**Module 1**

**Chapter 1 – The microbial world and you**

**Microbes in our liv**es

Overall theme of this course is to discuss microbes and how they are involved in the lives of humans. Microbes make the biggest news when they are causing harm

* Microbiology – The study of \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Microbes are organisms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to be seen with the \_\_\_\_\_\_\_\_\_\_\_\_
	+ aka, Microorganisms, germs, bugs
	+ Includes bacteria, fungus, protists, algae, viruses
	+ Huge diversity in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – only common theme is that \_\_\_\_\_\_\_\_\_
* Microbes are everywhere
	+ Most famous, or infamous, microbes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- TB, AIDS, food spoilage
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are microbes that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Only \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of microbes are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Most microbes are \_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Directly beneficial
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (bread, yogurt, beer), make \_\_\_\_\_\_\_\_\_\_\_\_\_ in intestine
	+ Indirectly beneficial
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organic matter in soil, clean up sewage, part of food chain

**Naming and classifying microorganisms**

* Nomenclature 🡪 system of naming for organisms
* Carolus Linnaeus established the system of scientific nomenclature
* Based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 🡪 language of scholars
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_ names 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ system
* The **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, which are *italicized* or underlined
* The genus is \_\_\_\_\_\_\_\_\_\_\_\_\_\_, species is in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* *Staphylococcus aureus*, *Escherichia coli*
* After the first use, scientific names may be abbreviated with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:
	+ *Escherichia coli* and *Staphylococcus aureus* are found in the human body
	+ *E. coli* is found in the large intestine, and *S. aureus* is on skin

**Types of Microorganisms**

* Diverse variety of microbes
* Microbes are classified into groups that share \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Microbes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ groups can also be diverse
	+ Helps \_\_\_\_\_\_\_\_\_\_\_\_\_\_ a very diverse group of organisms
* Bacteria (bacterium)
	+ Single celled
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – no \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** cell walls
	+ Diverse metabolism
		- Organic chemicals, inorganic chemicals, or light as food
* Archaea
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_ celled
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** in cell wall
	+ Archaea of interest:
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – produce methane
		- Extreme \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – live in \_\_\_\_\_\_\_\_\_\_\_\_ environments
		- Extreme \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – live in \_\_\_\_\_\_\_\_\_\_\_\_ environments
* Fungus (pl, fungi)
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – contain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cell walls
	+ Use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for energy
	+ \_\_\_\_\_\_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_\_\_cellular
		- Mushrooms, molds
	+ Some are single celled
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Protozoan (pl, protozoa)
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ celled, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** cells
	+ Absorb or ingest organic chemicals
	+ May be motile via pseudopods, cilia, or flagella
* Alga (pl, algae)
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cell walls
	+ Use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ producers”
		- Produce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_ that other organisms consume
* Viruses
	+ Extremely \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ particles - \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Consist of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ core
	+ Core is surrounded by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ coat
	+ Coat may be enclosed in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Are replicated only when they are in a living host cell
		- Obligate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Multicellular animal parasites
	+ **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
	+ Multicellular \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Parasitic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are called *helminths*
	+ Microscopic stages in life cycles

**Modern Developments in Microbiology**

* Bacteriology
	+ Study of \_\_\_\_\_\_\_\_\_\_\_\_
* Mycology
	+ Study of \_\_\_\_\_\_\_\_\_\_\_\_\_
* Parasitology
	+ Study of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ worms
* Virology
	+ Study of \_\_\_\_\_\_\_\_\_\_\_\_\_
* Immunology
	+ Study of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Microbial genetics**: the study of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Molecular biology**: the study of how \_\_\_\_\_\_\_ directs \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **Genomics**: the study of an organism’s \_\_\_\_\_\_\_\_\_\_\_\_\_; has provided new tools for classifying microorganisms
* **Recombinant DNA**: DNA made from two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ In the 1960s, Paul Berg inserted animal DNA into bacterial DNA, and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, the use of microbes to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, is centuries old
* **Recombinant DNA technology,** a new technique for biotechnology, enables bacteria and fungi to produce a variety of proteins, including vaccines and enzymes
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in human cells can be replaced in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Recombinant DNA technology can be used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from pests or make them resistant to harsh environments

**Microbial Ecology**

* Bacteria \_\_\_\_\_\_\_\_\_ carbon, nutrients, sulfur, and phosphorus that can be used by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Bioremediation**

* Use of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chemical \_\_\_\_\_\_\_\_\_\_\_\_\_ in environment
* Bacteria degrade organic matter in sewage
* Bacteria degrade or detoxify pollutants such as oil and mercury

**Biological Insecticides**

* Microbes that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are alternatives to chemical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in preventing insect damage to agricultural crops and disease transmission
* *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* infections are fatal in many insects but \_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, including humans, and to plants

**Microbes and Human Disease**

* Microbes normally \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the human body are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Normal microbiota \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of pathogens
* Normal microbiota produce \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, such as folic acid and vitamin K
* Only a small proportion of microbes are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Many more microbes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* When a pathogen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the host’s resistance, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (EIDs)**: \_\_\_\_\_\_\_\_\_\_\_\_\_ diseases and diseases \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Avian Flu
	+ West Nile
	+ MRSA
	+ AIDS
	+ Ebola

**Chapter 2 – Chemical Principles**

* **Chemistry** is the study of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ between atoms and molecules
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of microorganisms involve complex \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Nutrients are broken down by microbes to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**The Structure of Atoms**

* Atoms – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_of matter
* Consist of:
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge, have no discernable \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Molecules – combination of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ atoms
	+ Sometimes called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Ion – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ atom
	+ Can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged

**Chemical bonds**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are held together by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Three kinds of chemical bonds

* Ionic bonds
	+ Attraction between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to each other
		- “Opposites \_\_\_\_\_\_\_\_\_\_\_\_\_\_”
	+ Ions held together by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ interaction
		- Form an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Covalent bonds
	+ Bonds formed when \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ interaction
	+ Bonds can form between 2 \_\_\_\_\_\_\_\_\_\_ atoms, or 2 \_\_\_\_\_\_\_\_\_\_\_\_\_ atoms
	+ Strongest chemical bond
* Hydrogen bonds
	+ Form between:
		- A hydrogen atom covalently bonded to an \_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_ atom and;
		- Another \_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_ atom
* Order of bond strength:

\_\_\_\_\_\_\_\_\_\_\_\_\_ > \_\_\_\_\_\_\_\_\_\_\_\_\_\_ > \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Stronger ionic bonds not biologically relevant
	+ Only \_\_\_\_\_\_\_\_\_\_\_\_ ionic bonds are biologically important
* Covalent bonds require \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to form, break
	+ Energy can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when covalent bonds \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when they are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonds are biologically important
	+ \_\_\_\_\_\_\_\_\_\_\_ bond, can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Can \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2 molecules, or parts of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule
	+ Maintains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ structure of many molecules

**Important biological molecules**

* Organic compounds always \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Inorganic compounds typically \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Inorganic molecules**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and structurally \_\_\_\_\_\_\_\_\_\_\_\_
* Typically lack \_\_\_\_\_\_\_\_\_\_\_\_ atoms
* Water
	+ Most important \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule for supporting life
		- Hydrogen bonds between \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ make it a good \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – a liquid with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – the dissolving \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The ability of water to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ makes it an excellent solvent
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ many molecules
* Dissolving molecules helps with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Atoms and molecules in solution can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Organic compounds**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and structurally \_\_\_\_\_\_\_\_\_\_\_\_\_
* Contain \_\_\_\_\_\_\_\_\_\_\_ atoms
	+ Carbon can bond with \_\_\_\_ atoms, including \_\_\_\_\_\_\_\_\_
	+ Can form chains, branches, rings
* Organic molecules can combine to form large \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (“big molecules”)
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ formed by covalent bonding of many repeating \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – small molecules that make up \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Polymers are formed from monomers via \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_ is removed during the reaction (molecule is dehydrated)
* Polymers are broken down into monomers via \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Water is added to break (or \_\_\_\_\_\_\_\_\_\_\_) the polymer

**Carbohydrates**

* Group of organic compounds that include \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_
* Important functions:
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (cell walls, DNA)
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; fuel and storage
* Made up of C, H, O
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are building blocks (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) of carbohydrates
* Monosaccharides \_\_\_\_\_\_\_\_\_\_\_\_ sugar
	+ Usually \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in water
* Grouped by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in ring
	+ Triose (3 C), Tetrose (4 C), Heptose (7 C)
* Disaccharides
	+ Molecule of \_\_\_\_ monosaccharides
	+ Formed from two monosaccharides by?
	+ Broken into 2 monosaccharides by?
* Polysaccharides
	+ Consist of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ monosaccharides
		- Often number in the 100s
	+ Some important polysaccharides
		- Glycogen – energy reserve in \_\_\_\_\_\_\_\_\_\_\_
		- Cellulose – main component of \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_ cell walls
		- Starch – energy reserve in \_\_\_\_\_\_\_\_, eaten as food by animals

**Lipids**

* Diverse group with one common property:
	+ Hydro\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Primary functions:
* Simple lipids
	+ \_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Contain:
		- Glycerol – 3 carbon \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- 3 Fatty acids – long chain of \_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_
	+ Type of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ determine \_\_\_\_\_\_\_\_\_\_\_\_\_ of triglyceride
	+ Saturated fatty acids have the \_\_\_\_\_\_\_\_\_ number of \_\_\_\_\_\_\_\_ (2) per carbon
		- Saturated fatty acids are relatively \_\_\_\_\_\_\_\_, can pack closer together
		- Usually \_\_\_\_\_\_\_\_\_\_ at room temperature
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fats (butter) tend to be high in saturated fatty acids
	+ Unsaturated fatty acids have \_\_\_\_\_\_\_\_\_\_\_\_\_ double bonds between 2 carbons
		- Creates \_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_, in chains
		- Keeps chains \_\_\_\_\_\_\_\_\_\_\_
		- Usually \_\_\_\_\_\_\_\_\_\_\_\_ at room temperature
* Complex lipids
	+ Contain \_\_\_\_\_\_\_\_\_\_\_\_ attached to glycerol in addition to the fatty acids
		- Phosphorous, oxygen, nitrogen, sulfur
	+ Phospholipids made up of glycerol, \_\_\_ fatty acids, a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ group
		- Essential lipids that build \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- Phospholipids have hydrophobic and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (water loving) regions that allows for formation of cell membranes
* Steroids
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from other lipids
		- Interconnected carbon \_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ A steroid, \_\_\_\_\_\_\_\_\_\_\_\_\_, important part of some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Proteins**

* Most \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ organic molecule in a cell
* Perform \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ functions; cellular tools
	+ Enzymes – proteins that speed up biochemical reactions
	+ Transport – transport chemicals into and out of cells
	+ Toxins – harm living organisms
	+ Structure – in cell membranes, cell components
	+ Movement – muscles, movement of cells
* Amino acids - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of proteins
* Consist of:
	+ One carbon
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_ group (-COOH)
	+ An \_\_\_\_\_\_\_\_\_\_\_\_\_ group (-NH2)
	+ A hydrogen
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_-group
* \_\_\_\_\_ different amino acids
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ determines the property of the amino acid
	+ Can be large or small, hydrophobic or hydrophilic
* Amino acids are joined by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Two amino acids joined together are called a \_\_\_\_\_\_\_\_\_\_\_\_\_; three are called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are 10+ amino acids joined together
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a protein is vital for its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Loss of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = loss of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Proteins require a specific environment to function properly
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (high temperature, high salt, etc …) will cause protein to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Nucleic acids**

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ material of organisms
	+ Deoxyribonucleic acid (\_\_\_\_\_\_\_) – makes up \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Ribonucleic acid (\_\_\_\_\_\_) – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of DNA
* The monomers of nucleic acids are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consist of:
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ base
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (5 carbon) sugar; either deoxyribose or ribose
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_ group
* Nucleotides are named after the nitrogen containing bases:
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nucleotide, A
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nucleotide, T
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nucleotide, C
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nucleotide, G
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ nucleotide, U
* DNA
	+ Has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sugar
	+ \_\_\_\_\_\_\_\_\_\_ nucleic acid molecules form a double helix
		- Sugar and phosphate form “backbone”
		- Bases meet in the middle
	+ A always pairs with \_\_\_\_\_, C always pairs with \_\_\_\_\_\_
		- These bases are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to each other
		- “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_ bases are held together by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Order of bases is specific
	+ Determines the genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* RNA
	+ Has \_\_\_\_\_\_\_\_\_\_\_\_\_ sugar
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_ stranded nucleic acid molecule
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, instead of \_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- **A** to **U**
		- **C** to **G**
	+ Major role in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Adenosine triphosphate, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Principal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule of all cells
	+ Stores chemical energy released by some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Provides chemical energy for other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Consists of:
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_ base
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_ sugar
		- \_\_\_\_\_\_\_\_\_\_\_\_\_\_ groups
	+ Energy is released when \_\_\_\_\_\_\_\_\_\_\_\_\_ phosphate group is released
		- Forms adenosine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, ADP
	+ ATP is created by adding \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to ADP
		- Requires \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, usually from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_