

▶ Replication Review

1. What is DNA Replication?
2. Where does DNA Replication take place in eukaryotic cells?
3. Where does DNA Replication take place in the cell cycle?

4. What guides DNA Replication?
5. What enzymes do the work of DNA Replication?

▶ Replication Review

1. What is DNA Replication?

The process where DNA is copied to prepare the cell for mitosis (cell division)

2. Where does DNA Replication take place in eukaryotic cells?

nucleus

3. Where does DNA Replication take place in the cell cycle?

S (Synthesis) in Interphase

4. What guides DNA Replication?

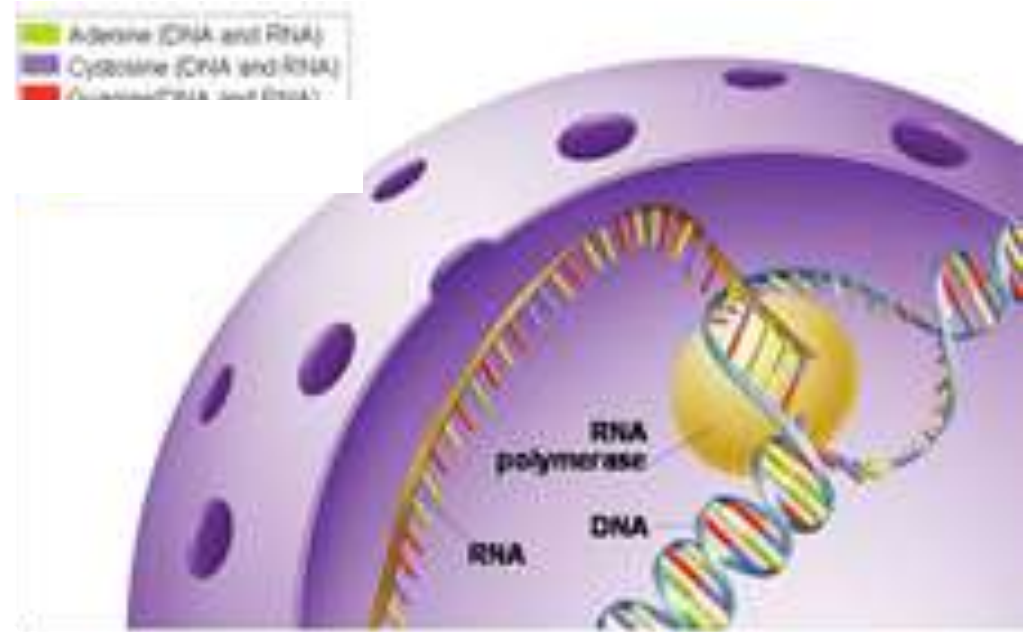
Base pairing rules (A with T & C with G)

5. What enzymes do the work of DNA Replication?

Helicase opens the double helix (uncoils); *DNA polymerase* adds the new nucleotides & proofreads

KEY CONCEPT - Transcription converts a gene into a single-stranded RNA molecule.

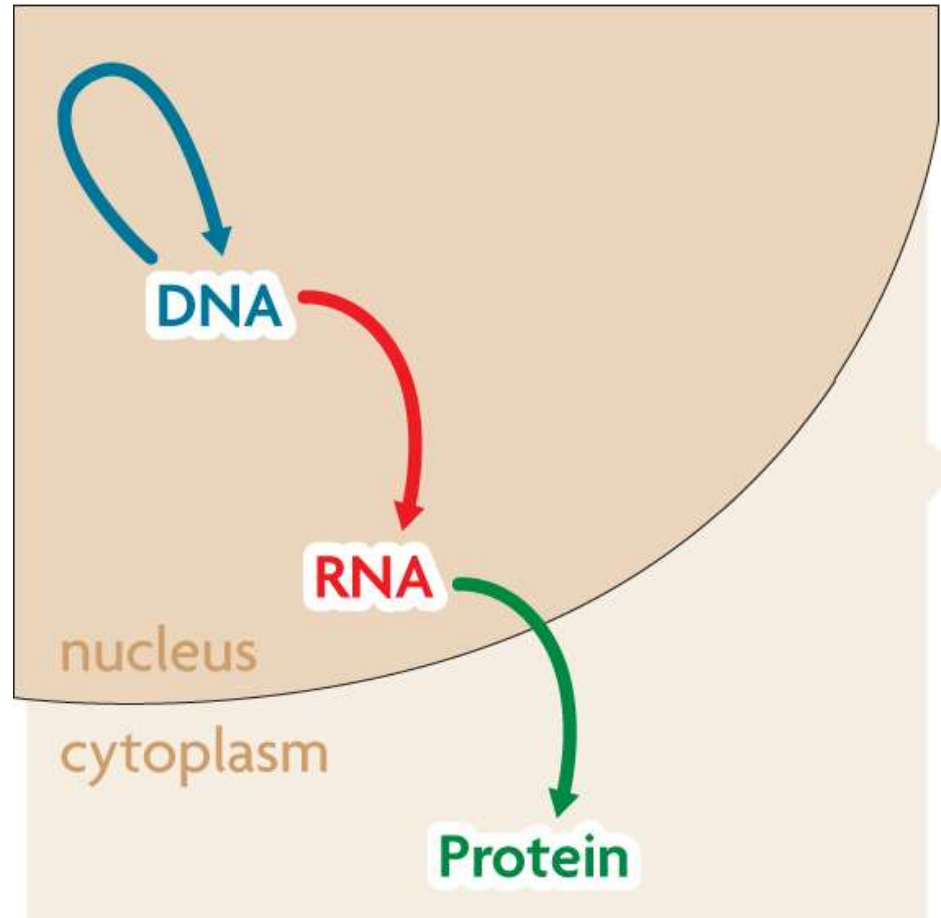
EQ – How does the info for proteins on DNA leave the nucleus?



- SB2. Students will analyze how biological traits are passed on to successive generations.**
- Distinguish between DNA and RNA.**
 - Explain the role of DNA in storing and transmitting cellular information.**

RNA carries DNA's instructions.

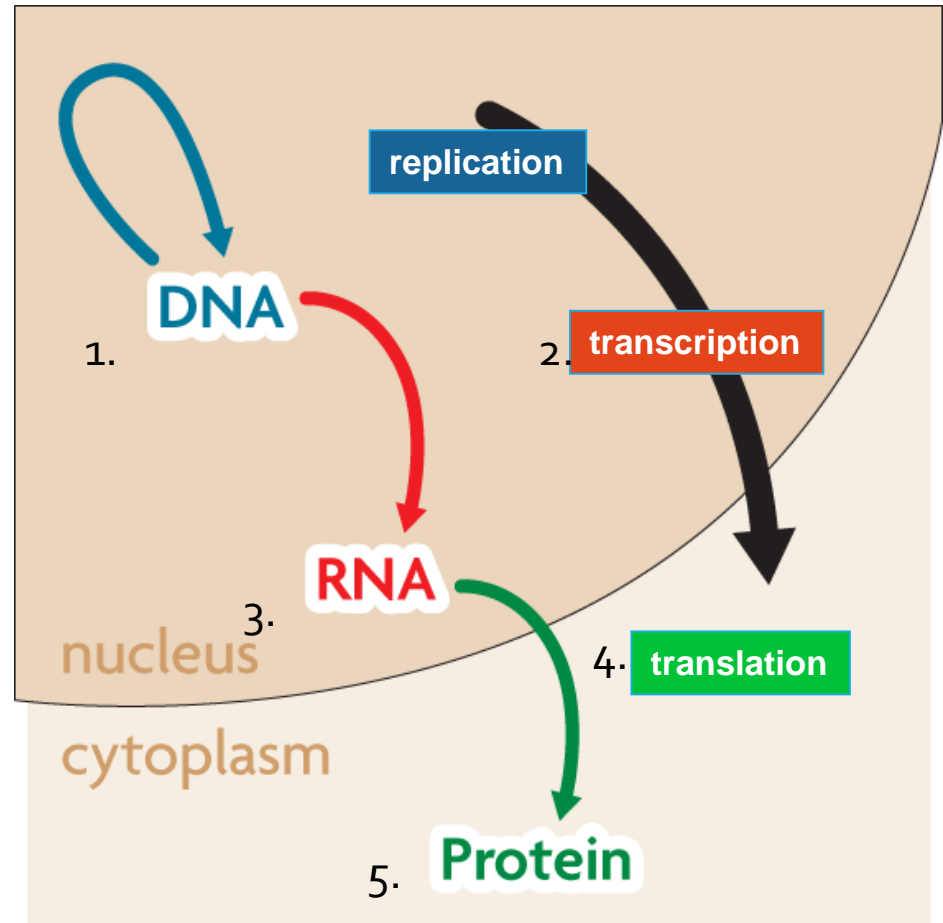
- The **central dogma** states that information flows in one direction from DNA to RNA to proteins.



- The central dogma includes **three processes.**

- Replication
- Transcription
- Translation

- RNA is a link between DNA and proteins.

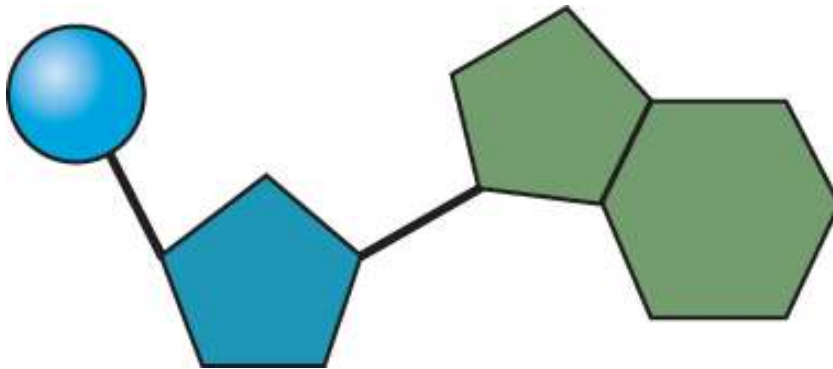


Remember....

DNA nucleotide and DNA molecule structure

phosphate group

nitrogen-containing
base

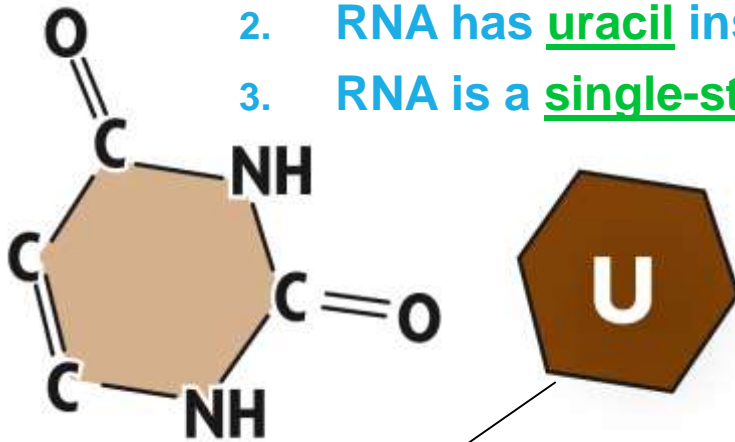


deoxyribose (sugar)



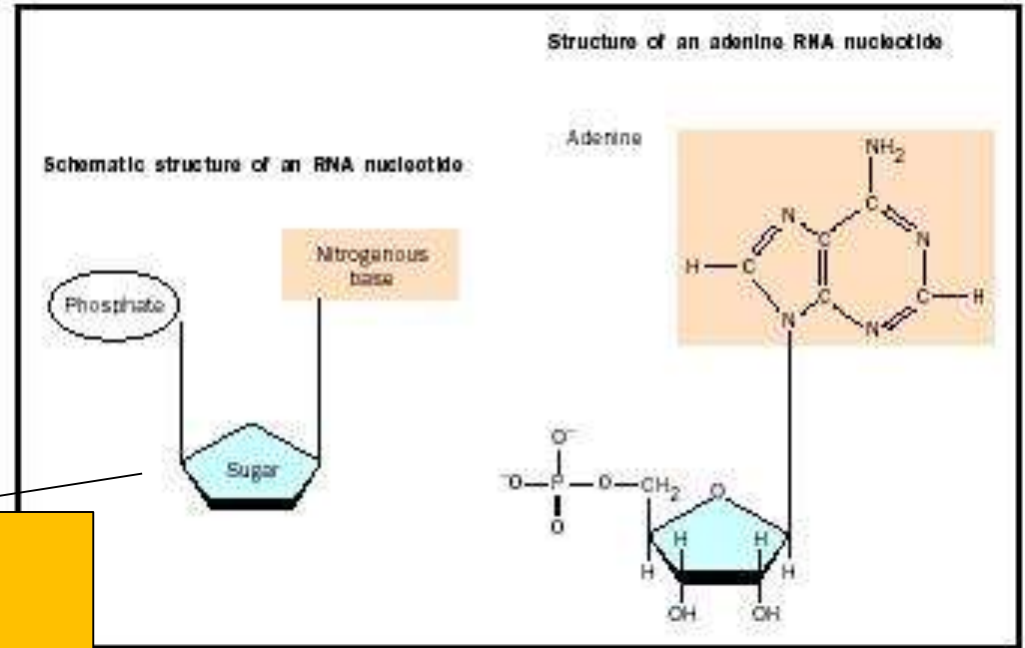
RNA differs from DNA in three major ways.

1. RNA has a ribose sugar. (DNA has deoxyribose)
2. RNA has uracil instead of thymine. (DNA has thymine)
3. RNA is a single-stranded structure. (DNA is double-stranded.)



Uracil

Ribose



DNA vs. RNA

	DNA	RNA
5-Carbon sugar	Deoxyribose	Ribose
Nitrogen-containing bases	A, C, T, G	A, C, U, G
Structure	Double-stranded	Single-stranded

Types of RNA

The three main types of RNA are:

Messenger RNA



Ribosomal RNA



Transfer RNA



Messenger RNA (mRNA)

- An mRNA molecule is a copy of the portion of DNA that will be used to make a protein.
- After being made in the nucleus, mRNA travels to the cytoplasm, the site of protein synthesis.

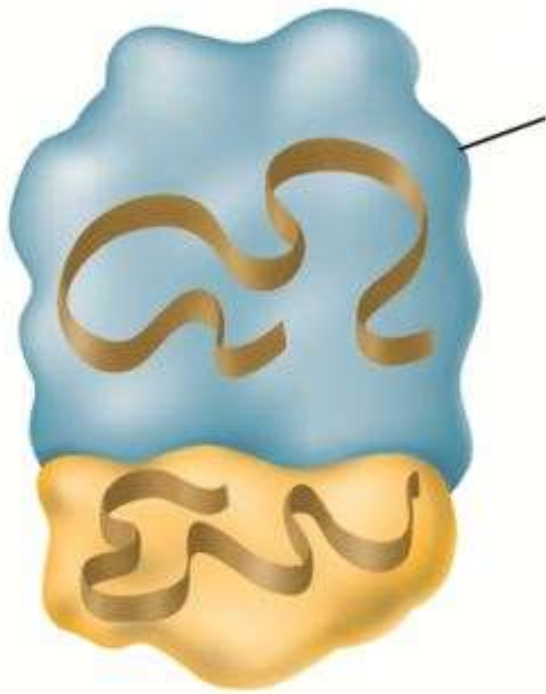


Messenger RNA

Carries instructions for polypeptide synthesis from nucleus to ribosomes in the cytoplasm.

Ribosomal RNA (rRNA)

- Protein synthesis occurs on ribosomes, which are made up of two subunits.
- These subunits consist of several molecules of ribosomal RNA (rRNA) and as many as 80 different proteins.



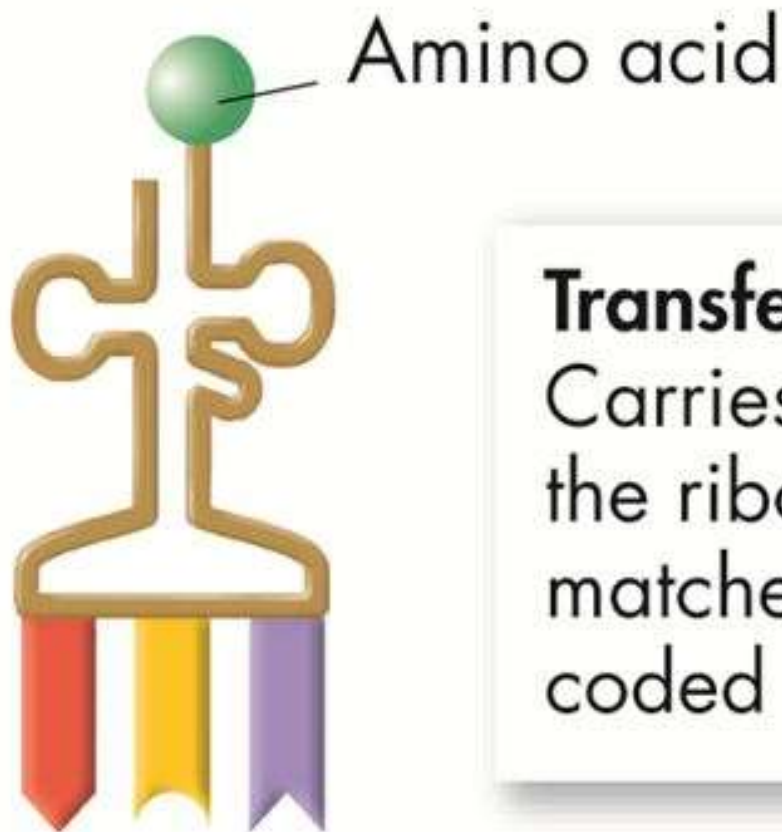
Ribosome

Ribosomal RNA

Forms an important part of both subunits of the ribosome.

Transfer RNA (tRNA)

During protein synthesis, transfer RNA molecules (tRNA) carry amino acids from the cytoplasm to the mRNA.

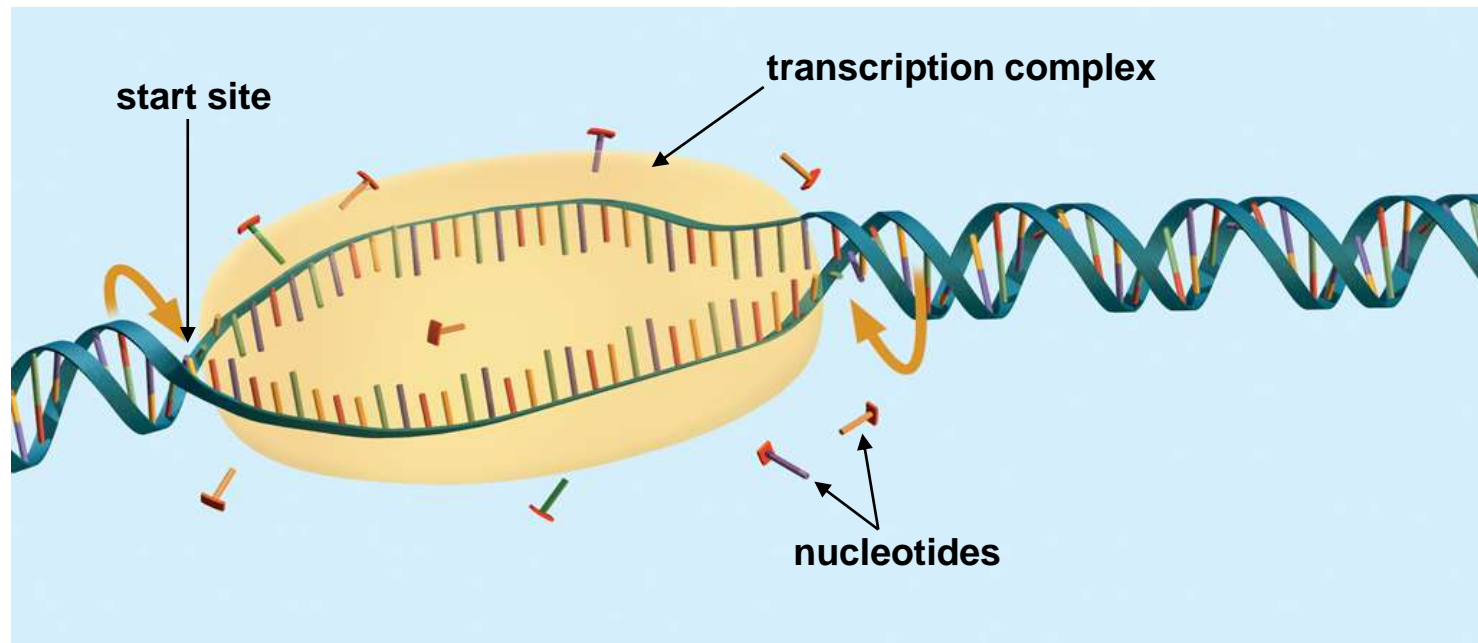


Transfer RNA

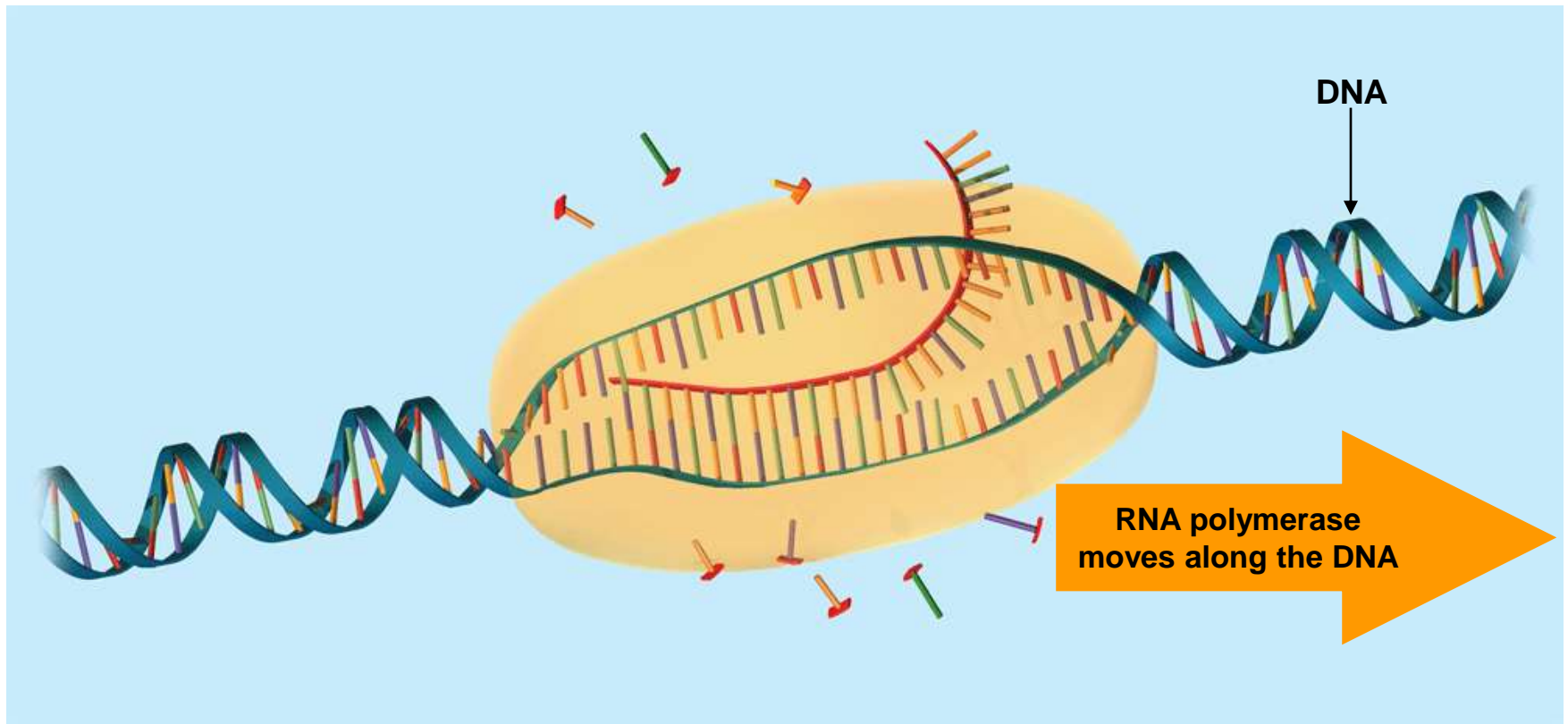
Carries amino acids to the ribosome and matches them to the coded mRNA message.

Transcription is catalyzed by **RNA polymerase**. (do not copy this yet!)

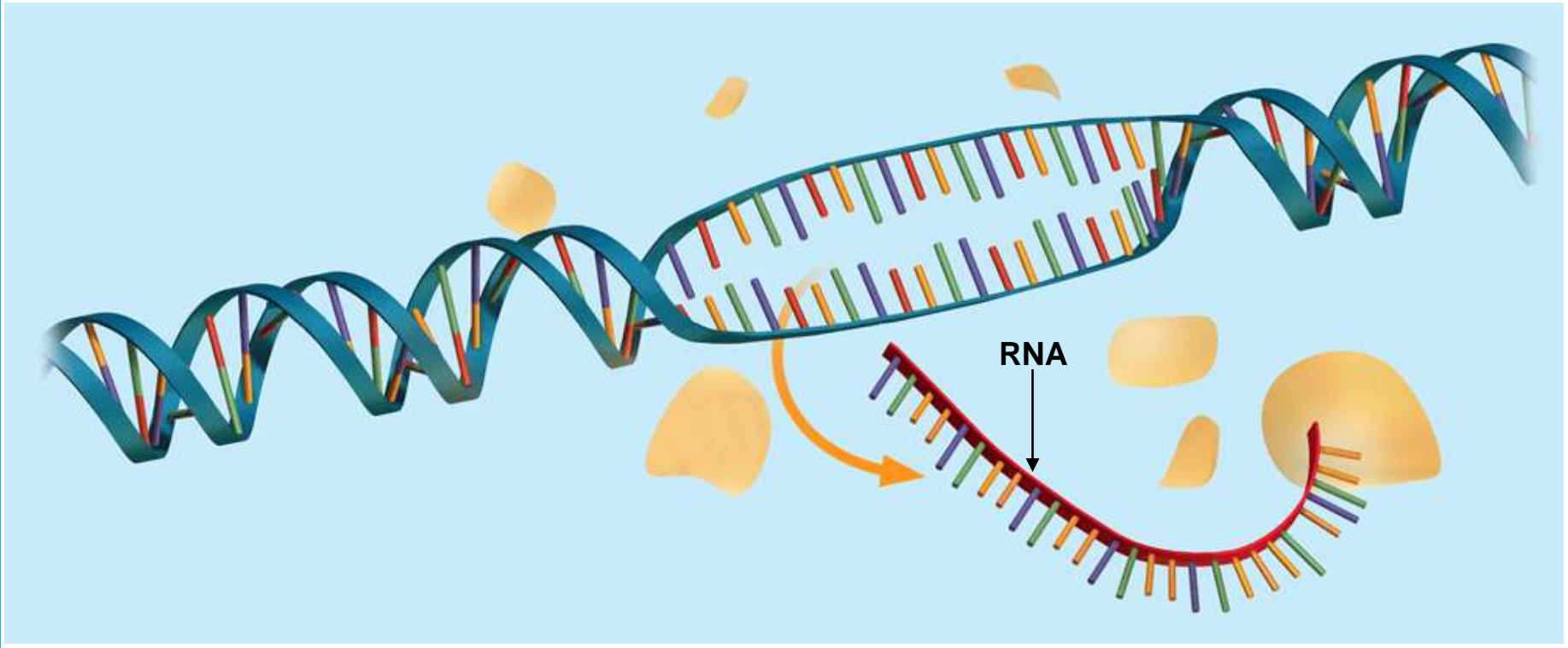
1. RNA polymerase and other proteins form a transcription complex.
2. The transcription complex recognizes the start of a gene and unwinds a segment of it.



3. Nucleotides pair with one strand of the DNA.
4. RNA polymerase bonds the nucleotides together.
5. The DNA helix winds again as the gene is transcribed.



- 6. The RNA strand detaches from the DNA once the gene is transcribed.
- 7. The RNA can now leave the nucleus.

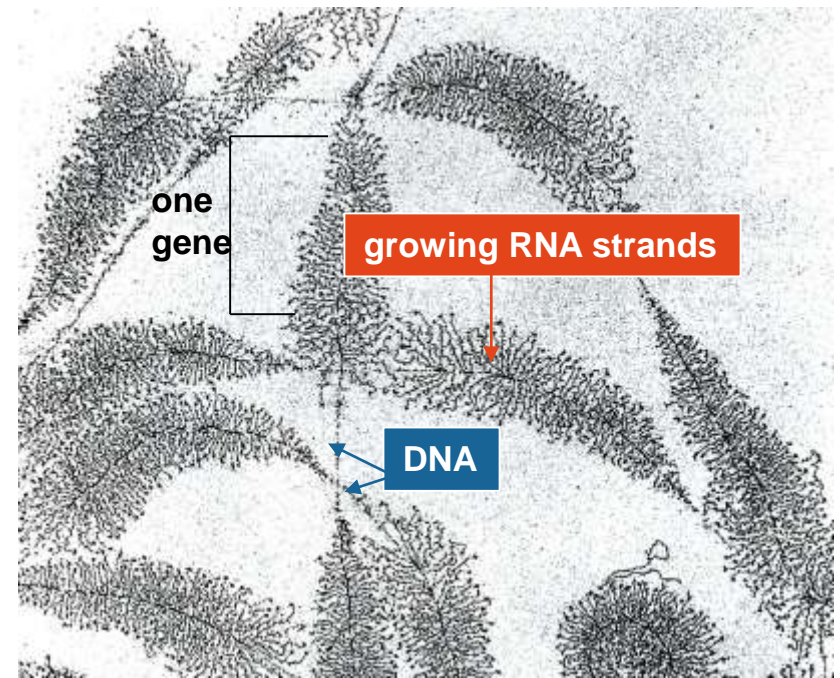


Your notes:

1. Transcription complex – RNA polymerase recognizes start of gene & begins to unwind DNA
2. RNA polymerase reads one side of the DNA template & strings together a complementary strand of RNA nucleotides
3. The growing RNA strand hangs freely & detaches completely once the entire gene is transcribed
4. DNA molecule
5. Free floating RNA nucleotides
6. Newly synthesized RNA strand
7. RNA polymerase

The transcription process is similar to replication.

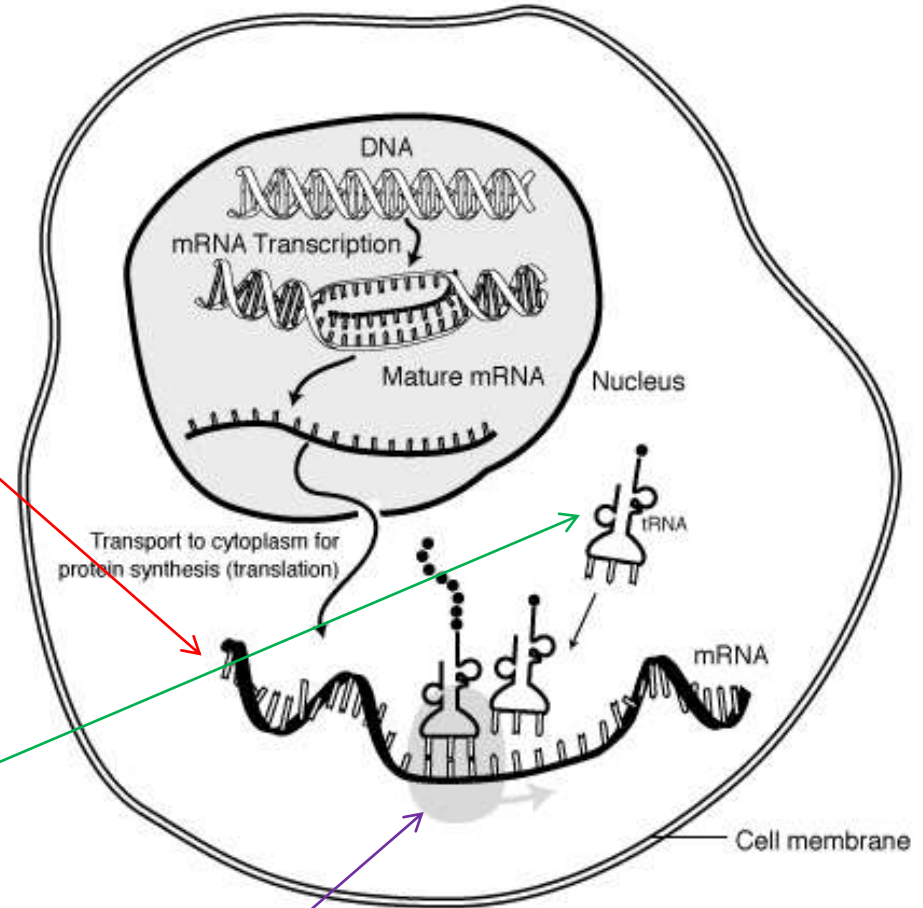
- Transcription and replication both involve complex enzymes and complementary base pairing.
- The two processes have different *end results*:
 - Replication copies all the DNA; transcription copies a gene.
 - Replication makes one copy; transcription can make many copies.



Transcription copies DNA to make a strand of RNA.

- Transcription makes three types of RNA.

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



rRNA



1. What is transcription?
2. Where does transcription take place in eukaryotic cells?
3. What guides transcription?

4. What enzyme does the work of transcription?
5. What are the 3 types of RNA?
6. DNA sequence – TAC CGC ACT. What would be the complementary sequence of RNA?

▶ Transcription Review

1. What is transcription? **The process where a gene on DNA codes for a complementary strand of RNA**
2. Where does transcription take place in eukaryotic cells? **nucleus**
3. What guides transcription? **Base pairing rules**
4. ~~What enzyme does the work of transcription?~~ ***RNA polymerase***
5. What are the 3 types of RNA? ***mRNA, rRNA, tRNA***
6. DNA sequence – TAC CGC ACT. What would be the complementary sequence of RNA? ***AUG GCG UGA***

Transcription Model

T
G
A
C
C
G

You must find the complementary RNA strand for the following DNA sequence:

↙ (left side sequence (*deoxyribose* sugar – vertical; The right side will be composed of complementary base with *ribose* sugar).

1. **Color** the pieces (colors must differentiate the parts).
 - Deoxyribose (red) - Cytosine (purple)
 - Ribose (blue) - Adenine (orange)
 - Phosphate groups (brown) - Guanine (yellow)
 - Thymine (green) - Uracil (pink)
2. **Cut** out the pieces needed to assemble your models.
3. **Assemble** the left side of the DNA strand first (template) - **glue**.
4. Then **assemble** the right side based on transcription of DNA to RNA - **glue**.
5. **Title** the page: **Transcription (DNA → RNA) Location: nucleus**