

1. What processes allow a protein to change shape?

Substrate binding

Phosphorylation

Binding of a ligand causes a conformational change to occur

2. Where are residues in the active site located?

Can be in very different locations on the primary sequence

3. Which amino acids can be reversibly phosphorylated?

Serine, threonine, tyrosine

4. What does phosphorylation of a protein allow it to act as?

A "molecular switch"

Allows cellular processes to be regulated

5. Describe glycosylation:

Proteins (usually found on the surface of cells, or secreted) that acquire carbohydrates on specific Asn residues

Increases the hydrophilicity and ability to interact with other molecules

Carbohydrates also interact with serine and threonine

6. Describe hydrophilic structure and function

Addition of hydroxyl group to proline residues

Stabilises newly formed collagen

Lack of vitamin C inhibits this process, resulting in weakened fibres and subsequently scurvy

7. Describe gamma-carboxylate

Vitamin K deficiency can result in insufficient carboxylation of some glutamate residues in prothrombin

Prothrombin is a clotting protein; lack of which results in haemorrhage

8. What are serine proteases function?

Proteolytic enzymes

Include digestive enzymes, some proteases for blood clotting

Triad "Asp-His-Ser" residues are catalytic

9. What is a protein family?

Closely related proteins with similar amino acid sequences and 3D structure

Different functions (enzymatic activity) from a common ancestor

10. What does a reaction mechanism show in a catalytic cycle?

Flow of electrons

11. How is a reaction mechanism drawn?

Determine where electrons are

Decide which bonds are broken and made

Describe flow of electrons (may be over multiple steps)

12. What are post-translational modifications?

Modification to a protein after folding, providing it with additional functionality

Modification of certain residue's side chains

13. What is a Lewis structure?

Shows locations of electrons in bonds in a molecule and lone pairs around the atoms in a molecules

14. What is the difference between a single and double headed arrow in a reaction mechanism?

Single: 1 electron moving

Double: Electron pair moving

15. How is a Lewis structure drawn?

Write out the molecular skeleton

Assume that all bonds are covalent

Count all available valence electrons

Add sigma bonds and give each atom 8 electrons (excl. H with only 2)

If number of electrons is same as in step 3, then the structure is correct; Otherwise, add pi bonds

16. If the active site of a protein binds too tightly to the substrate, what would happen?

Substrate would not be released

Therefore, the reaction cannot be catalysed

17. If the active site of a protein binds too weakly to the substrate, what would happen?

Enzyme would not have sufficient affinity for the substrate

Likely the reaction would not happen

Enzyme may not be able to stress bonds sufficiently, so the reaction does not occur

18. When would a polypeptide likely fold into multiple domains?


More than ~200 residues in a polypeptide chain

19. Are all enzymes highly specific?

Not all of them

Some recognise a common part within a family of proteins

20. Draw all 20 side chains

 amino acid structures.pdf