PEER Life Science Cells Are Us Building Proteins Notes Outline

**Introduction**

* Proteins are a type of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ made up of amino acids.
* Proteins perform various jobs in the cell. They make structures in the cell and act as \_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecules.
* \_\_\_\_\_\_\_\_\_ on chromosomes in the \_\_\_\_\_\_\_\_\_\_\_\_ direct protein building.

**Why It Matters**

* Proteins embedded in the cell membrane can function to \_\_\_\_\_\_\_\_\_\_\_\_\_\_ adjacent cells and recognize \_\_\_\_\_\_\_\_\_\_\_\_\_ outside of the cells like hormones, drugs, and neurotransmitters.
* Proteins inside of cells act as \_\_\_\_\_\_\_\_\_\_\_\_ to help chemical reactions occur or help turn \_\_\_\_\_\_\_\_\_\_ on/off.
* \_\_\_\_\_\_\_\_\_\_\_\_ (small proteins) can be secreted as hormones and chemicals to send signals to cells.
* Genes found on DNA are important because they direct the creation of \_\_\_\_\_\_\_\_\_\_\_. Many diseases involve \_\_\_\_\_\_\_\_\_\_\_\_\_ to certain proteins which interferes with their normal function.
* When we eat proteins, they are \_\_\_\_\_\_\_\_\_\_\_ or broken down into \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_. These building blocks of proteins are taken into cells and used to make new proteins.

**What We Know**

* Proteins are very large molecules that can be 2 to 20 times larger than other molecules in cells. Proteins often determine the \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_ of cells. They also are responsible for:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ with other molecules
  + Promoting \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between other chemicals
* Amino acids are the building blocks of proteins. There are 20 amino acids in the body. Nine of these are “essential” amino acids which \_\_\_\_\_\_\_\_\_\_\_ be made in the body and have to be acquired through the diet.
* Because proteins are such large molecules and there are 20 amino acids to choose from when making a protein, there is a huge variety of proteins you can make. If you had a protein made up of 300 amino acids, the number of possible proteins you could make would be \_\_\_\_\_\_\_\_.
* There are four levels of protein structure due to \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_ caused by different amino acids. The levels are:
  + \_\_\_\_\_\_\_\_\_\_ structure: simple chain of amino acids.
  + \_\_\_\_\_\_\_\_\_\_ structure: chains that are coiled or form pleated sheets.
  + \_\_\_\_\_\_\_\_\_\_ structure: coiled or pleated chains that are folded.
  + \_\_\_\_\_\_\_\_\_\_ structure: folded protein consisting of more than one amino acid chain.
* Parts of proteins can be connected by strong \_\_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_bonds. We can see how these bonds affect the shape of proteins on our own heads! These are the bonds that can control the shape of hair (whether it is curly or straight) and can be manipulated by chemicals in a hair perm.
* Amino acids that have an/have no electric charge are not attracted to water and are attracted to lipids and each other. Chains made up of these amino acids form a \_\_\_\_\_\_\_.
* Proteins that fit well with other molecules, like a key in a lock, can participate in \_\_\_\_\_\_\_\_\_\_\_\_\_\_ with those molecules.
* In membranes, protein structure affects function in two ways:
  + \_\_\_\_\_\_\_\_\_\_\_\_ parts coil in the membrane, acting like an anchor.
  + Portions or the protein that are attracted to \_\_\_\_\_\_\_\_, stick out both sides of the membrane, available to \_\_\_\_\_\_\_\_\_\_\_\_ with other molecules.

**How We Know**

* Proteins can be made visible by \_\_\_\_\_\_\_\_\_\_\_\_\_ them so they precipitate out of solution.
* In order to \_\_\_\_\_\_\_\_\_\_\_\_ proteins from other chemicals in the cells, lipids and salts must be \_\_\_\_\_\_\_\_\_\_\_\_, and different kinds of proteins must be separated from each other. There are six steps to accomplish this.
  1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_:this machine allows broken up cells to be spun very quickly to separate cell components by \_\_\_\_\_\_\_\_\_\_.
  2. Remove the \_\_\_\_\_\_\_\_\_\_: this can be done by mashing the cells and stirring the debris into a mixture of two different \_\_\_\_\_\_\_\_\_\_ that do not dissolve in each other, so that the lipids go into one layer and the proteins into the other.
  3. Remove \_\_\_\_\_\_\_\_: this can be done through a process called \_\_\_\_\_\_\_\_\_ in which salts move from an area of high concentration to low concentration.
  4. \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_: substances in mixtures can be separated through a process called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. These methods can separate substances by attraction to other substances (how they adsorb) or size/weight.
  5. Determine amino acid \_\_\_\_\_\_\_\_\_\_\_: this can be done by digesting amino acids one at a time and identifying them.
  6. Determine the 3-D \_\_\_\_\_\_\_\_\_\_\_\_: this can be done by exposing purified protein to \_\_\_\_\_\_\_\_ and examining how the rays are deflected by the protein. Knowing the 3-D structure of proteins helps scientists understand how the protein binds and interacts with other molecules.

**Common Hazards**

* Most lead exposure in children in the U.S. is through lead-based \_\_\_\_\_\_\_\_\_ and from \_\_\_\_\_\_\_\_\_ found in deteriorating buildings.
* Name three negative effects lead has on the body:
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Lead damages the brain and cardiovascular system by inhibiting \_\_\_\_\_\_\_\_\_\_\_\_, especially those that make \_\_\_\_\_\_\_ in red blood cells \_\_\_\_\_\_\_\_\_\_\_\_\_\_ chemicals. Lead generates reactive oxygen molecules and intensifies oxidative \_\_\_\_\_\_\_ and cellular \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Hexane has \_\_\_\_\_\_ carbon atoms bound to hydrogen. It can cause \_\_\_\_\_\_\_\_\_ damage and wasting away of \_\_\_\_\_\_\_\_\_ fibers (peripheral neuropathy).
* Hexane also kills \_\_\_\_\_\_\_\_\_ cells found in the brain and spinal cord and causes filaments inside of nerves to become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + This prevents materials from being transported down nerves and inhibits communication.
* Diseases like Creutzfieldt-Jakob Disease (mad cow disease) are caused by \_\_\_\_\_\_\_\_\_, which are proteins that trigger normal proteins in the brain to fold abnormally.