

Chapter 14 From DNA to Proteins

I. DNA to Proteins

A. DNA – book of instructions

1. The _____ are written in the alphabet of A, T, G, and C.
2. In _____, the two strands of nucleotides unwind to serve as templates for assembly of new complimentary strands.
3. Each _____ is a linear stretch of DNA nucleotides that codes for the assembly of amino acids into a polypeptide chain.
4. Base sequence – The particular _____ in which one nucleotide base follows the next in a strand of DNA. (Differs from one organisms to the next).
5. At certain times in a cell's life, the two strands of _____ unwind entirely from each other only in at certain regions to expose particular base sequences called genes

B. The Path from Genes to Proteins has two steps:

1. In _____, molecules of RNA are produced on the DNA templates in the nucleus.
2. In _____, RNA molecules shipped from the nucleus to the cytoplasm are used as templates for protein assembly.

II. Transcription of DNA into RNA

A. Three Classes of RNA

1. Messenger RNA (mRNA) carries the “_____” for protein assembly to the ribosome.
2. Ribosomal RNA (rRNA) combines with proteins to _____ upon which proteins are assembled.
3. Transfer RNA (tRNA) brings the correct _____ to the ribosome and pairs up with an mRNA code for that amino acid.

B. How RNA is Assembled

1. RNA differs from DNA in _____ ways:
 - (a) RNA uses _____ sugar, not deoxyribose.
 - (b) RNA bases are A, G, C, and _____ (U).
2. Transcription differs from replication in _____ ways:
 - (a) Only _____ region of one DNA is used as a template.
 - (b) RNA _____ is used instead of DNA polymerase.
 - (c) RNA is _____; DNA is double.
3. Transcription begins when RNA polymerase binds to a promoter region and then moves along to the end of a gene; an RNA transcript is the result
_____ – signals the start of a gene

C. Finishing Touches on the mRNA Transcripts

1. Newly formed mRNA is an _____ molecule, not yet ready for use.
2. mRNA transcripts are _____ before leaving the nucleus
 - (a) One end is
The cap assists with binding to the ribosome and signals the start for translation.
 - (b) A “_____” of about 100-200 molecules of adenine containing acids are added to the opposite end.
 - (c) Noncoding portions (_____) are snipped out, and actual coding regions (exons) are spliced together to produce the mature transcript.

III. Deciphering the mRNA transcripts

A. The Genetic Code

1. Both _____ and its _____ are linear sequences of nucleotides carrying the hereditary code.
2. Every _____ bases (a triplet) specifies an amino acid to be included into a growing protein; the complete set of triplets is called the genetic code.

- (a) Each base triplet in RNA is called a
- (b) The genetic code consists of _____ triplets that specify amino acids and three that serve to stop protein synthesis. (total = 64)
- (c) _____ (specifies methionine) is the “_____” codon.
- (d) With few exceptions, the genetic code is universal for all forms of life.

B. Translation

1. mRNA binds to _____ in the cytoplasm to signal the start of translation.
2. After the mRNA arrives and _____ to the ribosome, a tRNA bonds to a codon on mRNA, and eventually delivers a correct amino acid into the correct place.
3. tRNA will continue to bring the _____ amino acids to the ribosome in the sequence that mRNA dictates.
4. Eventually a _____ codon will be reached and the protein is released into the cytoplasm or it will enter the cytomembrane system for further processing.

IV. How Mutations Affect Protein Synthesis

A. A gene mutation is a change in one to several bases in the nucleotide sequence of DNA which can result in a change in the protein synthesized.

B. Causes of Gene Mutations

1. Mutations are _____, chance events but each gene has a characteristic mutation rate.
2. mutations can be caused by mutagens such as u.v. radiation, ionizing radiation, and chemicals – which act as carcinogens.

C. The Proof is in the Protein

1. If a mutation arises in a somatic cell, it will affect only the owner of that cell and will not be passed on to offspring.
2. If however, the mutation arises in a gamete, it may be passed on and thus enter the evolutionary arena.
3. Either kind of mutation may prove to be harmful, beneficial, or neutral in its effects.

