3:5a Protein Synthesis

- Besides directing its own replication, DNA also directs synthesis of proteins for the cell.
- Proteins fall into one of two categories: Structural or Functional
- Proteins are polymers.
- They consist of amino acids.
- Every 3 nucleotides (triplet) found on a DNA strand code for one amino acid.
- 20 amino acids occur in nature.
- There are 4 bases found in DNA. Combinations of 3 code for these amino acids. 4 cubed = 64 triplet combinations. Therefore, one amino acid may be coded for by different triplet combinations. Three triplets are "stop signs" or terminator sites.
- Every three bases on mRNA are referred to as a codon.

Steps Involved in Protein Synthesis:

- Transcription
- Translation

3:5b Protein Synthesis

Transcription

- Transcription is simply the rewriting of DNA into RNA.
- Transcription begins when a chemical known as a transcription factor recognizes and binds to a special DNA site that is next to a "start" sequence or promoter site of DNA.
- This allows RNA polymerase to bind to the DNA and open up the segment of DNA to be coded and uncoils it.
- Only one strand, called the sense strand, serves as the template for transcription.
- Complementary RNA bases are then paired with DNA and polymerized by RNA polymerase to form a mRNA strand.
- The process is complete when the terminator site is recognized releasing the mRNA strand.
- DNA zips back up and recoils.
- mRNA leaves the nucleus and travels to the ribosomes of the ER.

3:5c Protein Synthesis

Translation

- Translation is the process of decoding the mRNA into its amino acid sequence as dictated by the DNA.
- The process begins when the mRNA binds to a small rRNA subunit.
- tRNA transports a specific amino acid to the mRNA strand and bonds with the mRNA via the anti-codon and base pairing rules.
- This triggers the large ribosomal subunit to attach and form a functional ribosome.
- The ribosome travels along the mRNA and decodes each codon sequentially.
- As each amino acid is brought to the chain, it is bonded to the previous via a peptide bond and tRNA is released.
- The polypeptide (chain of amino acids) is released when the stop codon is reached.