

## Protein Synthesis Notes POST

### I. DNA & RNA Structure

#### A. Nucleic acids – DNA & RNA

1. DNA: genes; tells RNA which proteins to make
2. RNA: dictates amino acid sequence of proteins, which determines function of proteins

#### B. Structure: made of nucleotides that include a sugar (ribose or deoxyribose), a nitrogen base, and a phosphate

1. DNA: deoxyribose; bases are adenine, guanine, cytosine, thymine; double-stranded
  - a. 2 long chains of nucleotides
  - b. held together by hydrogen bonding
  - c. base-pairing: base on one strand pairs with complementary base on other strand (A=T, C=G); DNA replication
2. RNA: ribose; bases are adenine, guanine, cytosine, uracil; single-stranded
  - a. messenger RNA (mRNA): temporary copy of a gene that encodes a protein
    - i. transcription: process of making mRNA
    - ii. translation: process of mRNA determining the order that amino acids are added to the protein
  - b. ribosomal RNA (rRNA): combine with proteins to make ribosomes
  - c. transfer RNA (tRNA): carries and transfers amino acids to growing proteins

#### C. DNA → protein

1. when mRNA is made, it uses the DNA strand as a template
2. to make mRNA, A pairs with U, T → A, G → C, C → G
3. on the mRNA, every 3 bases (codon) codes for an AA
  - a. some are start and stop codons
4. codon pairs with anticodon on tRNA, which carries the corresponding AA

### II. Importance of Proteins

#### A. material for cell structures or tissues

1. keratin: skin, hair, feathers, scales
2. collagen: connective tissue
3. myosin: makes muscles contract

#### B. enzymes

1. catalyst for chemical reactions
2. hemoglobin in blood binds to oxygen
3. hormones: chemical messengers

#### Practice

##### DNA Replication

1. AACGTGCATTGACGG
2. CATGATTAATTCGTC
3. TGTACCAGAGGAGAT

##### mRNA

1. UUGCACGUAACUGCC
2. GUACUAAUGAAGCAG
3. ACAUGGUCUCCUCA

##### tRNA

1. AACGUGCAUUGACGG
2. CAUGAUUACUUCGUC
3. UGUACCAGAGGAGAU

### III. Transcription

#### A. RNA Synthesis

1. RNA polymerase: joins RNA nucleotides according to DNA base sequence
  - a. eukaryotes have 3 types: mRNA, tRNA, rRNA made in nucleus and moved out to cytoplasm for protein synthesis

#### B. Stages of transcription

1. initiation: RNA polymerase attaches to DNA on a promoter region
  - a. initiation factors: proteins required for polymerase to attach
2. elongation
  - a. RNA polymerase unwinds DNA and adds complementary base
  - b. makes primary transcript
3. termination
  - a. RNA polymerase reaches terminator region on DNA
  - b. releases and stops process

#### C. RNA Processing

1. splicing removes mRNA segments that don't code for AA
  - a. introns removed
  - b. exons remain
2. add mG head and polyA tail to mRNA for protection