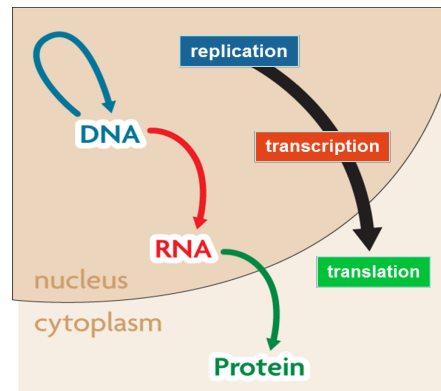


8.4 Transcription

I. RNA carries DNA's instructions.

*The *central dogma* states that information flows in one direction from *DNA to RNA to proteins*.



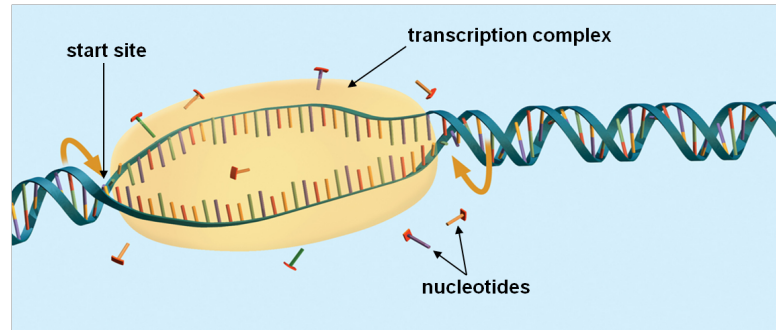
- The central dogma includes three processes.
 - *Replication*
 - *Transcription*
 - *Translation*
- *RNA* is a link between DNA and proteins.

II. Genes and Proteins

- The sequence of nucleotides in DNA, contain information that produce *proteins*.
- *Proteins* are key structures in cell function.
- The *sequence of nucleotides* in each gene contains information for assembling the string of amino acids that make up a single protein.

The Transfer of Genetic Information

- Scientists now know that DNA is used as a blueprint to make a similar molecule called *ribonucleic acid*, or *RNA*. This RNA molecule then directs the formation of proteins.
- *Gene expression* is the use of the genetic information in DNA to make proteins.



III. Gene expression takes place in two stages:

1. *Transcription* = the process by which a strand of RNA is made from DNA.
2. *Translation* = the process by which three different kinds of RNA work together to assemble amino acids into a protein molecule.

Through gene expression, the information encoded in DNA directs *all cellular activities*.

IV. How DNA Makes RNA

A. Why make RNA?

-because *DNA cannot leave the nucleus*. This is your cell's way of protecting the important genetic information.

B. Structure of RNA

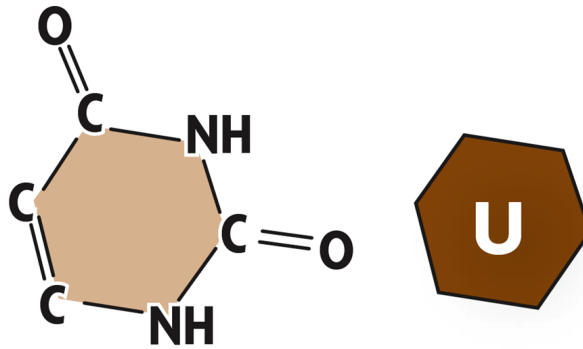
-Three parts:

1. *5-C sugar called ribose (it has an additional oxygen atom)*

2. *phosphate group*

3. *nitrogenous base*

adenine
cytosine
guanine
uracil

**Three different forms:**

- **Messenger RNA (*mRNA*)** *carries the message* that will be translated to form a protein.
- **Ribosomal RNA (*rRNA*)** *forms part of ribosomes* where proteins are made.
- **Transfer RNA (*tRNA*)** *brings amino acids* from the cytoplasm to a ribosome.

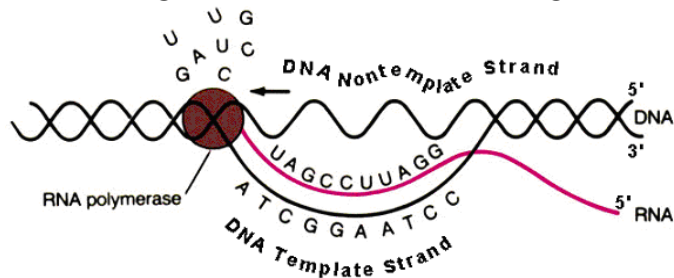
C. Steps of transcription

1. An enzyme by the name of **RNA polymerase** binds to a region of DNA called the **promoter** region.

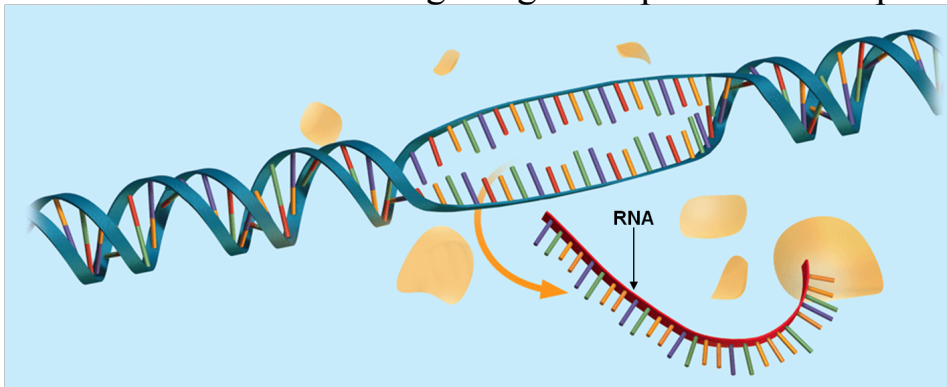
The enzyme moves along the strand of DNA and **unwinds** the double helix and separates a section of the two strands.

2. As RNA polymerase moves along the DNA strand **complimentary base-pairing** takes place between the DNA strand and **RNA** nucleotides.

The enzyme joins these nucleotides one right after the other, forming a chain of **single-stranded** RNA.



3. At some point a specific **“stop”** sequence or **terminator** in the DNA is reached. The polymerase then **detaches** from the DNA, and the RNA strand drifts **free**. The double helix of DNA then **winds** back up unharmed.
4. The mRNA just made, then passes through the **nuclear pores** of the nucleus and moves out into the **cytoplasm** of the cell where the second stage of gene expression takes place.



V. The transcription process is similar to replication.

- Transcription and replication **both** involve *complex enzymes* and complementary *base pairing*.
- The two processes have *different end results*.

Replication

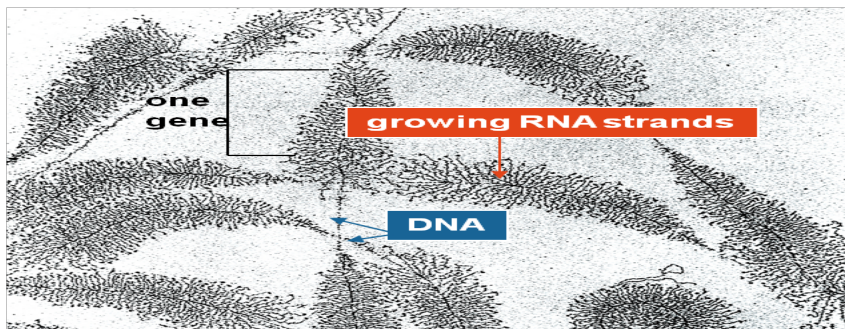
copies *all the DNA*

makes *one* copy per cell cycle

Transcription

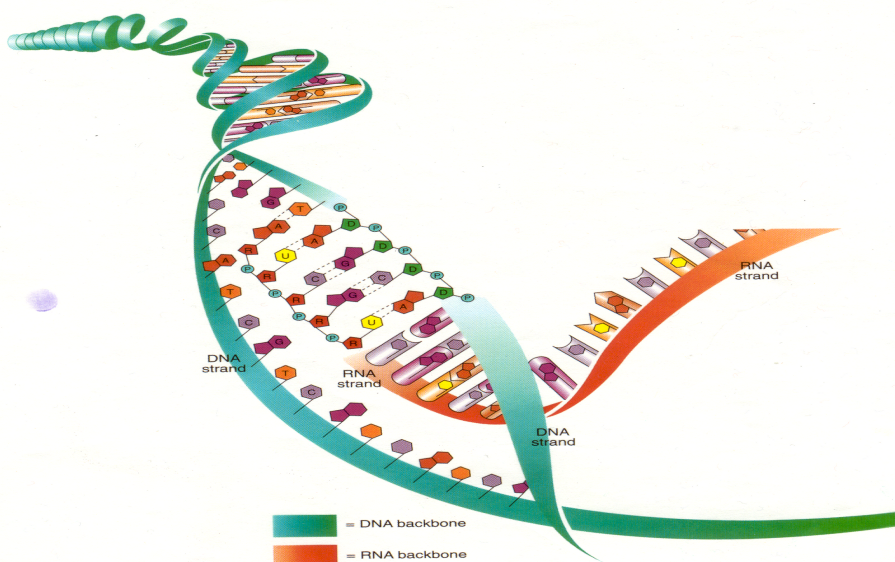
copies a *gene*.

makes *many* copies of genes



Transparency **17** DNA Transcription

BASIC CONCEPTS
Use with Chapter 11,
Section 11.2



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