Lecture 1:

In reality water does not exist in the form of H20 it exists in the form of the hydronium ion. The proton H+ that we usually use in the equation is actually the hydronium ion. The hydronium ion is formed by an acid in water.

The building blocks of a cell you have sugar, fatty acids, amino acids and nucleotides. Amino acids form proteins. What are the characteristics of amino acids: you have COOH and NH2 and the R group. There are 20 amino acids in animal cells. 9 of these amino acids we call essential amino acids, which means that the body cannot produce them they are synthesized somewhere else. All the other 11 can be biosynthesized by the cell. The Biosynthesis and degradation is usually closely related to the intermediates of the TCA cycle. This means that one of those intermediates will be used to biosynthesis an amino acid. But on the other hand amino acids are an important form of energy. Before they can become useful the NH2 has to be gotten rid by deamination. A deaminated amino acid will become an intermediate in the TCA cycle.

If you look at PH you see different ranges of all the 20 amino acids (4.7-12). What is the reason for this range? For some amino acids, it's the cooh group and for some of them it goes to the high PH side due to the amino group. So it covers a range. Now, let's look at how we can classify them. The one that we see here nonpolar hydrophobic: these groups of amino acids are hydrophobic but not nonpolar, it is very difficult for them to dissolve in water and it has very poor interaction with hydrophilic molecules. Another thing is that as these amino acids are chained together it gives the protein a specific function. Two things: 1.) You have membrane channel proteins that are integrated into the membrane. There are water channels in the membrane because water cannot seep through freely. So you have to have a channel that is nonpolar, water cannot go through but nonpolar molecules or electrically neutral molecules can go through. 2.) Nonpolar amino acids if you put it in a sequence is also important in ligand-receptor interaction. You have a protein binding to a protein. Ligand can be hydrophobic or hydrophilic. Take for example a hydrophobilic molecules like steroid or cholesterol. It is not going to bind to a protein receptor if the binding site is hydrophilic. The receptor site must also be hydrophobic. So this is the functional importance of the amino acids being hydrophobic or hydrophilic.

You have polar amino acids these are Aspartic acid, Glutamic acid. So they are very polar and can dissolve in water and if they are part of a sequence they will add a hydrophilic quality to that protein. You have also Polar uncharged: meaning that the number of carboxyl group when they ionize to COO-, it means that electrically they are neutral but at the the same time it is a polar molecule. And also you have Polar Basic. So you have this amino acid like Lysine in which there is this NH2 at the end and Arganine and Histidine and they give the amino acid a basic quality and at the same time the molecule is polar. So your understanding the amino acid sequence can help you to have a prediction of the 3-dimensional structure. Eventaully if you put the sequence together it needs to get to a point where it stabilizes. When the amino acids are linked together there is the C terminal end and the N-terminal end. The N-terminal part of the amino acids might have very important function, for example during protein translation, you have this ribosome attached, it is always the N-terminals being synthesized first.