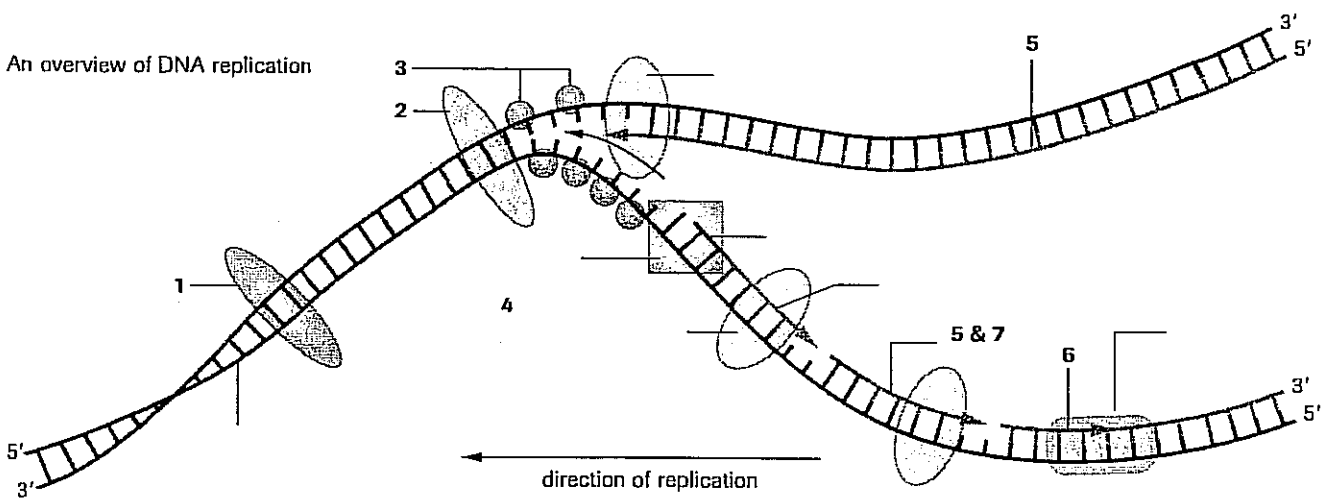
DNA Replication—An Overview

1. The enzyme _____ relieves any tension from the unwinding of the double helix.
2. The enzyme _____ breaks the hydrogen bonds holding the two complementary parent strands together, resulting in an unzipped helix that terminates at the _____.
3. _____ anneal to the newly exposed template strands, preventing them from reannealing.
4. The enzyme _____ lays down RNA primers that will be used by _____ as a starting point to build the new complementary strands.
5. _____ adds the appropriate deoxyribonucleoside triphosphates to the 3′ end of the new strand using the template strand as a guide. The energy in the phosphate bonds is used to drive the process. The _____ strand is built continuously toward the replication fork. A _____ strand composed of short segments of DNA, known as _____, is built discontinuously away from the replication fork.
6. _____ excises the RNA primers and replaces them with the appropriate deoxyribonucleotides. _____ joins the gaps in the Okazaki fragments by the creation of a _____ bond.
7. _____ and _____ proofread by excising incorrectly paired nucleotides at the end of the complementary strand and adding the correct nucleotides.

An overview of DNA replication



SBI4U Name: _____

GENETIC CHALLENGE WORKSHEET

1. From an extract of human cells growing in tissue culture, you obtain a white fibrous substance. By noting the differences in chemical structure, building blocks, etc. list the features by which you could distinguish whether it was DNA, RNA, or protein.

DNA	RNA	protein

2. If 35% of the nucleotide bases in a double-stranded DNA molecule are Thymine: what percentage of the bases are Cytosine, Adenine, and Guanine?

T = 35%	C = ___%	A = ___%	G = ___%

3. From a hospital patient afflicted with a viral disease, you isolate and culture some cells and then extract the DNA. You find that the DNA from the culture contains two different kinds of DNA, each placed in a different test tube: one is double-stranded human DNA and the other is single-stranded virus DNA. You analyze the percent base composition of the two DNA extracts with the following results:

	A	C	G	T
Tube 1	22	28	28	22
Tube 2	35	15	30	20

Which tube contains the single-stranded viral DNA? Explain how you know.

4. You have isolated some double-stranded dinosaur DNA from a biting insect preserved in fossilized amber! You then add the appropriate enzymes and manage to transcribe a strand of mRNA from one of the DNA strands. Below is the percentage composition of the bases for the DNA and mRNA:

	C	G	T	A	U
DNA strand 1	15	24	31	30	0
DNA strand 2	24	15	30	31	0
mRNA	24	15	0	31	30

Which strand of DNA is the strand from which the mRNA was made? Explain how you know.

5. The following base sequence represents part of a normal mRNA strand:

UAC-ACC-AUC-GCG

Write the sequence of amino acids coded for by the mRNA codons.

aa's: _____ - _____ - _____ - _____

A mutation of a single base in the mRNA (called a "point mutation") produces the sequence of amino acids below, where one amino acid is now different. Circle the different amino acid. Write the mRNA sequence of codons that codes for these amino acids and circle the base that has undergone mutation.

tyrosine - threonine - asparagine - alanine

mRNA: _____ - _____ - _____ - _____

Assuming that the change in the mRNA actually resulted from a mutation in the DNA (from which the mRNA is transcribed), what would the entire DNA sequence of triplets be? Circle the mutated DNA base.

DNA: _____ - _____ - _____ - _____

6. Give the mRNA, DNA, and tRNA sequences that code for each of the following amino acids. If there is more than one sequence, just give one.

	glutamine	serine	arginine
mRNA			
DNA			
tRNA			