

- Many years ago, a scientist grew pea plants that produced wrinkled peas. The peas from these plants produced new plants that also produced wrinkled peas. The scientist concluded that something in the parent plants was being transmitted to the next generation. This discovery is now known as
 - genetic engineering
 - biological evolution
 - heredity**
 - natural selection
- The principles of dominance, segregation, and independent assortment were first described by
 - Watson
 - Linnaeus
 - Mendel**
 - Morgan
- A dog gave birth to the three puppies shown in the photograph below. One of the puppies has darker fur on its face than the other two.

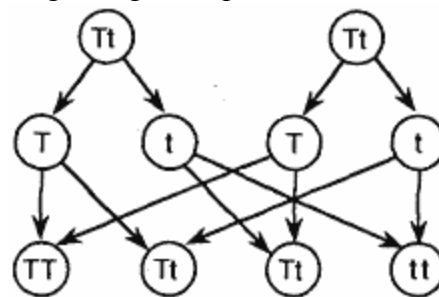


Source: <http://germanshepherdsatsdikennels.blogspot.com>

Which two biological processes account for this difference between the puppies?

- meiosis and recombination**
- meiosis and cloning
- mitosis and differentiation
- mitosis and cloning

- The processes of deletion, insertion, and substitution can alter genes in a skin cell. The altered genes will most likely be passed on to
 - sperm cells
 - egg cells
 - every cell that develops from that skin cell**
 - only a few of the cells that develop from that skin cell
- Which process will increase variations that could be inherited?
 - mitotic cell division
 - active transport
 - recombination of genes**
 - synthesis of proteins
- A pair of male Holstein (black-and-white) calves that have the same parents display many similarities but also exhibit some variations. Which process best explains these variations?
 - gene linkage
 - sex linkage
 - independent assortment**
 - dominance
- The diagram below represents the inheritance of stem height in garden peas.

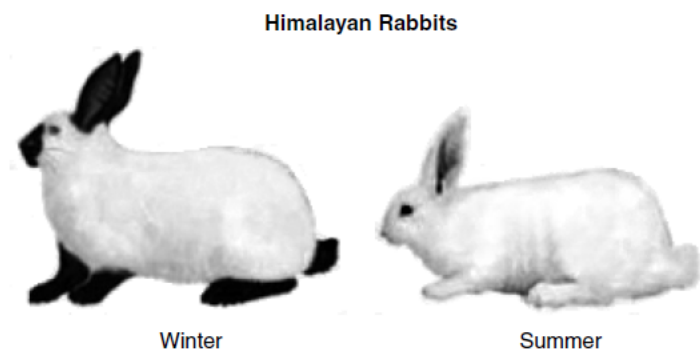


The diagram best illustrates

- intermediate inheritance
- segregation and recombination**
- sex linkage and codominance
- independent assortment

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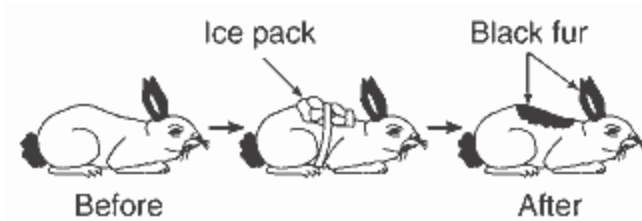
8. A hydrangea plant has blue flowers when grown in acidic soil, but has pink flowers when grown in basic soil. A clone of the pink-flowered plant is grown in acidic soil and produces blue flowers. This change in flower color is most likely due to
- A) sexual reproduction in the plants, resulting in variation
 - B) asexual reproduction in the plants, resulting in variation
 - C) genes being expressed in different ways due to environmental conditions**
 - D) a gene mutation that occurred after the clone was produced
9. A man is exposed to large amounts of ultraviolet radiation while sunbathing at the beach. This exposure causes a genetic change in the DNA of
- A) his male and female children
 - B) his male children, only
 - C) all cells in his body
 - D) his skin cells, only**
10. The photograph below shows two color variations of Himalayan rabbits. In the winter, the rabbits resemble the one on the left. In the summer, the rabbits resemble the one on the right.



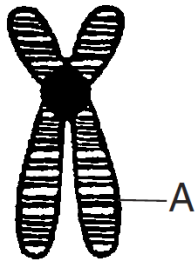
The changes in fur color are most likely due to

- A) a virus that affected genes in specific areas of the body
- B) the sorting and recombination of genes
- C) gene expression due to the differences in abiotic conditions**
- D) the molecular arrangement of sugars

11. Which statement best explains the change shown in the diagram below?



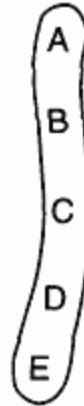
- A) **Gene expression in an organism can be modified by interactions with the environment.**
- B) Certain rabbits produce mutations that affect genes in specific areas of the body.
- C) Sorting and recombination of genes can be influenced by very cold temperatures.
- D) Molecular arrangement in existing proteins can be altered by environmental factors.
12. The diagram below represents a microscopic structure observed during mitosis.



The region indicated by letter *A* is known as

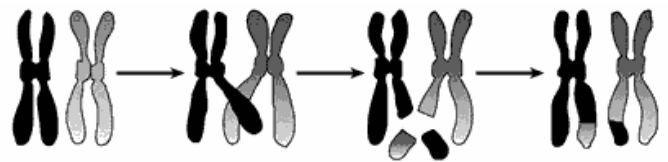
- A) an enzyme B) a gamete
- C) **a gene** D) an amino acid

13. The letters in the diagram below represent genes on a particular chromosome.



Gene *B* contains the code for an enzyme that cannot be synthesized unless gene *A* is also active. Which statement best explains why this can occur?

- A) **A hereditary trait can be determined by more than one gene.**
- B) Genes are made up of double-stranded segments of DNA.
- C) All the genes on a chromosome act to produce a single trait.
- D) The first gene on each chromosome controls all the other genes on the chromosome.
14. The diagram below shows a process that can occur during meiosis.

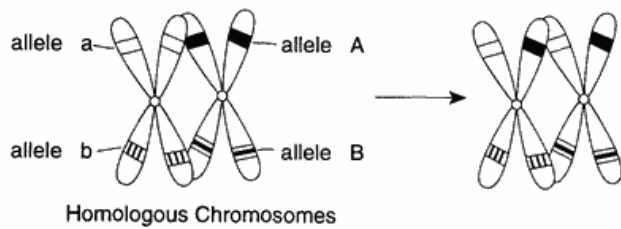


The most likely result of this process is

- A) **a new combination of inheritable traits that can appear in the offspring**
- B) an inability to pass either of these chromosomes on to offspring
- C) a loss of genetic information that will produce a genetic disorder in the offspring
- D) an increase in the chromosome number of the organism in which this process occurs

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15. The results of a genetic process are represented in the diagram below.



Which process most likely produced these results?

- A) chromosomal mutation during mitosis
 - B) nondisjunction during meiosis
 - C) independent assortment during mitosis
 - D) crossing-over during meiosis**
16. A strand of DNA in a skin cell contains the bases:

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

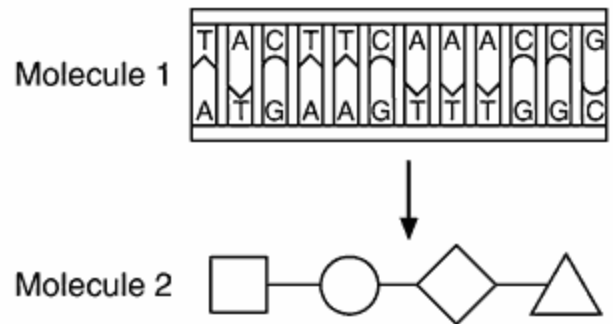
After the cell is exposed to ultraviolet light, the strand contains the bases:

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

Which statement describes the result of this exposure?

- A) A new base has been inserted.**
- B) A base has been deleted.
- C) One base has been substituted for another.
- D) There have been no changes in the bases.

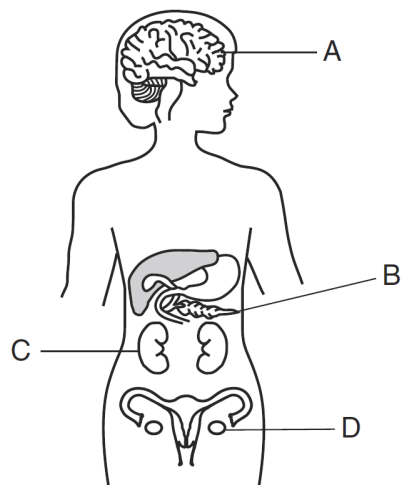
17. Molecule 1 represents a segment of hereditary information, and molecule 2 represents the portion of a molecule that is determined by information from molecule 1.



What will most likely happen if there is a change in the first three subunits on the upper strand of molecule 1?

- A) The remaining subunits in molecule 1 will also change.
 - B) A portion of molecule 2 may be different.**
 - C) Molecule 1 will split apart, triggering an immune response.
 - D) Molecule 2 may form two strands rather than one.
18. At one point, scientists observed that the ozone shield was getting thinner. They warned that the loss of the effectiveness of this shield may lead to an increase in
- A) allergies to ozone
 - B) mutations that lead to cancer**
 - C) viral diseases, such as AIDS
 - D) ice formation at the poles
19. When receiving x rays, individuals wear a lead shield over major organs in order to limit the body's exposure to radiation. One reason for this procedure is to
- A) protect the patient against broken bones
 - B) prevent mutations in gametes**
 - C) improve circulation in the patient
 - D) increase the chance of a change in DNA

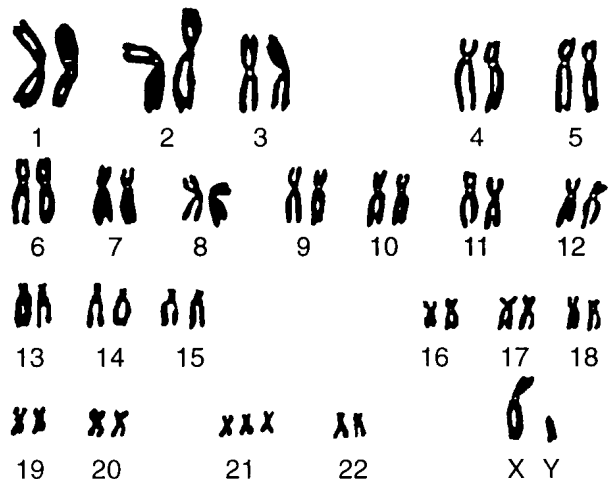
20. Some organs in the human body are represented in the diagram below.



A sudden change in the DNA of cells developing in which organ could be passed to future generations?

- A) *A* B) *B* C) *C* **D) *D***

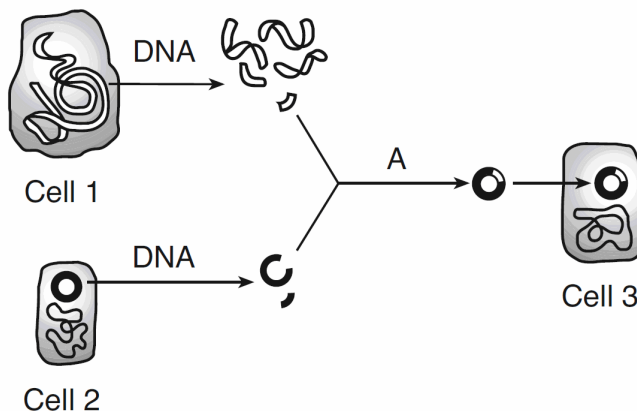
21. Base your answer to the following question on the diagram of paired homologous chromosomes shown below and on your knowledge of biology.



Which technique was used to organize the chromosomes as shown in the diagram?

- A) screening B) chromatography
C) **karyotyping** D) grafting

22. A laboratory technique is represented in the diagram below. Letter *A* represents a process.



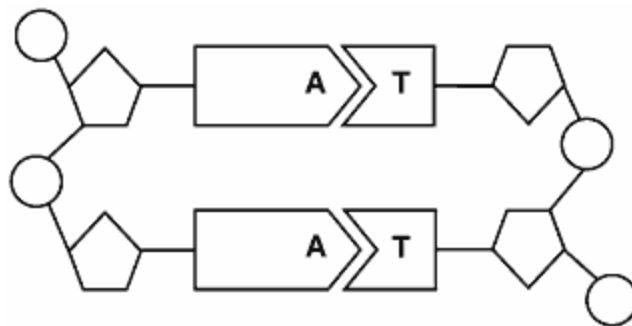
Which specific chemicals are needed to successfully carry out the process shown at *A*?

- A) receptor molecules
B) carbohydrates
C) enzymes
D) starch molecules

23. In a DNA sample, 15% of the bases are thymine (T). What percentage of the bases in this sample are adenine (A)?

- A) **15%** B) 30% C) 35% D) 85%

24. A portion of a molecule is shown in the diagram below.



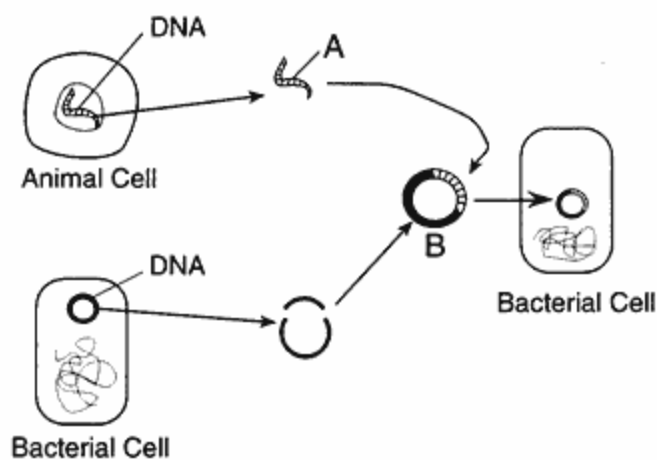
Which statement best describes the main function of this type of molecule?

- A) It is a structural part of the cell wall.
B) It stores energy for metabolic processes.
C) It determines what traits may be inherited.
D) It transports materials across the cell membrane.

25. In a portion of a gene, the nitrogenous base sequence is T-C-G-A-A-T. Which nitrogenous base sequence would normally be found bonded to this section of the gene?

- A) A-C-G-T-A-A B) A-C-G-U-U-A
C) **A-G-C-T-T-A** D) U-G-C-A-A-U

Base your answers to questions 26 through 28 on " the diagram below and on your knowledge of biology.



26. Structure A contains a

- A) **genetic code**
B) single nucleotide, only
C) messenger RNA molecule
D) small polysaccharide

27. Structure B represents

- A) a ribosome
B) transfer RNA
C) **recombinant DNA**
D) a male gamete

28. The technique illustrated in the diagram is known as

- A) cloning
B) **genetic engineering**
C) protein synthesis
D) in vitro fertilization

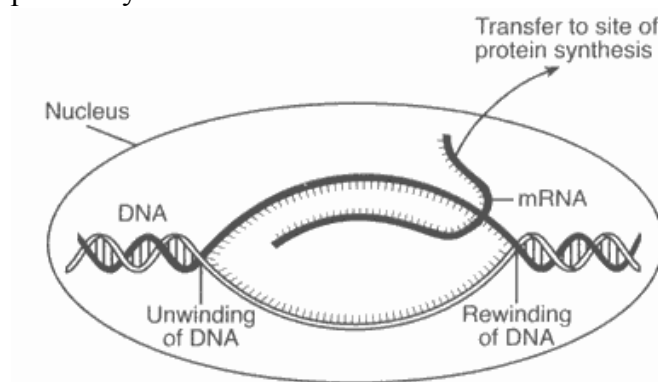
29. The instructions for the genetic traits of an organism are directly determined by the

- A) numbers of A, T, C, and G units in a sugar molecule
B) **sequence of bases in DNA molecules**
C) length of a DNA molecule
D) way the bases are paired in the two strands of a DNA molecule

30. Before a cell divides, an exact copy of each chromosome is made by the process of

- A) genetic engineering
B) **replication**
C) mutation
D) recombination

31. The diagram below shows some of the steps in protein synthesis?

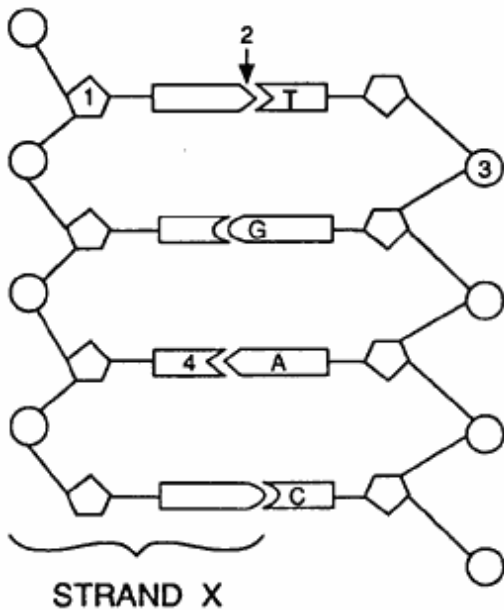


The section of DNA being used to make the strand of mRNA is known as a

- A) carbohydrate B) **gene**
C) ribosome D) chromosome

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Base your answers to questions 32 through 34 on the diagram below of a DNA molecule and on your knowledge of biology.

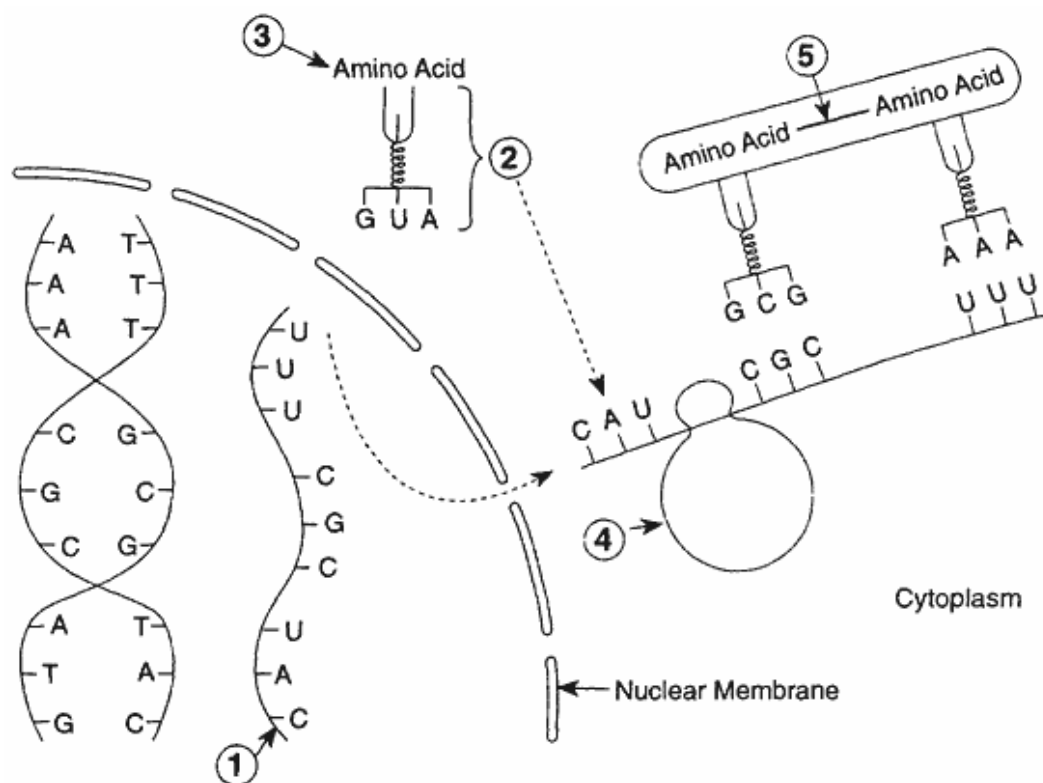


32. Which activity occurs in the process of replication?
- A) Structure 1 is hydrolyzed.
 - B) A chemical bond is broken in region 2.**
 - C) Structure 3 is synthesized.
 - D) Proteins are formed in region 2.
33. The base sequence of strand X is
- A) C-A-T-G
 - B) A-C-G-T
 - C) A-C-T-G**
 - D) G-C-T-A
34. A change in the sequence of T, G, A, and C would result in
- A) nondisjunction
 - B) polyploidy
 - C) a sex-linked gene
 - D) a gene mutation**
-
35. A mutation occurring in a human can be passed from parent to offspring when it occurs in a
- A) lung cell, due to exposure to a toxic gas
 - B) gamete formed in the ovary**
 - C) body cell undergoing mitosis
 - D) heart cell with chromosome damage

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Base your answers to questions 36 through 38 on

the diagram below, which represents some biochemical reactions involved in a cellular process.



36. The molecule coded directly from DNA is represented by number

- A) 1 B) 2 C) 3 D) 4

37. What is an example of a molecule produced by this type of process?

- A) glucose B) glycogen C) a fatty acid **D) a protein**

38. What is the bond labeled 5 known as?

- A) **a peptide bond** B) a hydrogen bond
C) an ionic bond D) a carboxyl bond

39. A sequence of three nitrogenous bases in a messenger-RNA molecule is known as a

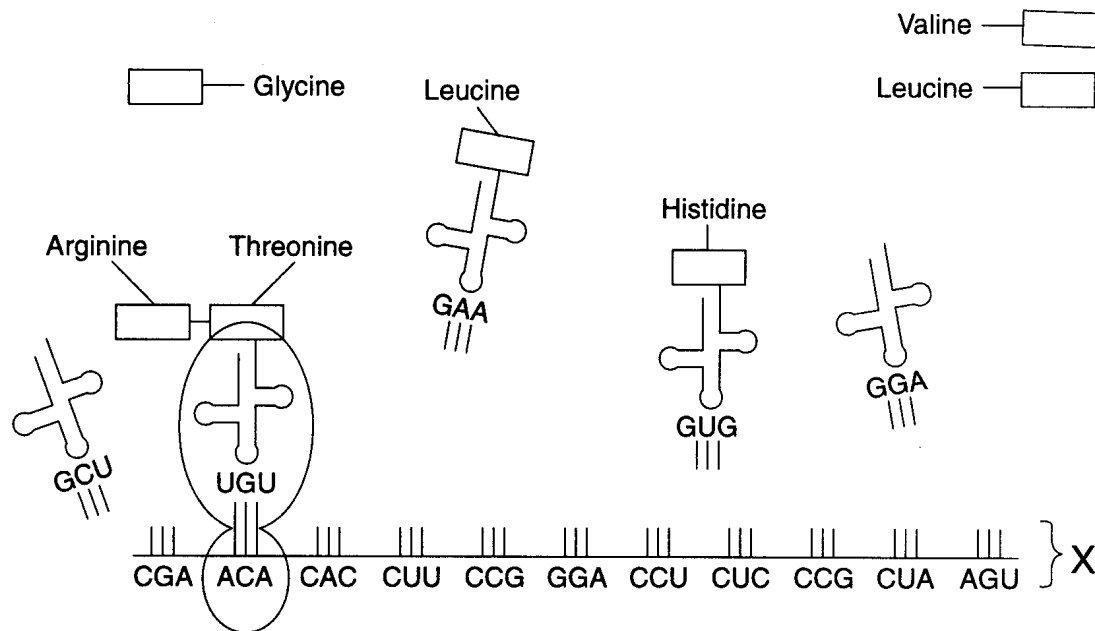
- A) **codon** B) gene
C) polypeptide D) nucleotide

40. Which base is normally used in the synthesis of RNA but *not* in the synthesis of DNA?

- A) adenine **B) uracil**
C) cytosine D) guanine

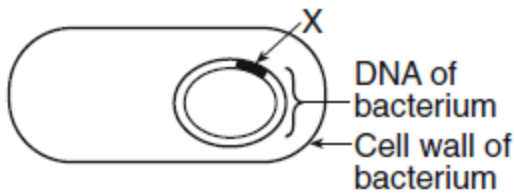
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Base your answers to questions 41 through 43 on the diagram below of a biochemical process and on your knowledge of biology.



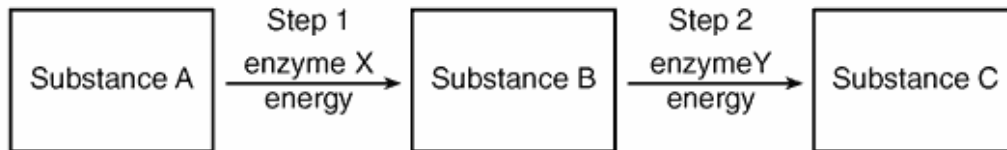
41. The synthesis of structure *X* occurred in the
A) **nucleus** B) cytoplasm C) lysosome D) vacuole
42. Which amino acid would be transferred to the position of codon CAC?
A) leucine B) glycine C) valine D) **histidine**
43. The biochemical process represented in the diagram is most closely associated with the cell organelle is known as the
A) nucleolus B) **ribosome** C) chloroplast D) mitochondrion

44. The diagram below shows some of the DNA in a bacterium into which a human gene, *X*, has been successfully inserted.



The bacteria that result from reproduction of this cell will most likely have the ability to

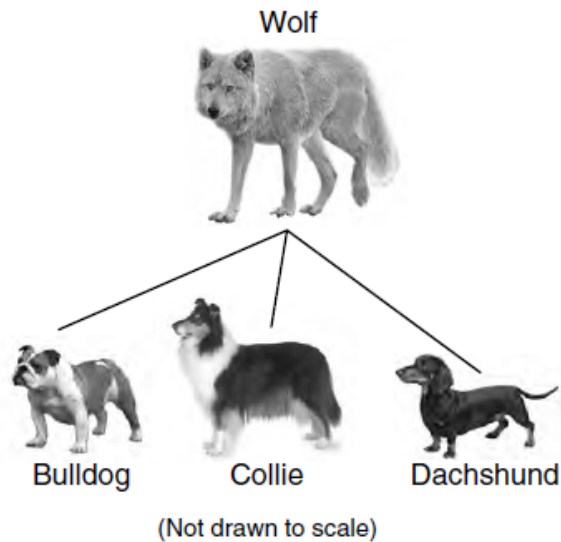
- A) replicate all of the genetic instructions found in humans
 - B) produce vaccines to be used to immunize humans
 - C) produce a human blood cell according to instructions in gene *X*
 - D) produce the human protein coded for by gene *X***
45. The diagram below represents the chemical pathway of a process in a human liver cell.



A particular liver cell is unable to make substance *C*. One possible explanation for the inability of this cell to make substance *C* is that

- A) excess energy for step 2 prevented the conversion of substance *B* to substance *C*
- B) an excess of enzyme *X* was present, resulting in a decrease in the production of substance *B*
- C) nuclear DNA was altered resulting in the cell being unable to make enzyme *Y***
- D) a mutation occurred causing a change in the ability of the cell to use substance *C*

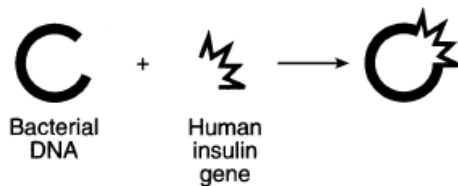
46. The diagram below indicates a few of the many varieties of domestic dogs thought to have originated from wolves that were domesticated thousands of years ago.



Adapted from: <http://evolution.berkeley.edu/evolibrary/article>

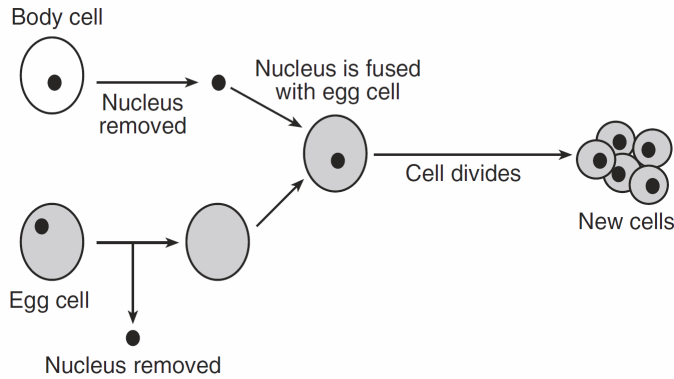
The many varieties of domesticated dogs were most likely produced as a result of

- A) mutating the body cells of the dogs
 - B) selective breeding over many generations**
 - C) genetic engineering with specific enzymes
 - D) cloning dogs with desirable traits
47. The process shown below is used to



- A) determine if a person has a genetic disease
- B) produce human growth hormone
- C) identify the father of a newborn
- D) produce a hormone to regulate blood sugar**

48. A technique used to alter cells is represented in the diagram below.



The genetic material contained in the nucleus of each of the new cells is most likely

- A) **identical to that in the original body cell**
- B) identical to that in the original egg cell
- C) 50% the same as the original egg cell and 50% the same as the original body cell
- D) 25% the same as the original egg cell and 75% the same as the original body cell

49. Scientists have been investigating a way to recreate extinct species such as the saber-toothed cat illustrated below.



Source: <https://IGS.Indiana.edu>

Which technique would use DNA from an extinct species to recreate an organism of the species?

- A) natural selection
- B) differentiation
- C) **cloning**
- D) selective breeding

Answer Key
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1. C
2. C
3. A
4. C
5. C
6. C
7. B
8. C
9. D
10. C
11. A
12. C
13. A
14. A
15. D
16. A
17. B
18. B
19. B
20. D
21. C
22. C
23. A
24. C
25. C
26. A
27. C
28. B
29. B
30. B
31. B
32. B
33. C
34. D
35. B
36. A

37. D
 38. A
 39. A
 40. B
 41. A
 42. D
 43. B
 44. D
 45. C
 46. B
 47. D
 48. A
 49. C
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