



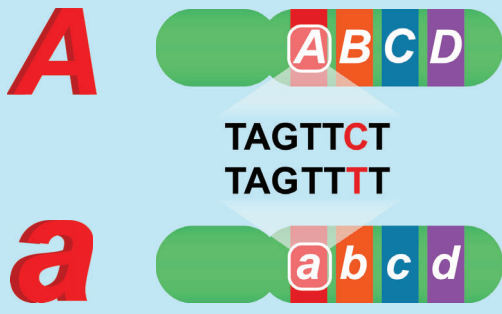
Study Prep

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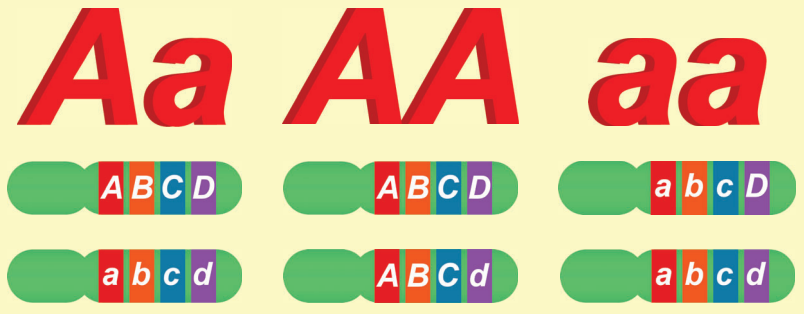
TOPIC: GENETIC VARIATION**Sources of Genetic Variation**

- ◆ *Recall:* evolution requires _____ variation.
- ◆ Two ways to talk about genetic variation in a population:

1. **New alleles:** from _____
to the ____ sequence.



2. **New combinations of alleles** (_____): from sexual reproduction and recombination (_____).

**PRACTICE**

Which process ensures that alleles are always found in new combinations?

- a) Natural selection.
- b) Sexual reproduction.
- c) Genetic drift.
- d) Mutation.

TOPIC: GENETIC VARIATION**Mutations**

- ◆ **Mutations:** changes in the DNA introduce _____ variation → _____ & _____.
- **Beneficial:** ____ fitness
 - **Neutral:** ____ fitness
 - **Harmful** (____): ____ fitness
- ◆ Mutations can introduce both new _____ & new _____.

New Alleles**Changes to DNA sequence:**

may affect coding regions or _____ regions.

- **Point mutation:** change in a _____ DNA nucleotide.

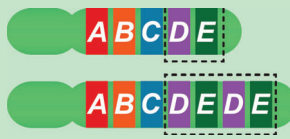


TAGTTCT
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**New Genes****Chromosome Level Mutation:**

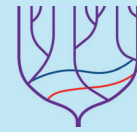
change in the _____ or _____ of chromosomes.

- Gene duplications can lead to the evolution of _____ genes.

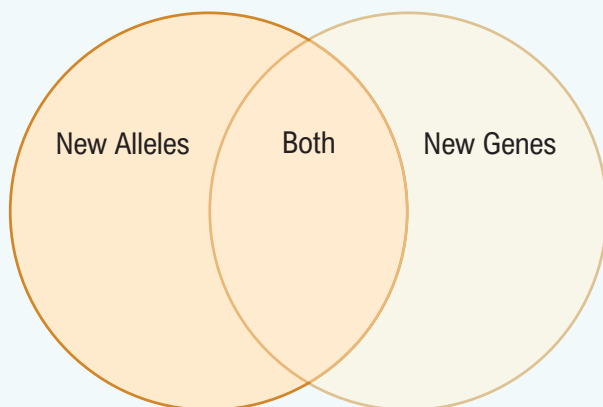
**Horizontal (____) gene**

transfer: movement of alleles from one _____ to another.

- Most common in _____ and archaea, but also happens in eukaryotes.

**EXAMPLE**

Fill in the Venn Diagram below with the statements from the box. If a statement applies to mutations that create both new alleles and new genes, place it in the overlapping section of the two circles.



- a) Can come from a change in the composition of chromosomes.
- b) Can be created from changes to a small number of base pairs in the DNA sequence.
- c) Increase genetic variability.
- d) Can introduce DNA from a different species.
- e) Can be created by gene duplications.

TOPIC: GENETIC VARIATION**PRACTICE**

Mutations that don't impact the fitness of an allele can be called?

- a) Neutral mutations.
- b) Point mutations.
- c) Beneficial mutations.
- d) Deleterious mutations.

PRACTICE

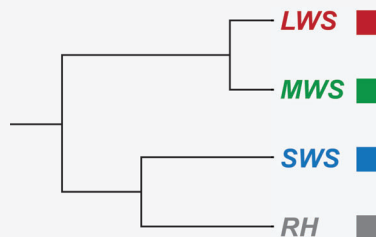
Which of the following statements about mutations is correct?

- a) Lateral gene transfer is most common in eukaryotes.
- b) Mutations are more common in populations with low fitness.
- c) Many mutations do not affect the fitness of an organism.
- d) Most mutations increase the fitness of an organism.

PRACTICE

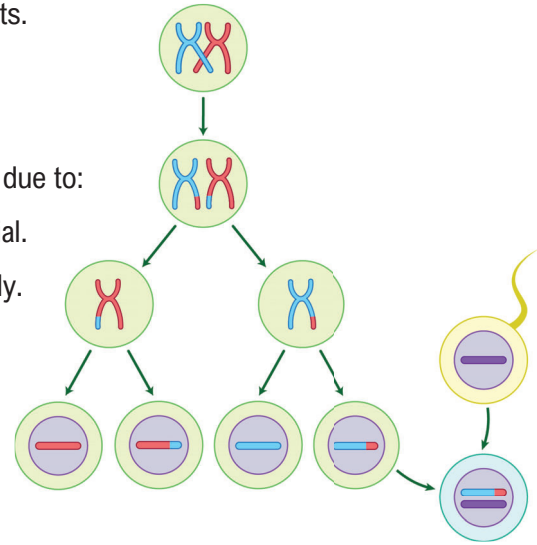
Gene trees are evolutionary trees that show the evolutionary lineages of specific genes separate from organisms. Below is a gene tree for the genes that code for opsins in humans. Opsins are the light sensitive proteins in the eyes. Humans have four opsins that are active in visual perception: long-wavelength sensitive (LWS or red-sensitive), medium-wavelength sensitive (MWS or green sensitive), short-wavelength sensitive (SWS or blue sensitive), and rhodopsin (RH, not color sensitive). Which mutational process would be most likely to create a gene tree like this?

- a) Point mutations.
- b) Deletion events.
- c) Horizontal gene transfer.
- d) Gene duplication events.



TOPIC: GENETIC VARIATION**Sexual Reproduction and Recombination**

- ◆ Genetic variation comes from new alleles and new _____ of alleles.
- ◆ **Sexual reproduction:** Offspring contain _____ alleles than parents.
 - _____ each carry ____ of the parent's ____ alleles.
- ◆ Alleles from different _____ are inherited in different combinations due to:
 1. Recombination (crossing over): chromosomes _____ material.
 2. Independent assortment: chromosomes are _____ separately.
 - Allows different genes to evolve _____.
 - Allows NS to work on different _____ of genes.

**PRACTICE**

Natural selection is able to work independently on different genes that are found on the *same* chromosome because of which process?

- a) Mutation.
- b) Recombination.
- c) Independent assortment.
- d) Fertilization.

PRACTICE

Over short time periods, what would you expect to be responsible for creating the most genetic variation in humans?

- a) Horizontal gene transfer.
- b) Natural selection.
- c) Mutation.
- d) Sexual reproduction.