

Lesson 1 - Main Terms

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| 1.2 | centigrade (oC) | A measurement unit of temperature which is derived from the Latin - centi (hundred) gradus (steps or degrees). Water freezes at 0oC and boils at 100oC |
| 1.2 | atom | The atom is the defining structural unit of matter. Atoms contain sub-atomic particles: positively-charged protons and electrically neutral neutrons in the atomic nucleus. Negatively-charged electrons orbit the atomic nucleus. |
| 1.2 | proton | A positively charged particle located in the nucleus of atoms. |
| 1.2 | electron | A negatively charged particle found in atoms, that orbits the nucleus. |
| 1.2 | neutron | A neutral (uncharged) particle located in the nucleus of atoms. |
| 1.2 | chemical element | A pure chemical substance composed of only one type of atom. |
| 1.2 | Periodic Table | A table of the chemical elements - arranged by consecutive atomic numbers. |
| 1.2 | atomic number | The number of protons in the nucleus of an atom of a given element. |
| 1.2 | atomic weight | The mass of an atom of a chemical element, The atomic weight approximately equals the number of protons and neutrons in the nucleus of that element. |

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| 1.2 | molecule | Two or more atoms held together by chemical bonds. Chemical bonding consists of sharing electrons. |
| 1.3 | cell | The basic structural, functional, and biological unit of all known living organisms. |
| 1.3 | Cell Doctrine | The theory that cells are the fundamental structural and functional units of all living organisms - (proposed by Matthias Schleiden and Theodor Schwann, 1838). The Cell Doctrine states that: 1. All living organisms are made of cells. 2. Cells are alive. |
| 1.4 | prokaryote | A single-cell organism that does not have a membrane bound nucleus. Bacteria are prokaryotes. |
| 1.4 | eukaryote | An organism whose cells have a membrane bound nucleus. All multicellular organisms are eukaryotes, e.g., plants and animals. |
| 1.4 | organic chemistry | The chemistry of the element: carbon. |
| 1.4 | macromolecule | A large complex molecule, such as DNA, proteins, carbohydrates, and lipids. Macromolecules typically contain hundreds and thousands of atoms. |

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| 1.4 | polymer | A large molecule composed of many repeated subunits - monomers. |
| 1.4 | monomer | The basic structural subunit of polymers. Monomers bind to each other to form polymers. |
| 1.4 | enzyme | A protein that carries out chemical reactions in our body. |
| 1.5 | valence | The ability of an atom to share electrons and form chemical bonds. Carbon has 4 valences, Oxygen 2 and Hydrogen 1. |
| 1.5 | chemical bond | Linking atoms together to form a molecule through sharing electrons. |
| 1.5 | polar | An uneven distribution of charge within a molecule. Water is polar; its oxygen is relatively more negative than its hydrogens, while the molecule as a whole remains neutral. |
| 1.5 | hydrogen bond | A bond formed through electrostatic attraction between a polar group of one molecule and a polar group of opposite charge in the same or other molecule. Two water molecules can hydrogen bond; the oxygen atom of one molecule is attracted to the hydrogen of the other. DNA base pairs bond G to C and A to T via three and two hydrogen bonds, respectively. |
| 1.5 | hydroxyl (OH group) | A chemical group - OH, that consists of one hydrogen atom bound to an oxygen atom. |
| 1.5 | hydrophilic | "Attracted to water". Molecules that contain polar groups are hydrophilic and thus are able to interact with water via hydrogen bonds. |

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| 1.5 | hydrophobic | "Afraid of water". Non-polar molecules (molecules lacking polar groups) are unable to hydrogen bond with water and so repel water. Such molecules are thus referred to as hydrophobic. Oils are hydrophobic. |
| 1.5 | amphipathic | Molecules that are both hydrophilic and hydrophobic. Soaps are amphipathic. |
| 1.7 | carbohydrate (saccharide) | A sugar molecule - sugars are "hydrated carbon" whose general formula is $(CH_2O)_n$. Glucose is a sugar of the formula - $C_6H_{12}O_6$ (where $n=6$). Starch, glycogen and cellulose are polysaccharides - they are polymers of glucose. |
| 1.8 | carboxyl (COOH group) | An organic acid (COOH). |
| 1.8 | fatty acid | An organic acid group (COOH) connected to a chain of hydrocarbons (carbons bound to hydrogens). Typically, the hydrocarbon tail can be 12-20 carbons long. A fatty acid is said to be "saturated" if all the carbons in the hydrocarbon tail are bound to 2 or 3 hydrogens. When two or more carbon atoms of the hydrocarbon tails are linked between themselves via double chemical bonds, these carbons are said to be "unsaturated". |
| 1.8 | lipid | Hydrophobic organic molecules that often contain two fatty acids linked together via a short 3 carbon chain called glycerol. Three fatty acids linked together via glycerol form the lipid - triglyceride. Cholesterol is also considered a lipid however it does not contain fatty acids. Cholesterol is a modified steroid. |
| 1.8 | phospholipid | A lipid in which the two fatty acids are also linked to a phosphate group. The phosphate group is often further bound to additional hydrophilic groups. Phospholipids are |

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| | | amphipathic; the hydrophobic fatty acid tails being linked to the polar phosphate containing group. |
| 1.8 | cell membrane | A lipid bilayer; a biological membrane typically made of phospholipids, which separates the interior of cells from the outside environment. The bilayer is arranged such that the polar heads face the water outside the cell and the water containing cytoplasm inside, while the fatty acid hydrocarbon tails from each leaflet of the bilayer face and intermingle with each other. This same arrangement is used in the formation of all the membranes within the cell that surround organelles. |
| 1.8 | organelles | Subcellular structures; such as the nucleus, endoplasmic reticulum and mitochondria, that are surrounded by one or two lipid bilayers. |
| 1.8 | cell nucleus | The central organelle of a eukaryotic cell that contains the cell's hereditary information - DNA. |
| 1.8 | ribosome | A subcellular structure that translates messenger RNA (mRNA) into its corresponding protein. Ribosomes are molecular "machines" that recognize the mRNA that needs to be translated, identifies the "reading frame" (the point to begin reading) of a given mRNA and is able to read the genetic code - the three letter codons, as well as actually link the amino acids via peptide bonds. |
| 1.8 | endoplasmic reticulum (ER) | An extensive network of intracellular membranes that is often associated with ribosomes active in producing proteins that need to be exported and secreted out of the cells. Antibodies and cytokines are made on ribosomes bound to the ER. The enzymes of |

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| | | lysosomes, the organelles that breakdown bacteria eaten by macrophages are also made on ribosomes bound to the ER. So are MHC and Fc receptors. |
| 1.8 | Golgi apparatus | The loading dock and distributor of proteins made in the ER. This membrane structure sorts the proteins made in the ER and sends them to other organelles such as the lysosome, or to export out of the cell, or to cell membranes. TLRs and the MHC proteins are proteins of the cell's outer membrane that were processed and distributed by the Golgi apparatus. |
| 1.8 | lysosome | An intracellular organelle full of digestive enzymes produced in the ER and distributed by the Golgi apparatus. These lysosomal enzymes function to digest and breakdown worn-out organelles, food particles, and engulfed viruses or bacteria. |
| 1.8 | mitochondria | A complex organelle that breaks down sugars and lipids from the foods we eat. This produces the energy that the cell uses to produce new proteins, replicate DNA, build muscles and bones and maintains our cells. |
| 1.8 | cytoplasm | The aqueous fluid of our cells. Cytoplasm contains proteins and other molecules as well as functional particles like ribosomes and proteasomes and bathes all the organelles, such as the ER and nucleus. |