**Topic 2.4: Proteins**

**Essential Idea: Proteins have a very wide range of functions in living organisms.**

**Statements & Objectives:**

**2.4.U1 Amino Acids are linked together by condensation to form polypeptides.**

Describe polypeptide chain formation in terms of the formation of peptide bonds and condensation reactions.

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

Determine the number of peptide bonds given the number of amino acids in a polypeptide.

(**Determine:** Find the only possible answer.)

Define dipeptide, oligopeptides and polypeptide.

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

**2.4.U2 There are 20 different amino acids in polypeptides synthesized on ribosomes.**

State the number of amino acids used by living organisms to make polypeptides.

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

Given an image of an amino acid, classify the amino acid chemical properties based on R group properties.

Outline the role vitamin C plays in the conversion of proline to hydroxyproline.

 ​**(Outline**: Give a brief account or summary)

**2.4.U3 Amino Acids can be linked together in any sequence giving a huge range of possible polypeptides.**

Calculate the possible number of amino acid sequences given n number of amino acids.

(**Calculate:** Find a numerical answer showing the relevant stages in the working.)

**2.4.U4 The amino acid sequence of polypeptides is coded for by genes.**

Outline the relationship between genes and polypeptides.

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

**2.4.U5 A protein may consist of a single polypeptide or more than one polypeptide linked together.**

Outline the structure and function of three example proteins composed of two or more polypeptides linked together.

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

**2.4.U6 The amino acid sequence determines the three-dimensional conformation of a protein.**

Contrast the structure of globular proteins with the structure of fibrous proteins.

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

Describe the structure of membrane bound globular proteins.

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

**2.4.U7 Living organisms synthesize many different proteins with a wide range of functions.**

Contrast the generalized function of globular proteins with generalized function of fibrous proteins.

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

List ten functions of proteins in a cell or organism.

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

Describe the function of enzyme proteins.

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

Describe the function of hormone proteins.

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

Describe the function of immunoglobulin proteins.

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

Describe the function of pigment proteins.

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

Describe the function of structural proteins

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

**2.4.U8 Every individual has a unique proteome.**

Define proteome pigment proteins.

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

Contrast proteome with genome.

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

**2.4.A1 Rubisco, insulin immunoglobulins, rhodopsin, collagen and spider silk as examples of the range of protein functions.**

State the function of each of the following proteins: rubisco, insulin, immunoglobulin, rhodopsin. collagen, spider silk, actin, myosin, casein, hemoglobin, acetylcholine receptor, oxytocin, prolactin, ferritin, billirubin, fibrinogen, transferrin and albumin.

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

**2.4.A2 Denaturation of proteins by heat or by deviation of pH from the optimum.**

Define denaturation.

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

Outline the effect of heat and pH on protein structure.

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

**2.4.S1 Drawing molecular diagrams to show the formation of a peptide bond.**

Draw peptide bond formation in a condensation reaction.

(**Draw:** Represent by means of pencil lines.)

**2.4.NOS Looking for patterns, trends, and discrepancies- most but not all organisms assemble proteins from the same amino acids.**

Explain the trend of organism’s assembly of polypeptides from the same amino acids.

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

Describe a discrepancy of the trend of all organisms using the same amino acids to assemble polypeptides.

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

**Key Terms**

amino acids

​ribosomes

​fibrous proteins

​genome

​spider silk

​oxytocin

​transferrin

carboxyl groups

polypeptide

R-groups

​hormone proteins

rubisco

​actin

prolactin

fibrinogen

​scurvy

peptide bonds

​genes

immunoglobulin proteins

insulin

​myosin

​acetylcholine receptor

​albumin

integrin

condensation

​globular proteins

pigment proteins

​rhodopsin

​casein

​ferritin

​denature

​catalysis

dipeptide

oligopeptides

proteome

​collagen

​hemoglobin

​bilirubin

​amine groups

​gel electrophoresis