

Topic 2.3: Proteins

2.4.U1 Amino acids are linked together by condensation to form polypeptides. AND

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

1. Condensation of amino acids is a polymerisation reaction. A chain of amino acids joined together is called a polypeptide. These building reactions are part of the anabolic metabolism.
 - a. What structure mediates and controls the formation of polypeptides?
 - b. Apart from the above structure what else is needed for the reaction to occur?
 - c. Draw and annotate a structural diagram below to outline how two generalised amino acids (i.e. use the R-group nomenclature) into a dipeptide through condensation, producing a peptide bond.

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

2. How many different amino acids do we know of?
3. How many of these amino acids are synthesised by ribosomes?
4. List three examples of amino acids synthesised by ribosomes.
5. **Extension:** Outline the process by which the remaining amino acids are created.

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

6. State the three key ideas that explain the huge range of possible polypeptides:
7. If a polypeptide contains just 5 amino acids calculate the how many different polypeptides can be created.
8. State both the name of the longest polypeptide known and approximately how many amino acids it contains.

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

9. Outline the central dogma of genetics.

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

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

10. The R-groups of an amino acid are classified as having one of a number of different properties. List the properties can they possess.
11. Complete the table to outline the four different levels of protein structure.

	Notes	Fibrous or Globular
Primary (polypeptide)	<ul style="list-style-type: none"> • <i>The order / sequence of the amino acids of which the protein is composed</i> • <i>Formed by covalent peptide bonds between adjacent amino acids</i> • <i>Controls all subsequent levels of structure</i> 	<i>Neither (– will fold to become one of the subsequent levels of structure)</i>
Secondary		
Tertiary		
Quaternary		

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

12. Complete the table to describe each of different functions that proteins have in and outside of cells.

Function	Description	Key examples
		Rubisco
Muscle contraction		
	Tubulin is the subunit of microtubules that give animals cells their shape and pull on chromosomes during mitosis.	
		collagen
Blood clotting		
	Proteins in blood help transport oxygen, carbon dioxide, iron and lipids.	
Cell adhesion		
Membrane transport		
		Insulin
Receptors		rhodopsin
Packing of DNA		
	This is the most diverse group of proteins, as cells can make huge numbers of different antibodies.	immunoglobulins

2.4.U8 Every individual has a unique proteome.

13. The proteome is unique to every individual.

- a. Define the term genome.
- b. Define the term proteome.
- c. Aside from the genome what affects the proteome?
- d. Explain why the proteome is larger and more varied than the genome.