**Topic 7.3: Translation**

**Essential Idea: Information transferred from DNA to mRNA is translated into an amino acid sequence.**

**Statements & Objectives:**

**7.3.U1 Initiation of translation involves assembly of the components that carry out the process.**

Outline the process of translation initiation.

(**Outline** Give a brief account or summary.)

**7.3.U2 Synthesis of the polypeptide involves a repeated cycle of events.**

Outline the process of translation elongation, including codon recognition, bond formation and translocation.

(**Outline** Give a brief account or summary.)

State the direction of movement of the ribosome along the mRNA molecule.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

**7.3.U3 Disassembly of the components follows termination of translation.**

Outline the process of translation termination, including the role of the stop codon.

(**Outline** Give a brief account or summary.)

**7.3.U4 Free ribosomes synthesize proteins primarily for secretion or use in lysosomes.**

State the difference between free and bound ribosomes.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

List destinations of proteins synthesized on free ribosomes.

(**List** Give a sequence of brief answers with no explanation.)

**7.3.U5 Bound ribosomes synthesize proteins for use primarily within the cell.**

List the destinations of proteins synthesized on bound ribosomes.

(**List** Give a sequence of brief answers with no explanation.)

Outline how a ribosome becomes bound to the endoplasmic reticulum.

(**Outline** Give a brief account or summary.)

**7.3.U6 Translation can occur immediately after transcription in prokaryotes due to the absence of a nuclear membrane.**

Compare the timing and location of transcription and translation between prokaryotes and eukaryotes.​

(**Compare** Give an account of the similarities and differences between two (or more) items or situations, referring to both (all) of them throughout.)

**7.3.U7 The sequence and number of amino acids in the polypeptide is the primary structure.**

Describe the primary structure of a protein, including the type of bonding involved.

**(Describe**: Give a detailed account)

**7.3.U8 The secondary structure is the formation of alpha helices and beta pleated sheets stabilized by hydrogen bonding.**

Describe the secondary structure of a protein, including the type of bonding involved.

**(Describe**: Give a detailed account)

Identify the alpha-helix and beta-pleated sheet in images of protein structure.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

**7.3.U9 The tertiary structure is the further folding of the polypeptide stabilized by interactions between R groups.**

Describe the tertiary structure of a protein, including the types of R group interactions involved.

**(Describe**: Give a detailed account)

Explain how the chemical characteristics of R groups in the polypeptide chain affect protein folding.

(**Explain** Give a detailed account including reasons or causes.)

**7.3.U10 The quaternary structure exists in proteins with more than one polypeptide chain.**

Outline the quaternary structure of protein folding.

(**Outline** Give a brief account or summary.)

Describe the structure of a conjugated protein, including the prosthetic group.

**(Describe**: Give a detailed account)

**7.3.A1 tRNA-activating enzymes illustrate enzyme-substrate specificity and the role of phosphorylation.**

State the role of the tRNA activating enzymes.

(**State** Give a specific name, value or other brief answer without explanation or calculation.)

Outline the process of attaching an amino acid to tRNA by the tRNA activating enzyme.

(**Outline** Give a brief account or summary.)

**7.3.S1 The use of molecular visualization software to analyze the structure of eukaryotic ribosomes and tRNA molecules.**

Describe the structure of the ribosomes, including the small and large subunits and the names and roles of the tRNA binding sites.

**(Describe**: Give a detailed account)

Use molecular visualization software to view and identify the small and large subunit and tRNA binding sites of the ribosome.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

Outline the structure of tRNA molecules.

(**Outline** Give a brief account or summary.)

Use molecular visualization software to view and identify the anticodon and amino acid binding site of a tRNA.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

**7.3.S2 Identification of polysomes in electron micrographs of prokaryotes and eukaryotes.**

Outline the structure of a polysome.

(**Outline** Give a brief account or summary.)

Identify the beginning of an mRNA strand in a micrograph of polysomes.

(**Identify** Provide an answer from a number of possibilities. Recognize and state briefly a distinguishing factor or feature.)

**7.3.NOS Developments in scientific research follow improvements in computing- the use of commuters has enabled scientists to make advances in bioinformatics applications such as locating genes within genomes and identifying conserved sequences.**

Define bioinformatics.

(**Define** Give the precise meaning of a word, phrase, concept or physical quantity.)

Outline why computers are necessary for genome analysis.

(**Outline** Give a brief account or summary.)

List seven species for which the entire genome has been sequenced.

(**List** Give a sequence of brief answers with no explanation.)

**Key Terms**

amino acid sequence

​codon recognition

​stop codon

​protein synthesis

​endoplasmic reticulum

​tertiary structure

tRNA activating enzymes

phosphorylation

initiation

polypeptide

​free ribosomes

​alpha helices

​protein folding

​prosthetic group

​bioinformatics

translation​ribosome

​bound ribosomes

​primary structure

​​hydrogen bonding

​conjugated protein

​genome analysis

elongation

​mRNA

​lysosomes

​secondary structure

​beta pleated sheets

​quaternary structure

​enzyme-substrate

initiation

​translation termination

​R groups

​binding sites

​anticodons

​polysome