GENERAL BIOLOGY Lecture 14 - Transcription & Translation

I. Transcription - synthesis of RNA
  A. Process of transcription
    1. Promotion (promoter) - specific base sequence at beginning of gene
      a) RNA polymerase initiates correct binding to DNA
      b) Usually in the vicinity of a TATA box
    2. Transcription
      a) Synthesized 5' to 3' (from 3' to 5' DNA strand)
      b) RNA strand is complementary
      c) Uracil replaces Thymine in the complementary RNA strand
      d) Uracil is easier to make than thymine and enables RNA to be distinguished from DNA
    3. Release of transcript
    4. Transcript modification (eukaryotes)
      a) Intron removal
        1) Exons are the portion that are read
      b) Cap at one end and a poly-A tail on the other

II. Translation - synthesis of protein
  A. The genetic code
    1. Every three nucleotides (base triplets) specify an amino acid
      a) Nucleotide triplets are referred to as codons
    2. Sets of nucleotides makes sets of amino acids
    3. Proteins are made of amino acids
  B. Where it happens
    1. On the surface of ribosomes - cluster referred to as polysome
  C. How it happens
    1. Initiation
      a) The small ribosomal subunit attaches to the mRNA in the vicinity of the start codon, AUG
      b) An initiator tRNA with the anticodon UAC pairs with the AUG codon and then the large ribosomal subunit joins with the small subunit
      c) Initiator tRNA occupies the P site on the large ribosomal subunit
    2. Chain elongation
      a) Another tRNA (with its anticodon) comes along to bind on the adjacent (A) site
      b) Adjacent amino acids become aligned
      c) The tRNA on the P site leaves and a peptide bond is formed between amino acids - energy (GTP) is used
      d) The amino acid occupying the A site moves to the P site
      e) Ribosome moves to align the third codon to the newly opened A site
      f) New amino acid joins the chain
    3. Chain termination
      a) A stop codon (UAG, UAA, or UGA) is encountered
      b) Release factors are invoked
      c) Protein is released

III. Changes that can occur in DNA leading to variation of species
  A. Gene mutation (molecular level) - base pair replaced, added, or deleted
  B. Crossing over & recombination - section of DNA recombined - expression of alleles
  C. Chromosome aberration - section of DNA deleted, duplicated, inverted, or moved