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FOOD AND ITS COMPONENTS

- **Food** is the basic necessity of life. Food is defined as any substance of either plant or animal origin consumed to provide nutritional support for an organism.
- It contains essential nutrients that provide energy, helps in normal growth and development, repair the worn-out tissues and protect the body from diseases.
- The main sources of our food are **plants and animals**.
- **Animals** which eat **only plants** are called **herbivores**.
- **Animals** which eat **only animals** are called **carnivores**.
- Animals which eat **both plants as well as other animals** are called **Omnivores**.
- **Bees** collect nectar (sweet juices) from flowers convert it into honey and store it in their hive.
- The major nutrients in our food are carbohydrates, proteins, fats, vitamins and minerals. In addition, food also contains **dietary fibres and water**.
- **Carbohydrates and fats** mainly provide energy to our body.
- Foods containing fats and carbohydrates are also called '**energy giving foods**'.
- Proteins and minerals are needed for the growth and the maintenance of our body.
- Our body needs **dietary fibres and water**. **Dietary fibres** are also known as **roughage**.
- Roughage is mainly provided by plant products in our foods. Whole grains and pulses, potatoes, fresh fruits and vegetables are main sources of roughage. Roughage does not provide any nutrient to our body, but is an essential component of our food.

Carbohydrate

- Consisting of oxygen (O), carbon (C), and hydrogen (H), carbohydrate is a biological molecule.
- Carbohydrate is one of the essential elements for the living organisms, as it plays various important roles.
- Carbohydrate is the main source of energy, as about two-third energy requirement of living beings is fulfilled by it.
- Glucose, sugar, and starch are the important examples of carbohydrate.

Source of Carbohydrate

Carbohydrates naturally are occurring in wide variety of foods, such as:

- Wheat
- Maize
- Rice
- Potatoes
- Sugarcane
- Fruits
- Table sugar
- Bread

- Milk
- Sugar that we eat in our everyday life is mainly sucrose (table sugar).
- Sucrose is added in many food items while preparing, e.g. jam, biscuits, cakes, energy drinks, etc.
- Further, many fruits naturally contain glucose and fructose.
- Glycogen is another type of carbohydrate that found in the liver and muscle.
- Cellulose found in the cell wall of plant cells is carbohydrate.

Types of Carbohydrate

The following table illustrates major categories and sub-categories of carbohydrate:

Class	Subgroup	Components
Sugar	Monosaccharides	Glucose, fructose, xylose, galactose
	Disaccharides	Sucrose, lactose, maltose, trehalose
	Polyols	Sorbitol, mannitol
Oligosaccharides	Malto-oligosaccharides	Maltodextrins
	Other oligosaccharides	Raffinose, stachyose, fructo-oligosaccharides
Polysaccharides	Starch	Amylose, amylopectin, modified starches
	Non-starch polysaccharides	Cellulose, hemicellulose, pectins, hydrocolloids

Functions of Carbohydrate

- Carbohydrates provide energy required for the proper function of the body.
- Carbohydrates also store food in the body for the contingency period.
- Carbohydrates form nucleic acids.
- Carbohydrates also support skeleton system of animals.
- Carbohydrates provide sweetness and flavor.
- Carbohydrates break down the fatty acid.

Proteins

- Proteins, which are basically biomolecules, play wide range of functions in the body of a living organism.
- Proteins are made up of tiny elements of different types of amino acids.
- A sequence of amino acid residues in a protein is known particularly by the sequence of a gene; gene is encoded in the genetic code.
- After formation, proteins exist for a fixed period of time and are then degraded and recycled.
- The proteins get recycled by the cell's machinery by the process of protein turnover.

- Most of the proteins contain linear polymers made up of series of up to 20 different L- α -amino acids.
- The amino acids in a polypeptide chain are connected by peptide bonds.
- The peptide bond, usually, has two resonance forms, which contribute some double-bond characters.

Protein Structure

- Most of the proteins illustrate unique 3-dimensional structures.
- However, proteins have not a rigid structure, but rather, proteins may vary between several related structures especially when they perform their functions.

Functions of Proteins

- In the cell, proteins are the chief actors that carry out the duties defined by the information encoded in genes.
- Proteins are essential for the overall body growth.
- Proteins play a role of bio-catalyst and biotic regulator.
- Proteins provide instant energy especially during the emergency period.
- Proteins help in catalyzing the metabolic reactions.
- Proteins are the essential elements in DNA replication.
- Proteins actively help in transporting molecules from one location to another in the body.

Types of Protein

- **Enzymes** – enzymes play important role especially during the breakdown of molecules. Enzymes are also required for the digestion and growth of the cell.
- **Structural Proteins** – such type of proteins provide strength to cells, tissues, and organs.
- **Signaling Proteins** – Such proteins facilitate cells to communicate with each other by providing signals.
- **Defensive Proteins** – Such proteins help organisms to fight with infection and support damaged tissue in healing fast.
- **Hormone** – Some hormones are proteins that help in metabolic activities.

Fats

- Fat is a significant foodstuff for many forms of life.
- Fats serve structural as well as metabolic functions.
- The fats are molecules made up of glycerol and fatty acid.
- Fat is an organic compound of hydrogen, carbon, oxygen.
- Based on the number and bonding of the carbon atoms, fats and oils, are categorized in the aliphatic chain.

Functions of Fats

- Fat is a vital dietary requirement.
- The fat is usually the stored source of energy in the body that remained store beneath the skin.

- Fat acts a protective layer especially in the human body and provide protection.
- Some of the vitamins such as vitamin A, vitamin D, vitamin E, and vitamin K are fat-soluble, which means they can only be absorbed, digested, and transported in conjunction with the fats.
- Fats actively help in maintaining the healthy skin and hair.
- Fats insulate body organs against external shock.
- Fats also maintain body temperature.
- Fats promote healthy cell function.

Types of Fats

Unsaturated Fats

- The fats that remain in the liquid form at room temperature are known as unsaturated fats.
- Unsaturated fats are beneficial for health, as it improves blood cholesterol levels, stabilize heart beats, etc.
- Unsaturated fats are commonly found in vegetable oils, nuts, and many seeds.

Saturated Fats

- Saturated fats have no double bonds between the carbons found in its chain.
- Saturated fats can easily solidify and typically found in solid form at room temperature.
- Saturated fats are found in animals' meat, cheese, ice cream, etc.

Vitamins

- Vitamin is one of the most essential organic compounds that organisms require for the growth and maintenance of the body.
- Unlike other nutrients, vitamins are classified by their biological and chemical activity, instead of their structure.
- The term vitamin was derived from a compound word namely "vitamin."
- The Polish biochemist Kazimierz Funk, first used the compound word 'vitamin' in 1912.
- Usually, vitamins are represented by the English capital letters, e.g. A, B, C, E, etc.
- The body of a human being stores different vitamins widely; the vitamins A, D, and B12 are stored in substantial amounts, generally in the liver.
- Deficiency of vitamins causes disease.
- Based on solubility, vitamins are classified as water soluble vitamins and fat soluble vitamins.
- Water-soluble vitamins can dissolve easily in water.
- On the other hand, fat-soluble vitamins can be dissolved easily in fat.
- Further, fat-soluble vitamins get absorbed easily through the intestinal tract.
- Water Soluble Vitamins: **Vitamins C and B-Complex**
- Fat Soluble Vitamins: **Vitamin A, D, E and K**
- Vitamins help in protecting our body against diseases
- Some sources of **Vitamin A** are:

- o Papaya
- o Carrot
- o Mango
- o Milk
- o Fish liver oil
- Some sources of **Vitamin B** are:
 - o Liver
 - o Wheat
 - o Rice
- Some sources of **Vitamin C** are
 - o Orange
 - o Tomato
 - o Guava
 - o Green Chilli
 - o Lemon
 - o Amla
 - o kiwi
- Some sources of **Vitamin D** are
 - o Fish
 - o Liver
 - o Egg
 - o Mushrooms
- **Vitamin K** is found in Green leafy vegetables
- **Vitamin D** presence in sunlight
- **Vitamin C** gets easily **destroyed** by **heat** during **cooking**
- The vitamin which is generally excreted by **humans in urine** is **Vitamin C**
- Liver damage is caused due to the overdose of **Vitamin B3**
- Vitamin B6, B9 and B12 are essential for brain health and are also called as brain vitamins
- First **artificially synthesized** Vitamin is **Vitamin C**
- Vitamin helps **immunity of body** is **Vitamin C**
- **Vitamin B12** contain **cobalt**

List of Vitamins and Diseases/Disorders Caused by its Deficiency

Vitamins	Chemical Name	Solubility	Deficiency disease
Vitamin A	Retinol	Fat	Night blindness, keratomalacia, etc.
Vitamin B1	Thiamine	Water	Beriberi
Vitamin B2	Riboflavin	Water	Ariboflavinosis, glossitis, etc.
Vitamin B3	Niacin	Water	Pellagra
Vitamin B5	Pantothenic acid	Water	Paresthesia
Vitamin B6	Pyridoxine	Water	Anemia
Vitamin B7	Biotin	Water	Dermatitis

Vitamin B9	Folic acid	Water	Megaloblastic anemia
Vitamin B12	Cyanocobalamin	Water	Pernicious anemia
Vitamin C	Ascorbic acid	Water	Scurvy
Vitamin D	Cholecalciferol	Fat	Rickets
Vitamin E	Tocopherols	Fat	Hemolytic anemia (in children)
Vitamin K	Phylloquinone	Fat	Bleeding diathesis

Functions of Vitamins

- Like hormone, vitamin D regulates and helps in mineral metabolism.
- Vitamin D also regulates and helps cells and tissue growth.
- Vitamin C and vitamin E act as antioxidants.
- Vitamin B complex acts as co-enzymes or the precursors of enzymes and helps them as catalysts in metabolic activities.

Minerals

- Mineral is a chemical element essentially required as nutrient for the proper functioning of the body and healthy life.
- Minerals cannot be made by living organisms, rather it occurs in the Earth naturally.
- Most of the minerals that required for the proper function of a human life come from green plants, animals, and from drinking water.
- Calcium, phosphorus, potassium, sodium, and magnesium are the five major minerals in the human body.
- Minerals are present in the blood of a healthy human being at certain mass.

Major Minerals

Minerals	Deficiency disease	Sources
Potassium	Hypokalaemia	Sweet potato, potato, tomato, lentils, banana, carrot, orange, etc.
Chlorine	Hypochloraemia	Table salt
Sodium	Hyponatremia	Table salt, sea vegetable, milk, etc.
Calcium	Hypocalcaemia	Eggs, canned fish, dairy products, nuts, etc.
Phosphorus	Hypophosphatemia	Red meat, fish, bread, dairy products, rice, oats, etc.
Magnesium	Hypomagnesemia	Legumes, nuts, seeds, spinach, peanut butter, etc.
Iron	Anaemia	Meat, seafood, beans, nuts, etc.
Zinc	Hair loss, diarrhoea	Red meat, nuts, dairy products, etc.
Manganese	Osteoporosis	Grains, nuts, leafy vegetables, legumes, seeds, tea, coffee
Copper	Copper deficiency	Seafood, oysters, nuts, seeds
Iodine	Goitre	Grains, eggs, iodized salt

Chromium	Chromium deficiency	Broccoli, grape juice, meat, etc.
Molybdenum	Molybdenum deficiency	Legumes, whole grains, nuts
Selenium	Selenium deficiency	Brazil nuts, meat, seafoods, grains, dairy products, etc.

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