

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. CATGATTAATTCCTC
3. TGTACCAGAGGAGAT

mRNA

1. UUGCACGUAACUGCC
2. GUACUAAUGAAGCAG
3. ACAUGGUCUCUCUA

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