

13.1 RNA

The Role of RNA RNA (ribonucleic acid) is a nucleic acid like DNA. It consists of a long chain of nucleotides. The RNA base sequence directs the production of proteins. Ultimately, cell proteins result in phenotypic traits. The main differences between RNA and DNA are:

- ▶ The sugar in RNA is ribose instead of deoxyribose.
- ▶ RNA is generally single-stranded and not double-stranded like DNA.
- ▶ RNA contains uracil in place of thymine.

RNA can be thought of as a disposable copy of a segment of DNA. Most RNA molecules are involved in protein synthesis. The three main types of RNA are:

- ▶ **Messenger RNA (mRNA)** carries copies of instructions for polypeptide synthesis from the nucleus to ribosomes in the cytoplasm.
- ▶ **Ribosomal RNA (rRNA)** forms an important part of both subunits of the ribosomes, the cell structures where proteins are assembled.
- ▶ **Transfer RNA (tRNA)** carries amino acids to the ribosome and matches them to the coded mRNA message.

RNA Synthesis Most of the work of making RNA takes place during transcription. In **transcription**, segments of DNA serve as templates to produce complementary RNA molecules. In prokaryotes, RNA synthesis and protein synthesis takes place in the cytoplasm. In eukaryotes, RNA is produced in the cell's nucleus and then moves to the cytoplasm to play a role in the production of protein. The following focuses on transcription in eukaryotic cells.

- ▶ The enzyme **RNA polymerase** binds to DNA during transcription and separates the DNA strands. It then uses one strand of DNA as a template from which to assemble nucleotides into a complementary strand of RNA.
- ▶ RNA polymerase binds only to **promoters**, regions of DNA that have specific base sequences. Promoters are signals to the DNA molecule that show RNA polymerase exactly where to begin making RNA. Similar signals cause transcription to stop when a new RNA molecule is completed.
- ▶ RNA may be “edited” before it is used. Portions that are cut out and discarded are called **introns**. The remaining pieces, known as **exons**, are then spliced back together to form the final mRNA.

The Role of RNA

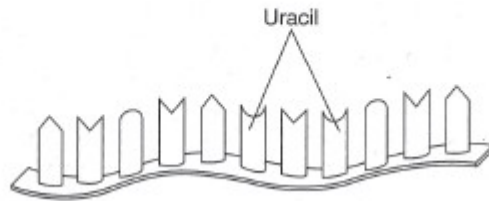
1. Complete the table to contrast the structures of DNA and RNA.

	Sugar	Number of Strands	Bases
DNA			
RNA			

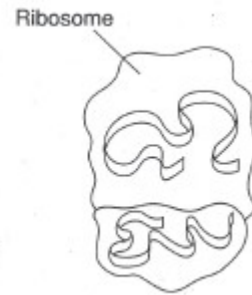
2. On the lines provided, identify each kind of RNA.



a. _____



b. _____



c. _____

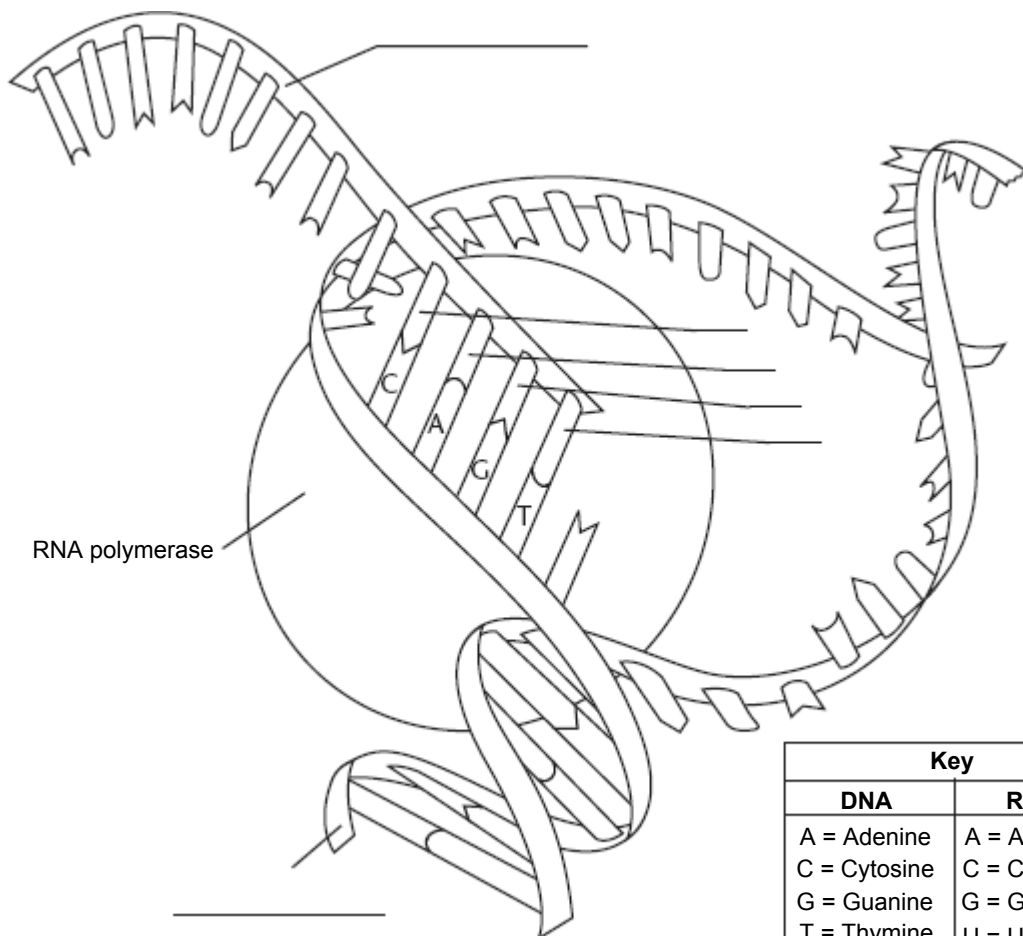
In transcription, RNA polymerase separates the two DNA strands. RNA then uses one strand as a template to make a complementary strand of RNA. RNA contains the nucleotide uracil instead of the nucleotide thymine.

Follow the directions.

3. Label the RNA

4. Label the DNA.

5. Use the key to label the missing nucleotides marked on the diagram.



Key	
DNA	RNA
A = Adenine	A = Adenine
C = Cytosine	C = Cytosine
G = Guanine	G = Guanine
T = Thymine	U = Uracil

Answer the questions.

17. What is the mRNA if the complementary DNA is TCTGAG? _____

18. What does a cell copy in DNA replication? _____

19. How many strands of DNA are used to make complementary strands of DNA?

20. How does the cell make RNA?

21. What are introns?

22. What are exons?

Follow the directions.

Create your own example of DNA with at least 10 pairs of bases. Fill in the chart.

Template	Complementary DNA	Messenger RNA (mRNA)