

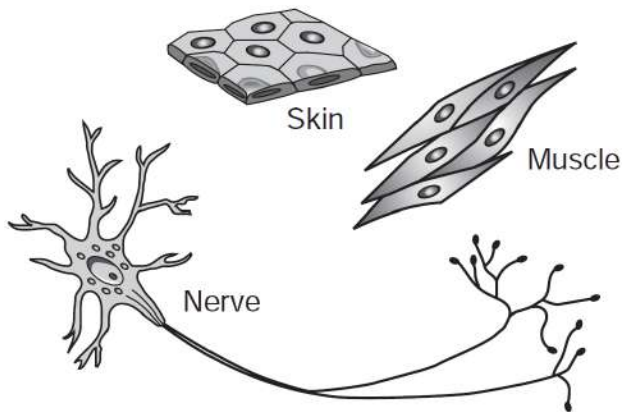
1. Base your answer to the following question on the information below and on your knowledge of biology.

For many years, scientists hypothesized the existence of a single tomato gene that increases the sweetness and production of tomatoes. After years of research, a team of scientists identified the gene and observed greater sweetness and tomato production in plants that contain this gene.

Identify a process that could be used to insert this gene into other plant species to increase fruit production.

Base your answers to questions 2 and 3 on the information and diagram below and on your knowledge of biology.

Each body cell contains the same genetic information, but can differ in appearance and size. The diagram below shows three different types of cells found in the human body.

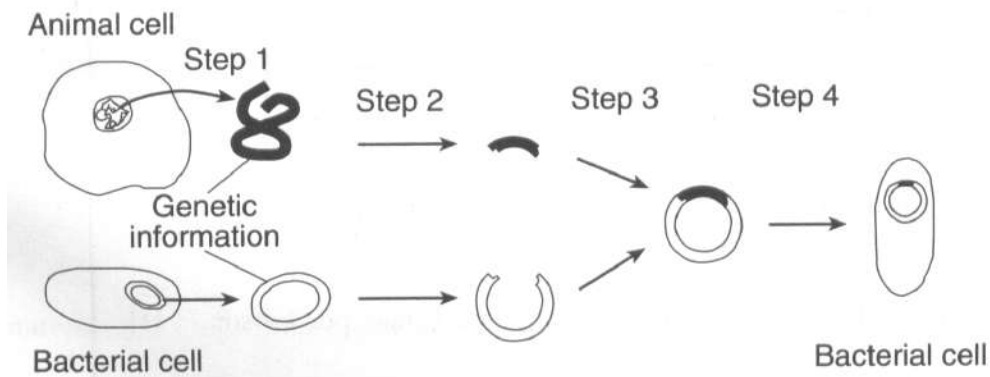


2. Explain why differences in these human body cells are a biological advantage.
3. Identify *one* similarity, other than the genetic information, that these body cells have.

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4. Each body cell of a chimpanzee contains 48 chromosomes. How many chromosomes would normally be present in a gamete produced by this chimpanzee?

A) 24 B) 36 C) 48 D) 96

Base your answers to questions 5 and 6 on the diagram below, which illustrates some steps in genetic engineering and on your knowledge of biology.



5. What is the result of step 3?
- A) a new type of molecular base is formed
 - B) different types of minerals are joined together
 - C) DNA from the bacterial cell is cloned
 - D) DNA from different organisms is joined together**
6. State *one* way that enzymes are used in step 2.
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7. One variety of wheat is resistant to disease. Another variety contains more nutrients of benefit to humans. Explain how a new variety of wheat with disease resistance and high nutrient value could be developed. In your answer, be sure to:
- identify *one* technique that could be used to combine disease resistance and high nutrient value in a new variety of wheat
 - describe how this technique would be carried out to produce a wheat plant with the desired characteristics
 - describe *one* specific difficulty (other than stating that it does not always work) in developing a new variety using this technique
8. Animal cells utilize many different proteins. Discuss the synthesis of proteins in an animal cell. Your answer must include at least:
- the identity of the building blocks required to synthesize these proteins
 - the identity of the sites in the cell where the proteins are assembled
 - an explanation of the role of DNA in the process of making proteins in the cell
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Base your answers to questions 9 through 11 on the information below and on your knowledge of biology.

Mutations are often referred to as the "raw materials" of evolution.

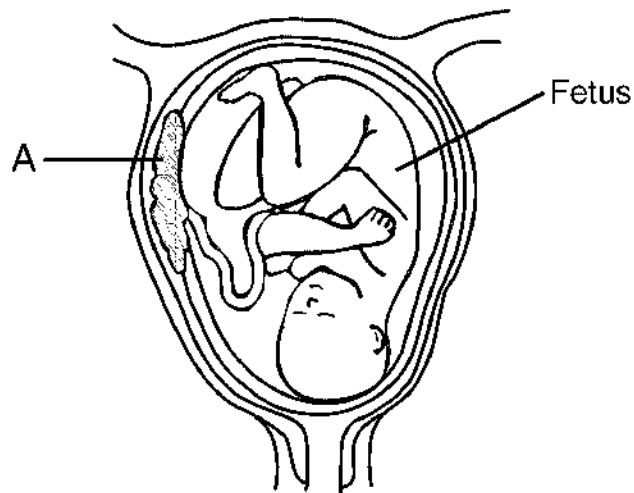
9. Use appropriate letters to write a 9-base DNA sequence that could represent a portion of a gene.

10 Show one example of what could happen to the 9-base DNA sequence you wrote in the previous question if a mutation occurred in that gene.

11 State one reason that mutations are often referred to as the "raw materials" of evolution.

12. Base your answer to the following question on the statement and diagram below and on your knowledge of biology.

Women are advised to avoid consuming alcoholic beverages during pregnancy.



Identify the structure labeled *A* and explain how the functioning of structure *A* is essential for the normal development of the fetus.

Structure A: _____

13. Define fertilization and describe the resulting development of a human embryo. In your answer, be sure to include a definition of fertilization and the functions of the ovary, uterus, and placenta. Circle the terms *fertilization*, *ovary*, *uterus*, and *placenta* in your description.

14. Sexually produced offspring often resemble, but are not identical to, either of their parents. Explain why they resemble their parents but are *not* identical to either parent.

15. Which mutation in a fruit fly could be passed on to its offspring?

- A) a mutation in a cell of an eye that changes the color of the eye
- B) a mutation in a leg cell that causes the leg to be shorter
- C) a mutation in a sperm cell that changes the shape of the wing**
- D) a mutation in a cell of the digestive tract that produces a different enzyme

16. The *least* genetic variation will probably be found in the offspring of organisms that reproduce using

- A) mitosis to produce a larger population**
- B) meiosis to produce gametes
- C) fusion of eggs and sperm to produce zygotes
- D) internal fertilization to produce an embryo

17. Which statement best explains the observation that clones produced from the same organism may *not* be identical?

- A) Events in meiosis result in variation.
 - B) Gene expression can be influenced by the environment.**
 - C) Differentiated cells have different genes.
 - D) Half the genetic information in offspring comes from each parent.
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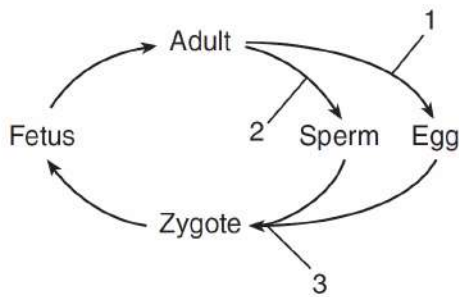
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18. Base your answer to the following question on the information below and on your knowledge of biology.

The reproductive cycle in a human female is not functioning properly. An imbalance of hormones is diagnosed as the cause.

Identify one hormone directly involved in the human female reproductive system that could cause this problem.

19. Base your answer to the following question on the information below and on your knowledge of biology.

The diagram below represents some stages in the life cycle of humans. The numbers in the diagram represent various processes in the cycle.



State how process 3 affects the amount of genetic information on offspring receives.

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20. Base your answer to the following question on the information and photographs below and on your knowledge of biology.

In addition to their use for hearing, ears contain many blood vessels that allow heat to escape into the air. Animals that live in warm climates tend to have ears with large areas exposed to the environment. Animals in cold climates have a more compact ear that keeps exposure to the environment to a minimum. The photographs below show a jackrabbit from desert regions of the southwestern United States and a fennec fox from northern Africa with large ears, and a snowshoe hare and an arctic fox with small ears.



Jackrabbit



Fennec Fox



Snowshoe Hare



Arctic Fox

Discuss how differences in ear size in these organisms might have occurred.

Identify *one* process that most likely resulted in the animals in warm climates having large ears, while animals in cold climates have small ears

Answer Key

Repro and Genetics

1. — genetic engineering, — gene splicing, — gene manipulation
 2. — This allows these cells to be specialized for a specific function. — Differences in cells are related to different functions in the body
 3. — All of the cells contain organelles. — All have a cell membrane/nucleus/cytoplasm/mitochondria. — They carry out life processes/respiration/mitosis. — They all use ATP/glucose.
 4. A
 5. D
 6. *Examples:* — Enzymes are used to cut the DNA. — to cut the genetic material
 7.
 - Identify one technique that could be used to combine disease resistance and high nutrient value in a new variety of wheat. — genetic engineering — selective breeding (cross-pollinating)
 - Describe how this technique would be carried out to produce a wheat plant with the desired characteristics. — Genetic engineering involves moving the genes for one of the desired traits into a plant with other desired traits. — Selective breeding (cross-pollinating) involves mating plants with one desired characteristic with plants with other desired characteristics.
 - Describe one specific difficulty (other than stating that it does not always work) in developing a new variety using this technique. — The moved gene may not be expressed. — It is difficult to isolate the gene. — The trait may be recessive. — There may be unintended adverse qualities.
 8. *Examples:* — DNA codes for the amino acid sequence. — DNA provides instructions for making proteins.
The building blocks are amino acids. The proteins are assembled in the cytoplasm of the cell, at the site of the ribosomes.
 9. — AACCTGCTC — CCTACGGCA
 10. Allow credit for showing one example of what could happen to the 9-base DNA sequence if a mutation occurred in that gene. At least one change to the student's answer to the previous question must be indicated.
 11. *Examples:* — Mutations may result in variations that may promote survival. — A mutation can result in the production of a new variation that could be passed on to offspring. — Mutations cause variations.
 12.
 - The structure labeled A is the placenta.
 - Exchange surface for nutrients or wastes or O₂ between mother and fetus
 13. *Examples:* Eggs are produced in the *ovaries*. *Fertilization* occurs when a sperm unites with an egg. An embryo forms and is implanted into the *uterus*. A *placenta* develops and helps provide nutrients for the embryo. (The placenta also provides oxygen for the embryo and it helps to remove wastes from the embryo.)
 14. Responses include, but are not limited to: Offspring receive only half their genes (or DNA or chromosomes or genetic information) from each parent; They receive some genes from each parent.
 15. C
 16. A
 17. B
 18. *Examples:* — estrogen — progesterone — FSH — LH
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Answer Key
Repro and Genetics

19. — This process ensures that offspring will have all the genetic information needed. — Fertilization restores the full number of chromosomes characteristic of the species. — When the sperm and egg combine, the zygote will contain a full set of chromosomes.
 20. – natural selection – evolution – mutation – recombination
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