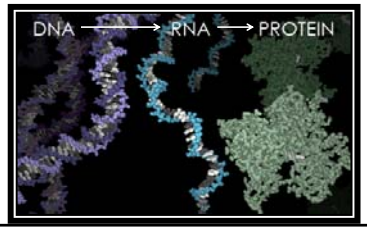
RNA & Protein Synthesis

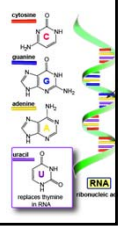


Remember this:

- **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?

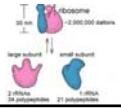
RNA!



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

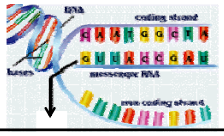
Ribosomal RNA (rRNA)

- **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**



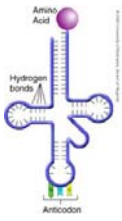
Messenger RNA (mRNA)

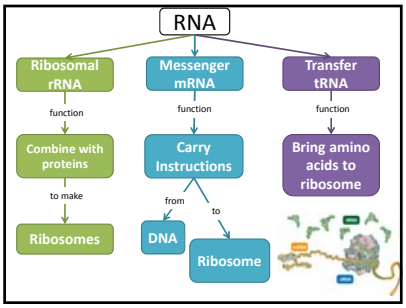
- **Result of Transcription – copying the instructions from DNA**
- **Made of Codons = 3 bases that code for 1 amino acid**



Transfer RNA (tRNA)

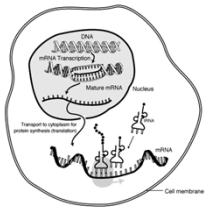
- **Small, coiled RNA chain**
- **Carries a specific amino acid**
- **Anticodon = recognizes codon on mRNA**





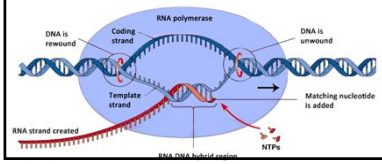
Protein Synthesis: From Gene to Protein

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

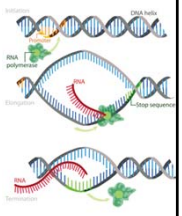


DNA → RNA = Transcription

- **Inside the nucleus**
- **A gene is "read" & transcribed in to mRNA**



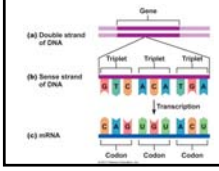
1. **Initiation**: RNA Polymerase binds to a promoter nucleotide sequence; DNA unwinds & separates
2. **Elongation**: Complementary RNA nucleotides create mRNA
3. **Termination**: mRNA is translated until the stop codon (termination signal) is reached



Complementary Base Pairs

- Adenine bonds with Uracil
- Guanine with Cytosine

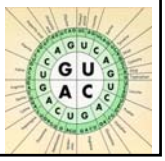
Remember NO "T" in RNA



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

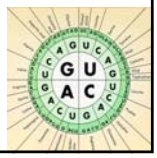
mRNA Strand = AUGUCGCACUAC

This would be read 3 bases at a time

AUG - UCG – CAC - UAC

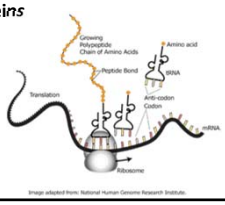
These codons represent amino acids

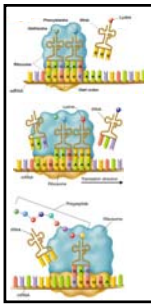
Methionine (Start)
Serine
Histidine
Stop



RNA → Protein = Translation

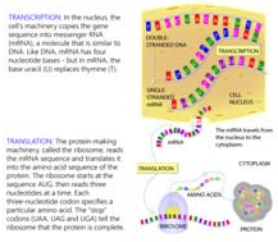
- Using the mRNA instructions to create proteins





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

DNA → RNA → Protein



Questions? Comments?