

Remember this:

- DNA is located in the nucleus (*in eukaryotic cells*).
- DNA structure allows for replication.
- Genes are sections of DNA that code for proteins.
- Proteins are made at the ribosomes.

Problem: How does DNA get the instructions to the ribosomes?

RNA!

- Single chain of nucleotides
 - Ribose (sugar)
 - Phosphate Group
 - N-base (A C G & Uracil)
- 3 types of RNA

Ribosomal RNA (rRNA)

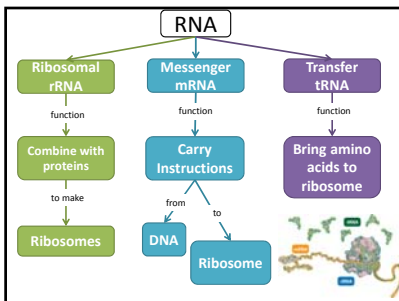
- rRNA is the catalytic part of a ribosome
- The ribosome binds with mRNA to carry out protein synthesis
- ~80% of RNA in cytoplasm is rRNA

Messenger RNA (mRNA)

- Result of Transcription – copying the instructions from DNA
- Made of Codons = 3 bases that code for 1 amino acid

Transfer RNA (tRNA)

- Small, coiled RNA chain
- Carries a specific amino acid
- Anticodon = recognizes codon on mRNA



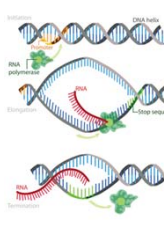
Protein Synthesis: From Gene to Protein

- Forming proteins based on information in DNA and carried out by RNA
- DNA → RNA → Protein

DNA → RNA = Transcription

- Inside the nucleus
- A gene is "read" & transcribed into mRNA

- Initiation:** RNA Polymerase binds to a **promoter** nucleotide sequence; DNA unwinds & separates
- Elongation:** Complementary RNA nucleotides create **mRNA**
- Termination:** mRNA is translated until the **stop codon** (termination signal) is reached

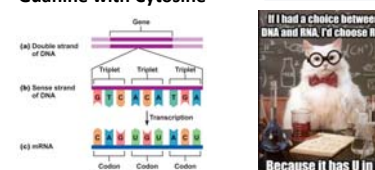


Complementary Base Pairs

- Adenine bonds with Uracil
- Guanine with Cytosine

Remember NO "T" in RNA

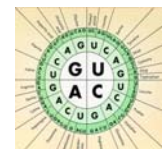
If I had a choice between DNA and RNA, I'd choose RNA because it has U in it



The Genetic Code

- The "language" of mRNA instructions
- How a sequence of nitrogenous bases corresponds to a particular amino acid

There are **4** nitrogen bases, which combine to make **64** different codons, which code for **20** different amino acids.



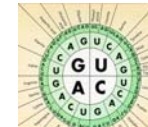
1 Codon = 3 mRNA nucleotides = 1 specific amino acid

mRNA Strand = AUGCGCACUAC

This would be read 3 bases at a time
AUG - UCG - CAC - UAC

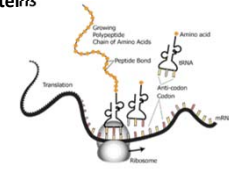
These codons represent amino acids

- Methionine (Start)
- Serine
- Histidine
- Stop

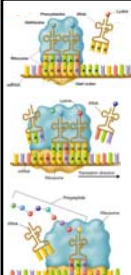


RNA → Protein = Translation

- Using the mRNA instructions to create proteins



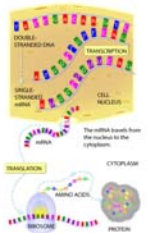
- Initiation:** Ribosome, mRNA, & 1st tRNA bind
- Elongation:** tRNA brings the amino acids as specified by the mRNA codons. Peptide bonds form between adjacent amino acids creating a polypeptide chain.
- Termination:** The protein is complete when the stop codon is reached.



DNA → RNA → Protein

TRANSCRIPTION: In the nucleus, the cell's machinery copies the gene sequence into messenger RNA (mRNA), a molecule that is similar to DNA. Like DNA, mRNA has four nucleotide bases. But in mRNA, the base uracil (U) replaces thymine (T).

TRANSLATION: The protein-making machinery, called the ribosome, reads the mRNA sequence and translates it into the amino acid sequence of the protein. The ribosome starts at the sequence AUG, then reads three nucleotides at a time. Each three-nucleotide codon specifies a particular amino acid. The "stop" codons UAG and UGA tell the ribosome that the protein is complete.



Questions? Comments?

