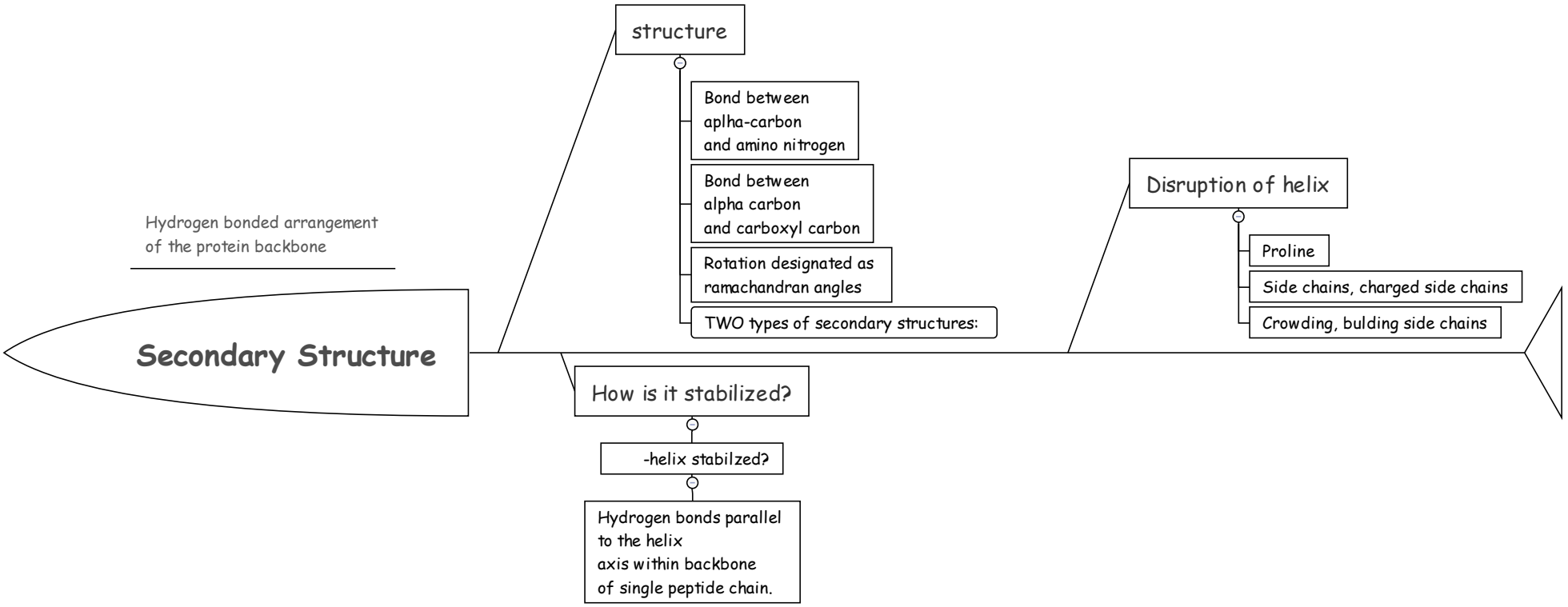
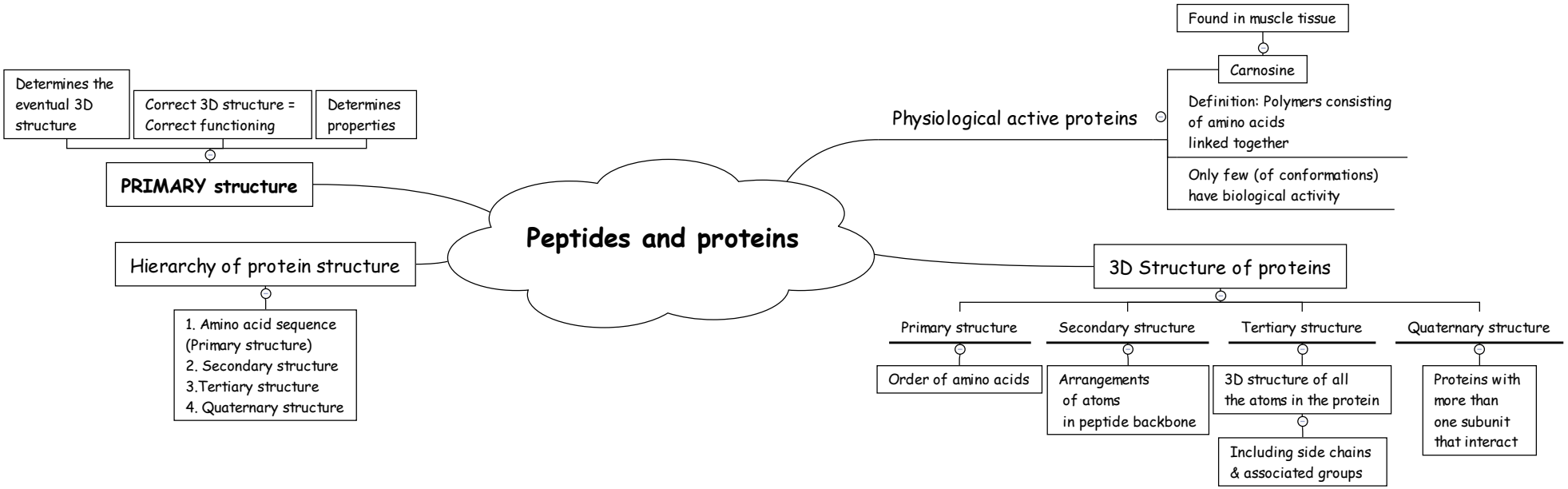
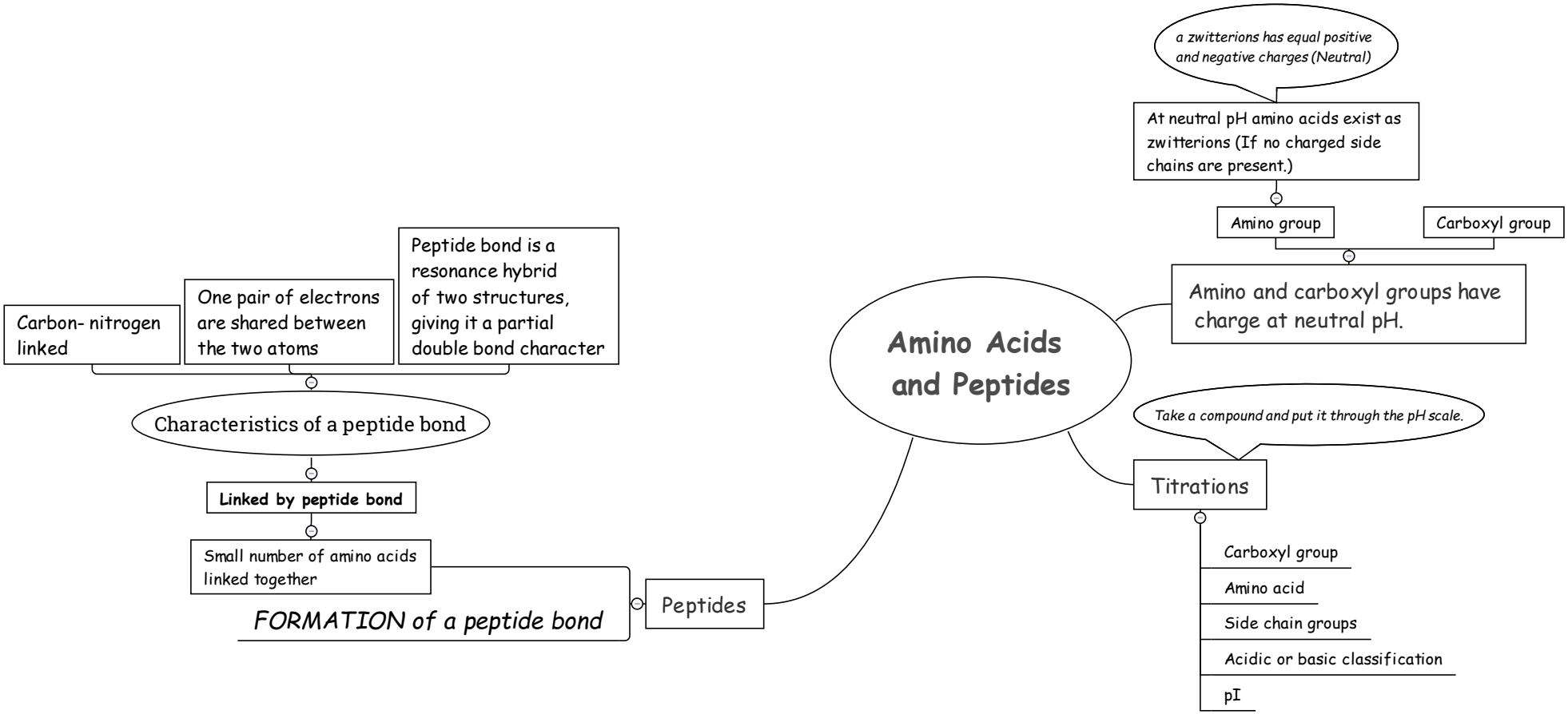

Hydrogen bonded arrangement of the protein backbone
Secondary Structure
structure
Bond between aplha-carbon and amino nitrogen
Bond between alpha carbon and carboxyl carbon
Rotation designated as ramachandran angles
TWO types of secondary structures:
How is it stabilized?
-helix stabilzed?
Hydrogen bonds parallel to the helix axis within backbone of single peptide chain.
Disruption of helix
Proline
Side chains, charged side chains
Crowding, bulding side chains


Peptides and proteins
PRIMARY structure
Determines the eventual 3D structure
Correct 3D structure = Correct functioning
Determines properties
Hierarchy of protein structure
1. Amino acid sequence (Primary structure)
2. Secondary structure
3.Tertiary structure
4. Quaternary structure
Physiological active proteins
Found in muscle tissue
Carnosine
Definition: Polymers consisting of amino acids linked together
Only few (of conformations) have biological activity
3D Structure of proteins
Primary structure
Order of amino acids
Secondary structure
Arrangements of atoms in peptide backbone
Tertiary structure
3D structure of all the atoms in the protein
Including side chains & associated groups
Quaternary structure
Proteins with more than one subunit that interact


Amino Acids and Peptides
Peptides
FORMATION of a peptide bond
Small number of amino acids linked together
Linked by peptide bond
Characteristics of a peptide bond
Carbon- nitrogen linked
One pair of electrons are shared between the two atoms
Peptide bond is a resonance hybrid of two structures, giving it a partial double bond character
Amino and carboxyl groups have charge at neutral pH.
Amino group
Carboxyl group
At neutral pH amino acids exist as zwitterions (If no charged side chains are present.)
a zwitterions has equal positive and negative charges (Neutral)
Titrations
Take a compound and put it through the pH scale.
Carboxyl group
Amino acid
Side chain groups
Acidic or basic classification
pI

BCM 251: Chapter 6

1.	**Activation energy**	Energy required to start a reaction
2.	**Active site**	The part of the enzyme to which the substrate binds and at which the reaction takes place
3.	**Aspartate transcarbamoylase (ATCase)**	A classic example of an allosteric enzyme that catalyzes an early reaction in pyrimidine biosynthesis.
4.	**Catalysis**	Process of increasing the rate of chemical reactions
5.	**Chymotrypsin**	A proteolytic enzyme that preferentially hydrolyzes amide bonds adjacent to aromatic amino acid residues.
6.	**Enzymes**	Biological catalysts, usually globular proteins, with self-splicing RNA as the only exception.
7.	**First order**	Describe a reaction whose rate depends on the first power of the concentration of a single reactant.
8.	**Induced-fit-model**	Description of substrate binding to an enzyme such that the conformation of the enzyme changes to accommodate the shape of the substrate.
9.	**Inhibitor**	Substance that decreases the rate of an enzyme-catalyzed reaction.
10.	**Irreversible inhibition**	Covalent binding of an inhibitor to an enzyme, causing permanent inactivation
11.	**Isozyme**	Multiple forms of an enzyme that catalyze the same overall reaction but have subtle physical and kinetic parameters
12.	**Lineweaver-Burk double-reciprocal plot**	Graphical method for analyzing the kinetics of enzyme-catalyzed reactions
13.	**Lock-and-key model**	Description of the binding of a substrate to an enzyme such that the active site and the substrate exactly match each other in shape.
14.	**Michaelis constant**	Numerical value for the strength of binding of a substrate to an enzyme; an important parameter in enzyme kinetics
15.	**Noncompetitive inhibition**	A form of enzyme inactivation in which a substance binds to a place other than the active site so that the reaction is inhibited.
16.	**Ordered mechanism**	An enzyme mechanism where the substrates have to bind to the enzyme in a specific order
17.	**Ping-pong mechanism**	An enzyme mechanism where a substrate binds to the enzyme and releases a product before before the second substrate binds to the enzyme.
18.	**Random mechanism**	An enzyme mechanism where the substrates can bind to the enzyme in any order.
19.	**Rate constant**	Proportionality constant in the equation that describes the rate of a reaction
20.	**Second order**	Describe a reaction whose rate depends on the product of the concentrations of two reactants
21.	**Standard free energy change**	Difference between the energies of reactants and products under standard conditions
22.	**Steady state**	Condition in which the concentration of an enzyme-substrate complex remains constant in spite of continuous turnover.
23.	**Substrate**	A reactant is an enzyme-catalyzed reaction
24.	**Suicide substrates (Trojan horse substrates)**	Molecules used to bind to an enzyme irreversibly and inactivate it
25.	**Transition site**	Intermediate stage in a reaction in which old bonds break and new bonds are formed
26.	**Turnover number**	Number of moles of substrate that react per mole of enzyme
27.	**Uncompetitive inhibition**	A type of inhibition where the inhibitor can bind to ES, , but not to free E.
28.	**Zero order**	Refers to a reaction that proceeds at a constant rate, independent of the concentration of a reactant

1.	**Abzymes**	Antibodies that are produced against a transition-state analog and that has catalytic activity similar to that of a naturally occurring enzyme.
2.	**Allosteric effector**	A substance- substrate, inhibitor, or activator- that binds to an allosteric enzyme and effects its activity
3.	**Allosteric sites**	Binding sites on a target molecule for allosteric effectors
4.	**Apoptosis**	The biochemically and biologically programmed death of a cell
5.	**Caspases**	A family of homodimer cysteine proteases responsible for many processes
6.	**Coenzymes**	Nonprotein substances that take part in the enzymatic reactions and are regenerated at the end of the reaction
7.	**Concerted model**	A description of allosteric activity in which the conformations of all subunits change simultaneously.
8.	**Electrophile**	An electron-poor substance that tends to react with centers of negative charge or polarization
9.	**Feedback inhibition**	Process by which the final product of a series of reactions inhibits the first reaction in the series
10.	**General acid-base catalysis**	A form of catalysis that depends on transfer of protons
11.	**Heterotrophic effect**	Allosteric effects that occur when different substances are bound to a ptotein.
12.	**Homotrophic effect**	Allosteric effects that occur when several identical molecules are bound to a protein
13.	**Inhibitor**	Substance that decreases the rate of an enzyme-catalyzed reaction.
14.	**K0.5**	The substrate level at one-half Vmax in a K system.
15.	**K systems**	Combinations of allosteric enzymes and inhibitors or activators, in which the presence of the inhibitor/ activator changes the substrate concentration that yields one-half Vmax.
16.	**Labeling**	Covalent modification of a specific residue on an enzyme
17.	**Metal-ion catalysis**	(Lewis acid-base catalysis) a form of catalysis that depends on the Lewis definition of an acid as an electron-pair acceptor and a base as an electron-pair donor.
18.	**Negative cooperativity**	A cooperative effect whereby binding of the first ligand to an enzyme or protein causes the affinity for the next ligand to be lower.
19.	**Nucleophile**	An electron-rich substance that tends to react with sides of positive charge or polarization
20.	**Nucleophilic substitution reactions**	Reactions in which one functional group is replaced by another as the result of a nucleophilic attack
21.	**Protein kinases**	A class of enzymes that modify a protein by attaching a phosphate group to it
22.	**Sequential model**	Description of the action of allosteric proteins in which a conformational change in one subunit is passed along to the other subunits.
23.	**Serine proteases**	A class of proteolytic enzymes in which a serine hydroxyl plays an essential role in catalysis
24.	**SN1**	Unimolecular nucleophilic substitution reaction; one of the most common types of organic reactions seen in biochemistry; the rate of the reation follows first-order kinetics
25.	**SN2**	A Bimolecular nucleophilic substitution reaction; an important type of organic reaction seen in biochemistry; the rate of the reaction follows second-order kinetics
26.	**Transition-state analogs**	Synthesized compounds that mimic the form of the transition state of an enzyme reaction.
27.	**V systems**	Combinations of allosteric enzymes and inhibitors or activators which the presence of the inhibitor/ activator changes the maximal velocity of the enzyme but not the substrate level that yields one half Vmax.
28.	**Zymogen**	An inactive protein that can be activated by specific hydrolysis of peptide bonds