

Interactive website to practice transcription/translation (also linked on calendar):

<http://learn.genetics.utah.edu/content/basics/transcribe/>

**Vocabulary**

DNA	Cytosine	DNA Replication	Small-scale Mutation
mRNA	Guanine	Transcription	Large-scale Mutation
Nucleotide	Uracil	Translation	Substitution (or Point)
Deoxyribose (sugar)	Gene Coding Strand	Mitosis	Insertion
Phosphate	Template Strand	Gene Expression	Deletion
Base	5' → 3'	Protein	Frameshift
Complementary Base Pairing	Helicase	Amino Acid	Silent Mutation
Adenine	DNA Polymerase	Codon	Missense
Thymine	tRNA (anti-codon)	Mutation	Nonsense
			Nondisjunction

**MAJOR IDEAS FROM THE UNIT: DNA REPLICATION, GENE EXPRESSION:  
TRANSCRIPTION & TRANSLATION, MUTATIONS, MITOSIS**

\*Check the calendar and review all activities and worksheets and lecture notes given during this unit. Be sure to review and correct any completed work and quizzes.

For each of the following sequences, fill in either the DNA, the mRNA sequence, or the amino acid sequences that have been left blank. If several sequences might work choose any one.

1. DNA T A C T G A T C G A C C C C C A T A A T G A A A A T C  
 mRNA A U G A C U A G C U G G G G G U A U U A C U U U U A G  
 AA Met Thr Thr Trp Gly Tyr Tyr Phe Stop  
 (start)

2. DNA T A C C G C T C C G C C G T C G A C A A T A C C A C T  
 mRNA A U G G C G A G G C G G C A G C U G U A A U G G U G A  
 AA Met Ala Arg Arg Gln Leu Leu Trp Stop  
 (start)

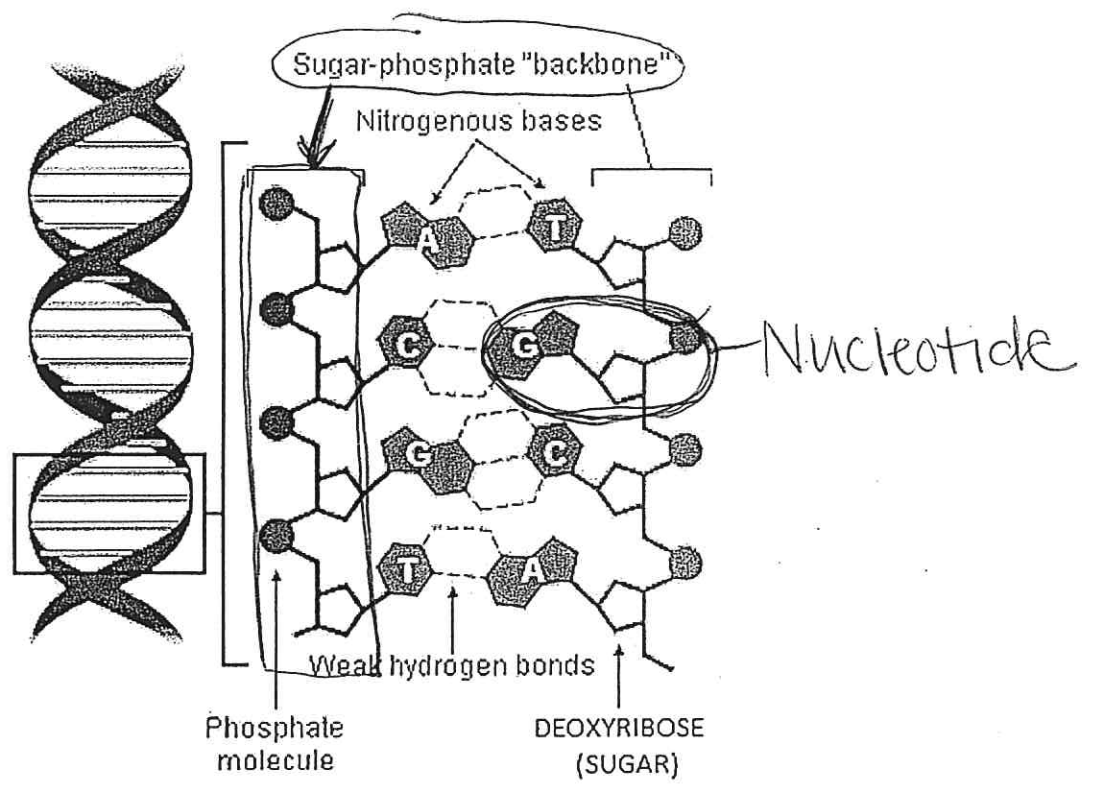
3. DNA T A C G G <sup>oops!</sup> C C T A A A C T A T T C G G T G G G A T T  
 mRNA A U G C C A G G A U U U G A U A A G C C A C C C U A A  
 AA Met Pro Gly Phe Asp Lys PRO Pro (STOP)  
 (start)

\* More than one codon will code for this amino acid

4. DNA    TAC GCG CCT AAG AAA TAC CAC CCC ACT  
 mRNA    AUG CGG GGA UUC UUU AUG GUG GGG UGA  
 AA        MET    \*ARG    \*GLY    \*PHE    \*PHE    MET    \*VAL    \*GLY    \*(STOP)

5. DNA    T A C    ACA CTA    A T G  
 mRNA    AUG    U G U    G A U    UAC  
 AA        Met    Cys    Asp    Tyr  
 (Start)

## DNA Structure



# Review

## Molecular Genetics

Process	Definition or description	Molecules involved (Major structures, enzymes used, and subunits involved)	Location in Cell or Body in which this process takes place	Significance (Why does this occur?)	Output (What is the end product of this process?)
DNA Replication	Making an exact copy of a DNA strand (Semi-conservative) each new double helix has one old + one new	Helicase $\Rightarrow$ unwinds DNA DNA polymerase $\Rightarrow$ adds nucleotides to the strand Nucleotides (deoxyribose, phosphate, base A $\leftrightarrow$ T, G $\leftrightarrow$ C)	Nucleus of cells	Pass on genetic information to new cells/offspring	2 identical strands of DNA
Transcription	DNA $\rightarrow$ mRNA is read 5' $\rightarrow$ 3'	messenger RNA RNA polymerase DNA template 3' $\rightarrow$ 5'	Nucleus of cells	mRNA is a messenger it carries genetic information from the nucleus to the ribosomes in cytoplasm.	mRNA
Translation	mRNA $\rightarrow$ amino acid sequence	mRNA, transfer RNA (tRNA); amino acids codons; anti-codons	Cytoplasm	TO create the amino acid sequence to build proteins.	Amino acid sequence/ polypeptide/protein.
Mitosis	Cell division for growth, repair, tissue development	DNA, sister chromatids, spindle fibers, cytoplasm	Somatic cells	For multicellular organisms to grow repair and replace damaged cells.	2 daughter cells.

Create large Venn Diagrams (here or in journal) to compare and contrast the following:

- Transcription vs. Translation
- DNA Replication vs. Mitosis OR DNA Replication vs. Transcription OR DNA Replication vs. Translation

# Molecular Genetics Review

Name \_\_\_\_\_

Complete each statement.

1. Adenine (A), Guanine (G), Cytosine (C), and Thymine (T) are the four nucleotides in DNA.
2. In DNA, Cytosine always forms hydrogen bonds with Guanine.
3. The sequence of DNA/nucleotides carries the genetic information of an organism.
4. The process of Replication produces a new copy of an organism's genetic information, which is passed on to a new cell.
5. The double-coiled shape of DNA is called a Double helix.
6. Proteins are made up of amino acids.
7. There are twenty different types of amino acids.
8. The message of the DNA code is information for ultimately building proteins to help express phenotype.
9. Each set of three nucleotides that code for an amino acid is known as a codon.
10. The amino acid (Thr)reonine is represented by the mRNA codon ACA.
11. UUU and UUC are mRNA codons for the amino acid Phenylalanine.
12. There can be more than one codon for the same amino acid.
13. For any one codon, there can be only ONE anti-codon.
14. UAA, UAG, and UGA are all stop codons.
15. Met and Trp are amino acids that are each represented by only one codon.
16. DNA is only found in the Nucleus.
17. The process of making RNA from DNA is called transcription.
18. The process of making an amino acid sequence and therefore a protein is called translation.
19. mRNA is a transcript, complimentary to DNA, that carries information from the DNA in the nucleus out into the cell.
20. A mutation is any mistake or change in the DNA or RNA sequence.
21. Protein synthesis is a complex process. You will be tracing the steps involved in protein synthesis of a part of a large molecule called Oxytocin. It is a hormone that helps regulate blood pressure, stimulates the uterus to contract during childbirth, and stimulates the production of milk after childbirth. Below is a sequence that codes for part of Oxytocin. Write the sequence of mRNA codons that would result from the transcription of the following DNA sequence.

DNA Sequence → ACA ATA TAG CTT TTG ACG GGG AAC CCC ATT

mRNA Sequence → UGU UAU AUC GAA AAC UGC CCC UUG GGG UAA

Amino Acids →  
(to become a protein) Cys Tyr Ile Glu Asn Cys Pro Leu Glu Stop