Student ‘s Assignment 1 (Module One)

Student name: Thor Dak Khoak

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Questions

Giving two examples for each, define the following terms:

a. Food

b. Nutrients

c. Nutrition

2. Distinguish between dispensable and indispensable nutrients

3. Suggest a reason why protein deficiency/inadequacy would interfere with the process of digestion.

4. Giving specific examples, explain what you understand by the term enzyme specificity.

5. Explain what you understand by the term antinutrients.

b. Explain three functions of bile in the digestion of lipids.

c. Explain how proteins differ structurally from carbohydrates and lipids.

1**. Giving two examples for each, define the following terms**:

a. Food

Food is any nourishing substance that living organisms, including human beings eat, drink, or otherwise take into their bodies to sustain life, provide energy, promote growth, and body tissues repair. It can also be defined as any material consisting essentially of protein, carbohydrate, and fat used in the body of an organism to sustain growth, repair, and vital processes and to furnish energy.

b. Nutrients

Nutrients are substances from animals or plants that when consumed by living organisms such as human, provide nourishment essential for the maintenance of life and growth.
Nutrients can also refer to molecules in food that all organisms need to make energy, grow, develop, and reproduce. Nutrients are digested and then broken down into basic parts to be used by the organism. There are two main types of nutrients, **macronutrients** and **micronutrients**.

The three main categories of macronutrients include carbohydrate, protein, and fat.

Carbohydrates are a type of macronutrient used for quick energy in cells. The basic unit of carbohydrates is a monosaccharide. An example of a monosaccharide is **glucose** or sugar. Glucose can be by itself or assembled into long chains to make things like starch, which can be found in potatoes. Foods that contain carbohydrates include grains, cereal, bread, pasta, potatoes, fruits and sweets such as soda and candy.

Proteins are a macronutrient that the cells in your body use for structure. Protein is very important for building tissues, such as muscle. Muscle is mainly made up of proteins. Think how bodybuilders are always eating plain chicken and protein bars - they're trying to build their muscles by getting lots of protein in their diet. Proteins are made from smaller monomers called **amino acids**. There are twenty amino acids that make up all the kinds of protein your body needs. A body can make some of the amino acids you need, but there are nine that you must consume in your diet. These are called essential amino acids. Meat, fish, beans, and eggs are examples of foods rich in protein.

Fats are called **lipids** and are a macronutrient in your body that stores energy. Fats have long chains of carbon and hydrogen, which store lots of energy in the chemical bonds. Fats are important in our body to cushion organs, protect our cells, and send signals in the form of hormones around our body. Foods that are rich in fats are butter and oil.

The two types of **micronutrients** are vitamins and minerals, and these are extra molecules that cells need to make energy.

Vitamins and minerals are micronutrients, meaning the body needs them in small quantities. Vitamins are organic compounds produced by living beings, while minerals are inorganic elements that originate in the earth. Vitamins and minerals support the body's biochemical processes. Each of the vitamins and minerals has a distinct function, including regulating metabolism, guarding the cells from oxidative stress and synthesizing hormones.

Water

Water Comprises of 60 percent of your body weight, water is vital for the normal functioning of all your body's systems. It helps cleanse your body of wastes and toxins, carries essential nutrients to your cells, lubricates your joints and helps maintain your body temperature. While the rule is to drink eight glasses of water daily, this maxim is not supported by scientific evidence, according to MayoClinic.com. If your urine output is about 6 cups per day, your urine is slightly yellowish or clear and you don't often feel thirsty, your water intake is likely adequate.

c. Nutrition

Nutrition is the process of providing or obtaining the food necessary for health and growth.

Nutrition is the science that interprets the interaction of nutrients and other substances in food in relation to maintenance, growth, reproduction, health and disease of an organism. It includes food intake, absorption, assimilation, biosynthesis, catabolism, and excretion.

Nutrition is nourishment or energy that is obtained from food consumed or the process of consuming the proper amount of nourishment and energy. An example of nutrition is the nutrients found in fruits and vegetables. An example of nutrition is eating a healthy diet.

Nutritional science also examines how the body responds to food. Fast facts on nutrition. The human body requires seven major types of nutrients. Not all nutrients provide energy but are still important, such as water and fiber. Micronutrients are important but required in smaller amounts.

2. Distinguish between dispensable and indispensable nutrients

The main difference between essential and nonessential nutrients is that essential nutrients are those food substances that must be obtained from outside the body, meaning body cannot make

them. Whereas, the body can synthesize the nonessential nutrients but, body can obtain them through the diet as well**.**

Furthermore, some building blocks of carbohydrates, lipids, and proteins, certain vitamins and minerals and water are essential nutrients while biotin, vitamin K, cholesterol, dietary fiber, certain amino acids and fatty acids are non-essential nutrients.

Essential and nonessential nutrients are two categories of nutrients required by organisms for their growth, survival, and reproduction. The other types of nutrients are the conditionally essential nutrients and non-nutrients.

This table reads more the differences between essential and non-essential nutrients.

Essential nutrients	**Non-essential nutrients**
The nutrients required for normal body functioning that cannot be made by the body	The nutrients that can be made by the body and may also be absorbed from food.
Cannot be synthesized by the body and hence, they must be included in the diet	Can be synthesized by the body or they may be included in the diet
Types; some of the building blocks of carbohydrates, proteins, and lipids, certain vitamins and minerals and water	Types; biotin, vitamin K, cholesterol, dietary fiber, certain amino acids and fatty acids.
Play a vital role in metabolic processes and the functioning of tissues and organs	Have a significant effect on the health.

3. Suggest a reason why protein deficiency/inadequacy would interfere with the process of digestion.

Insufficient protein in your diet reduces lean body mass, muscle strength, and function.

Not consuming enough protein can also cause muscle cramping, weakness, and soreness. This eventually causes muscle wasting or atrophy as a direct result of chronic, low dietary protein.

Our bodies break down protein in foods like meat and fish into amino acids, which are the ***building blocks*** of protein. Any amino acids that aren't needed are broken down further and removed from the body. People with **Phenylketonuria** (**PKU**) can't break down the amino acid phenylalanine, which then builds up in the blood and brain. **Phenylketonuria** (**PKU**) is a type of amino acid metabolism disorder. It is inherited. If you have it, your body can't process part of a protein called phenylalanine (Phe).

Proteins are important nutrients that your body uses to build cellular structures that carry out vital functions. In fact, the basic building blocks of proteins are so important to your cells that if you did not consume protein, it would be like trying to build a house without tools or nails.

4. Giving specific examples, explain what you understand by the term enzyme specificity.

Enzyme specificity means enzyme acts upon on a particular type of chemical reaction. It is that enzyme works only precise biochemical response. A few enzymes exhibit absolute specificity; that is, they will catalyze only one particular reaction. Other enzymes will be specific for a particular type of chemical bond or functional group. In general, there are four distinct types of specificity: Absolute specificity - the enzyme will catalyze only one reaction

Specificity of Enzymes; One of the properties of enzymes that makes them so important as diagnostic and research tools is the specificity they exhibit relative to the reactions they catalyze. A few enzymes exhibit absolute specificity; that is, they will catalyze only one particular reaction. Other enzymes will be specific for a particular type of chemical bond or functional group. In general, there are four distinct types of specificity :

- Absolute specificity - the enzyme will catalyze only one reaction.
- Group specificity - the enzyme will act only on molecules that have specific functional groups, such as amino, phosphate and methyl groups.
- Linkage specificity - the enzyme will act on a particular type of chemical bond regardless of the rest of the molecular structure.
- Stereochemical specificity - the enzyme will act on a particular steric or optical isomer.

5. a. Explain what you understand by the term antinutrients.

Antinutrients are natural or synthetic compounds that **interfere** with the absorption of nutrients. Antinutrients are compounds that work in opposition to nutrients, interfering with the body’s

ability to absorb beneficial nutrients and minerals. Beyond limiting the nutritional value of foods, you eat, they can cause or contribute to a wide range of problems, including leaky gut syndrome, inflammation, abdominal pain, headaches, nausea, diarrhea, kidney stones, and allergy like symptoms such as rashes and itchiness.

Nutrition studies focus on these antinutrients commonly found in food sources and beverages.

The highest concentrations of antinutrients are typically found in legumes, beans, grains, and nuts, but are also found in the leaves, roots, and fruits of certain types of plants. Antinutrients are not entirely bad, and it is neither healthy nor possible to avoid them completely. Rather than trying to avoid them altogether, it is best to identify the ones that cause problems for you and do your best to limit those in your diet. The most reliable way to do this is an elimination diet. Basically, you remove foods from your diet until you find your problems reduced or eliminated, then slowly reintroduce foods to see which cause your symptoms to come back. Once you have figured out which foods cause problems for you, avoid them going forward.

There are four primary antinutrients found commonly in many foods: gluten, lectins, oxalates, and phytates;

Gluten is the most famous (or infamous) antinutrient of the bunch, is a protein found in wheat, rice, barley, and oats. Gluten cannot be digested by the human gastrointestinal system and causes some amount of trouble for almost all people. Individuals with celiac disease deal with immediate and severe reactions to consuming any gluten at all, but many other people have some amount of gluten sensitivity. When an indigestible material like gluten passes through the digestive system, it causes an inflammatory immune response. This inflammatory response can interfere with the body's ability to properly absorb nutrients, and cause cramping, bloating, abdominal pain, brain fog, and eventually leaky gut syndrome.

Foods containing gluten can be particularly difficult to remove from your diet, because grains containing gluten are thought to be broken down in the digestive system into compounds called gluteomorphins. These compounds are related to opioids, and bind to the same receptors in the brain, causing cravings and addictive tendencies in similar ways. Gluten is also found in a huge number of processed and packaged food, including many products you wouldn't expect to find it in, making avoiding it a challenge.

Lectins are a type of protein found in most species of plants, and certain varieties of lectins can cause problems in the digestive system. Different people can have widely varying sensitivity to lectins, and for some people they don't cause any problems. For those that are sensitive, they can cause problems in the intestines by sticking to intestinal walls leading to intestinal permeability. As you digest food, the process can cause small traumas to the intestinal lining,

which your body normally heals without any trouble. Lectins stuck to the intestinal walls interfere with this process, preventing the healing. Over time this unrepaired damage may lead to holes in the lining of the intestinal walls, leading to leaky gut syndrome.

Because lectins are found so commonly in plants, they are essentially impossible to avoid entirely. But certain sources of lectins, particularly nightshades, wheat, and beans tend to be particularly problematic. If you are sensitive to lectins, you may have noticed headaches, stomach pain, joint pain, or brain fog when eating these foods.

Oxalates, or **oxalic acids**, are found in many plants such as beans, black pepper, chocolate, beets, and many cruciferous vegetables. In the bloodstream, oxalates bind to calcium, forming small sharp oxalic acid crystals. These crystals can be deposited in muscles through the body, causing muscle pain, or deposited in the kidneys, eventually leading to kidney stones.

Like other antinutrients different people will have a different sensitivity to oxalates, but they do have a cumulative effect, meaning frequent consumption over time can increase negative reactions and effects. For those particularly sensitive to oxalates, small amounts can cause allergic-like reactions including pain or burning in the eyes, mouth, and throat. Stomach pain, nausea, and diarrhea can result from consuming large amounts of oxalates.

Phytates, or **phytic** acids, are found in many common foods, including whole grains, seeds, and soybeans. They block absorption of valuable minerals like calcium, zinc, and magnesium, by binding to these minerals, preventing your body from using them. Phytates also interfere with certain enzymes in the digestive system, including amylase, pepsin, and trypsin. Your body uses amylase to break down starches, and pepsin and trypsin to break down proteins. When phytates interfere with these enzymes, your body can’t process such foods correctly, and you do not get the full nutritional value.

The body can deal with phytates in small quantities without trouble, and they are so common you won’t be able to eliminate them completely. But minimizing your consumption of foods with high concentrations of phytates will ensure your digestive system is operating optimally, leading to more effective fat burning and muscle building.

b. Explain three functions of bile in the digestion of lipids.

Bile is a yellow-green fluid that is made by the liver, stored in the gallbladder and passes through the common **bile** duct into the duodenum where it helps emulsification and absorption of fats.

It is a yellow or greenish viscid alkaline fluid secreted by the liver and passed into the duodenum where it aids in the emulsification and absorption of fats.

Functions of bile: The **liver** produces **bile** which emulsifies fats i.e. breaks them down into small droplets for a larger surface area. This will increase the rate at which the fat is **digested** by lipase.

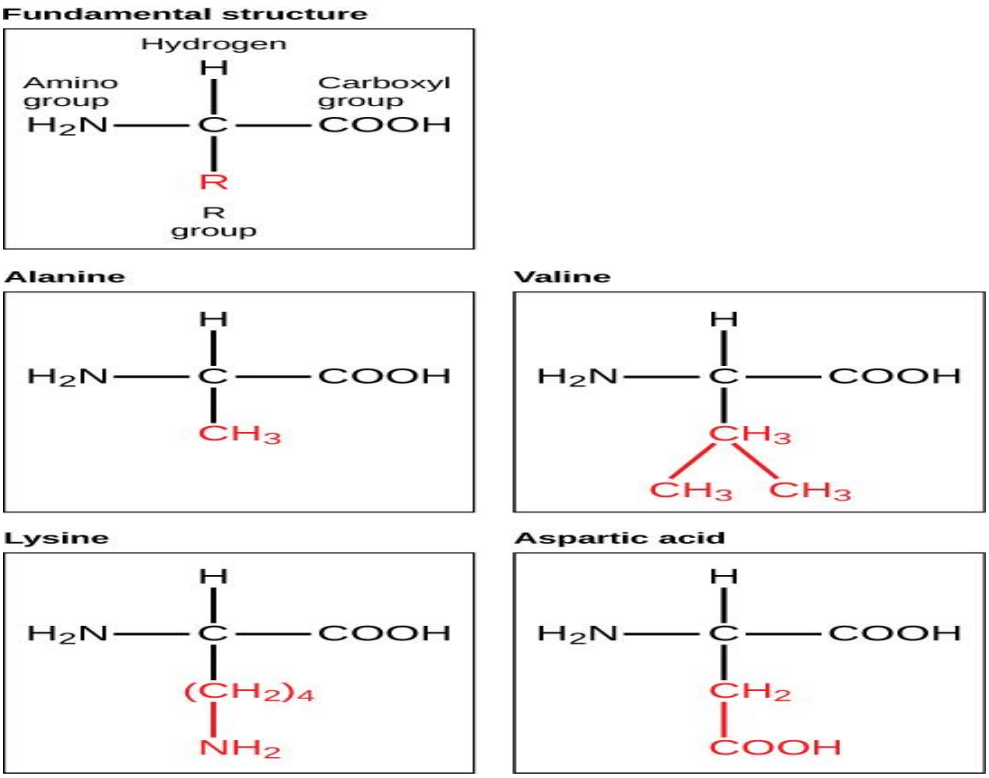
Bile also neutralizes the acid produced by the stomach to provide ideal alkaline conditions for enzymes in the small intestine.

Distributes immunoglobins and antioxidants throughout the gut Promotes “exocrine” lipid secretion.

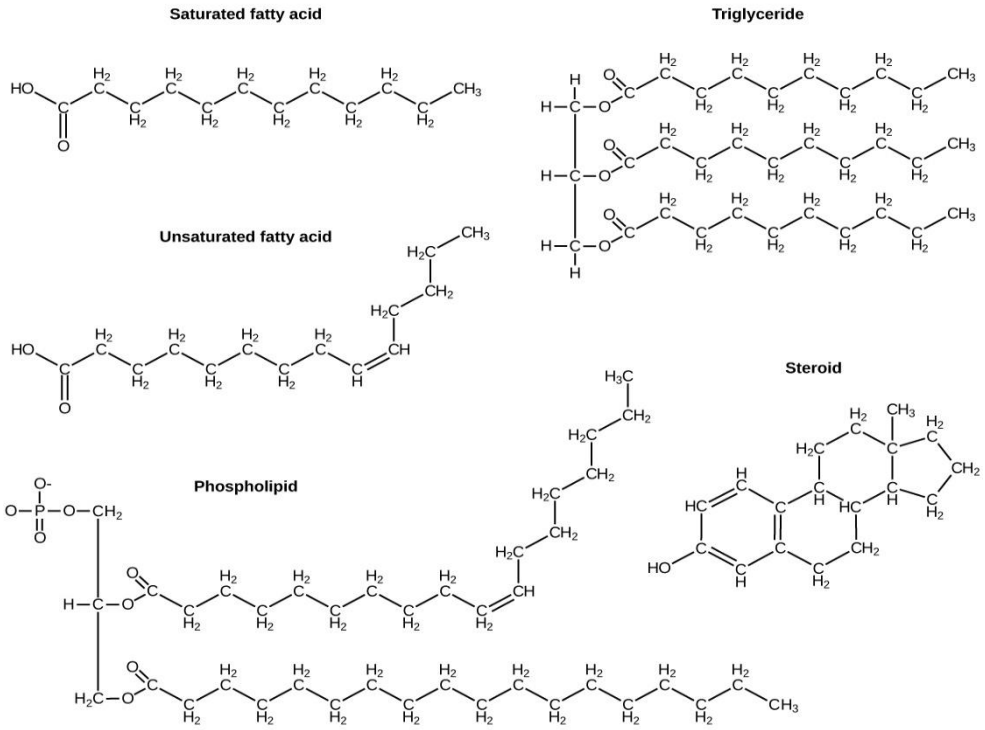
c. Explain how proteins differ structurally from carbohydrates and lipids

The major **differences between carbohydrates** and **proteins** include their **structure** and function inside the cell;

Proteins are made of the elements carbon, hydrogen, oxygen, nitrogen and sulfur. They are used for **structure** and support in the body. Proteins are polymers of amino acids. While there are hundreds of thousands of different proteins that exist in nature, they are all made up of different combinations of amino acids. Proteins are large molecules that may consist of hundreds, or even thousands of amino acids. Amino acids all have the general structure: The R in the diagram represents a functional group that varies depending on the specific amino acid in question. For example, R can be simply an H atom, as in the amino acid glycine, or a more complex organic group. When 2 amino acids bond together, the two ends of nearby amino acids are released and the carbon (called a carboxyl) end of one amino acid bonds to the nitrogen end of the adjacent one forming a peptide bond, as illustrated below right. When many amino acids bond together to create long chains, the structure is called a protein (it is also called a polypeptide because it contains many peptide bonds).

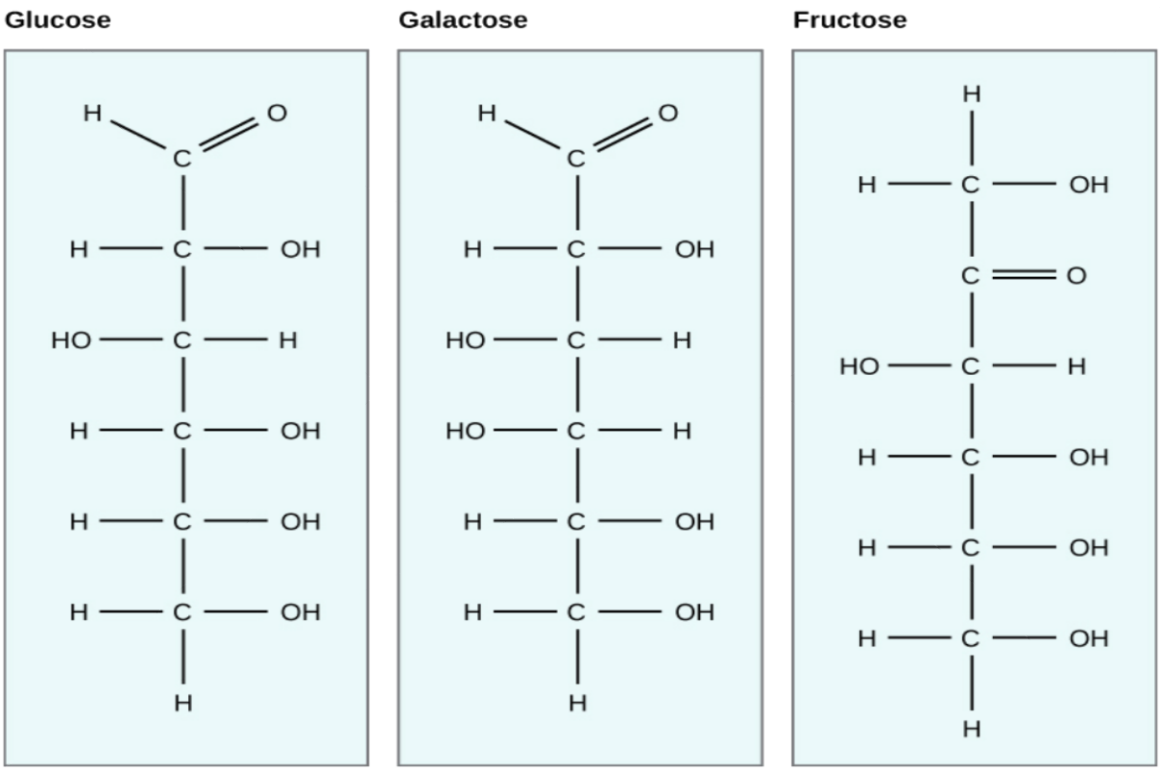


Fats are a sub-group of compounds known as lipids that are found in the body and have the general property of being hydrophobic (meaning they are insoluble in water). Fats are also known as triglycerides, molecules made from the combination of one molecule of glycerol with three fatty acids, as depicted at the right:



Carbohydrates

There are two types of carbohydrates, the simple sugars and those carbohydrates that are made of long chains of sugars - the complex carbohydrates.



Simple Sugars: All carbohydrates are made up of units of sugar (also called saccharide units). Carbohydrates that contain only one sugar unit (monosaccharides) or two sugar units (disaccharides) are referred to as simple sugars. Two of the most common monosaccharides are glucose and fructose.

Disaccharides have two sugar units bonded together. For example, common table sugar is sucrose (right), a disaccharide that consists of a glucose unit bonded to a fructose unit.

Complex carbohydrates: Complex carbohydrates are polymers of the simple sugars. In other words, the complex carbohydrates are long chains of simple sugar units bonded together (for this reason the complex carbohydrates are often referred to as polysaccharides). Starch (above) is a polymer of the monosaccharide glucose (n is the number of repeating glucose units and ranges in the 1,000's). Starches and cellulose are complex carbohydrates used by plants for energy storage and structural integrity.

Glycogen, another polymer of glucose, is the polysaccharide used by animals to store energy. Both starch and glycogen are polymers of glucose, however starch is a long, straight chain of glucose units, whereas glycogen is a branched chain of glucose units.

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