

Lecture 1 Learning Objectives

## KNOW

- the names of the 3 features that eukaryotes have, which they have in common with the other two domains
- what makes up eukaryotic cell cytoplasm, be able to describe cytoplasm, cytosol
- what the basic feature of an organelle is that makes it an organelle
- the names of at least 3 organelles in eukaryotes
- 2 of 3 reasons given on slide 19 “Size Limitations” why a cell cannot exceed a certain size
- what light versus electron microscopy is with respect to scale of resolution
- be able to name the two kinds of electron microscopy discussed and which of them gives higher magnification
- how to give one example of how a cell’s structure/shape is optimized for its function

Lecture 2 Learning Objectives

## KNOW

- the three subatomic particles
- what orbitals and the nucleus are and which subatomic particles populate them
- what an atomic number is and what it means
- what the mass number of an element is and what it means
- what an isotope is and that it describes the differences of the number of a certain subatomic particle
- what the importance is of a valence shell of an atom
- how to describe electronegativity
- what two things must balance in a chemical reaction
- the parts of a reaction energy diagram (lower left figure of slide 16)
- the difference between an exothermic and endothermic reaction
- that a bond is formed by a pair of electrons making a molecular orbital (MO)
- the difference between ionic bonding, covalent bonding, hydrogen bonding, hydrophobic interaction, and van der Waals forces
- how to recognize an ion
- what the properties of H<sub>2</sub>O are: how is polarity created, what its specific heat means, how we know it’s cohesive
- what catalysis does to the reaction energy diagram

Lecture 3 Learning Objectives

## KNOW

- what the compartments of body water are
- what the inorganic components of the cell are
- at least 7 elements that are found in the human body
- that  $\text{H}_2\text{O}$  undergoes this chemical reaction:  $\text{H}_2\text{O} \leftrightarrow \text{H}^+ + \text{OH}^-$  which reaches an equilibrium in which the concentration of  $\text{H}^+$ , shown as  $[\text{H}^+]$ , is  $10^{-7}$  M (“molar” or “moles per liter”)
- the definition of the pH is the mathematical expression “ $-\log[\text{H}^+]$ ”
- that with the definition of pH, thus the pH of pure water is 7
- what an acid is: it produces  $\text{H}^+$  ions
- what a base is: it produces  $\text{OH}^-$  ions (or decreases the  $\text{H}^+$  ions in solution)
- the difference between strong and weak when talking about an acid or a base
- that weak acids and bases make good buffers, and what a buffer is good at doing
- what two substances buffer the pH of the cytosol
- what substances buffer the blood (bicarbonate-carbon dioxide)
- how to describe osmosis
- differences between isotonic, hypertonic, hypotonic

Lecture 4 Learning Objectives

## KNOW

- how to define or describe the terms hydrolysis, condensation, polymer, isomer
- that carbohydrates (CHOs) have 1 carbon, 2 hydrogens, 1 oxygen as a ratio of atoms in the molecule
- that CHOs are aldehydes or ketones that are poly-hydroxylated
- glucose is most important 6-carbon sugar
- names of other monosaccharides: mannose, galactose, fructose (is a ketose, or ketosugar)
- names and combinations of disaccharides: fructose + glucose = sucrose, galactose + glucose = lactose
- Monosaccharides are linked by condensation or dehydration synthesis, with  $\text{H}_2\text{O}$  produced
- Glycogen is a highly branched form of glucose polymer (poly-glucose) which is a storage form of glucose in animals, and mainly deposited in liver and skeletal muscle
- Starch is a less highly branched form of glucose polymer produced by plants as food storage for plants but also digestible by animals that eat plant products
- Cellulose is a poly-glucose form not digestible by animals at all and used for plant cell wall construction
- Ribose and its 2-deoxyribose are 5-carbon monosaccharides used in forming RNA and DNA respectively
- Polysaccharides are used to form arthropod exoskeletons and form cartilage in humans
- that a glycolipid is an oligosaccharide attached to the polar end of a membrane lipid (diglyceride), and what two important functions it has that were discussed

Continued Lecture 4 points

- how to describe the four submolecular parts (moieties) of the amino acid
- how many amino acids there are and the kinds of bonding or interactions that their side chains can make
- how to describe the peptide bond and how it is formed
- structure of the polypeptide: its two ends and the names for them and direction of biosynthesis
- what the four levels of protein structure are, and how to describe them, including the names of the two kinds of secondary structure and how to describe them
- at least two functions of proteins
- how to describe the three features of an enzyme, and the two kinds of regulation of enzyme activity
- the two basic types of membrane proteins

The quiz will have three multiple choice questions and one short essay type question. It will amount to 2% of the final course grade. I will score the quiz on a raw scale.

The quiz will not necessarily have you regurgitate facts, but also possibly ask you to use the facts to analyze and solve a problem.

Question difficulty will vary from the many that everyone should be able to answer with the proper level of study to some challenging questions. Do your best and you will stand out among the best.