ASSIGNMENT 1

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

Food is a material consisting essential of protein, carbohydrate and fat used in the body of an organism to sustain growth, repair and vital processes and to furnish energy. Such food together with supplementary substances such as minerals, vitamin and carbohydrates. Food can be classified in to three main groups according to their nutritional function in the body

* Energy foods
* Body building foods
* Protective foods

This food combines several of these functions, for instance, energy food such as red beans contain carbohydrates, fat, protein, minerals and vitamins. Body building foods and protective food are necessary to know the combination of different foods i.e. which nutrients they contain, to understand their function in the body. An example is seen in maize and cassava, both of which contain large amounts of carbohydrate and therefore give energy. But maize also contain 8% of protein, while cassava has only 1%. this means that maize provides body building nutrients as well as energy.

* 1. Nutrients

nutrient is any chemical substance that can be used by an organism to sustain its metabolic activities. These metabolic activities in humans and other animals include the provision of energy, growth, renewal of tissues, reproduction and lactation.

in Another way nutrient is any substance that is absorbed and either provides you with energy or enables growth, repair or proper functioning of your body.

Examples of nutrients and their functions:

* [Starch](http://www.nutrientsreview.com/carbs/polysaccharides-starch.html) and its breakdown product [glucose](http://www.nutrientsreview.com/carbs/monosaccharides-glucose.html) provide you with energy.
* [Proteins](http://www.nutrientsreview.com/proteins) build muscles and form enzymes.
* [Lipids](http://www.nutrientsreview.com/lipids) form the cell membranes and certain hormones.
* [Potassium](http://www.nutrientsreview.com/minerals/potassium-kalium.html) and sodium enable the proper functioning of the nerves.
* [Vitamin C](http://www.nutrientsreview.com/vitamins/vitamin-c-ascorbic-acid.html) is necessary for the wound healing.

**Nutrient Functions**

Nutrients are substances intended primarily to nourish your body and not to treat diseases. Nutrients can be, of course, used to treat diseases caused by nutrient deficiencies–for example, vitamin C is used to treat scorbut–and, in rare cases, some other diseases, for example, [magnesium](http://www.nutrientsreview.com/minerals/magnesium.html) sulfate injections are used to treat seizures during pregnancy.

**Nutrients Sources**

You usually get nutrients from foods and beverages. You can also get them from the dietary supplements in the form of pills or liquids, by intravenous or intramuscular injections or transdermal patches applied on the skin.

**Nutrients Types**

**Macronutrients or Mayor Nutrients, and Micronutrients**

**Macronutrients** include [carbohydrates](http://www.nutrientsreview.com/carbs), [proteins](http://www.nutrientsreview.com/proteins), [lipids](http://www.nutrientsreview.com/lipids) ([fats](http://www.nutrientsreview.com/lipids/fats.html)) and also [alcohol (ethanol)](http://www.nutrientsreview.com/alcohol). You consume them in great, that is “gram,” amounts. They provide you with energy and building blocks for your body growth and repair.

**Micronutrients** include [vitamins](http://www.nutrientsreview.com/vitamins) and [minerals](http://www.nutrientsreview.com/minerals). You usually consume them in small, that is “milligram,” amounts. They, for example, help to build your bones, enable muscle contractions, transport oxygen via the blood; they have many other functions in your body.

1. Nutrition

Nutrition is the process by which food consumed by an organism is utilized through digestion, absorption, transport, storage, metabolism and elimination; its purpose is to maintain life, growth, normal functioning of organs and the production of energy.

Distinguish between dispensable and indispensable nutrients

Here, we compared the traditional nutritional definition of the dispensable and indispensable amino acids for humans with categorizations based on amino acid metabolism and function. The three views lead to somewhat different interpretations. From a nutritional perspective, it is quite clear that some amino acids are absolute dietary necessities if normal growth is to be maintained. Even so, growth responses to deficiencies of dispensable amino acids can be found in the literature. From a strictly metabolic perspective, there are only three indispensable amino acids (lysine, threonine and tryptophan) and two dispensable amino acids (glutamate and serine). In addition, a consideration of in vivo amino acid metabolism leads to the definition of a third class of amino acids, termed conditionally essential, whose synthesis can be carried out by mammals but can be limited by a variety of factors. These factors include the dietary supply of the appropriate precursors and the maturity and health of the individual. From a functional perspective, all amino acids are essential, and an argument in favor of the idea of the critical importance of nonessential and conditionally essential amino acids to physiological function is developed.

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

A protein deficiency (hyperproteinemia) means someone is not getting enough protein to meet their body’s needs. We get the protein we need from the food we eat. If our diet doesn’t contain enough protein, we may suffer from protein deficiency. A lack of protein can cause a number of signs and symptoms and even life-threatening health conditions. There are three basic kinds of protein foods that are important to include in your diet:

* Complete proteins: These proteins are found primarily in animal sources such as meat, dairy, and eggs. All of the essential amino acids your body needs can be found in these protein sources. However, it’s important to eat healthy versions of these proteins, such as lean meats and low fat cheeses and yogurt, rather than less healthy choices such as processed or fatty meats.
* Incomplete proteins: Plant protein sources are mostly incomplete proteins, which means that they contain at least one essential amino acid, but they do not contain all of the amino acids. Because of this, if you don’t eat animal proteins, you must be sure to eat a wide variety of plant protein sources such as vegetables, beans, legumes, and grains to get the protein you need. You may also need to include a protein supplement in your diet.
* Complementary proteins: These proteins are incomplete on their own, but in combination they work together to provide the essential amino acids you need. A couple of common examples are rice and beans or peanut butter and whole grain bread.

Protein Deficiency Causes

Not getting enough protein in your diet is just one cause of low protein. There are also several health conditions and other factors that can cause low protein levels. lack of protein causes may include:

* Chronic alcoholism resulting in liver disorders such as cirrhosis
* Other liver disorders such as hepatitis
* Problems absorbing nutrients through the intestines (such as celiac disease or inflammatory bowel disease, also known as IBD)
* Kidney disease
* Infections, burns or trauma that cause an abnormal loss of body protein
* Deficiencies in other nutrients or not getting enough calories
* Malnutrition due to eating disorders such as anorexia or bulimia
* Difficulty getting enough protein during pregnancy due to extreme nausea or vomiting
* Not including enough protein sources in a restrictive diet such as vegetarianism or veganism
* Low income and inability to afford a balanced diet

Protein Deficiency Symptoms

There are several symptoms of protein deficiency to watch out for, some more obvious than others.

* Swollen or puffy skin (known as edema)
* Hair thinning or hair loss (alopecia)
* Brittle nails
* Changes in appetite
* Fatigue
* Brain fog (not able to think clearly)
* Unexpected weight loss

If you find yourself experiencing any of these signs of protein deficiency, take a closer look at your diet, and also see your health care professional. Your doctor can order a protein deficiency test, known as a plasma protein test, to check your protein levels. This way you can find out if low protein is causing your symptoms.

Protein Deficiency Complications

One of the most severe protein deficiency diseases is known as kwashiorkor. This is a Ghanaian word that refers to first born children developing the condition as they are weaned from breast milk and moved to a diet high in carbohydrates but with low total protein. Meanwhile, a new child then begins to receive the mother’s milk. The condition results in significant malnutrition, stunted growth, and emaciation.

Another type of severe low protein complication is called maramus. This condition happens when you are not getting enough protein or enough calories. Your body then starts to use the protein you eat for energy instead of building muscle and other body tissues.

* Fatty liver, which may lead to liver disease if left untreated
* Muscle wasting
* Greater risk of bone fractures
* Stunted growth
* Impaired immune system and more severe infections
* Slow wound healing
* Anemia (low iron)
* Muscle and joint pain
* Low blood pressure and low heart rate

Benefits of Protein

Protein provides many functions and creates tissues in the body. Some of these basic, but important, protein functions include:

* Structural proteins such as keratin, which provides strength to the hair. This is why protein is so important for healthy hair and nails.
* Collagen, a key structural protein that helps support connective tissues
* Hormonal, such as insulin, which is needed for metabolism.
* Carriers, such as hemoglobin, which carries oxygen in the blood
* Enzymes, which help cause important chemical reactions, such as the exchange of oxygen and carbon dioxide during respiration (breathing)

Protein and Weight Loss

A higher protein intake helps to boost metabolism and reduce appetite. By eating more protein than carbs and fats, you can help to increase the hormones that help you feel full and reduce the hormones that make you feel hungry. This combination then helps you to lower the amount of calories you eat. In fact, eating more protein can also help you burn more calories. Eating more protein can also help cut down on cravings and snacking because you feel more satisfied.

A diet that’s higher in protein than fats and carbs also helps to maintain muscle mass. Weight loss usually impacts both fat and muscle, causing a reduction in both. Combining strength training with high protein diet can help to both keep your metabolism up and maintain muscle mass.

Spread your protein intake out throughout your day so that you eat some at each meal. Experts also recommend aiming to get about 25 percent to 30 percent of your calories from protein if your goal is to lose weight. It’s still important to make sure you are burning more calories than you are eating.

A diet higher in protein also seems to help maintain weight loss.

Eating a diet that’s higher in protein and lower in carbohydrates causes the body to go into ketosis. Ketosis is a process where the body burns its own fat to create energy rather than burning carbohydrates. In the short term, eating a diet much higher in protein can be an effective strategy to help lose fat. But this type of diet seems to lose its effectiveness after about six months. The reason why isn’t entirely clear at this point. However, in general it’s still important to eat a balanced diet that includes an appropriate amount of proteins, healthy carbs (like vegetables and fruits), and healthy fats.

Best Protein Sources

You may be wondering how to get enough protein in your diet. The most basic way to get enough protein is to eat a balanced diet. Remember, animal sources provide complete proteins. Plant sources don’t provide complete proteins on their own, but they are also an important source of fiber.

Eating lean meats and other healthy animal sources of protein, along with lots of plant sources like leafy green vegetables, beans, and nuts, will provide a balanced diet with plenty of protein.

If you follow a vegan or vegetarian diet, in order to get enough protein from plant sources, be sure you eat a variety of vegetables, legumes, beans, and possibly include a protein supplement in your diet as well.

If you are eating a healthy, balanced diet but find that you have signs of protein deficiency, be sure to see your doctor to find out what’s causing your symptoms.

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

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.

Though enzymes exhibit great degrees of specificity, cofactors may serve many apoenzymes. For example, nicotinamide adenine dinucleotide (NAD) is a coenzyme for a great number of dehydrogenase reactions in which it acts as a hydrogen acceptor.

1. Explain what you understand by the term antinutrients.

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 digest fat. The principal components of bile are [cholesterol](https://www.medicinenet.com/cholesterol_management/article.htm), bile salts, and the pigment bilirubin.

1. An imbalance between these components of bile leads to the formation of [gallstones](https://www.medicinenet.com/gallstones/article.htm). Gallstones can thus be composed of different materials. Cholesterol gallstones form when there is an imbalance between the amounts of cholesterol and the bile salts. Cholesterol is normally kept in liquid form by the dissolving action of the bile salts. An increased amount of cholesterol in the bile overwhelms the dissolving capacity of the bile salts and leads to the formation of cholesterol gallstones. Similarly, a deficiency of bile salts promotes cholesterol gallstone formation. Pigment gallstones are frequently associated with chronic infection in the bile, especially in certain Asian countries where parasitic infection of the bile ducts is common. Patients with blood diseases that cause excessive breakdown of red blood cells can have increased amounts of bilirubin (breakdown product of red cells) in the bile, thus causing bilirubin gallstone formation

Explain how proteins differ structurally from carbohydrates and lipids.

Top of Form

There are three types of substances present in the food. They are i. [Carbohydrates](https://www.bioscience.com.pk/glossary/carbohydrate),

ii. [Proteins](https://www.bioscience.com.pk/glossary/protein),

iii. [Lipids](https://www.bioscience.com.pk/glossary/lipids)

CARBOHYDRATES

1. Carbohydrates are the primary products of photosynthesis. They are the most important energy providing substrates for animals.
2. Most carbohydrates contain only three elements, viz., carbon, hydrogen and oxygen.
3. The simplest carbohydrates are monosaccharides. This may be hexose, pentose or triose sugars.
4. Hexose sugars are mainly three isomers namely glucose, fructose and galactose.
5. Pentose sugars are mainly ribose and deoxyribose sugars in [RNA](https://www.bioscience.com.pk/glossary/rna) and [DNA](https://www.bioscience.com.pk/glossary/dna).
6. Triose sugars are formed during [metabolism](https://www.bioscience.com.pk/glossary/metabolism) like glyceraldehyde.
7. Three common disaccharides are: Maltose (Glucose + glucose), Sucrose (Glucose + Fructose) and Lactose (Glucose + Galactose)
8. Sucrose is the cane sugar found in sugarcane. Sucrose does not reduce Cu++ to Cu+.
9. Maltose or malt sugar is formed during germination of starch seeds.
10. Lactose or milk sugar is found in milk.
11. Comparing to the milk of cow, buffalo and goat, lactose is highest in human milk.
12. Starch common in plants and [glycogen](https://www.bioscience.com.pk/glossary/glycogen) in animals are two food storage polysaccharides.
13. Starch is found abundantly in rice, wheat, legumes, potato, bananas, etc.
14. Our food mostly contains carbohydrates.
15. Rice and potato are good source of carbohydrates.

PROTEINS

1. Proteins are among the most important macromolecules of organisms.
2. After water, proteins form the major (14%) part of living protoplasm. Of the dry weight of protoplasm, 75% is the protein.
3. Proteins [ae](https://www.bioscience.com.pk/prefixes-and-sufixes/ae" \o "ae) very complex organic molecules containing carbon, hydrogen, oxygen and nitrogen and less commonly sulphur, phosphorus, iodine and iron.
4. The term 'Protein' was coined by Berzelium and Mulder.
5. Fischer and Hof meister discovered that on complete hydrolysis all protein molecules break down into simpler amino [acids](https://www.bioscience.com.pk/glossary/acid).
6. Basic unit or smallest structural units of proteins are called [amino acids](https://www.bioscience.com.pk/glossary/amino-acid). Amino acids are linked together in long chain to form protein.
7. The anhydrobonds of proteins are called peptide bonds. A peptide bond is formed between carboxyl group of one amino acid and amino group of adjacent.
8. Proteins in our body may be circulated in the form of amino acids. The excess of amino acids cannot be stored in the body.
9. Although about 300 amino acids occur in nature, only 20 of these enter into the composition of proteins.
10. Amino acids that cannot be synthesized in the body are called essential.
11. Essential amino acids are those which are taken from food, not synthesized in the body.
12. Other amino acids may be synthesized in the body, particularly from carbohydrate [metabolites](https://www.bioscience.com.pk/glossary/metabolite). They need not be supplied in the diet and are called non-essential or dispendable amino acids.
13. Proteins which contain most of the essential amino acids are termed first class, while those do not, are called second class.
14. Animal proteins are mostly first class and plant proteins are second class proteins.
15. Casein is a protein which forms the part of food for the young animal. Best source of casein is milk.
16. Many children in our country suffer from malnutrition, a protein deficiency disease known as Kwashiorkor disease. This can be prevented by giving food rich in protein.
17. A person suffering from Kwashiorkor should have more meat, butter, milk and eggs in his diet.
18. Glutelins are large globular proteins present in the wheat or rice.
19. Haemoglobin and cytochromes are two chromoproteins.

FATS (LIPIDS)

1. Fats are esters of fatty acids with glycerol.
2. Each molecule of glycerol can react with three molecules of fatty acids.
3. Depending on the number of fatty acids that are attached to the glycerol molecule, the esters are called [mono-](https://www.bioscience.com.pk/prefixes-and-sufixes/mono), [di-](https://www.bioscience.com.pk/prefixes-and-sufixes/di) or triglycerides.
4. Fats that are generally liquid at room temperature are called oils.
5. Fatty acids most commonly involved in fat formation are: Palmitic, stearic and oleic acids.
6. Fatty acids are called saturated if they do not have any double bond between the carbons of molecular chains, eg., palmitic acid (16C) and stearic acid (18C)
7. Unsaturated fatty acids have one or more double bonds between the carbons of the chain, eg., oleic acid with one double bond.
8. Essential fatty acids are some polyunsaturated fatty acids (with more than one double bond) which cannot be synthesized in the animal body and must be supplied with food to avoid their deficiency.
9. Linoleic, linolenic and arachidonic acids are essential fatty acids for man.
10. Excess intake of saturated fats like butter, ghee and hydrogenated vegetable fats enhances blood cholesterol level.
11. High amounts of fats, particularly saturated fats and cholesterol should be avoided by sedentary, old or obsese persons and patients of heart disorders and high blood pressure.
12. Too much use of fats should be avoided during summer months.
13. Fat yields twice as many calories per gram as carbohydrates.
14. Fats are richly found in adipose [tissues](https://www.bioscience.com.pk/glossary/tissue).
15. Obesity can be controlled by reducing intake of calories from fats and carbohydrates.

REFEANCES

Mahan, K and Escott-Stump, S. *Krause’s Food and Nutrition Therapy*, 12th edition.

Saunders, Elsevier: St. Louis, MO, 2008.

Shils, M, Olson, J, Shike, M, and Ross, A, eds. *Modern Nutrition in Health and Disease,*

*9th edition*. Lippincott Williams & Wilkins: Philadelphia, PA, 1999.

Dietitians in Nutrition Support. *Sharpening Your Skills as a Nutrition Support Dietitian*.

American Dietetic Association: Chicago, IL 2003.

Bennett, T. P., and Frieden, E.: Modern Topics in Biochemistry, pg. 43-45, Macmillan, London (1969).

Holum, J.: Elements of General and Biological Chemistry, 2nd ed., 377, Wiley, NY (1968).

Martinek, R.: Practical Clinical Enzymology: J. Am. Med. Tech., 31, 162 (1969). 4. Harrow, B., and Mazur, A.: Textbook of Biochemistry, 109, Saunders, Philadelphia (1958).

Pfeiffer, J.: Enzymes, the Physics and Chemistry of Life, pg 171-173, Simon and Schuster, NY (1954)