

Lipids Lecture Guide

Purpose

The purpose of this lecture guide is to guide you through the lecture and highlight important topics. This assignment will help to increase your knowledge and familiarity with lipids, osmosis, and diffusion.

Student Learning Outcomes: After completing this lecture guide, you will be able to:

- Classify types of fatty acids.
- Recognize the structural features of lipids.
- Distinguish between the physical properties of lipids.
- Explain the role of lipids.
- Explain the processes of osmosis and diffusion.
- Predict the movement of molecules across a cell membrane.
- Propose the effect of tonicity on red blood cells.

Criteria

This worksheet is optional and will not count as a grade.

1. _____ are a class of biomolecules containing nonpolar substances that provide components of cell membranes, vitamins, and steroids. The different classes of these compounds are classified according to their structure and function.
2. _____ are the building blocks of lipids. These compounds contain an _____ number of carbon atoms and the _____ functional group. They are also considered to be _____ because they contain polar and nonpolar regions.
3. Fatty acids can be classified based on the carbon-carbon bonds. A(n) _____ fatty acid contains only carbon-carbon single bonds. If one carbon-carbon double bond is present, the fatty acid is classified as a(n) _____ fatty acid. If multiple carbon-carbon double bonds are present, the molecule represents a(n) _____ fatty acid. Most unsaturated fatty acids contain _____ (geometric type) double bonds which give them a “flattened” appearance.

4. Two naming systems can be used to detail the location of double bonds in unsaturated fatty acids. The _____ system indicates the starting location of each carbon-carbon double bond and assigns C1 to the carbon of the _____. The _____ system indicates the starting location of the first carbon-carbon double bond and assigns C1 to the carbon that is located at the end _____ the functional group. If multiple double bonds are present, the starting location of each would be _____ carbon atoms from the previous starting location.
5. The _____ provides information about the total number of carbon, number of carbon-carbon double bonds, and the location of double bonds in a fatty acid. The format is typically shown as [__: __], ω -#, but can also be shown as [__: __], $\Delta^{#,#}$.
6. When fatty acids combine with other molecules, more complex lipids will form. If _____ fatty acids combine with _____, the result is a triacylglycerol (which is also referred to as a _____). Triacylglycerols are energy storage lipids that can be classified as _____ or _____ depending on the types of fatty acids present. If the triacylglycerol contains mostly saturated fatty acids, it is referred to as a(n) _____. These compounds are derived from _____ and are typically _____ or _____ at room temperature. If the triacylglycerol contains mostly unsaturated fatty acids, it is referred to as a(n) _____. These compounds are derived from _____ and are typically _____ at room temperature.

7. The _____ reaction can be used to convert oils to fats. If the reaction converts some but not all carbon-carbon double bonds into single bonds, the process is referred to as _____. This results in the formation of a _____, because the _____ alkenes are converted to the lower energy _____ alkene.
8. Fatty acids can also combine with other molecules to produce membrane lipids that contain the _____ or _____ backbone. Phospholipids that contain the glycerol backbone are referred to as _____ and those containing the sphingosine backbone are referred to as _____. A glycerophospholipid contains glycerol, _____ fatty acid(s), and a _____ that forms when phosphate is linked between glycerol and a(n) _____. A sphingophospholipid (also referred to as a _____) contains the 18-carbon sphingosine molecule, _____ fatty acid(s), and a monophosphate diester that forms when phosphate is linked between glycerol and a(n) _____. Sphingolipids that contain a carbohydrate instead of the monophosphate diester are known as glycosphingolipids or _____. If the glycosphingolipid contains a monosaccharide, it is classified as a _____.
9. Phospholipids arrange themselves in two layers called a _____. The arrangement allows the _____ of the phospholipids to be exposed to water while shielding the _____. The model that

shows how these two layers are arranged along with proteins and other molecules that are embedded is known as the _____.

10. A _____ membrane allows particles to selectively move into and out of a cell. When the solute moves, the process is known as _____. The movement of water across a cell membrane is known as _____.
11. There are three methods in which solute particles can undergo diffusion and move across the cell membrane. When the particles move from an area of higher concentration to an area of lower concentration without the assistance of a protein or added energy, the process is known as _____. When the particles move from an area of higher concentration to an area of lower concentration with the assistance of a protein but no added energy, the process is known as _____. When the particles move from an area of low concentration to an area of higher concentration with the assistance of a protein and added energy, the process is known as _____. During the process, the solute is moving _____ the concentration gradient.
12. One example of diffusion in the body is through the process of _____. This allows the kidneys to filter waste from the blood. The artificial form of this filtration process is called _____.
13. When water moves across the semipermeable membrane, the side with the higher solution concentration will exert a higher _____. If the pressure is greater than the osmotic pressure, water will move against the concentration gradient in a process known as _____.

14. Osmosis occurs until solution concentration inside and outside of a cell become _____.
If the concentration of the solution outside of the cell is lower than the concentration inside the cell, the solution is _____. This results in _____ causing water to flow _____ the cell. If the concentration of the solution is higher outside of the cell than inside the cell, the solution is _____. This results in _____ causing water to flow _____ the cell.
15. The physiological solution concentration of NaCl is _____ %(m/v) and glucose is _____ %(m/v). Any concentration _____ either of these is hypotonic and a concentration _____ either is hypertonic.
16. The class of lipids that contain _____ fused rings is the _____. The most abundant of these compounds is _____, which is the precursor for all other compounds belonging to this class. Such precursors include _____ which act as emulsifying agents to aid in digestion; _____ to help regulate electrolyte concentrations; and _____ which help regulate glucose and contain anti-inflammatory properties. The sex hormones _____, _____, and _____ also represent hormones containing the cholesterol precursor.