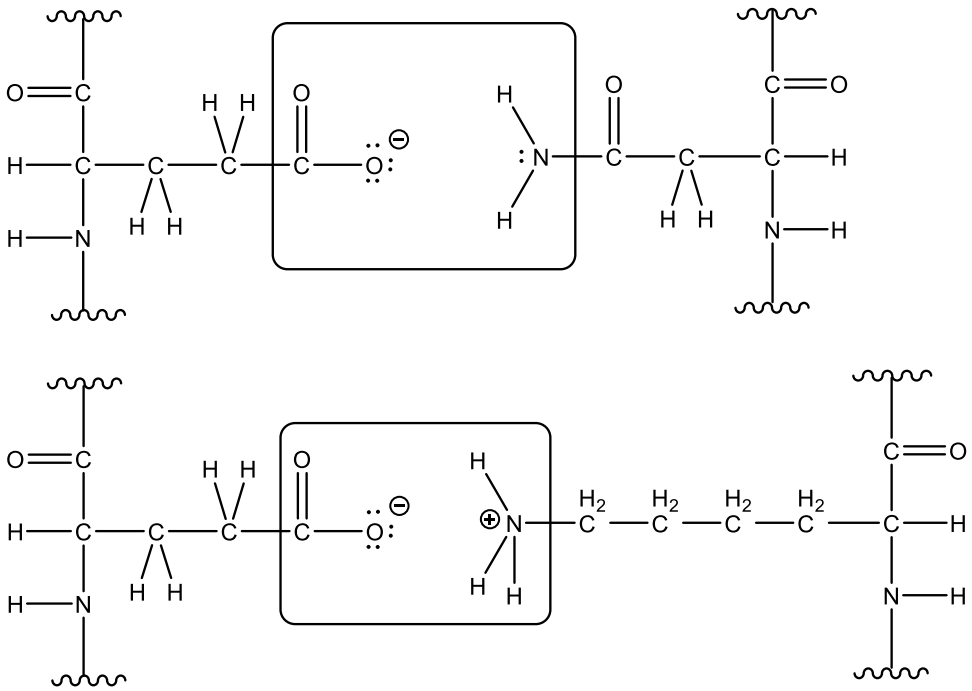
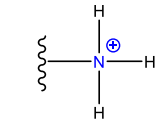
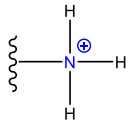
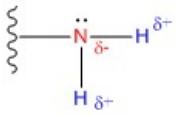
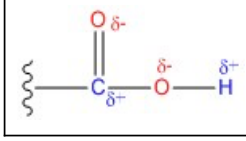
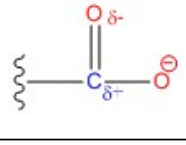
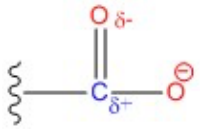
Higher order

PROTEIN DENATURING

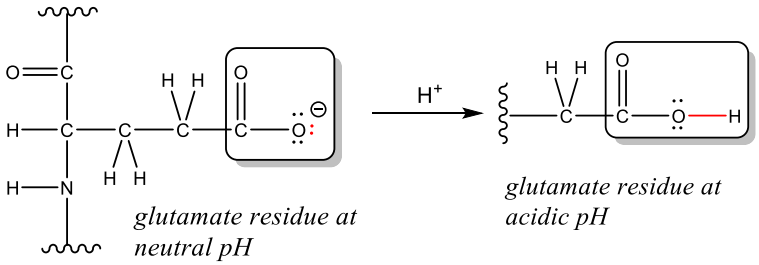
3-D protein structure can also be held together by interactions of ionic amino acid side chains with ionic or polar side chains.



Very Acidic (< pH 4.5)	Mildy acidic to mildly alkaline (pH 4.5-10)	Very alkaline (pH > 10)
		
		

Acidic conditions frequently ***denature*** proteins. Some amino acid side chains react with the protons (H^+) in acid.

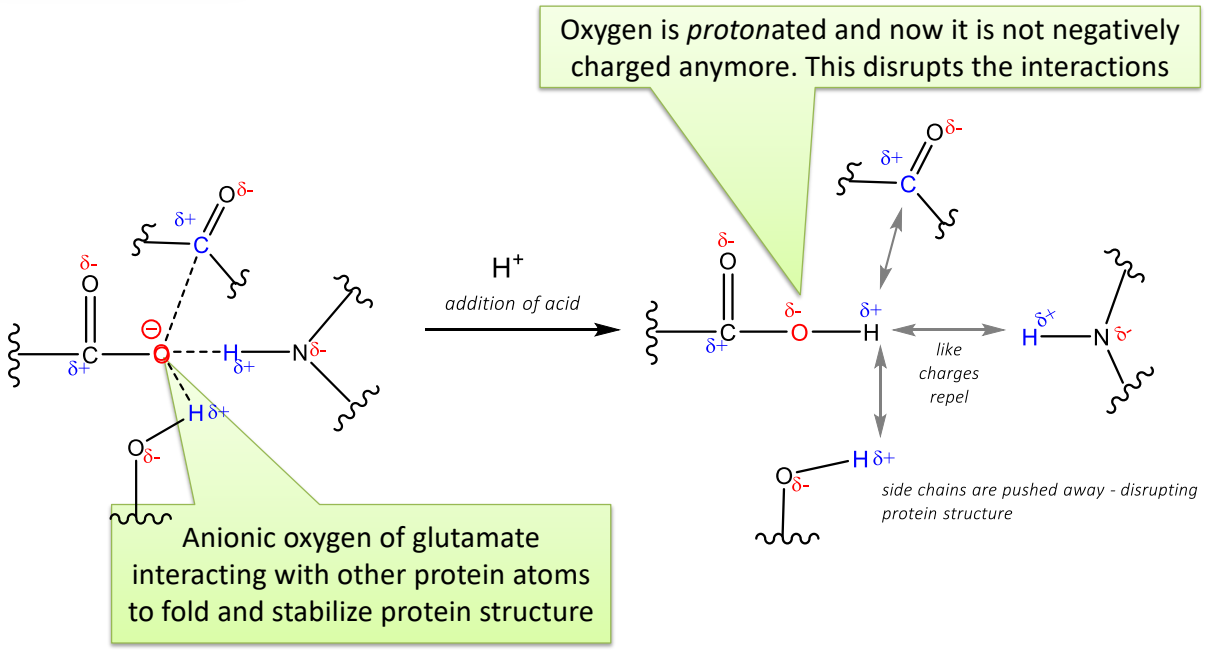
Changing the charge disrupts non-covalent interactions between amino acid residues.



glutamate residue at neutral pH

glutamate residue at acidic pH

Acid *denaturation* unfolds the *globular* protein structure. The disruption of *non-covalent* attractions between charged or partially charged atoms in amino acids weakens the folded structure until the protein unravels. The process of turning milk into cheese or yogurt can be accomplished by **acid *denaturation*** of the milk protein, casein.



Draw a cartoon to explain how disruption of interactions between amino acid atoms leads to **unfolding (denaturation)** of the protein structure.