**Department of Biochemistry**

GLOSSARY FOR TERMS IN ‘BIOMOLECULES’

**A**

**Acetyl Value:** It is the number of milligrams of KOH required to neutralize the acetic acid obtained by saponification of 1 gram of fat after it has been acetylated. It is a measure of the number of hydroxyl groups in the fat.

**Acid Number:** It is defined as the number of mg of KOH required to completely neutralize free fatty acids present in one gram of fat or oil. It helps to determine the purity of the oil.

**Acrodermatitis enteropathica:** Acrodermatitis enteropathica is an autosomal recessive metabolic disorder affecting the uptake of zinc, characterized by periorificial (around the natural orifices) and acral (in the limbs) dermatitis, alopecia (loss of hair), and diarrhea.

**Albright’s hereditary osteodystrophy:** Albright’s hereditary osteodystrophy consists of a constellation of features including a form of osteodystrophy that occur in pseudohypoparathyroidism type 1a.

**Amino acids:** Amino acids are the simplest units of a protein molecule and they form the building blocks of protein structure. An amino acid is an amino carboxylic acid. R is the side chain or residue and it represents the group other than -NH2 and -COOH.

**Anomers:** Anomers are isomers differing in configuration of a particular carbon atom alone. α – and β - isomers are called as anomers and the carbon atom responsible for this is the anomeric carbon atom.

**Antioxidant:** Antioxidants are chemical substances that help protect against cell damage from free radicals. Well-known antioxidants include vitamin A, vitamin C, vitamin E, carotenoids, and flavonoids.
Beriberi: Beriberi refers to a cluster of symptoms caused primarily by thiamine (vitamin B1) deficiency. Beriberi has conventionally been divided into three separate entities, relating to the body system mainly involved (peripheral nervous system or cardiovascular) or age of person (like infantile).

Biochemistry: Biochemistry is the branch of science that explores the chemical processes within and related to living organisms. It is a laboratory based science that brings together biology and chemistry.

Biomolecule: A biomolecule or biological molecule is any molecule that is present in living organisms, including large macromolecules such as proteins, carbohydrates, lipids, and nucleic acids, as well as small molecules such as primary metabolites, secondary metabolites, and natural products.

Bitot's spots: Bitot's spots are the buildup of keratin located superficially in the conjunctiva, which are oval, triangular or irregular in shape. These spots are a sign of vitamin A deficiency and are associated with conjunctival xerosis.

Body Mass Index (BMI): Body Mass Index is a standardized ratio of weight to height, and is often used as a general indicator of health. Your BMI can be calculated by dividing your weight (in kilograms) by the square of your height (in meters). A BMI between 18.5 and 24.9 is considered normal for most adults. Higher BMIs may indicate that an individual is overweight or obese.

Calcinosis cutis: Calcinosis cutis or cutaneous calcification is a type of calcinosis wherein calcium deposits form in the skin. A variety of factors can result in this condition. The most common source is dystrophic calcification, which occurs in soft tissue as a response to injury.

Calcinosis: An abnormal deposit of calcium salts in body tissues. Examples include the calcifications in the skin from scleroderma and in the muscle from polymyositis.
**Calciphylaxis:** Calciphylaxis, or calcific uremic arteriolopathy (CUA), is a syndrome of vascular calcification, thrombosis and skin necrosis. It is seen mostly in patients with Stage 5 chronic kidney disease, but can occur in the absence of renal failure.

**Calcium:** Calcium is an important component of a healthy diet. Its minor deficit can affect bone and teeth formation, while its excess can lead to kidney stones. Vitamin D is needed to absorb calcium.

**Carbohydrates:** Carbohydrates are defined as polyhydroxy aldehydes or ketones. Carbohydrates are widely distributed in plants in which they are synthesized through photosynthesis. Animals obtain their carbohydrates from plants.

**Chargaff's Rule:** The first rule was, in DNA the number of guanine units equals the number of cytosine units, and the number of adenine units equals the number of thymine units. The second rule was that the relative amounts of guanine, cytosine, adenine and thymine bases vary from one species to another. Chargaff rules that helped lead to the discovery of the double helix structure of DNA.

**Cholesterol:** Cholesterol is a soft, waxy substance present in all parts of the body including the nervous system, skin, muscles, liver, intestines, and heart. It is both made by the body and obtained from animal products in the diet. Cholesterol is manufactured in the liver for normal body functions including the production of hormones, bile acid, and vitamin D. It is transported in the blood to be used by all parts of the body.

**Chromoprotein:** These proteins contain heterocyclic compounds like porphyrins as the prosthetic group. (eg) Hemoglobin and Myoglobin.

**Codon:** A codon is a sequence of three adjacent nucleotides that corresponds with a specific amino acid or stop signal during protein synthesis.

**Complex or compound Lipids:** These are esters of fatty acids with alcohols containing additional groups such as phosphate, nitrogenous base, carbohydrate, protein etc. Eg., Phospholipids, glycolipids etc.
**Conjugated protein:** These are proteins composed of simple proteins combined with non-protein part called as prosthetic groups. Eg., nucleoprotein, phosphoprotein, glycoprotein, lipoprotein, chromoprotein, metalloprotein etc.

**Copper toxicity:** Copper toxicity, also called copperiedus, refers to the consequences of an excess of copper in the body. Copperiedus can occur from eating acid foods cooked in uncoated copper cookware or from exposure to excess copper in drinking water or other environmental sources.

**Copper:** Copper is a trace element that is essential for most animals, including humans. It is needed to absorb and utilize iron. The influence of copper upon health is due to the fact that it is part of enzymes, which are proteins that help biochemical reactions occur in all cells.

**Cyclic Fatty acids:** These are fatty acids which contain ring structure in their structure. Eg., hydnocarpic acid, chaulmoogric acid etc.

**Denaturation of Nucleic acids:** Denaturation is a process in which nucleic acids lose their biological activity due to disruption of their native state, by some external stress or compound such as a strong acid or base, a concentrated inorganic salt, an organic solvent (e.g., alcohol or chloroform), radiation or heat.

**Derived Lipids:** These are the derivatives obtained from simple and compound lipids on hydrolysis. Eg., mono and diacyl glycerols, lipid soluble vitamins, steroid hormones etc.

**Derived proteins:** These are proteins derived from the simple and conjugated proteins by the action of acids, alkalies or enzymes. They are the products resulting from partial to complete hydrolysis of proteins. (eg.) proteoses, peptones and peptides.

**Diglycerides:** Diglycerides or diacylglycerols are fats composed of glycerol and 2 fatty acids. Eg., 1,2-dipalmitin.

**Disaccharides:** Disaccharides are sugars containing two molecules of monosaccharides. Disaccharides are formed by the condensation of two molecules of monosaccharides with the
elimination of one molecule of water. The general formula is Cn(H2O)n-1. (eg) Lactose, Maltose and Sucrose. The monosaccharide units are united by a glycosidic linkage.

**Disulphide bond:** These are formed between two cysteine residues. They are strong, high energy covalent bonds. These S-S bonds formed between -SH groups of distant cysteine residues.

**DNA:** Deoxyribonucleic acid (DNA), is a polymeric molecule of deoxyribonucleotides which act as the hereditary material in humans and almost all other organisms.

**Dystrophic calcification:** Dystrophic calcification (DC) is the calcification occurring in degenerated or necrotic tissue, as in hyalinized scars, degenerated foci in leiomyomas, and caseous nodules. This occurs as a reaction to tissue damage, including as a consequence of medical device implantation.

**Epimerisation:** Two sugars which differ from one another only in configuration around a single carbon atom are termed “epimers” eg : Glucose and mannose are epimers in respect of C2. Glucose and galactose differ only with respect to C4. The process by which one epimer is converted to other is called as epimerization and it requires the enzyme epimerases in the living organisms. Galactose is converted to glucose by this manner in our body.

**Essential amino acids:** Certain amino acids cannot be synthesized by the living organisms. They must be compulsarily included in the diet for normal health. These amino acids are called essential amino acids. For human being about 10 amino acids are considered as essential eg, Arginine, Methionine, Histidine, Phenyl alanine, Isoleucine, Threonine, Leucine, Tryptophan, Lysine and Valine.

**Essential Fatty Acids:** The fatty acids that cannot be synthesized by the body and therefore, should be supplied in the diet are known as essential fatty acids eg., linoleic acid, linolenic acid, arachidonic acid.
**Familial hypocalciuric hypercalcemia:** Familial hypocalciuric hypercalcemia is a condition that can cause hypercalcemia, a serum calcium level typically above 10.2 mg/dL. It is also known as familial benign hypocalciuric hypercalcemia (FBHH) where there is usually a family history of hypercalcemia which is mild, a urine calcium to creatinine ratio <0.01, and urine calcium <200 mg/day.

**Fats and oils:** These are esters of fatty acids with glycerol (triglycerides). Fats are solid while oils are liquid at the room temperature.

**Fat-soluble vitamins:** Fat-soluble vitamins can be stored in the body for long periods. They are stored mostly in the fatty tissue and in the liver. The fat-soluble vitamins include vitamin A, vitamin D, vitamin E, and vitamin K. These are generally consumed along with fat-containing foods. Because they can be stored in the body's fat, they do not have to be consumed every day.

**Fatty acids:** Fatty acids are carboxylic acids with hydrocarbon side chains ranging from 4-36 carbons long. They are the simplest form of lipids.

**Folate deficiency:** Folate deficiency is a low level of folic acid in the body. Also known as vitamin B9, it is involved in adenosine, guanine, and thymidine synthesis (part of DNA synthesis). Signs of folate deficiency are often subtle. Anemia is a late finding in folate deficiency. Folate deficiency anemia is the term given for this medical condition. Characterized by the appearance of large-sized, abnormal red blood cells (megaloblasts), which form when there are inadequate stores of folic acid within the body.

**Folic acid:** Folic acid is a component of vitamin B. It is used in our bodies to make new cells. Increased folic acid intake is frequently recommended for women who are pregnant or who are trying to get pregnant.

**Free Radicals:** An atom or molecule with at least one unpaired electron, making it unstable and reactive. When free radicals react with certain chemicals in the body, they may interfere with the ability of cells to function normally. Antioxidants can stabilize free radicals.
Glycerophospholipids: These are phospholipids containing glycerol as the alcohol. Eg., lecithin, cephalin, plamalogens, cardioplipid etc.

Glycogen: Glycogen is a homopolysaccharide since it gives only glucose units on hydrolysis. It is the major reserve carbohydrate in animals. Glycogen is present in all cells of skeletal muscle and liver and occurs as cytoplasmic granules.

Glycolipids: These lipids contain a fatty acid, sphingosine, carbohydrate and nitrogenous base. Eg., cerebrosides, gangliosides etc.

Glycoprotein: These are proteins containing carbohydrate moiety as prosthetic group. (eg.) Gonadotrophic hormone, mucous glycoprotein mucin (saliva) and osseomucoid (bone).

Heteropolysaccharides: These on hydrolysis yield a mixture of different types of monosaccharides. (eg) hyaluronic acid, heparin, keratan sulphate and chondroitin sulphate.

Homopolysaccharides: These on hydrolysis yield same type of monosaccharide units. (eg.) starch, glycogen, cellulose, inulin, pectin and hemicellulose yield only glucose on hydrolysis.

Hydrogen bond: These are weak, low energy non-covalent bonds sharing a single hydrogen by two electronegative atoms such as O and N. Hydrogen bonds are formed in secondary structure by sharing H-atoms between oxygen of and nitrogen of of different peptide bonds.

Hydrogen bonds: Normally formed by the polar side chains of the amino acids.

Hydrophobic interactions: Normally occur between nonpolar side chains of amino acids such as alanine, leucine, methionine, isoleucine and phenyl alanine. They constitute the major stabilizing forces for tertiary structure forming a compact three-dimensional structure.

Hyper and Hypochromic Effect: Hyperchromicity is the material's increasing ability to absorb light. The most famous example is the hyperchromicity of DNA that occurs when the
DNA duplex is denatured. The Hypochromic Effect describes the decrease in the absorbance of ultraviolet light in a double stranded DNA compared to its single stranded counterpart.

**Hypercalcaemia:** Hypercalcaemia is elevated calcium (Ca\(^{2+}\)) level in the blood. Normal range is 8.7–10.4 mg/dL or 2.2–2.5 mmol/L. It can be an asymptomatic laboratory finding, but because an elevated calcium level is often indicative of other diseases, a workup should be undertaken if it persists. It can be due to excessive skeletal calcium release, increased intestinal calcium absorption, or decreased renal calcium excretion.

**Hypermagnesemia:** Hypermagnesemia is an electrolyte disturbance in which there is an abnormally elevated level of magnesium in the blood. Usually this results in excess of magnesium in the body. Hypermagnesemia occurs rarely because the kidney is very effective in excreting excess magnesium. It usually develops only in people with kidney failure who are given magnesium salts or who take drugs that contain magnesium (e.g. some antacids and laxatives).

**Hyperphosphatemia:** Hyperphosphatemia is an electrolyte disturbance in which there is an abnormally elevated level of phosphate in the blood. Often, calcium levels are lowered (hypocalcemia) due to precipitation of phosphate with the calcium in tissues. Average phosphorus levels should be between 0.81 mmol/L and 1.45 mmol/L.

**Hypervitaminosis D:** Hypervitaminosis D is a state of vitamin D toxicity. The normal range for blood concentration is 30.0 to 74.0 nanograms per milliliter (ng/mL).

**Hypervitaminosis:** A refers to the toxic effects of ingesting too much preformed vitamin A. Symptoms arise as a result of altered bone metabolism and altered metabolism of other fat-soluble vitamins. Hypervitaminosis A is believed to have occurred in early humans, and the problem has persisted throughout human history.

**Hypocalcaemia:** Hypocalcaemia is the presence of low serum calcium levels in the blood. Physiologically, blood calcium is tightly regulated within a narrow range for proper cellular processes. Calcium in the blood exists in three primary states: bound to proteins (mainly albumin), bound to anions such as phosphate and citrate, and as free (unbound) ionized calcium. Only the ionized calcium is physiologically active. Normal blood calcium level is
between 8.5 to 10.5 mg/dL (2.12 to 2.62 mmol/L) and that of ionized calcium is 4.65 to 5.25 mg/dL (1.16 to 1.31 mmol/L).

**Hypomagnesemia:** Hypomagnesemia is an electrolyte disturbance in which there is an abnormally low level of magnesium in the blood. Normal magnesium levels in humans fall between 1.7 - 2.2 mg/dL. Usually a serum level less than 1.7 mg/dL (0.7 mmol/L) is used as reference for hypomagnesemia.

**Hypophosphatemia:** Hypophosphatemia is an electrolyte disturbance in which there is an abnormally low level of phosphate in the blood. The condition has many causes, but is most commonly seen when malnourished patients (especially chronic alcoholics) are given large amounts of carbohydrates, which creates a high phosphorus demand by cells, removing phosphate from the blood (refeeding syndrome).

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**International Unit (IU):** IU is a measurement unit that is primarily used on nutrition labeling for vitamin A. One IU is equivalent to 0.3 mcg of retinol, 0.6 mcg of beta-carotene, or 1.2 mcg other provitamin-A carotenoids.

**Iodine Number:** It is defined as the number of grams of iodine absorbed by 100 g of fat or oil. It is useful to know the relative unsaturation of fats or oils and is directly proportional to the content of unsaturated fatty acid.

**Ionic or electrostatic interactions:** The interaction occurs between appositively charged polar side chains of amino acids, such as basic and acidic amino acids.

**Iron deficiency:** Iron deficiency (sideropenia or hypoferremia) is the most common nutritional deficiency in the world. Iron is present in all cells in the human body and has several vital functions, such as: carrying oxygen to the tissues from the lungs as a key component of the hemoglobin protein; acting as a transport medium for electrons within the cells in the form of cytochromes; facilitating oxygen use and storage in the muscles as a component of myoglobin and as an integral part of enzyme reactions in various tissues. Too little iron can interfere with these vital functions and lead to morbidity and death.
Iron: Iron is an essential mineral stored by the body in red blood cells. It is also the most common mineral deficiency in the world. The symptoms of deficiency are tiredness, general weakness, an inability to concentrate, susceptibility to infection, impaired performance, and in general, ill health. Calcium and copper must be present for iron to function properly, and ascorbic acid (vitamin C) enhances absorption. Iron is necessary for proper metabolization of B vitamins.

Isoelectric point: The pH at which an amino acid bears no net charge and hence does not migrate to either of the anode or cathode under the influence of an electric current, is known as the isoelectric point or isoelectric pH.

Lactose: Lactose is a disaccharide composed of glucose and galactose. It is commonly called as milk sugar. It is less soluble in water and less sweet than sucrose.

Lipids: Lipids are naturally occurring organic substances insoluble in water and soluble in organic solvents, such as acetic acid and acetone. These are a heterogenous group of compounds including fats, oils, steroids, waxes and related compounds. Chemically lipids are either esters of fatty acids or substances capable of forming such esters.

Lipoproteins: Lipoproteins are molecular complexes that consist of lipids and proteins. They functions as transport vehicles for lipids in blood plasma. Lipoproteins include chylomicrons, VLDL, LDL and HDL.

Long-chain Fatty acids: Fatty acids containing 13-22 carbon atoms are called long-chain fatty acids (LCFA). They are the most common fatty acids in the human diet and in the human body. Eg., Myristic acid (C14), Palmitic acid (C16), Stearic acid (C18), Arachidic acid (C20) etc.

Macronutrient: Macronutrient: Nutritionists often group nutrients into two subclasses, called macronutrients and micronutrients. Macronutrients refer to those nutrients that form the major portion of your consumption and contribute energy to your diet. Macronutrients include carbohydrates, fats, protein, and alcohol. Sometimes water is also considered to be a
macronutrient. All other nutrients are consumed in smaller amounts, and are labelled as micronutrients.

**Magnesium:** Magnesium is an essential mineral for the human body. It is needed for protein, bone, and fatty acid formation, making new cells, activating B vitamins, relaxing muscles, blood clotting, and forming adenosine triphosphate (ATP). The production and use of insulin also requires magnesium.

**Maltose:** Maltose is a disaccharide composed of two glucose molecules combined by α-1,4 glycosidic linkage. It is commonly called malt sugar. Malt from sprouting barley is the major source of maltose. It is a rather sweet sugar and is highly soluble in water.

**Manganese:** Manganese is an essential trace mineral that is required in small amounts to manufacture enzymes necessary for the metabolism of proteins and fat.

**Medium-chain Fatty acids:** Fatty acids containing 6-12 carbon atoms are called medium-chain fatty acids (MCFA). Eg., Caproic acid (C6), Caprylic acid (C8), Capric acid (C10), Lauric acid (C12).

**Megadose.** Supplements that provide more than 100% of the daily value of the body's required vitamins and minerals.

**Melting Temperature:** The Melting Temperature (Tm) is defined as the temperature at which 50% of double stranded DNA is changed to single-standard DNA. The higher the melting temperature the greater the guanine-cytosine (GC) content of the DNA.

**Menkes disease (MNK):** Menkes disease, also known as Menkes syndrome, is a X-linked recessive disorder that affects copper levels in the body, leading to copper deficiency.

**Metalloproteins:** These proteins contain metal as prosthetic group (eg) Siderophilin (Fe) and Ceruloplasmin (Cu).

**Metastatic calcification:** Metastatic calcification is deposition of calcium salts in otherwise normal tissue, because of elevated serum levels of calcium, which can occur because of deranged metabolism as well as increased absorption or decreased excretion of calcium and related minerals, as seen in hyperparathyroidism.
**Micronutrients**: The name given to vitamins and minerals because your body needs them in small amounts. Micronutrients are vital to your body's ability to process the "macronutrients:" fats, proteins, and carbohydrates. Examples are chromium, zinc, and selenium.

**Minerals**: Nutrients found in the earth or water and absorbed by plants and animals for proper nutrition. Minerals are the main component of teeth and bones, and help build cells and support nerve impulses, among other things. Examples include calcium and magnesium.

**Mixed Triglycerides**: A fat molecule containing 2 or 3 different kinds of fatty acid residues in glycerol is called mixed triglycerides. Eg., Dipalmitostearin, Oleopalmitostearin.

**Monoglycerides**: Monoglycerides or monoacylglycerols are fats composed of glycerol and one fatty acid. Eg., Monopalmitin.

**Monosaccharides**: These are carbohydrates that cannot be hydrolysed into more simpler form. These are otherwise known as simple sugars. The general formula is Cn(H2O)n. They may be subdivided into trioses, tetroses, pentoses and hexoses depending upon the number of carbon atoms they contain and also subdivided as aldoses and ketoses depending upon the presence of aldehyde or ketone groups.

**Monounsaturated Fatty acids**: Monounsaturated fatty acids (MUFA) have one unsaturated (double) bond between the carbon atoms. Eg., Oleic acid, Palmitoleic acid etc.

**mRNA**: Messenger RNA (mRNA) is a large family of RNA molecules that convey genetic information from DNA to the ribosome, where they specify the amino acid sequence of the protein products of gene expression.

**Mutarotation**: When an aldohexose is first dissolved in water and the solution is kept in optical path and plane polarised light is passed, the initial optical rotation shown by the sugar gradually changes until a constant fixed rotation characteristic of the sugar is reached. This phenomenon of change of rotation is called as “Mutarotation”.

N
Neutral Lipids: The lipids which are uncharged are referred to as neutral lipids. Eg., Cholesterol.

Non protein amino acids: Certain amino acids which do not exist in proteins are called non protein amino acids eg. Ornithine and β-alanine etc.

Non-essential amino acids: Certain amino acids can be synthesized in the cells from essential amino acids or from other compounds. So these amino acids need not be included in the diet. They are called non-essential amino acids.

Nuclease: A nuclease is an enzyme capable of cleaving the phosphodiester bonds between the nucleotide subunits of nucleic acids.

Nucleic Acids: Nucleic acids are biopolymers, or large biomolecules, essential for all known forms of life. Nucleic acids, which include DNA (deoxyribonucleic acid) and RNA (ribonucleic acid), are made from monomers known as nucleotides.

Nucleo protein: Proteins present along with nucleic acids. (eg) Histones and Protamines.

Nucleoside: A Nucleotide without phosphate is called nucleoside. A nucleoside consists of a nitrogenous base covalently attached to a sugar (ribose or deoxyribose).

Nucleotide: A nucleotide is the basic structural unit and building block for Nucleic acids (DNA & RNA). The nucleotides are composed of a nitrogenous base, a five-carbon sugar (ribose or deoxyribose), and at least one phosphate group.

Oligosaccharides: These are carbohydrates that yield 2-10 monosaccharide units on hydrolysis.e.g, Maltotriose.

Optical Isomerism: When a beam of plane polarized light is passed through a solution of an optical isomer, if the plane polarised light is found to rotate to the left, it is described as levorotation. If the plane polarised light rotates to an equal number of degrees to the right, it is described as dextrorotation. This phenomenon exhibited by asymmetric compounds, is called optical isomerism.
**Osteomalacia**: Osteomalacia is the softening of the bones caused by impaired bone metabolism primarily due to inadequate levels of available phosphate, calcium, and vitamin D, or because of resorption of calcium. The impairment of bone metabolism causes inadequate bone remineralization. Osteomalacia in children is known as rickets. Signs and symptoms can include diffuse body pains, muscle weakness, and fragility of the bones.

**Pellagra**: Pellagra is a vitamin deficiency disease most frequently caused by a chronic lack of niacin (vitamin B3 or synonym: vitamin PP (from: Pellagra Preventing factor) in the diet. A deficiency of the amino acid lysine can lead to a deficiency of niacin.

**Peptide bonds**: In proteins, amino acids are linked together by linkages called peptide bonds. The carboxyl group of one amino acid is joined to the amino group of another amino acid by a peptide bond.

**Phosphodiester Bond**: A phosphodiester bond occurs when exactly two of the hydroxyl groups in phosphoric acid react with hydroxyl groups on other molecules to form two ester bonds. Eg., in nucleic acids each nucleotides are linked by means of phosphodiester bond.

**Phospholipids**: These are lipids containing a phosphoric acid residue in addition to fatty acids and alcohol. They frequently have nitrogen containing bases and other substituents. Eg., phosphatidyl choline, phophatidyl serine etc.,

**Phosphoprotein**: These are protein containing phosphoric acid (eg) casein of milk.

**Phosphorus**: Phosphorus is an essential mineral that is usually found in nature combined with oxygen as phosphate. Most phosphate in the human body is in bone, but phosphate-containing molecules (phospholipids) are also important components of cell membranes and lipoprotein particles, such as good (HDL) and bad (LDL) cholesterol.

**Plasma proteins**: Plasma consists of many proteins such as albumin, globulin and fibrinogen. Total protein of the plasma is about 6-8gm /100ml. Plasma proteins comprise a major part of the solids of plasma. Albumin combines with substances of low solubilities such as cholesterol, triacylglycerol to form more soluble complexes, which can be transported in the aqueous environment of the body fluids.
**Polynucleotide:** A polynucleotide is a biopolymer composed of many nucleotide monomers covalently bonded in a chain by phosphodiester linkage. DNA and RNA are examples of polynucleotides.

**Polysaccharides:** Polysaccharides, which are also known as glycans composed of many number of monosaccharide units. These carbohydrates yield more than 10 monosaccharide units on hydrolysis. Monosaccharides are linked together by glycosidic bonds in polysaccharides.

**Polyunsaturated Fatty acids:** Fatty acids which contain two or more unsaturated (double) bonds are called polyunsaturated fatty acids (PUFA). Eg., Linolenic acid, arachidonic acid etc.

**Potassium:** Potassium is an essential mineral that helps regulate heart function, blood pressure, and nerve and muscle activity. Potassium is also required for carbohydrate and protein metabolism and helps maintain the proper pH within the body.

**Primary structure of Protein:** The primary structure of protein is defined as the sequence of amino acid residues making up its polypeptide chain. The protein may be formed of one or more polypeptide chains. The amino acid residues are linked by peptide bonds. The peptide bond is formed between the carboxyl group of one amino acid and the amino group of adjacent amino acid. Sometimes the adjacent polypeptide chains are linked by disulphide bonds.

**Prostaglandins:** Prostaglandins are derivatives of a 20-carbon fatty acid namely prostanoic acid.

**Proteins:** Proteins may be defined as the high molecular weight polymers composed of \(-\)-amino acids united to one another by peptide linkage (-CO-NH-). Proteins are the major constituents of all living organisms. They contain carbon, hydrogen, nitrogen, oxygen and sulphur.

**Pseudohypoparathyroidism:** Pseudohypoparathyroidism is a condition associated primarily with resistance to the parathyroid hormone. Those with the condition have a low serum calcium and high phosphate, but the parathyroid hormone level (PTH) is actually appropriately high (due to the low level of calcium in the blood). Its pathogenesis has been linked to dysfunctional G Proteins (in particular, Gs alpha subunit).
Quaternary structure of Protein: Some proteins are made up of more than one polypeptide chain. These peptide chains held together by non-covalent interactions or by covalent cross-links it is referred to as the quaternary structure. The assembly is often called as an oligomer and each constituent peptide chain is called as a monomer or subunit.

Racemic mixture: When equal amounts of dextrorotatory and levorotatory isomers are present, the resulting mixture has no optical activity, since the activities of isomers cancel each other. Such a mixture is said to be a “racemic mixture”.

Reichert-Meissl Number: It is defined as the number of ml of 0.1N KOH required to completely neutralize the soluble volatile fatty acids derived from 5 g fat. It is useful in testing the purity of butter.

Renaturation of Nucleic acids: The process by which proteins or complementary strands of nucleic acids re-form their native conformations.

Retinol Activity Equivalent (RAE): The Retinol Activity Equivalent is a relatively new unit for expressing vitamin A activity. One mcg of RAE is equivalent to 1 mcg of all-trans-retinol, 12 mcg of all-trans-beta-carotene, or 24 mcg of other provitamin A carotenoids. These RAE conversion factors are based on recent studies that show that the conversion of provitamin A carotenoids to retinol is only half as great as previously thought.

Rickets: Rickets is defective mineralization or calcification of bones before epiphyseal closure in immature mammals due to deficiency or impaired metabolism of vitamin D, phosphorus or calcium, potentially leading to fractures and deformity. Rickets is caused due to vitamin D deficiency, but lack of adequate calcium in the diet may also lead to rickets (cases of severe diarrhea and vomiting may be the cause of the deficiency).

RNA: Ribonucleic acid (RNA) is a polymeric molecule of ribonucleotides, implicated in various biological roles in coding, decoding, regulation, and expression of genes.
**rRNA:** Ribosomal ribonucleic acid (rRNA) is the RNA component of the ribosome, and is essential for protein synthesis in all living organisms. It constitutes the predominant material within the ribosome, which is approximately 60% rRNA and 40% protein by weight.

**SAMe (S-adenosyl-L-methionine):** SAMe, a natural metabolite of the amino acid methionine, plays a key role in dozens of chemical reactions in the body.

**Saponification number:** It is defined as the number of milligram of KOH required to hydrolyse (saponify) one gram of fat or oil. It is a measure of the average chain length of the fatty acids present in the fat or oil.

**Saturated Fatty acids:** These are fatty acids in which all the carbon atoms are saturated with hydrogen atoms, so they contain no double bonds. Eg., palmitic acid, stearic acid etc.

**Scurvy:** Scurvy is a disease resulting from a deficiency of vitamin C. Humans and certain other animal species require vitamin C in their diets for the synthesis of collagen.

**Secondary structure of Protein:** The peptide chain formed assumes a two-dimensional secondary structure by way of folding or coiling consisting of a helically coiled, zig-zag linear or mixed form. It results from the steric relationship between amino acids located relatively near to each other in the peptide chain. The linkages or bonds involved in the secondary structure formation are hydrogen bonds and disulphide bonds.

**Selenium:** Selenium is an essential trace mineral. Selenium activates an antioxidant enzyme called glutathione peroxidase, which may help protect the body from cancer. Selenium is also essential for healthy immune functioning.

**Short-chain Fatty acids:** Fatty acids containing 2-5 carbon atoms are called Short-chain fatty acids (SCFA). Eg., Acetic acid (2C), Propionic acid (3C), Butyric acid (4C).

**Simple Lipids:** These are esters of fatty acids with various alcohols and do not carry any other group. eg., fats, oils and waxes.

**Simple protein:** These proteins on hydrolysis yield only amino acids. (eg). albumin, globulin.
**Simple Triglycerides:** A fat molecule containing a single kind of fatty acid in all three positions of glycerol is called simple triglycerides. Eg., Tripalmitin, Triolein etc.

**Sodium:** Sodium is an essential mineral. It helps to maintain blood volume, regulate the balance of water in the cells, and keep nerves functioning.

**Sphingophospholipids:** These are phospholipids containing sphingosine as the alcohol. Eg., sphingomyelin.

**Starch:** Starch is a homopolysaccharide made up of glucose units. This is the storage form of carbohydrate present in plants. They are abundantly found in root, stem, vegetables, fruits and cereals. The bulk of our diet which consists mainly of rice, wheat and vegetables is a good source of starch.

**Stereo isomerism:** The presence of asymmetric carbon atoms in a compound give rise to the formation of isomers of that compound. Such compounds which are identical in composition and differ only in spatial configuration are called “stereo isomers”.

**Steroids:** Steroids are the compounds containing a cyclic steroid nucleus namely cyclopentanoperhydrophenanthrene.

**Sucrose:** Sucrose is a disaccharide composed of glucose and fructose. It is ordinary “table sugar”. It is also called as “cane sugar” as it can be obtained from sugar cane. It is widely distributed in sugar cane, beet root, pine apple, honey, carrot and ripe fruits.

**Tertiary structure of Protein:** The polypeptide chain with secondary structure may be further folded, super-folded, twisted about itself forming many sizes. Such a structural confirmation is called tertiary structure. It is only one such confirmation which is biologically active and protein in this confirmation is called as native protein.

**Triglycerides:** Triglycerides or triacylglycerols are fats composed of glycerol and 3 fatty acids. They are the most common lipids in the human diet.
**tRNA:** Transfer RNA (tRNA) is a family of RNA molecules, typically 76 to 90 nucleotides in length, that serves as the physical link between the mRNA and the amino acid sequence of proteins. It transfers the specific amino acids to the growing polypeptide chain during translation.

**U**

**Unsaturated Fatty acids:** These are fatty acids in which all the carbon atoms are not completely saturated with hydrogen atoms, so they contain one or more double bonds at the unsaturated carbon atoms. Eg., oleic acid, arachidonic acid etc.

**V**

**Vander-wall forces:** Occurs between non polar side chains.

**Vitamin A (Retinol):** Vitamin A is a fat-soluble vitamin with multiple functions in the body. It helps cells differentiate, an essential part of cell reproduction. It is a central component for healthy vision; vitamin A nourishes cells in various structures of the eye and is required for the transduction of light into nerve signals in the retina.

**Vitamin A deficiency (VAD) or hypovitaminosis:** A is a lack of vitamin A in blood and tissues. It is common in poorer countries but rarely seen in more developed countries. Nyctalopia (night blindness) is one of the first signs of VAD. Xerophthalmia, keratomalacia, and complete blindness can also occur since Vitamin A has a major role in phototransduction.

**Vitamin B1 (Thiamin):** Vitamin B1 is a water-soluble vitamin that the body requires to break down carbohydrates, fat, and protein. Every cell of the body requires vitamin B1 to form adenosine triphosphate (ATP). Vitamin B1 is also essential for the proper functioning of nerve cells.

**Vitamin B12 (Cobalamine):** Vitamin B12 is a water-soluble vitamin needed for normal nerve cell activity, DNA replication, and production of the mood-affecting substance SAMe (S-adenosyl-L-methionine). Vitamin B12 acts with folic acid and vitamin B6 to control homocysteine levels. An excess of homocysteine has been linked to an increased risk of coronary disease, stroke, and other diseases such as osteoporosis and Alzheimer’s.
**Vitamin B2 (Riboflavin):** Vitamin B2 is a water-soluble vitamin that helps the body process amino acids and fats, activate vitamin B6 and folic acid, and convert carbohydrates to adenosine triphosphate (ATP). Under some conditions, vitamin B2 can act as an antioxidant.

**Vitamin B3 (Niacin):** Vitamin B3 is a water-soluble vitamin required for cell respiration and helps release the energy in carbohydrates, fats, and proteins. It also supports proper circulation and healthy skin, functioning of the nervous system, and normal secretion of bile and stomach fluids. A shortage of niacin may be indicated with symptoms such as canker sores, depression, diarrhoea, dizziness, fatigue, halitosis, headaches, indigestion, insomnia, limb pains, and loss of appetite, low blood-sugar, muscular weakness, skin eruptions, and inflammation.

**Vitamin B5 (Pantothenic Acid):** Vitamin B5 is a water-soluble vitamin involved in the Kreb’s energy production cycle. Vitamin B5 also triggers the adrenal glands, is essential in transporting and releasing energy from fats, and enables the synthesis of cholesterol, vitamin D, and steroid hormones.

**Vitamin B6:** Vitamin B6 is a water-soluble vitamin and is part of the vitamin B complex. Vitamin B6 plays a role in the synthesis of antibodies by the immune system, which are needed to fight many diseases. It helps maintain normal nerve function and also acts in the formation of red blood cells.

**Vitamin B9 (Folate):** Vitamin B9, also known as folic acid, is a B vitamin necessary for cell replication and growth. Folic acid helps form building blocks of DNA, which holds the body’s genetic information, and building blocks of RNA, needed for protein synthesis. Folic acid is most important, then, for rapidly growing tissues, such as those of a fetus, and rapidly regenerating cells, like red blood cells and immune cells. Folic acid deficiency results in an anemia.

**Vitamin C:** Vitamin C is a water-soluble vitamin essential for the manufacturing of collagen, necessary for tissue repair. Vitamin C is also vital for healthy immune and nervous systems because it strengthens blood vessels, as it is an antioxidant that participates in oxidation-reduction reactions.
Vitamin D (Cholecalciferol): Vitamin D is a fat-soluble vitamin that helps maintain blood levels of calcium, by increasing absorption from food and reducing urinary calcium loss. Both functions help keep calcium in the body and therefore spare the calcium that is stored in bones.

Vitamin D deficiency: Vitamin D deficiency, or Hypovitaminosis D, can result from inadequate nutritional intake of vitamin D and/or inadequate sunlight exposure (in particular sunlight with adequate ultraviolet B rays), disorders limiting vitamin D absorption, and conditions impairing vitamin D conversion into active metabolites—including certain liver, kidney, and hereditary disorders. Deficiency impairs bone mineralization, leading to bone softening diseases as rickets in children and osteomalacia and osteoporosis in adults.

Vitamin E (Tocopherol): Vitamin E is an antioxidant that protects cell membranes and other fat-soluble parts of the body, such as LDL cholesterol (the “bad” cholesterol), from damage.

Vitamin E deficiency: Vitamin E deficiency or hypovitaminosis E is a deficiency of vitamin E. It causes nerve problems due to poor conduction of electrical impulses along nerves due to changes in nerve membrane structure and function.

Vitamin K (Phylloquinone): Vitamin K is a fat soluble vitamin necessary for proper bone growth and blood coagulation.

Vitamin K deficiency: Vitamin K deficiency or hypovitaminosis K is a form of avitaminosis resulting from insufficient vitamin K1 or vitamin K2 or both.

Water-soluble vitamins: Water-soluble vitamins: The water-soluble vitamins include the eight B vitamins and vitamin C. These cannot be stored in the body for long and should be consumed frequently, preferably every day.

Waxes: These are long chain fatty acids with alcohol other than glycerol. Eg., Bees wax, Sperm whale wax etc.
Wernicke–Korsakoff syndrome: Wernicke–Korsakoff syndrome (WKS) is the combined presence of Wernicke's encephalopathy (WE) and Korsakoff's syndrome. Due to the close relationship between these two disorders, people with both are usually diagnosed with WKS, as a single syndrome. It occurs due to thiamine (vitamin B1) deficiency.

Wilson's disease: Wilson's disease, also called Wilson disease or hepatolenticular degeneration, is an autosomal recessive genetic disorder in which copper accumulates in tissues; this manifests as neurological or psychiatric symptoms and liver disease. It is treated with medication that reduces copper absorption or removes the excess copper from the body, but occasionally a liver transplant is required.

Zinc toxicity: Zinc toxicity is a medical condition involving an overdose on, or toxic overexposure to, zinc. Such toxicity levels have been seen to occur at ingestion of greater than 225 mg of zinc. Excessive absorption of zinc can suppress copper and iron absorption. The free zinc ion in solution is highly toxic to bacteria, plants, invertebrates, and even vertebrate fish. Zinc is an essential trace metal with very low toxicity in humans.

Zinc: Zinc is an essential mineral that is found in every cell in our body. It stimulates the activity of about 100 enzymes, substances that promote biochemical reactions in your body. Among its many functions, zinc maintains a healthy immune system, is needed for wound healing, helps maintain your sense of taste and smell, and is needed for DNA synthesis.

α-Helix: A polypeptide chain forms regular helical coils called α-helix. These coils are stabilized by hydrogen bonds between carbonyl oxygen of first amino acid and amide N of fourth amino acid residues. Thus in α-helix intra chain hydrogen bonding is present. The α-helices can be either right handed or left handed. Left handed α-helix is less stable because of the steric interference between the carbonyl group and the side chains.

β-Glycosidic Linkage: A glycosidic bond or glycosidic linkage is a type of covalent bond that joins a carbohydrate (sugar) molecule to another group, which may or may not be another carbohydrate. For example, in nucleoside, sugar and nitrogenous base are linked by β-glycosidic linkage.
**β-pleated sheet structure**: A conformation called β-pleated sheet structure is thus formed when hydrogen bonds are formed between the carbonyl oxygens and amide hydrogens of two or more adjacent extended polypeptide chains. Thus the hydrogen bonding in β-pleated sheet structure is interchain. The structure is not absolutely planar but is slightly pleated due to the bond angles. The adjacent chains in β-pleated sheet structure are either parallel or antiparallel, depending on whether the amino to carbonyl peptide linkage of the chains runs in the same or opposite direction.

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**DEPARTMENT OF BIOCHEMISTRY**

**GLOSSARY FOR TERMS IN FOOD & NUTRITION**

**Additives** - Additives are substances added to food, to preserve or enhance flavours or appearance. To regulate additives each is assigned a unique ‘E number’ to demonstrate it has been approved by EFSA (European Food Safety Authority).

**AI** - Adequate Intake - The recommended average daily intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group of apparently healthy people that are assumed to be adequate used when an RDA cannot be determined.

**Allergic reaction** - Immunologically induced tissue response to a foreign substance (allergen).

**Allergy** - a damaging immune response by the body to a substance, especially a particular food, pollen, fur, or dust, to which it has become hypersensitive.

**Alpha-linolenic acid** - 18 carbon fatty acid with three double bonds; the first double bond is on the third carbon atom from the methyl end and therefore it is called n-3 fatty acid. It is abbreviated as 18:3 n-3.

**Amino acid** - The fundamental building block of proteins.

**Anabolism** - Process by which complex materials in tissues and organs are built up from simple substances.

**Anaemia** - Anaemia is a common nutritional problem especially among Indian women. Women in the reproductive age group are the most affected. The causes of anaemia
may be Inadequate diet in quality and quantity, deficient in folate, Iron, B Complex vitamins and vitamin C. Excessive menstruation, Poverty, Lack of awareness of food values, Poor environmental hygiene and sanitation.

- **Anorexia** - Eating Disorder that leads to a potentially fatal low body weight.

- **Anthropometric** - Relating to measurement of the physical characteristics of the body such as height and weight.

- **Antioxidants** - Antioxidants are synthetic or naturally occurring substances found in some foods and drinks. They are added to foods to prevent oxidation, for example, Vitamin C in fruit juice prevents oxidation. They also may have protective effects on our body by counteracting the negative effects of free radicals (reactive atoms that may lead to cancer and other age-related diseases).

- **Aseptic packaging** - This is a special packaging method which means that foods can last for months without refrigeration. During the process, food and packaging are sterilised by flash heating to high temperatures, killing micro-organisms and preserving nutrients. This method is often used for milk, fruit juices and liquid egg.

- **Balanced Diet** - A diet consisting of the proper quantities and proportions of foods needed to maintain health or growth.

- **Basal Metabolic Rate (BMR)** - The rate at which the body uses energy while at rest to maintain vital functions such as breathing and keeping warm.

- **BCA (Body Composition Analysis)** - Determines percent of body fat and percent of lean body tissue (lean body mass).

- **Behavior Modification** - The changing of behavior by the manipulation of cues and environment factors that trigger behavior. The changing of behavior itself.

- **Behavioral Guidance** - Provides nutritional counseling to learn proper eating habits.

- **Beta-Carotene** - A yellow-orange plant pigment which yields vitamin A by oxidation in the body.

- **Bifidus factor** - A substance in human milk which stimulates the growth of a micro-organism (Lactobacillus bifidus) in the infants' intestine.

- **Bioelectrical Impedance Analysis** - A method of body composition analysis based on electrical conductance and the greater electrical conductivity of fat-free mass.

- **Blood Pressure** - The pressure of the blood on the walls of the arteries.
BMI - BMI stands for Body Mass Index and is used to calculate if someone is a healthy weight for their height. It is calculated by dividing weight (in kilograms) by the square of the height (in metres). A healthy BMI is considered to be between 18.5-24.9.

Body Mass Index - Body weight in relation to height. Body weight in kilograms divided by 2 height in metres.

Bulimia - Eating disorder characterized by binge eating, sometimes followed by vomiting or purging.

Caffeine - Caffeine is naturally found in many common foods and beverages, including coffee, tea, cola drinks and chocolate. It is a stimulant and has been proven to increase physical performance in exercise.

Calcium - Calcium is the most abundant mineral in the body and is needed for strong bones and teeth. It is also vital for many other processes including blood clotting, muscle contractions and transferring information via the nervous system. Calcium is found in dairy products (like milk and cheese) and also in some dark green vegetables as well as fortified soya products.

Calorie - A calorie is a unit measure of energy. When used on food labels, it is actually referring to kilocalorie(s)(kcal). Calories are used to define the amount of energy in the food we eat that is used by the body. Calories are found in fats, carbohydrates, proteins and alcohol. To calculate calories to kilojoules you need to multiply by 4.2

Calorimeter - An apparatus for measuring the amount of heat involved in a chemical reaction or other process.

Canning - Canned foods have been around for about 200 years. Food that would otherwise go off is filled into airtight cans and then heated to kill off any microorganisms. This is all done very quickly so nutrients are ‘locked’ in the can. No chemicals or preservatives are required as the process itself acts as a preservative. Until opened, canned food can last for years at room temperature.

Carbohydrates - Carbohydrates are a food group that include complex carbohydrates, such as starchy foods like bread and pasta, and simple carbohydrates, including sugar and sugary foods. Starchy carbohydrates should make up about a third of your diet.
Sugary foods should be eaten occasionally and in smaller amounts. Carbohydrates provide 4 Kcal per gram (16KJ)

- **Catabolism** - Process of breakdown of complex organic constituents in the body.
- **Cholesterol** - Cholesterol is a waxy component of fat. It is an essential part of cell membranes in the body, a component of some hormones and also needed to synthesise vitamin D. However a high level of cholesterol in the blood—hypercholesterolemia—is a major risk factor for coronary heart disease.

- **Colostrum** - During first two or three days colostrum is secreted in small quantities of about 10-40 ml. Colostrum contains interferon like substance which has strong antiviral activity. It contains B12 binding protein making it unavailable for growth of E-coli and other bacteria. It also contains antibodies against viral infection. Enzymes lysozyme and peroxidase which promote cell maturation are found to be more in colostrum.
- **Colours** - Colours are used to improve the appearance of a food or drink. All colours approved for human consumption have allocated E numbers.
- **Complete Protein** - A protein containing all the essential amino acids.
- **Counseling** - The professional guidance of an individual in a specific area.
- **CU** - **Consumption Unit** - One unit represents Recommended Dietary Allowance of energy for a sedentary man.

- **Diabetes Mellitus** - The incidence of Non Insulin Dependent Diabetes Mellitus (NIDDM) is increased due to impaired glucose tolerance and decreased sensitivity of cells to insulin.
- **Diabetes Type 1** - Insulin Dependent-perssons body does not produce insulin at all.
- **Diabetes Type 2** - Non-Insulin Dependent-persons body does produce insulin but fat cells resist the insulin. Majority of cases are due to obesity.
- **Diet** - To eat sparingly or according to prescribed rules.
- **Dietary fibre** - The part of plant foods that we cannot digest. Whole grains, fruits, vegetables, nuts and seeds contain fibre. Fibre helps fill up, can help lower cholesterol. Daily need is at least 25 to 38 grams. To be considered high in fibre, a food must contain least 5 grams per serving.
- **Dietetics** - The branch of knowledge concerned with the diet and its effects on health, especially with the practical application of a scientific understanding of nutrition.
**Digestion** - Digestion is the mechanical and chemical process of breaking down food into its smaller molecules, which can then be absorbed into the bloodstream.

**E numbers** - E numbers are additives which have been approved by EFSA (European Food Safety Authority) as safe for human consumption. Each is assigned a unique ‘E number’ that can then be used internationally so there is no confusion as to what the ingredient is.

**ECG (Electrocardiogram)** - Records electrical impulses of the heart.

**Electrolytes** - Essential elements necessary for cell function to regulate the distribution of body fluids, (Ex. sodium, potassium).

**Empty calories** - Term used for foods that provide only energy without any other nutrient, eg. white sugar and alcohol.

**Emulsifier** - Emulsifiers are used to stop emulsions from separating, e.g. lecithin in mayonnaise stops it from separating out into oil and water.

**Emulsion** - An emulsion is when droplets of one liquid are suspended evenly within another liquid, without separating into their separate parts, e.g. mayonnaise.

**Energy** - The strength and vitality required for sustained physical or mental activity.

**Energy Metabolism** - The reactions by which the body obtains and spends the energy from food.

**Enriched** - Enriched foods have nutrients added to them to replace those lost during food processing. B vitamins, for example, are lost when wheat is processed into white flour, so these nutrients are later added back.

**Enzymes** - Biological catalysts which enhance the rate of chemical reactions in the body.

**Essential Amino Acids** - Amino acids that the body cannot make in sufficient amounts to meet physiological needs and must come from foods we consume.

**Essential fatty acids (EFA)** - Fatty acids like linoleic acid and alpha linolenic acid which are not made in the human body and must be supplied through the diet.

**Exchange Lists** - Diet planning tools that organize foods by their nutrient and energy contents. Foods on any single list can be used interchangeably.

**Extrusion** - Extrusion is used to form shapes in products such as cereals. The ingredients are mixed together to the required particle size and then forced through a very small mould at very high pressure. The friction caused by the high pressure creates heat which cooks the ingredients. Examples include pasta, puffed corn, cornflakes.
- **Fat** - Fats are compounds that are insoluble in water. They can be liquid (e.g. vegetable oils) or solid (e.g. lard) at room temperature and can be derived from both vegetable and animal sources. A gram of fat provides 9 calories (37KJ) meaning that foods high in fat are energy dense.

- **Fatty acids** - Fundamental constituents of many lipids.

- **Fermentation** - Fermentation is when microorganisms, particularly yeasts, convert carbohydrates (e.g. sugar) producing alcohol and carbon dioxide. This process is used in many food and drink processes such as brewing, baking and making yoghurts.

- **Fibre** - Fibre is the indigestible part of plants. It helps to keep gut healthy and prevent constipation. Fibre is defined as soluble or insoluble. Soluble fibre is fermented in the colon and insoluble fibre moves through the gut undigested aiding defecation.

- **Flavonoids** - Pigments widely distributed in nature in flowers, fruits and vegetables.

- **Flavourings** - Flavourings have to undergo stringent safety tests to prove they are safe for human consumption.

- **Flavours** - Flavours are chemical substances added to foods in tiny amounts to ensure that food and drink tastes good and is consistent. They are obtained by chemical synthesis or isolated using chemical processes.

- **Food** - Any nutritious substance that people or animals eat or drink of that plants absorb in order to maintain life and growth.

- **Food Exchange** - Foods are classified into different groups for exchange. Each “exchange list” includes a number of measured foods of similar nutritive value that can be substituted inter-changeably in meal plans.

- **Food Group** - A food group is a collection of foods that share similar nutritional properties or biological classifications. Nutrition guides typically divide foods into food groups and recommend daily servings of each group for a healthy diet.

- **Food Pyramid** - A food pyramid or diet pyramid is a pyramid-shaped diagram representing the optimal number of servings to be eaten each day from each of the basic food groups.

- **Fortification** - Fortification is the process of adding nutrients to a food. Sometimes this has to be done by law, for example, in the case of margarine, and sometimes nutrients are added to help the population meet their nutrient needs, e.g. breakfast cereals.
**Fortified** - Fortified foods have nutrients added to them that weren’t there originally. Milk, for example, is fortified with vitamin D, a nutrient that helps in the absorption of milk’s calcium.

**Free radicals** - Highly reactive oxygen-derived species formed in the body during normal metabolic processes. They have the capacity to damage cellular components by oxidation.

**Freezing** - Freezing has been used as a method for preserving food for thousands of years. Today foods are frozen quickly making it impossible for microorganisms to multiply. Food is then stored at -18°C or below. If stored correctly foods should retain their nutrients as well as maintain their quality.

**Galactogogue** - A food or drug that promotes or increases the flow of a mother's milk.

**Glucose** - A monosaccharide, sometimes known as blood sugar.

**Health** - Health is a state of complete physical, mental and social well-being and not merely the absence of disease or injury.

**High Quality Protein** - A protein that is easily digestible and a complete protein.

**High-density lipoproteins (HDL)** - These transport cholesterol from the extra-hepatic tissues to the liver. They are anti-atherogenic.

**High-fructose corn syrup (HFCS)** - A sweetener that is often used instead of sugar in food manufacturing.

**Homogenisation** - This process is used to make liquids of different substances into a consistent blend. It is achieved by forcing the liquid at high pressure through small holes, this forces the particles to become smaller and uniform in size. A common example is milk. Milk is homogenised so that the fat particles are evenly distributed within the water making it smooth with no separation.

**Hormones** - Substances produced by a gland (endocrine) which are secreted directly into the blood stream to produce a specific effect on another organ.

**Hydrogenated** - Hydrogenation turns a liquid fat such as vegetable oil into a semi-solid, more shelf-stable fat, such as margarine. Most oils are only partially hydrogenated, which creates harmful trans fats that can raise cholesterol.

**Hyperglycemia** - Increase in blood sugar.

**Hyperlipidemia** - An increase in the concentration of blood lipids (triglycerides and cholesterol).
- Hypertension - Elevated blood pressure.
- Hypoglycemia - Deficiency of glucose in the blood, low blood sugar.
- Hypotension - Low blood pressure.

ICMR - Indian Council of Medical Research - Following the recommendations of the League of Nations in 1937, an attempt to recommend dietary allowances for energy, protein, iron, calcium, vitamin A, thiamine, ascorbic acid and vitamin D for Indians was made in 1944 by the Nutrition Advisory Committee of the Indian Research Fund Association, now called Indian Council of Medical Research (ICMR). The Indian Council of Medical Research recommends 1.0 g/kg/day as the safe level of intake in terms of dietary protein for Indians. During pregnancy and lactation additional allowances are recommended. Protein requirements for children vary depending on body weight and expected weight gain.

Ideal Body Weight - The weight appropriate for an individual that results in a body mass index of 20-25.

Insulin - A hormone secreted by special cells in the pancreas in response to increased blood glucose (blood sugar) concentrations.

Invisible fats - Fat present as an integral component of plant and animal foods such as in cereals, legumes and spices.

Iron - Iron is a mineral which forms an important part of haemoglobin, helping to transport oxygen round the body in our blood. Iron also has an important role in the immune system.

Irradiation - This process is used as a preservation technique as it kills bacteria that could cause food poisoning. It is also used to delay ripening of some foods. It works by exposing food to electron beams, x-rays or gamma-rays. The food does not become radioactive itself, and the appearance and quality of the food is not affected as much as during cooking or pasteurisation.

Kilocalorie - A unit of energy of one thousand calories (equal to one large calorie).

Kilojoules - Kilojoules are another measure of energy like calories. Kilojoules have to legally be used on food labels where energy is declared as they are the internationally accepted unit. To calculate calories from kilojoules you need to divide by 4.2

Acto vegetarians - do not eat meat, only dairy products.
Lactoferrin - Minor protein of milk containing iron. Lactose intolerance - Disorder resulting from improper digestion of milk sugar called lactose, due to lack of an enzyme, lactase, in the intestinal mucosa.

Lacto-ovo vegetarians - do not eat meat, but will eat dairy products and eggs.

Lactose Intolerance - A condition that results from inability to digest the milk sugar-lactose.

Lactose - The main carbohydrate in milk (milk sugar).

Lean Body Mass - The fat-free mass or part of the body including all its components except fat storage.

Lecithin - Added to chocolates, baking products, and cosmetics, lecithin is used as a thinner, a preservative, or an emulsifier. Egg yolks, soy beans, fish, and other foods naturally contain lecithin.

Linoleic acid - Fatty acid containing 18 carbon atoms and two double bonds. The first double bond is on the sixth carbon atom from the methyl end. Therefore it is called n-6 fatty acid and is abbreviated as 18:2 n-6.

Lipids - A technical term for fats. They are important dietary constituents. The group includes triglycerides, steroids, cholesterol and other complex lipids.

Lipoproteins - Lipids are not soluble in blood; they are therefore transported as lipid and protein complexes.

Low-density lipoproteins (LDL) - These transport cholesterol from the liver to tissues. High blood levels indicate that more cholesterol is being transported to tissues.

Macrocytic anaemia - Anaemia characterized by red blood cells which are larger than normal.

Macronutrients - Nutrients like carbohydrates, proteins and fats which are required in large quantities.

Malnutrition - Malnutrition is the condition of an unbalanced diet, which may be lacking in nutrients, too high in nutrients or nutrients are provided in the wrong proportions.

Metabolism - The chemical reactions that happen in living cells to sustain life. This includes digestion and transporting substances between cells. The speed of metabolism will determine how much food is needed.

Metabolism - The sum total of all the chemical reactions that go on in living cells; also the transformation by which energy is made available for the uses of the organism.
- **Microcytic anaemia** - Anaemia characterized by red blood cells which are smaller than normal.
- **Micronutrients** - Nutrients which are required in small quantities, such as vitamins and trace elements.
- **Minerals** - Inorganic elements; some minerals are essential nutrients required in small amounts.
- **Modified Atmosphere Packaging (MAP)** - Modified Atmosphere Packaging is a way of preserving food products by changing the air in the pack to a protective mix of natural gases. This prevents the growth of micro-organisms.
- **Modified food starch** - Extracted from corn, potato, wheat, and other starches, modified food starch is used as a thickener, stabilizer, or fat replacer in foods like dessert mixes, dressings, and confections.
- **Monosaccharide** - A carbohydrate that consists of a single ring.
- **Monosodium glutamate (MSG)** - Used as a flavor enhancer, MSG is like salt. Though some people may have a mild reaction after consuming MSG, the FDA recognizes MSG as “generally safe” when “eaten at customary levels.”
- **Monounsaturated fat** - A healthy fat found in foods such as nuts, olive oil, and avocados. When used to replace saturated fats, a diet high in monounsaturated fats can help lower bad cholesterol. Most of the fat in your diet should be mono- and polyunsaturated. All fats have 9 calories per gram.
- **Monounsaturated fatty acids** - Unsaturated fatty acids with one double bond. n-6 PUFA: Linoleic acid and its longer chain polyunsaturated fatty acids are collectively called n-6 PUFA. n-3 PUFA: Alpha-linolenic acid and its longer-chain polyunsaturated fatty acids are collectively called n-3 PUFA.
- **Morbid Obesity** - 100% to 149% above ideal body weight.

- **Natural colours** - These are obtained from natural sources such as vegetables, grasses, fruit skins and seeds. They include natural constituents of food and natural sources which are not normally consumed as foods. They can also be obtained from animals such as beetles, e.g. the red colouring cochineal.
- **Natural flavours** - These are made from animal or vegetable sources. They may be used in their raw state or can be further processed, by traditional food preparation processes.
- **NPU-Net Protein Utilization** - The NPU of a food is the percentage of protein contained in that food which is retained by the body after the food has been eaten. NPU is the ratio of amino acid converted to protein to the ratio of amino acids supplied.

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NPU = \frac{\text{Digestibility coefficient} \times \text{Biological value}}{\text{Protein digested}}
\]

- **Nutrients** - Substances obtained from food and used in the body to provide energy and structural materials and to regulate growth, maintenance and repair of the body's tissue.
- **Nutrition** - The process of providing or obtaining the food necessary for health and growth.
- **Obesity** - It affects 10-20 percent of adolescent population. Lack of exercise rather than excess calorie consumption is the cause. Concern about personal appearance may make adolescents more reluctant to participate in activities like sports. Obesity may also be due to hormonal imbalance, emotional stress or family habits.
- **Overnutrition** - The excessive intake of food, especially in unbalanced proportions.
- **Overweight** - Being overweight is classified as having a BMI >24.9, with more body fat than is optimally healthy.
- **Oxidation** - Oxidation is the addition of oxygen or loss of electron. It happens when an atom or compound loses one or more electrons.
- **Pasteurisation** - Pasteurisation involves heating a food or drink to a high temperature (less than boiling) for several minutes. This does not kill all the microbes but, as long as the food or drink is stored appropriately, it slows down spoilage. This process is mainly used for milk and fruit juice.
- **Phytochemicals** - These are chemicals naturally occurring in plants, but are not classified as nutrients. They may have protective properties against cancers, heart disease and other chronic health conditions.
- **Plateau (Weight)** - Reaching a level or period of stability.
- **Polyunsaturated fat** - A fat found in foods such as walnuts, salmon, and, soybean oil. Polyunsaturated fats provide essential fatty acids such as omega-3s and omega-6s to your diet. Most of the fat you eat should be mono- and polyunsaturated.
- **Polyunsaturated fatty acids (PUFA)** - Unsaturated fatty acids with two or more double bonds.
Potassium - Essential for life, potassium helps maintain normal blood pressure and keeps your heart and kidneys working normally. Potassium is found in bananas, nuts, potatoes, dairy, and other foods. Adults should aim for 4,700 milligrams of potassium daily.

Preterm baby - A premature birth is a birth that takes place more than three weeks before the baby is due. In other words, a premature birth is one that occurs before the start of the 37th week of pregnancy. Normally, a pregnancy usually lasts about 40 weeks.

Processed foods - Foods that are produced by converting raw food materials into a form suitable for eating.

Protein - A class of nitrogenous organic compounds which have large molecules composed of one or more long chains of amino acids and are an essential part of all living organisms, especially as structural compounds of body tissues such as muscle, hair etc. and as enzymes and antibodies.

Protein Energy Malnutrition (PEM) - A marked dietary deficiency of both energy and protein resulting in undernutrition.

QUID - Quantitative, Ingredient Declarations (QUID) are used when ingredients are mentioned in the name of the food (such as ‘chicken’ in chicken pie), or emphasised on the label in words (e.g. ‘made with real cream’) or pictures, or are usually associated with the food (as lamb is with shepherd’s pie). The amount contained in the food will be given as a percentage. This should appear either next to the name of the food product or in the list of ingredients at the relevant point.

RDA - Recommended Dietary Amounts are estimates of the amount of vitamins and minerals which are sufficient (or more than sufficient) to meet the needs of an adult; these form part of European nutrition labelling regulations. The UK also has RNI (Recommended Nutrient Intakes) which provide ranges of recommendations for vitamins and minerals dependent on age, sex and physiological status.

RDI (Reference Daily Intakes) - Food labeling values for protein, vitamins and minerals based on population-adjusted means of the RDA.

Reference men - Reference man is between 20-39 years of age and weighs 60 kg. He is free from disease and physically fit for active work. On each working day he is employed for 8 hours in occupation that usually involves moderate activity. While not
at work he spends 8 hours in bed, 4-6 hours sitting and moving about and 2 hours in walking and in active recreation or house-hold duties.

- **Reference woman** - Reference woman is between 20-39 years of age and weighs 50 kg. She is engaged in 8 hours in general household work or in light industry or in any other moderate active work. Apart from 8 hours in bed, she spends 4-6 hours sitting or moving around in light activity and 2 hours walking or in active recreation or household chores.

- **Refined** - Refers to the fine grinding of grains and removal of unwanted components that may not be desirable for processing or the finished product. An example is white flour, where the grain is ground and the husk and germ are removed.

- **Refined foods** - Foods which have been processed to improve their appearance, colour, taste, odour or keeping quality.

- **Respiratory Quotient (RQ)** - The ratio of the volume of carbon dioxide evolved to that of oxygen consumed by an organism, tissue or cell in a given time.

- **Salt** - Sodium and chloride form salt (NaCl). Salt is used in many foods for flavour, as a preservative and for processing e.g. controlling yeast fermentation in bread. Too much salt can lead to hypertension (high blood pressure). The recommended intake is no more than 6g a day for an adult.

- **Satiety** - Feeling of satisfaction after food intake.

- **Saturated Fat** - Saturated fats contain fatty acids that have no double bonds as the carbon chains are fully saturated with hydrogen atoms. This means they are solid at room temperature. Saturated fats are often from animal sources such as lard, but also some vegetable sources such as palm oil and coconut oil. Consuming too much saturated fat can lead to high levels of cholesterol in the blood, which, in turn, can increase the risk of cardiovascular disease.

- **Saturated fatty acids** - Fatty acids containing maximum number of hydrogen atoms that each carbon atom can carry. They do not have double bonds.

- **SDA-Specific Dynamic Action** - SDA also known as thermic effect(TEF) of food of dietary induced thermogenesis(DIT). SDA of a food represents the effort or energy that the body has to use to break down the food until it is reduced to its basic unit, which is the only form in which it can enter the bloodstream. How much work this involved depends on the food’s consistency and its molecular structure.

- **Semi-vegetarians** - do not eat red meat, but will often eat fish and poultry.
✦ **Serving size** - This section of a nutrition label helps you determine the number of calories and amount of each nutrient in a recommended serving of a food. USDA serving sizes are often smaller than you might eat. So read labels carefully. Even small packages often contain more than one serving.

✦ **Sodium** - While sodium (commonly called salt) is vital for healthy nerves and muscles. Normal daily sodium requirement is 2,300 milligrams a day or less.

✦ **Spray drying** - Spray drying is used to make liquid foods into powders by drying the liquid really quickly with hot air, making the water vaporise leaving just powder. This increases the shelf life as dry foods are less likely to be affected by microbiological spoilage. It also makes products lighter for transit. Common examples include powdered milk and egg.

✦ **Starch** - A complex carbohydrate made up of many glucose units that the body digests to use for energy. About a third of our diet should be made of starchy carbohydrates which are found in foods such as bread, potatoes and pasta.

✦ **Stress** - A state of mental or emotional strain or tension resulting from adverse or demanding circumstances.

✦ **Sugar** - Sugars are simple carbohydrates that our bodies break down and use for energy quicker than complex carbohydrates. Sugars can be defined as either monosaccharides (one unit), examples include glucose, fructose and galactose or disaccharides (two units) examples include sucrose, which we know as white table sugar, lactose (the sugar in milk) and maltose.

✦ **Supplementary food** - The foods that are introduced in addition to breast milk are called supplementary foods. Introducing supplementary foods not only ensures the fulfillment of nutrient needs of the infant (which cannot be met by breast milk alone after 6 months) but also introduces the child gradually to the family eating pattern.

✦ **Sweeteners** - Sweeteners are additives used for sweetening foods and drink. They can either be artificial or natural and are usually many times sweeter than sugar, often with fewer or no calories. Sweeteners undergo the same strict safety testing as all other food additives.

✦ **Synthetic (artificial)** - These are colours that do not naturally occur and are man-made. They are carefully tested to make sure that they are safe.

✦ **Testimonial** - A statement testifying to benefits received.
✦ **Total calories** - This number on a food label indicates how many calories are in a single serving of a food.

✦ **Total carbohydrate** - This number on a food label indicates how many grams of carbohydrates are in a single serving of a food.

✦ **Total fat** - This number on a food label indicates how much fat is in a single serving of a food. Limit total fat to less than 25% to 35% percent of the calories you consume each day. All fats have 9 calories per gram.

✦ **Trans fats** - Trans fatty acids are naturally occurring in tiny amounts in foods from ruminant animals such as milk and lamb. They also occur through processing when unsaturated oils are partially hydrogenated, moving the location of the double bond. This makes the oils more solid and better for processing. There is a concern around trans fats as they have been proven to have negative health effects, increasing the levels of bad cholesterol (LDL).

✦ **Trans-fatty acids** - Are mainly produced during hydrogenation of oils; a few also occur naturally in very small quantities.

✦ **Triglycerides** - The scientific name for the common form of fat, found in both vegetable and animal fats. Most body fat is stored in the form of triglycerides, when there are unused calories.

✦ **Triglycerides** - The scientific name for the common form of fat, found in both the body and in foods. Most body fat is stored in the form of triglycerides.

✦ **Ultra Heat Treatment (UHT)** - Ultra-heat treatment involves heating food or drink to a very high temperature (>135°C) for only 1-2 seconds. This destroys micro-organisms meaning that the product can last for months without refrigeration. It is often used for long life milk, which does not have to be kept refrigerated.

✦ **Undernutrition** - Nutritional deficiency resulting from lack of food or from the inability of the body to convert or absorb it.

✦ **Unsaturated Fat** - Unsaturated fats have one or more double bonds, meaning they are liquid at room temperature. They are often from vegetable sources such as sunflower and olive oil. Monounsaturated fats have one double bond and can be found in various foods, e.g. avocados. Polyunsaturated fats contain more than one double bond and can be found in both vegetable sources and fish. Unsaturated fats have been proven to have positive effects on our heart health and help reduce cholesterol in the blood.
- **Unsaturated fatty acids** - Fatty acids in which there is a shortage of hydrogen atoms. The carbon atoms then become linked by double bonds. Unsaturated fatty acids are less stable than saturated fatty acids.

- **Vacuum packing** - Vacuum packing describes the process where the air is removed from a pack prior to sealing. This is usually to remove oxygen, resulting in extended shelf life.

- **Vegans** - strict vegetarians, with no foods from animal sources at all - they may also avoid clothing and other non-food products derived from animals.

- **Vegetarian** - There is no single definition for vegetarian but it refers to a diet that excludes some or all foods from animal sources.

- **Visible fats** - Fats and oils that can be used directly or in cooking.

- **Vitamins** - A group of nutrients that our bodies need in small amounts to maintain many processes. Vitamins can be defined as either water soluble or fat soluble. Most vitamins cannot be made by the body and therefore have to be obtained through the diet.

- **Weaning** - Weaning is the process of gradually introducing foods other than breast milk in the child’s feeding schedule.

- **Weaning foods** - Foods which are used during gradual transition of the infant from breastfeeding to a normal diet.

- **WHO** - World Health Organization - Recommendations for energy and protein requirements by the Food and Agricultural Organization (FAO) and based on the international data provided by the FAO/WHO expert groups and those available in India, the recommendations for dietary requirements were revised.

- **Whole grain**. Whole grain foods include the bran, nutrient-rich germ, and endosperm of grains such as wheat, oats, or rice. Examples include brown rice, corn, and whole wheat bread. Whole grain foods have more fiber, vitamins, and minerals than processed white grains. Eating more whole grains can reduce the risk of cardiovascular disease.