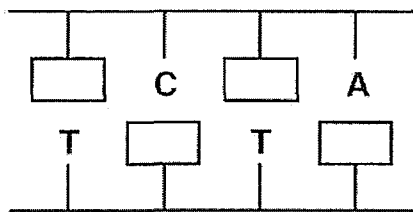


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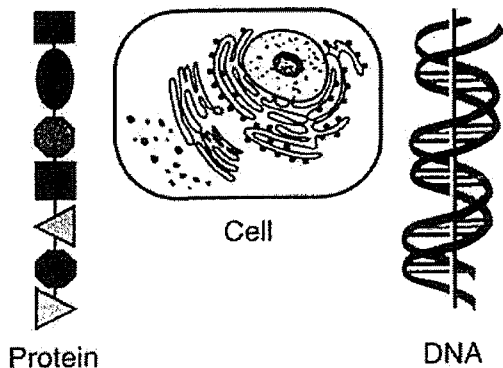
Topic Review: Modern Genetics Living Environment

1. The diagram below represents an incomplete section of a DNA molecule. The boxes represent unidentified bases.



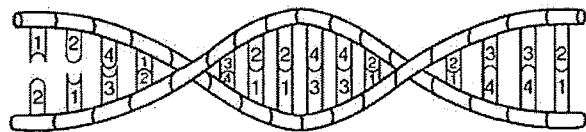
When the boxes are filled in, the total number of bases represented by the letter *A* (both inside and outside the boxes) will be

- | | |
|------|------|
| 1) 1 | 3) 3 |
| 2) 2 | 4) 4 |
2. Three structures are represented in the diagram below.



What is the relationship between these three structures?

- DNA is made up of proteins that are synthesized in the cell.
 - Protein is composed of DNA that is stored in the cell.
 - DNA controls the production of protein in the cell.
 - The cell is composed only of DNA and protein.
3. The diagram below represents a section of a molecule that carries genetic information.



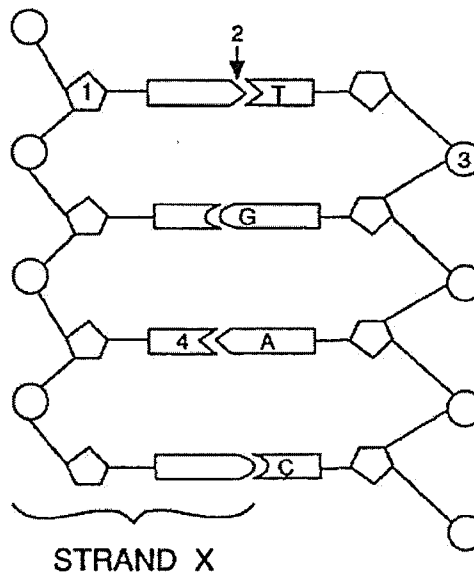
The pattern of numbers represents

- a sequence of paired bases
- the order of proteins in a gene
- fold of an amino acid
- positions of gene mutations

4. The genetic code of a DNA molecule is determined by a specific sequence of

- | | |
|--------------------|--------------------|
| 1) ATP molecules | 3) chemical bonds |
| 2) sugar molecules | 4) molecular bases |

5. Base your answer to the following question on the diagram below of a DNA molecule and on your knowledge of biology.



Structure 3 represents a

- | | |
|----------------------|-----------------|
| 1) phosphate | 3) ribose sugar |
| 2) deoxyribose sugar | 4) base |

6. Which pair of molecules, when bonded together, would most likely be found in a nucleotide of DNA?

- | | |
|-----------------------|----------------------------|
| 1) ribose and adenine | 3) deoxyribose and guanine |
| 2) ribose and thymine | 4) deoxyribose and uracil |

7. Which is the sugar component of a DNA nucleotide?

- | | |
|----------------|--------------|
| 1) adenine | 3) glucose |
| 2) deoxyribose | 4) phosphate |

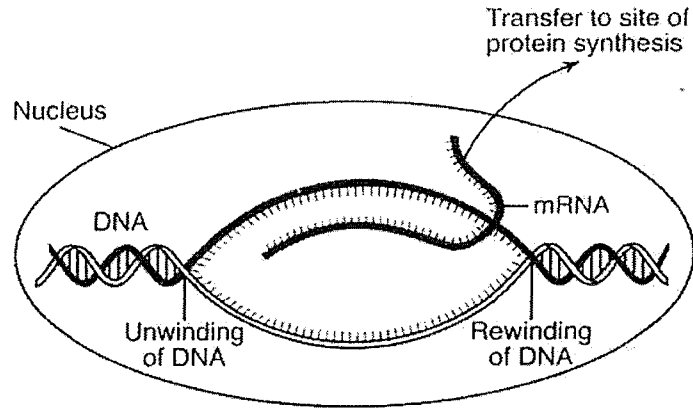
8. Genes involved in the production of abnormal red blood cells have an abnormal sequence of

- | | |
|------------------|-----------|
| 1) ATP molecules | 3) sugars |
| 2) amino acids | 4) bases |

9. One similarity between DNA and messenger RNA molecules is that they both contain

- the same sugar
- genetic codes based on sequences of bases
- a nitrogenous base known as uracil
- double-stranded polymers

10. 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

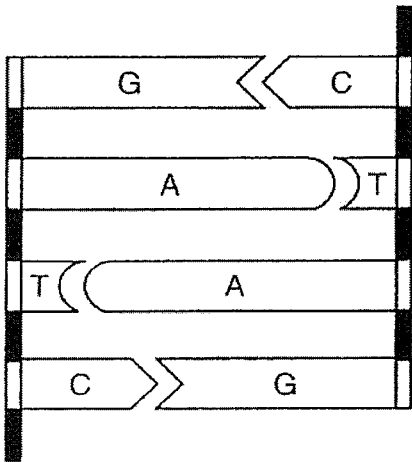
- 1) carbohydrate 2) gene 3) ribosome 4) chromosome

11. Which nuclear process is represented below?

A DNA molecule → The two strands of → Molecular bases → Two identical DNA
 untwists. DNA separate. pair up. molecules are produced.

- 1) recombination 2) fertilization 3) replication 4) mutation

12. The diagram below represents a portion of a type of organic molecule present in the cells of organisms.



What will most likely happen if there is a change in the base sequence of this molecule?

- 1) The molecule will be converted into an inorganic compound.
- 2) The amino acid sequence may be altered during protein synthesis.
- 3) The chromosome number will decrease in future generations.
- 4) The chromosome number may increase within the organisms.

13. A change in the base subunit sequence during DNA replication can result in

- 1) variation within an organism
- 2) rapid evolution of an organism
- 3) synthesis of antigens to protect the cell
- 4) recombination of genes within the cell

14. Which statement indicates one difference between the gene that codes for insulin and the gene that codes for testosterone in humans?

- 1) The gene for insulin is replicated in vacuoles, while the gene for testosterone is replicated in mitochondria.
- 2) The gene for insulin has a different sequence of molecular bases than the gene for testosterone.
- 3) The gene for insulin is turned on in liver cells, but the gene for testosterone is not.
- 4) The gene for insulin is a sequence of five different molecular bases while the gene for testosterone is a sequence of only four different molecular bases.

15. The DNA of a human cell can be cut and rearranged by using

- 1) a scalpel 3) hormones
- 2) electrophoresis 4) enzymes

16. Which phrase does *not* describe cells cloned from a carrot?

- 1) they are genetically identical
- 2) they are produced sexually
- 3) they have the same DNA codes
- 4) they have identical chromosomes

17. Base your answer to the following question on the portion of the mRNA codon chart and information below.

AUU } AUC } ILE AUA } (Isoleucine) AUG } MET } (Methionine)	ACU } ACC } THR ACA } (Threonine) ACC }	AAU } ASN AAC } (Asparagine) AAA } LYS AAG } (Lysine)	AGU } SER AGC } (Serine) AGA } ARG AGG } (Arginine)
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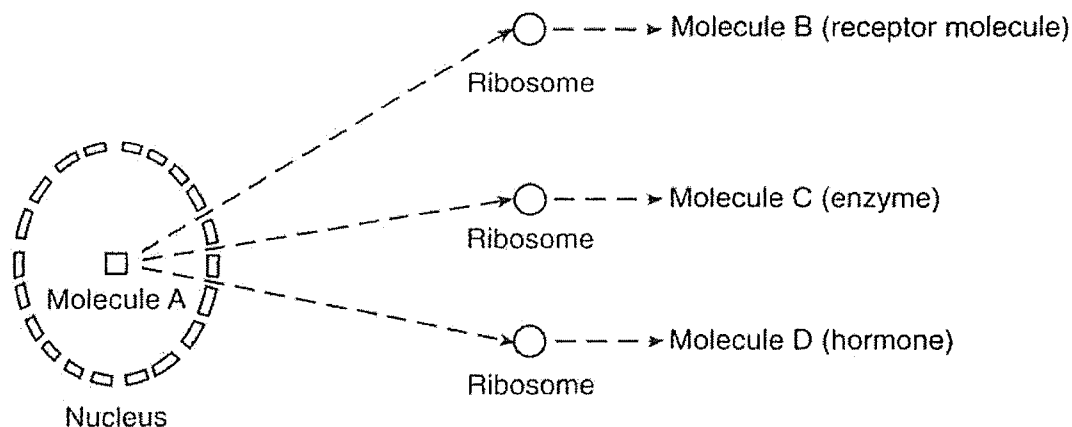
Series I represents three mRNA codons. Series II includes a mutation of series I.

Series I AGAUCGAGU

Series II ACAUCGAGU

How would the amino acid sequence produced by the mutant strand (series II) compare to the amino acid sequence produced by series I?

- 1) The amino acid sequence would be shorter.
 - 2) One amino acid in the sequence would change.
 - 3) The amino acid sequence would remain unchanged.
 - 4) More than one amino acid in the sequence would change.
18. Base your answer to the following question on the diagram below, which represents a sequence of events in a biological process that occurs within human cells and on your knowledge of biology.



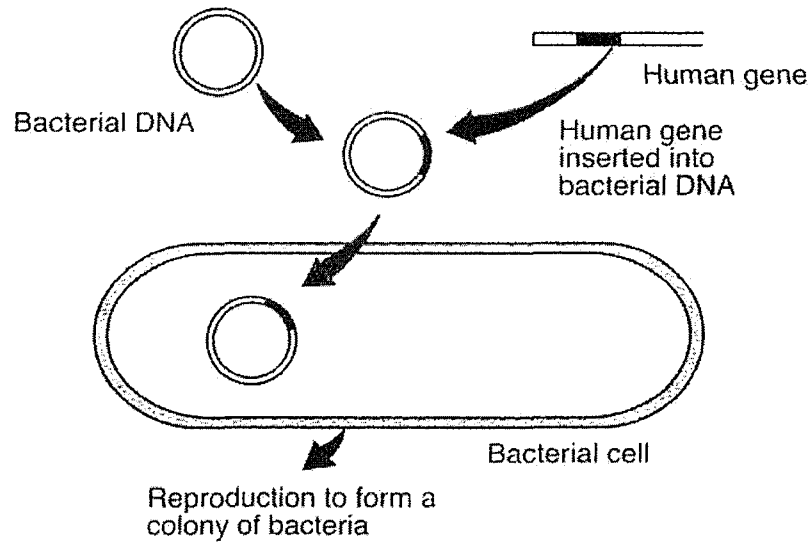
Molecule A contains the

- 1) starch necessary for ribosome synthesis in the cytoplasm
 - 2) organic substance that is broken down into molecules B, C, and D
 - 3) proteins that form the ribosome in the cytoplasm
 - 4) directions for the synthesis of molecules B, C, and D
19. Base your answer to the following question on the statement below and on your knowledge of biology.

Selective breeding has been used to improve the racing ability of horses.

State *one disadvantage* of selective breeding.

20. The diagram below represents a genetic procedure.



Which statement best describes the outcome of this procedure?

- 1) Bacterial cells will destroy defective human genetic material.
- 2) Bacterial cells may form a multicellular embryo.
- 3) The inserted human DNA will change harmful bacteria to harmless ones.
- 4) The inserted human DNA may direct the synthesis of human proteins.

21. Steps in a reproductive process used to produce a sheep with certain traits are listed below.

- Step 1** — The nucleus was removed from an unfertilized egg taken from sheep *A*.
- Step 2** — The nucleus of a body cell taken from sheep *B* was then inserted into this unfertilized egg from sheep *A*.
- Step 3** — The resulting cell was then implanted into the uterus of sheep *C*.
- Step 4** — Sheep *C* gave birth to sheep *D*.

Which sheep would be most genetically similar to sheep *D*?

- 1) sheep *A*, only
- 2) sheep *B*, only
- 3) both sheep *A* and *B*
- 4) both sheep *A* and *C*

Base your answers to questions 22 through 24 on the passage below and on your knowledge of biology.

In Search of a Low-Allergy Peanut

Many people are allergic to substances in the environment. Of the many foods that contain allergens (allergy-inducing substances), peanuts cause some of the most severe reactions. Mildly allergic people may only get hives. Highly allergic people can go into a form of shock. Some people die each year from reactions to peanuts.

A group of scientists is attempting to produce peanuts that lack the allergy-inducing proteins by using traditional selective breeding methods. They are searching for varieties of peanuts that are free of the allergens. By crossing those varieties with popular commercial types, they hope to produce peanuts that will be less likely to cause allergic reactions and still taste good. So far, they have found one variety that has 80 percent less of one of three complex proteins linked to allergic reactions. Removing all three of these allergens may be impossible, but even removing one could help.

Other researchers are attempting to alter the genes that code for the three major allergens in peanuts. All of this research is seen as a possible long-term solution to peanut allergies.

22. Explain how selective breeding is being used to try to produce commercial peanuts that will *not* cause allergic reactions in people.
23. How does altering the DNA of a peanut affect the proteins in peanuts that cause allergic reactions?
- 1) The altered DNA is used to synthesize changed forms of these proteins.
 - 2) The altered DNA leaves the nucleus and becomes part of the allergy-producing protein.
 - 3) The altered DNA is the code for the antibodies against the allergens.
 - 4) The altered DNA is used as an enzyme to break down the allergens in peanuts.
24. Allergic reactions usually occur when the immune system produces
- | | |
|--|---|
| 1) antibiotics against usually harmless antigens | 3) antibodies against usually harmless antigens |
| 2) antigens against usually harmless antibodies | 4) enzymes against usually harmless antibodies |
-

25. Base your answer to the following question on the passage below.

The number in the parenthesis () at the end of a sentence is used to identify that sentence.

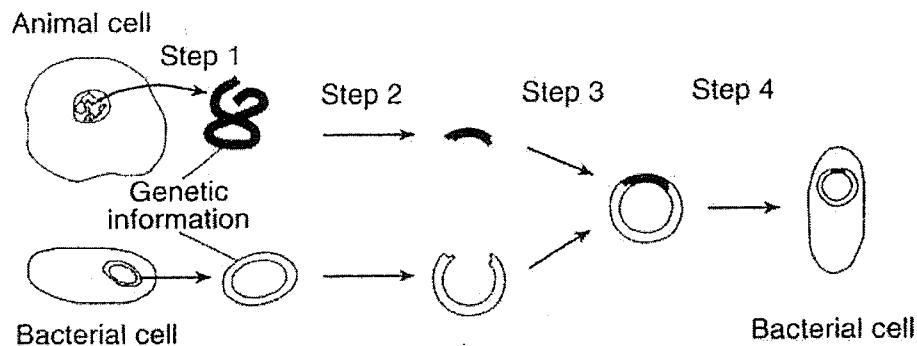
They Sure Do Look Like Dinosaurs

When making movies about dinosaurs, film producers often use ordinary lizards and enlarge their images thousands of times (1). We all know, however, that while they look like dinosaurs and are related to dinosaurs, lizards are not actually dinosaurs (2).

Recently, some scientists have developed a hypothesis that challenges this view (3). These scientists believe that some dinosaurs were actually the same species as some modern lizards that had grown to unbelievable sizes (4). They think that such growth might be due to a special type of DNA called repetitive DNA, often referred to as “junk” DNA because scientists do not understand its functions (5). These scientists studied pumpkins that can reach sizes of nearly 1,000 pounds and found them to contain large amounts of repetitive DNA (6). Other pumpkins that grow to only a few ounces in weight have very little of this kind of DNA (7). In addition, cells that reproduce uncontrollably have almost always been found to contain large amounts of this type of DNA (8).

Which kind of cells would most likely contain large amounts of repetitive DNA?

- 1) red blood cells
 - 2) cancer cells
 - 3) nerve cells
 - 4) cells that are unable to reproduce
26. Base your answer to the following question on the diagram below, which illustrates some steps in genetic engineering and on your knowledge of biology.



State *one* way that enzymes are used in step 2.

27. Scientists have successfully cloned sheep and cattle for several years. A farmer is considering the advantages and disadvantages of having a flock of sheep cloned from a single individual. Discuss the issues the farmer should take into account before making a decision. Your response should include:

- how a cloned flock would be different from a noncloned flock
- *one* advantage of having a cloned flock
- *one* disadvantage of having a cloned flock
- *one* reason that the farmer could *not* mate these cloned sheep with each other to increase the size of his flock
- *one* reason that the offspring resulting from breeding these sheep with an unrelated sheep would *not* all be the same

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

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

State *one* reason that mutations are often referred to as the “raw materials” of evolution.

29. 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
30. Base your answer to the following question on the passage below.

The Human Genome Project

For a number of years, scientists at Cold Spring Harbor Laboratory have been attempting to map every known human gene. By mapping, scientists mean that they are trying to find out on which of the 46 chromosomes each gene is located and exactly where on the chromosome the gene is located. By locating the exact positions of defective genes, scientists hope to cure diseases by replacing defective genes with normal ones, a technique known as gene therapy. Scientists can use specific enzymes to cut out the defective genes and insert the normal genes. They must be careful to use the enzyme that will splice out only the target gene, since different enzymes will cut DNA at different locations.

While the human genome project should eventually improve the health of humans, many people are skeptical and apprehensive, believing that gene therapy would be working against nature and would have religious, moral, legal, and ethical implications.

Explain why scientists must use only certain enzymes when inserting or removing a defective gene from a cell.

