Why do we have DNA?

- It is a set of instructions that tells our cells/bodies how to function

How does DNA create action?

- It contains information on how to make proteins (proteins do the actual work in a cell)

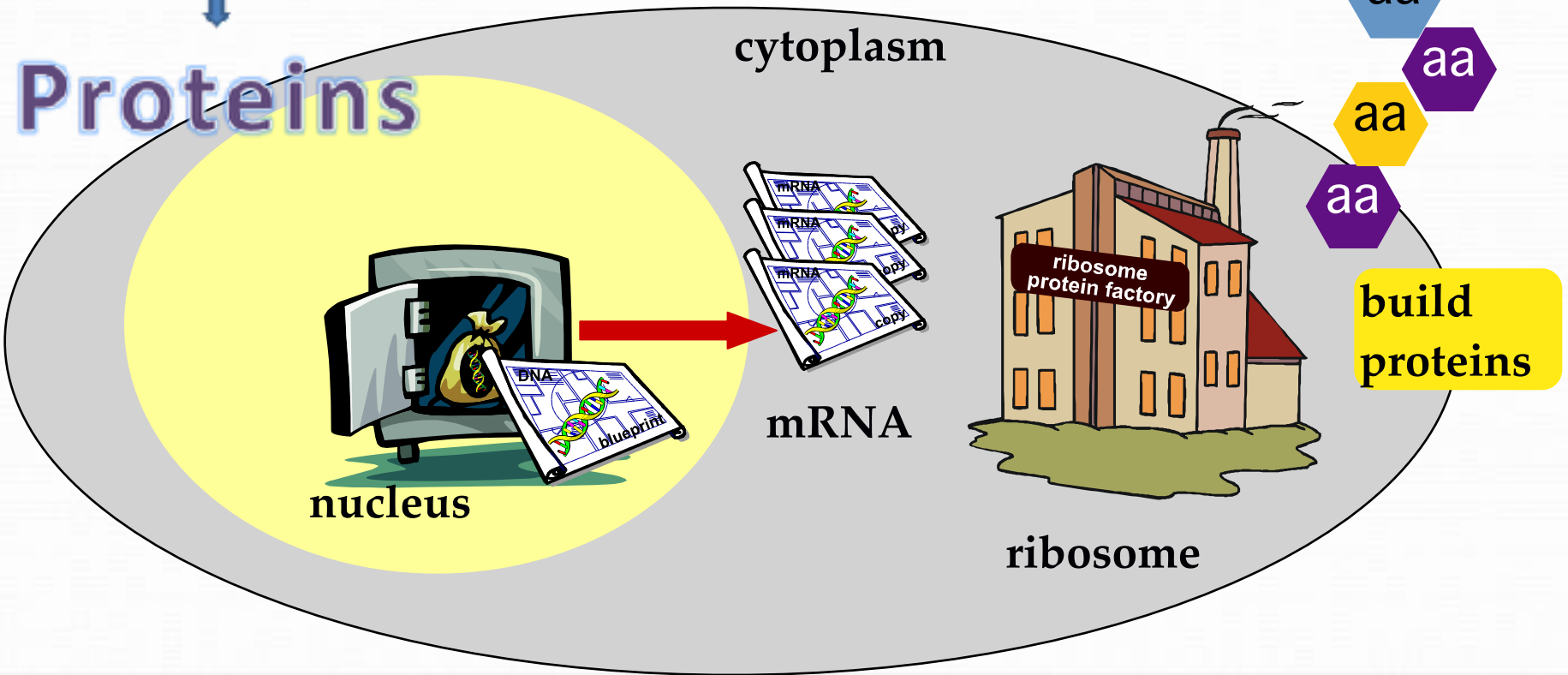
How does protein come from DNA?

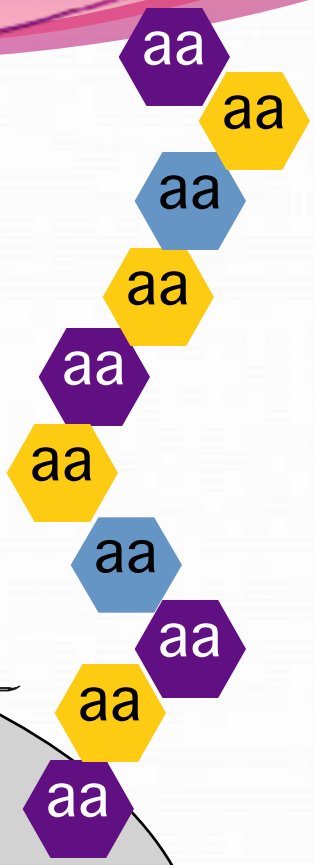
- The process of **Protein Synthesis**

Big Idea...

DNA → (Replication) → DNA

DNA → (Transcription) → RNA → (Translation) → Proteins





Protein Synthesis:

From Gene to Protein

Key Players

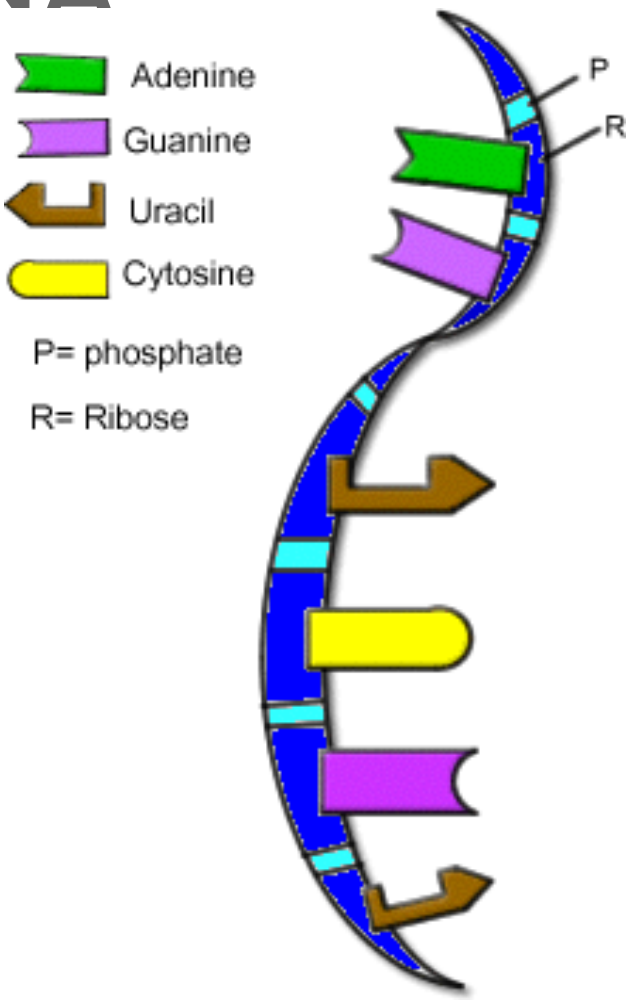
- DNA
- RNA (3 types)
- RNA polymerase
- Ribosomes
- Amino Acids

Key Processes

- Transcription
- Translation

Key Players - RNA

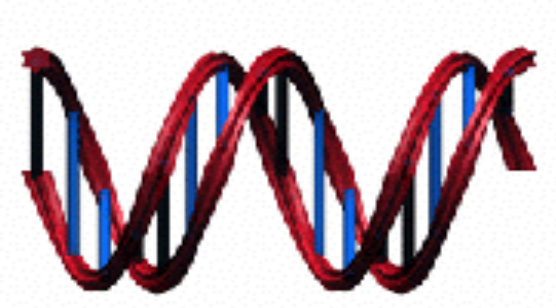
- Nucleic Acid
- Structure – similar to DNA
- Made up of Nucleotides
  - Sugar (ribose)
  - Phosphate group
  - Base (A, U, G or C)
- Bases attach to sugars



Key Players- RNA

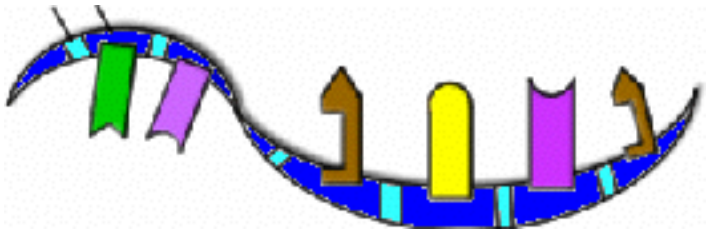
DNA

- Thymine (T)
- 2 strands
- 4 Oxygens per sugar (deoxyribose)
- Must STAY in nucleus



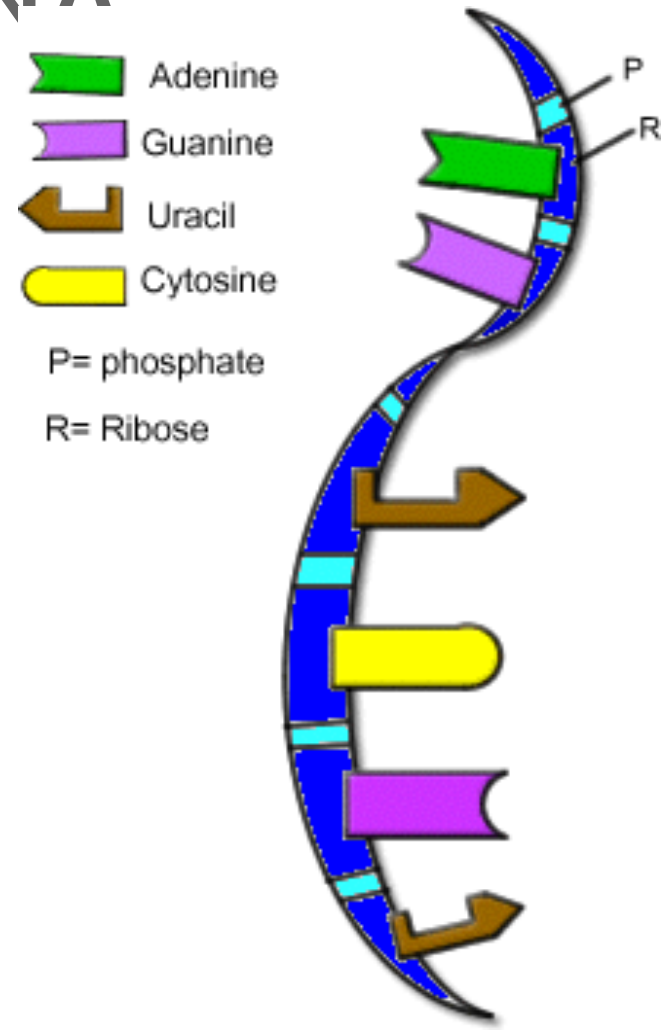
RNA

- Uracil (U)
- 1 strand
- 5 Oxygens per sugar (ribose)
- Can LEAVE nucleus



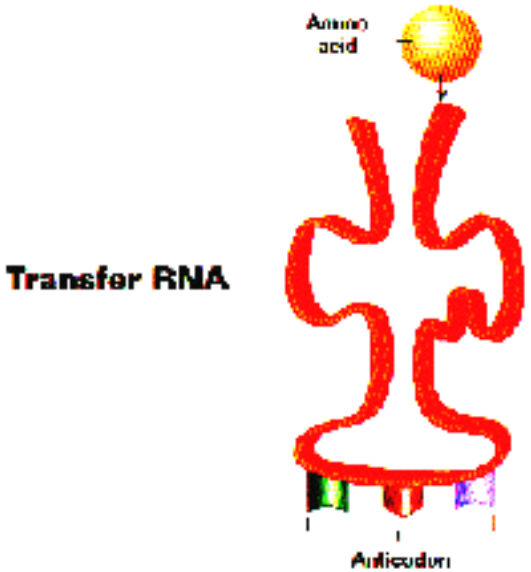
Key Players – RNA

- There are 3 types of RNA
  - **mRNA ~(<u>messenger</u>) takes genetic information out of the nucleus**



Key Players – RNA

- **tRNA ~(<u>transfer)</u> carries amino acids, anti-codon on the other side connects with the codon on mRNA strand**



- **rRNA ~(ribosomal) makes up ribosomes**

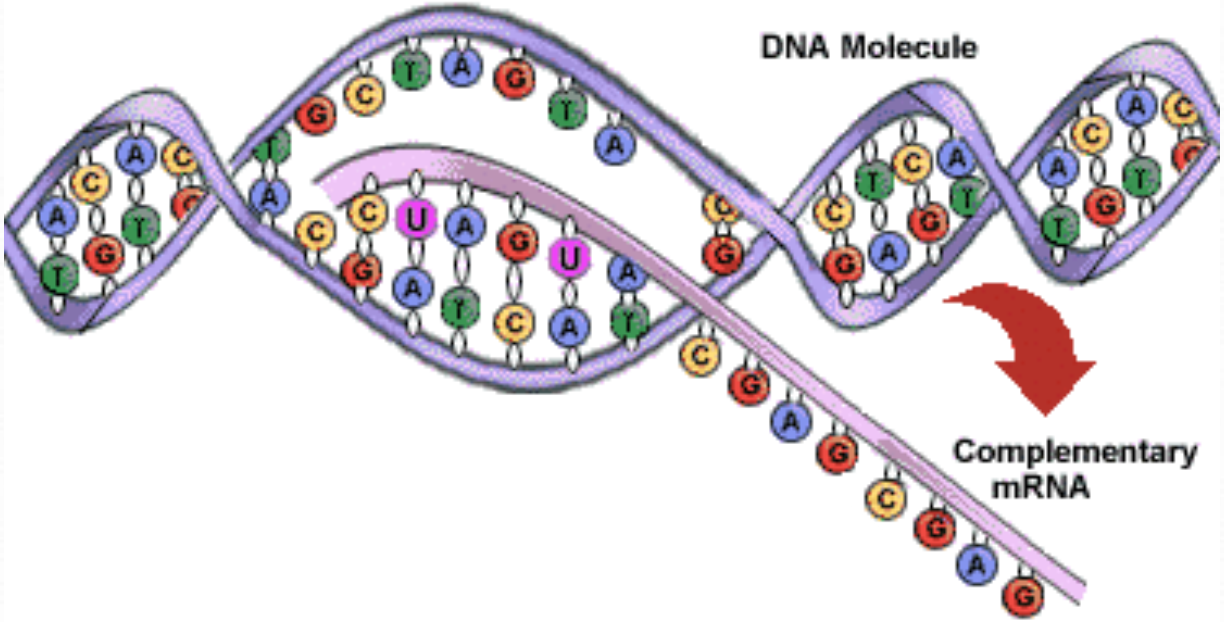
Key Processes - Transcription

- Definition ~ making an RNA copy from DNA

- REMEMBER: Uracil (U) replaces Thymine (T)

Key Processes - Transcription

- DNA unzips in small portions and is read by **RNA Polymerase**



Key Processes - Transcription

- RNA Nucleotides attach in a complimentary sequence to make a chain of RNA
- The termination site on the DNA tells the RNA polymerase to detach from the DNA

Key Processes - Transcription

- The new chain of RNA nucleotides is called mRNA and can now leave the nucleus

Key Processes – Translation

- Definition – Three types of RNA working together to make proteins using amino acids
- Important terms:
  - Codon – set of 3 bases on mRNA
  - Anti-codon – set of 3 bases on tRNA (complimentary to a codon)

Key Processes – Translation

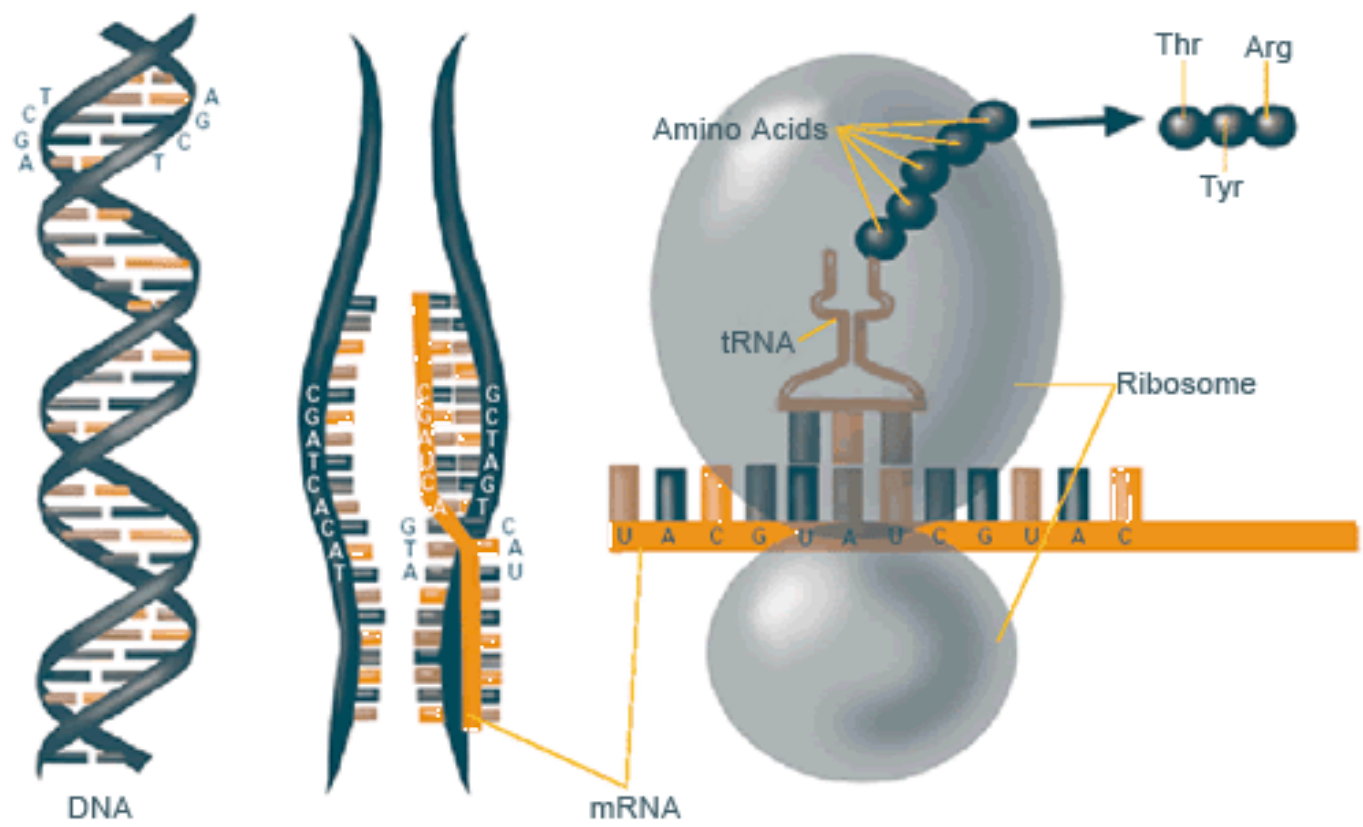
1. mRNA leaves the nucleus and attaches to ribosomes (ribosomes are in 2 parts)
2. Ribosomes read mRNA one codon at a time
3. tRNA with the matching anti-codon attaches, bringing with it an amino acid

Key Processes- Translation

4. tRNA attaches its amino acid to the previous amino acid and then leaves
5. Long chains of amino acids are made. A long chain of amino acids is a **protein.**

Key Processes- Translation

6. The stop codon ends protein synthesis and the new protein leaves the ribosome
7. The proteins determine our traits and also do all the work in our cells.


Thr
Arg
Amino Acids
Tyr
tRNA
Ribosome
U A C G U A U C G U A C
DNA
mRNA

Key Processes - Translation

- View this animation on translation:
- http://youtu.be/NJxobgkPEAo
- http://youtu.be/d1UPf7lXeO8

Key Processes – Translation

Important terms:

- Stop Codon – tells tRNA to stop making the protein. Signals the end of a chain of amino acids. (UAA, UAG, UGA)
- Initiator – the first codon in a sequence of mRNA. Tells tRNA where to start making a protein

The Secret Code! Shhh!

- Original DNA Strand

T A C G A A C A T

The Secret Code! Shhh!

Transcription:

- Original DNA Strand

T A C G A A C A T

A U G C U U G U A

- mRNA strand

The Secret Code! Shhh!

Translation:

- mRNA strand

A U G C U U G U A

- Methionine leucine Valine
- tRNA

The Secret Code! Shhh!

- UAC = Tyrosine
- GAA = Glutamic Acid
- CAU = Histidine

Practicing the Secret Code

1. GCA

Alanine

Practicing the Secret Code

2. AGU

Serine

Practicing the Secret Code

3. AUG

Methionine (Initiator)

Practicing the Secret Code

4. CCG

Proline

Practicing the Secret Code

5. GGG

Glycine