* Final product of some genes is RNA itself.
* However, most genes in a cell produce mRNA molecules that serve as intermediaries on the pathway to proteins.
* Cell converts info from mRNA to protein, this is translation
* Cells read this code using the ribosome
* DNA to RNA is like written text to typed text. RNA to protein is like translating to a different language.
* mRNA to protein is converted through something called the genetic code.
* Each group of 3 nucleotides is called a codon.
* Genetic code is uniform in most organisms except for a few differences in the DNA of mitochondria.
* Sequence of 3 is called codon, but it isn’t directly translated into an amino acid – tRNA (around 80 nucleotides) helps in converting.
* tRNA causes wobble base pairing between codons and anticodons (complementary codon), allowing codons to be translated into amino acids with upto one mismatch.
* tRNAs are covalently modified before they exit from nucleus.
* Some tRNA contains introns.
* Enzyme synthetase and and tRNAs are both important in converting codon to amino acid.
* Editing by RNA synthetase ensures accuracy in amino acid.
* Amino Acids Are Added to the C-terminal End of a Growing Polypeptide Chain.
* To maintain the correct reading frame and to ensure accuracy (about 1 mistake every 10,000 amino acids), protein synthesis is performed in the ribosome
* The mRNA nucleotide sequence is translated into an amino acid sequence using the tRNAs as adaptors to add each amino acid in the correct sequence to the end of the growing polypeptide chain.
* A ribosome contains four binding sites for [RNA](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A5756/) molecules: one is for the [mRNA](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A5496/) and three (called the A-site, the P-site, and the E-site) are for tRNAs
* A [tRNA](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A5902/) [molecule](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A5486/) is held tightly at the A- and P-sites only if its [anticodon](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A4829/) forms [base](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A4875/) pairs with a [complementary](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A5012/) [codon](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A4997/) (allowing for wobble) on the mRNA molecule that is bound to the ribosome. The A- and P-sites are close enough together for their two tRNA molecules to be forced to form base pairs with adjacent codons on the mRNA molecule. This feature of the ribosome maintains the correct [reading frame](https://www.ncbi.nlm.nih.gov/books/n/mboc4/A4754/def-item/A5718/) on the mRNA.
* When a stop codon is encountered, the ribosome releases the finished protein, its two subunits separate again. These subunits can then be used to start the synthesis of another protein on another mRNA molecule.
* A different type of variation, sometimes called translational recoding, occurs in many cells.
* Another form of recoding is translational frameshifting. This type of recoding is commonly used by retroviruses, a large group of eucaryotic viruses, in which it allows more than one protein to be synthesized from a single mRNA.
* A stop codon at the end of the gag coding sequence can be bypassed on occasion by an intentional translational frameshift that occurs upstream of it.
* This frameshift occurs at a particular codon in the mRNA and requires a specific recoding signal.