

Unit 6 Topic Reviews

Topic 1: DNA History and Structure.

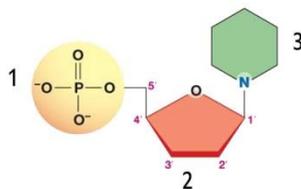
Matching: Write in the letter that corresponds to the term from the word bank that correctly completes each statement.

A. 3'	G. Adenine	M. Double Helix
B. 5'	H. Thymine	N. Complementary Base Pairing
C. Pyrimidines	I. Cytosine	O. Backbone
D. Purines	J. Guanine	P. 5-Carbon Sugar (deoxyribose)
E. Nucleotides	K. Hydrogen Bonds	Q. Phosphate Group
F. Watson and Crick	L. X-ray crystallography	R. Nitrogenous Base
	T. AntiParallel	S. Rosalind Franklin

- _____ determined that the basic structure of DNA—or deoxyribonucleic acid—is a _____. They used _____ data from _____ to support this conclusion.
- DNA is made of monomers called _____.
- Each nucleotide is made of three parts a _____, _____, and _____.
- There four different nitrogen bases found in DNA. They are _____, _____, _____, and _____.
- Sugars and phosphate groups make up the _____ of each DNA strand (the sides of the ladder).
- Nitrogen bases connect together across the double helix using _____ (a weak type of bond) to form the rungs of the DNA ladder.
- The phosphate end of the sugar-phosphate backbone is considered the _____ end of the strand.
- The sugar end of the sugar-phosphate backbone is considered the _____ end of the strand.
- Because the two DNA strands (the sides of the ladder) run in opposite directions from one another (i.e. one from 3' to 5' and the other from 5' to 3'), scientists say that the two strands are _____.
- Adenine and guanine are examples of _____, nitrogen bases with a double-ring structure.
- Thymine and cytosine are examples of _____, nitrogen bases with a single-ring structure.
- Erwin Chargaff found that there were equal amounts of adenine and thymine and equal amounts of guanine and cytosine in a DNA molecule. He concluded that adenine/thymine and guanine/cytosine pair together across the DNA double helix. The idea that certain bases always pair together is called _____.

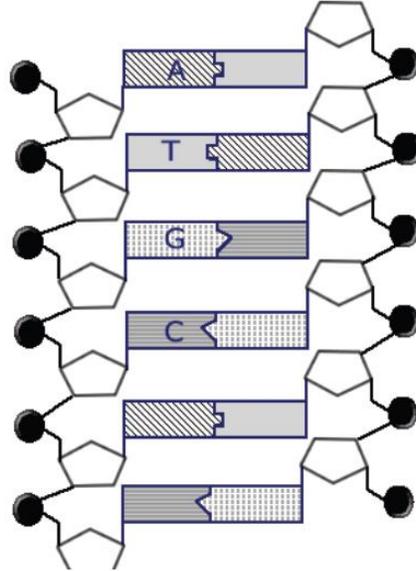
Labeling/Analyzing Images: Follow the directions next to each picture.

- Label the following parts of the nucleotide pictured below: sugar, phosphate group, and nitrogen base

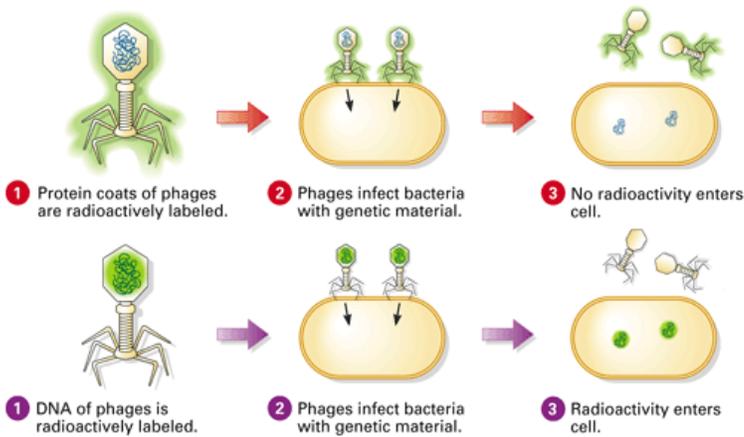


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14. Label the following parts of the DNA double helix pictured below: sugar, phosphate group, nitrogen base, 5' end (of both strands), 3' end (of both strands), hydrogen bond(s).
15. Circle a single nucleotide on the DNA double helix pictured below.
16. Label the "blank" nitrogen bases with the letter that corresponds to the "complementary base."



17. What conclusion did Hershey/Chase draw from their virus experiment? Explain your answer by referring to the picture below, which details the steps of the experiment.



Topic 2: DNA Replication

1. Why does DNA need to be replicated? _____
2. At what point, during the cell cycle, is the DNA replicated? _____
3. Mistakes are made during DNA replication. What is the initial rate of error in this process?

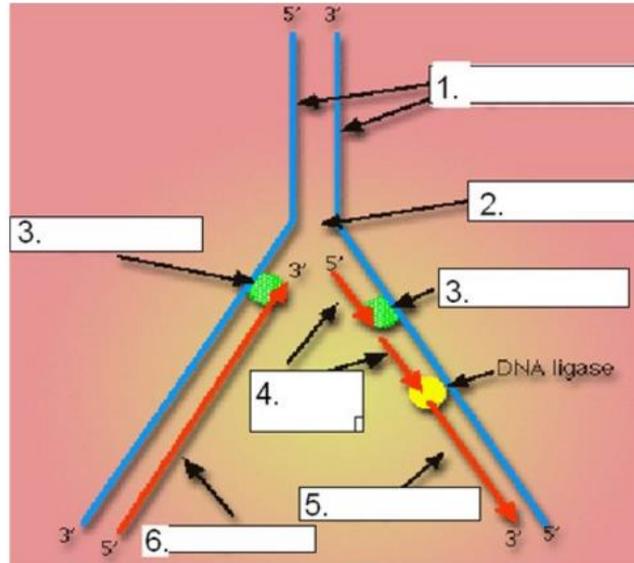
4. After proofreading, many errors have been fixed. Provide the new rate of error:

5. Provide the function for each of the following enzymes:
 - a. Helicase: _____

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- b. Primase: _____
 - c. Ligase: _____
 - d. Polymerase: _____
6. Match the following to their definitions.
- | | |
|----------------------|--|
| a. helicase | 1) short segments formed by the lagging strand |
| b. DNA polymerase | 2) the starting point for synthesis in DNA |
| c. replication fork | 3) enzyme that unwinds the DNA double helix |
| d. Okazaki fragments | 4) enzyme that matches complementary bases |
7. DNA Polymerase can only add nucleotides to which end of the DNA strand? _____
8. Which strand is built continuously into the replication fork? _____
9. Which strand is built in sections out of the replication fork? _____
10. Why is the process of DNA replication said to be semiconservative? _____
-

11. Label the following image:



Topic 3: Protein Synthesis

1. _____ is the process of making a protein. There are two steps: _____ and _____.
2. _____ takes place in the _____, because that is where _____ is located and DNA is too large to leave the nucleus.
3. _____ takes place at the ribosome, the site of protein synthesis.
4. _____ is single stranded and is made of nucleotides that are "read" in sets of three. Each set of three bases/nucleotides is called a _____ and each of these "codes" for one _____.
5. _____ is clover-shaped and has important components at each end. One end has three bases and this end is called an _____. At the other end, _____ is held and then dropped off for protein synthesis.
6. If a DNA sequence is TTC – ACG – GCA – CAT, what will the following be:
 - a. mRNA: _____
 - b. tRNA: _____
 - c. Amino acids: _____

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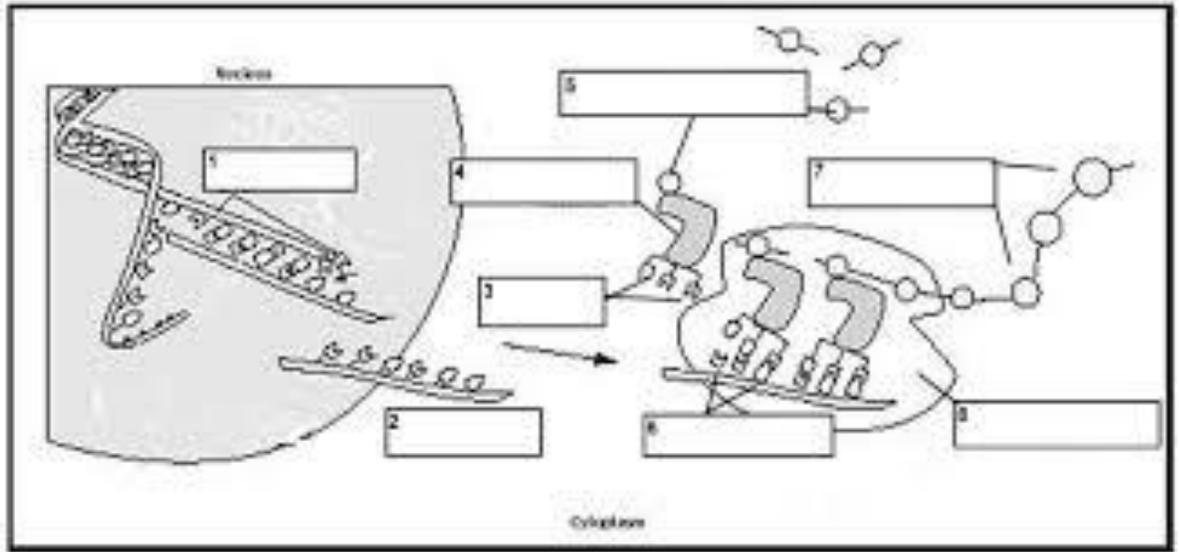
7. What is the monomer for both DNA and RNA (nucleic acids)? _____
8. What is the monomer for proteins? _____
9. What bond holds the monomer of proteins together? _____
10. What two changes can cause a frameshift mutation? _____ and _____
11. What are the three types of mutations caused by a substitution?

12. What type of mutation has the smallest effect on a protein?

13. When will a mutation be passed from parent to offspring?

14. Contrast gene mutations with chromosomal mutations:

15. Be familiar with the five types of chromosomal mutations. 😊
16. Label the image:



Topic 4: Biotechnology

Vocabulary: Match the term with the corresponding definition

A. Recombinant DNA	B. Gel electrophoresis	C. Genetic engineering	D. Cloning
E. Transgenic organism	F. Zygote	G. Restriction enzymes	H. DNA Finger Printing

1. _____ Organisms that are produced as the result of recombinant DNA technologies.
2. _____ The process of sorting DNA sequences by size, that allows them to then be read and analyzed.
3. _____ Chemicals that bind to and make cuts in DNA at specific locations.
4. _____ Refers to the fertilized egg.
5. _____ The modification of an organism's genetic composition by artificial means.

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6. Dolly was the first to be successfully created using _____.
7. _____ is used to solve crimes where DNA evidence is left behind
8. _____ DNA that contains genes from two or more organisms.
9. What is the most logical sequence of steps for splicing foreign DNA into a plasmid and inserting the plasmid into a bacterium (place the following steps in order)?
 - I. Transform bacteria with a recombinant DNA molecule.
 - II. Cut the plasmid DNA using restriction enzymes.
 - III. Extract plasmid DNA from bacterial cells.
 - IV. Hydrogen-bond the plasmid DNA to nonplasmid DNA fragments.
 - V. Use ligase to seal plasmid DNA to nonplasmid DNA.

Answer: _____

10. What is the overall goal of the human genome project?
11. List several benefits that have arisen from the completion of the Human Genome Project.

12. The DNA profiles in the image to the right represent four different individuals. Which of the following statements is consistent with these results?

- a. B is the child of A and C.
- b. C is the child of A and B.
- c. D is the child of B and C.
- d. A is the child of B and C.
- e. A is the child of C and D.

