

# POGIL: Protein Synthesis

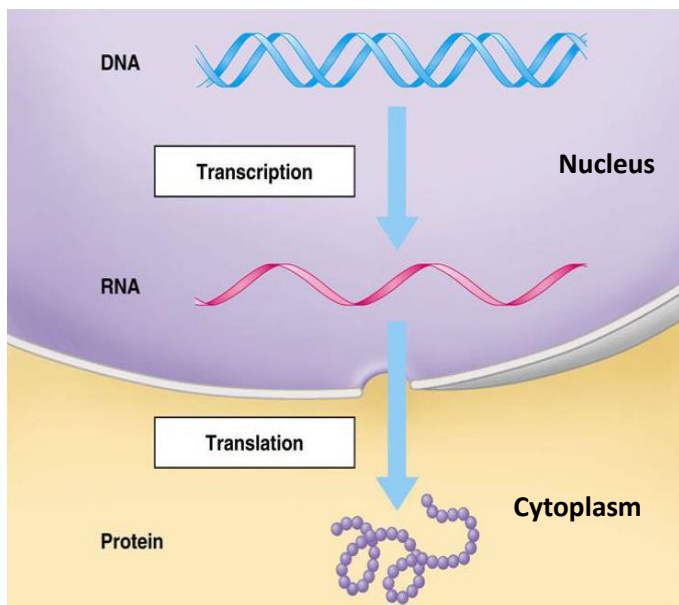
## The Central Dogma of Biology

Use the diagrams and text provided to answer the following questions.

### Module 1: Pre-thinking questions

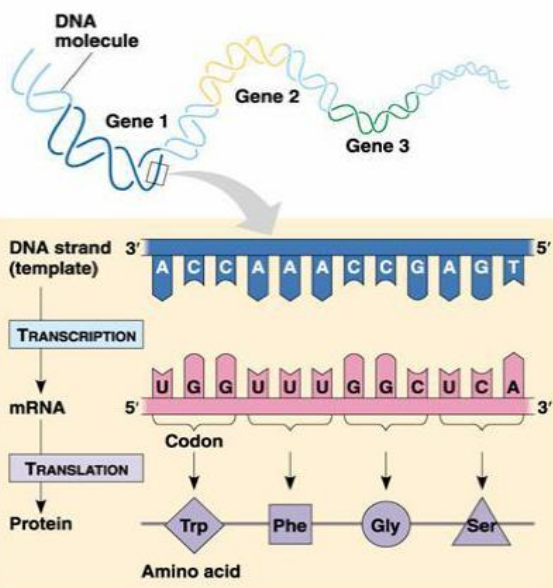
1. DNA provides the instructions for building which type of biological molecule?
2. Where is DNA located in a eukaryotic cell? Where is it located in a prokaryotic cell?
3. Which cellular structures are the "machines" that build proteins? Where are they located?
4. If DNA can't leave the nucleus, how do you think the DNA instructions get to the ribosomes in the cytoplasm?

### Module 2: The flow of information in EUKARYOTIC cells



**Figure 1:** This figure shows the flow of information from **DNA** to a molecule called **RNA** (in the nucleus) and then to the creation of proteins (in the cytoplasm). We now know that **RNA**, which is similar but not identical to DNA, moves from the nucleus to the cytoplasm. RNA is a nucleic acid polymer composed of nucleotides like DNA. However, RNA has the sugar **ribose** and the nitrogen base **uracil**, instead of DNA's deoxyribose and thymine. Also RNA is a much smaller molecule than DNA.

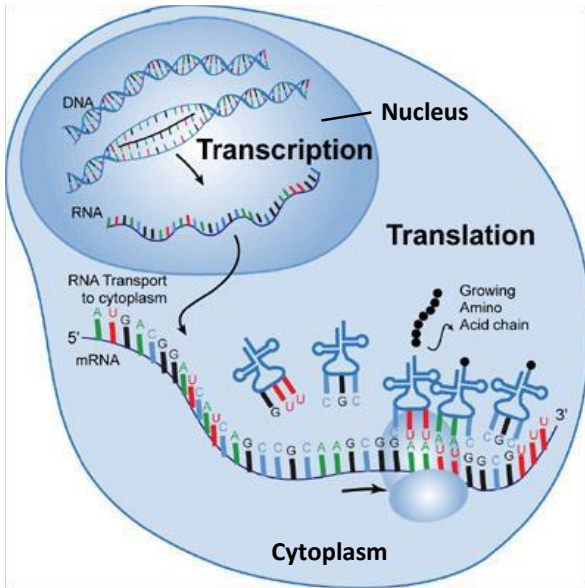
5. Fill in the blank: **DNA** → → **Protein**
6. List at least 3 differences between DNA and RNA.



**Figure 2:** This figure shows the flow of genetic information in a little more detail. Examine this figure carefully, paying attention to the different labels.

7. What is the name of the process that uses DNA as a **template** to make mRNA? (*\*hint\* it starts with a T*)
8. Look at how the DNA and RNA complement each other. Which DNA base does the **U** in RNA pair with? How is this different from the base-pairing rules for DNA?
9. What is the name of the process that uses mRNA to make a **protein**? (*\*hint\* it also starts with a T*)

10. How many letters of mRNA code for an amino acid? (\*hint\* look at the curly brackets next to "codon" in **Figure 2**)



**Figure 3:** This diagram shows the processes of *transcription* and *translation* and where they occur in a eukaryotic cell.

11. What is the purpose of **transcription**? What does it make?
12. Where does this process occur?
13. Transcribe the following DNA template into mRNA: (look back at **Figure 2** for help if you need it)

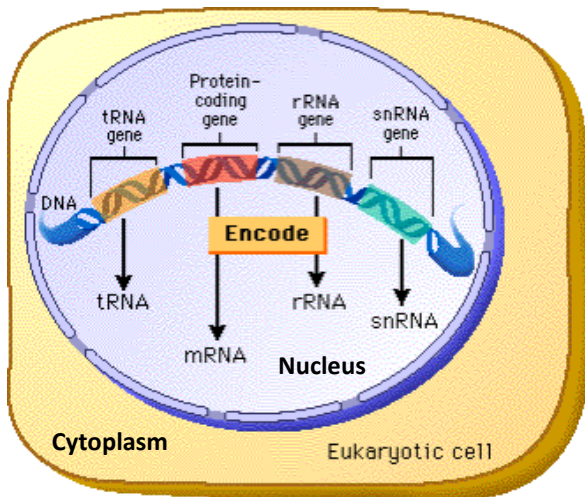
**A T C G G A T A C**

14. What is the purpose of **translation**? What does it make?

15. Where does this process occur?

### Module 3: The 3 types of RNA

In any cell, only some of the genes are **expressed** ("turned on"); in other words, only some are **transcribed** into RNA. We will study 3 main types of RNA, only one of which is made during transcription. The following describes all three.



- **mRNA** - Messenger RNA: the instructions for making a protein are encoded within its sequence of nucleotides.
- **tRNA** - Transfer RNA: attaches to **amino acids** and then transfers them to the **ribosome** during **translation**.
- **rRNA** - Ribosomal RNA: combines with ribosomal proteins to make up the actual ribosome.

16. **Module 3** states that only some genes are expressed. Why do you think this is true? Why would a gene be expressed? Why would it not be expressed?

17. How many types of RNA are there and what do they do?