations be repaired according to the Amoeba Sisters?

The video mentions that cells have mechanisms such as DNA repair enzymes that can correct mutations to maintain genetic stability.

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