





Name: Date:

QA3 - Intramolecular forces within polypeptides

Intermolecular forces are those which occur between **different molecules/macromolecules**. The forces which join two polypeptide chains to make the **quaternary structure** of a protein are intermolecular forces.

Intramolecular forces are those which occur between parts of the **same molecule/macromolecule**. These are the forces which fold the polypeptide chain into a specific shape, producing **secondary**, **and tertiary structure**, by interactions between the amino acid residues.

1. What makes the intramolecular forces within a protein so important to its overall function?

2. What makes the intermolecular forces within a protein so important to its overall function?

- 3. Describe a type of protein complex which requires intermolecular interactions, but which doesn't have a quaternary structure.
- 4. State four types of interactions which could be present within a protein structure

Produced by Rebecca Kirkley at Emmanuel College as part of an extracurricular project. Edited by Adam Stubbs at Newcastle University as part of a summer outreach project.

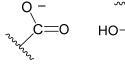






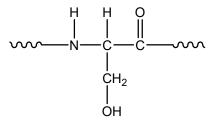
5. Explain what causes a protein's secondary structure to be different to its primary structure.

6. Using the following diagram, explain how these two groups could interact and make a polypeptide chain fold. Draw the interaction.





 The amino acid residue serine is shown below. Using your knowledge of intramolecular interactions, explain how a serine residue could interact with another part of a polypeptide chain.



8. Why can secondary structures be easily disrupted by gentle heating or changes in pH?

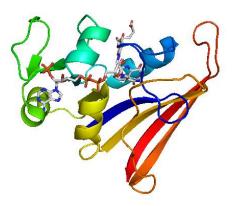
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- 9. State what happens to the α -helices and β -sheets to form a tertiary structure.
- 10. In a protein's tertiary structure, where do ionic bonds occur?
- 11. The enzyme dihydrofolate reductase is shown below, PDBe entry 7dfr. Identify the types of protein structure which are visible.



- 12. Which type of interaction is unique to cysteine residues, which have the side chain -CH₂SH?
- 13. The above interaction between cysteine residues can be either intramolecular or intermolecular. Explain why.

14. The two amino acid residues shown below are leucine and isoleucine respectively. Which type of interaction can they exclusively take part in?

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