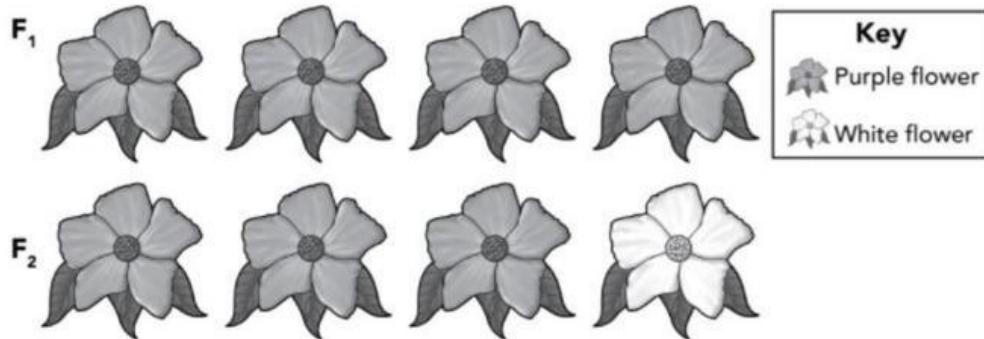


# Genes and Heredity

## Topic Test

Write the letters of the correct answers on the lines at left.

1. Dr. Michelle Wang at Cornell University studies DNA replication and protein synthesis. Her group researches how a protein called helicase unzips the DNA strand. After DNA is unzipped, what is the next step in DNA replication?
  - Messenger RNA forms along the exposed DNA bases.
  - A chromosome with two identical strands of DNA is formed.
  - Nitrogen bases pair up with the DNA strands.
  - Ribosomes attach to DNA and move along the strand.
2. One of the traits Gregor Mendel studied was flower color in pea plants. Mendel found that purple color factor was dominant to white color factor. Now, we know that Mendel's factors are genes, or alleles.



Look at the F<sub>1</sub> generation produced when two parent plants are crossed. Then, look at the F<sub>2</sub> generation produced when two F<sub>1</sub> plants are crossed. What can you infer about the original parents' genotype and phenotype? Choose the 2 statements that apply.

- Both the parents were homozygous for white flowers.
- Both the parents were heterozygous for purple flowers.
- One parent was homozygous for white flowers and the other was homozygous for purple flowers.
- Both parents had purple flowers.

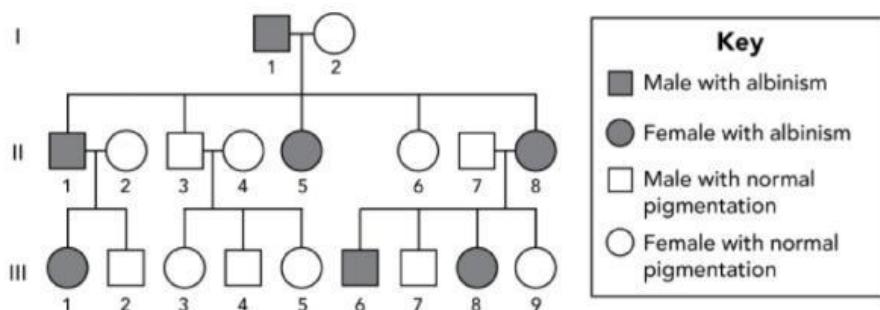
\_\_\_\_\_ 3. Many people have big toes that are shorter than their second toes. The short big toe allele (S) is dominant to the long big toe allele (s).

	S	S
S		
S		

The Punnett square shows a cross between an Ss parent and an ss parent. What is the probability that their child will have short big toes?

A. 0/4  
 B. 1/4  
 C. 2/4  
 D. 3/4  
 E. 4/4

\_\_\_\_\_ 4. Albinism is a genetic trait in which a person produces little to no melanin, or pigment. An albino person's skin and hair are much lighter than normal. Albinism is a recessive trait.



The pedigree shows a family with a few albino members. Shapes representing family members with albinism are shaded. Based on the pedigree, which of the following statements is correct?

A. Only female members of the family show the albinism trait  
 B. In Generation II, family members 3, 4, and 6 have no albinism gene.  
 C. Generation IV children from Generation III members 1, 6, and 8 are guaranteed to be albinos.  
 D. Every person in the pedigree is either an albino or a possible carrier of albinism.

Circle the words or phrases that correctly complete the sentence.

5. Tyler and Isaac have the same mother and father but look different from each other. Their parents gave them each a different set of genetic material. Variation was introduced through crossing over during meiosis.

During crossing over, (sex cell / chromosome / chromatid / parent cell) pairs exchange pieces, so that each sibling has a different combination of (genes / pedigrees / body cells / mutations).

Fill in the term that correctly completes the sentence.

6. All cells need proteins. Proteins help build the cell membrane, carry messages, guide chemical reactions, and much more. One cell uses 20,000 to 100,000 unique types of protein. A protein starts out as a long chain of amino acids, translated from DNA. Then, the protein bends and folds into a complex shape. A protein's shape is crucial to its function. Many diseases result from badly folded proteins.

A protein may fold incorrectly if \_\_\_\_\_ brings the wrong amino acid to the ribosome to assemble the protein.

Use the information below to answer questions 7 and 8.

James observes DNA sequences and notices a change from Sequence 1 to Sequence 2.

#### DNA Sequences

##### Sequence 1

C	A	C	G	T	G	G	A	G	C	T	C	C	T	C
G	T	G	C	A	C	C	T	G	A	G	G	A	G	G

##### Sequence 2

C	A	C	G	T	G	G	A	G	C	A	C	C	T	C
G	T	G	C	A	C	C	T	G	A	T	G	G	A	G

Circle the words or phrases that correctly complete the sentence.

7. James's work in a genetics lab helps him recognize what this change represents.

This sequence shows an example of a(n) (autosomal chromosome / mutation / sex-linked gene / variation) because it has a(n) (addition / deletion / protein / substitution).

Write the letter of the correct answer on the line at left.

\_\_\_\_\_ 8. How might the change in Sequence 2 affect the individual?

- A. It may cause an incorrect protein to be made.
- B. It may cause an extra amino acid to be coded.
- C. It may cause a new type of protein to be created.
- D. It may cause an amino acid to be missing.

9. Underline the sentence that describes a neutral variation.

Differences between individuals of the same species is known as variation. Variations may be harmful, helpful, or neutral. One example of a variation is that Mikayla has brown eyes, while her friend Joanna has green eyes. Another example is that some individuals in a population of butterflies avoid predation because they are the same color as a species of poisonous butterfly. Another is that individuals with sickle cell anemia have red blood cells that block the flow of oxygenated blood cells.

Use the word bank to complete the sentence.

DNA • cytoplasm • RNA • proteins

10. One of the biggest news stories of 1996 was the successful cloning of Dolly the sheep. Dolly was the first mammal cloned from an adult body cell. At first, Dolly appeared to be perfectly healthy. However, she died at age 6 of cancer. Dolly's early death made scientists wonder whether cloned animals age faster than normal. A small flock of sheep cloned from Dolly have been observed since 2007. Happily, these clones show no sign of early aging.

Scientists worried that cloned animals would age rapidly because their cells contain \_\_\_\_\_ as old as the individual they were cloned from.

Write the letter of the correct answer on the line at left.

\_\_\_\_\_ 11. Animal breeders are just as excited about genetic technologies as doctors. Many problems that were difficult before now have a solution in sight. Which of the following problems could potentially be solved through DNA fingerprinting?

- A. test to confirm that a calf was fathered by a specific bull
- B. produce a bull with identical DNA to a champion
- C. produce a very small but healthy breed of cow
- D. remove a gene to develop cows with no horns