

BIOLOGY

Class 9th (KPK)

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Chapter No.8

Nutrition

Q.1: Define Nutrition and its types?

Ans: Nutrition:

Definition:

“The Process in which food is obtained or prepared, absorbed and converted into body substances for growth and energy is called Nutrition.

Nutrient:

Nutrients are the materials (elements & compounds) that organisms obtain and use for maintaining life.

Types:

i. Autotrophic nutrition:

The nutrition of those organisms which prepare their own food is called Autotrophic Nutrition.

ii. Heterotrophic Nutrition:

The nutrition of those organisms which cannot prepare their own food and depends on other organisms for food is called Heterotrophic Nutrition.

Q2: Define Nutrient and its types?

Ans: Nutrient:

Definition:

Nutrients are the materials (elements & compounds) that organisms obtain and use for maintaining life.

Types:

There are two types of nutrients.

i. Macronutrients:

The nutrients which are required in large amount for body are known as macronutrients.

Examples: Carbon, oxygen, calcium etc.

ii. Micronutrients:

The nutrients which are required in small amount for body are known as micronutrients.

Example: Zinc, sodium, Boron etc.

Importance of nutrients:

- It constitutes a source of energy for organisms.
- It provides a building material for growth and development.
- It regulates various body functions.

Q3. Explain the role of mineral elements in plants life?

Ans: Plants require mineral elements for various activities and structures. These required nutrients are categorized into two groups.

Macronutrients:

The elements which are required by plants in larger quantities are called macronutrients. These are nine in numbers.

Micronutrients:

The mineral elements which are required in lower quantities are called micronutrients. These are eight in numbers.

Note:

If any one of these is not supplied plants display abnormalities of growth and do not reproduce normally.

Role of Mineral elements in plants life:

	Mineral elements	Role in plant life
Macronutrient	Carbon	Form the backbone of many plant biomolecules
	Hydrogen	Necessary for cellular respiration
	Oxygen	Component of ATP nucleic acids and coenzymes
	Phosphorus	Necessary for seed germination, photosynthesis, protein formation etc.
	Potassium	Regulates the opening and closing of the stomata reduces water loss from the leaves
	Nitrogen	Component of proteins, hormones, chlorophyll, vitamins and Enzymes
	Sulphur	Component of proteins vitamins
	Calcium	Activates enzymes is a structural component of cell wall influences water movement in cells
	Magnesium	Component of chlorophyll activates many enzymes.

	Mineral elements	Role in plant life
Micronutrient	Iron	Necessary for Photosynthesis, activates many enzymes
	Molybdenum	Component of the enzymes that reduces nitrates to ammonia important in building amino acids.
	Boron	Important in sugar transport, cell division and synthesizing certain Enzymes
	Copper	Component of several enzymes
	Manganese	Involved in enzyme activity for photosynthesis, respiration and nitrogen metabolism.
	Zinc	Required in a large number of enzymes
	Chlorine	Involved in osmosis of water
	Nickel	Required in nitrogen metabolism

Q4: Write the Role and Deficiency symptoms of Nitrogen and Magnesium?

Ans: Nitrogen Source:

Plants obtain nitrogen in the form of nitrate and Ammonia from the decay of dead Animals

Role:

- Nitrogen is the basic component of proteins, vitamins, hormones, chlorophyll and enzymes essential for plants life.
- Nitrogen helps in the growth of stem and leaf.
- Carnivorous plants have evolved mechanisms for trapping and digesting small animals. The products of this digestion provide Nitrogen for these plants.

Deficiency:

- Too much nitrogen can delay flowering and fruiting.
- Deficiency of nitrogen can reduce yields, causing yellowing of the leaves and stunt growth.

Magnesium Source:

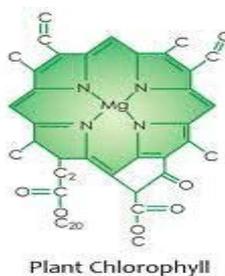
Plants absorb magnesium in the form of Mg^{+2} ions from the soil.

Role:

- Magnesium is the central part of chlorophyll molecule.
- It used for fruit, seed and not formation.
- It is necessary for functioning of plant enzymes to produce carbohydrates sugars and fats.
- It is essential for germination of seeds.

Deficiency:

- Deficiency of magnesium causes chlorosis (yellowing of leaves).
- Its deficiency may affect normal rate of metabolism and ultimately lead to necrosis (cell death).



Q5. What are fertilizers in how many groups they are classified, also write its importance?

Ans: Fertilizers:

Fertilizers are materials applied to plants for result of desirable characteristics. Such as more fruits, faster growth better colour and more flowers etc.

Classification:

They are classified as organic and inorganic fertilizers.

I. Organic fertilizers:

- They are derived either from plant or animal source.
- Fertilizer obtained from animal source include manure, compost etc.
- Plants materials called mulch are also organic fertilizer example are hay, leaves, barks, wood chips, seed hulls and corn husks.

Advantages of organic fertilizers:

- Improve the soil structure.
- Retain soil moisture.
- Release nutrients slowly and consistently.
- Mobilize existing soil nutrients
- Make the soil permeable for absorption of water and nutrients movement inside the soil.

ii. Inorganic fertilizers:

- Inorganic fertilizers are also called chemical fertilizers.
- Mostly they are formed from chemical compounds such as ammonium nitrate (NH_4NO_3), Ammonium phosphate $(\text{NH}_4)_3\text{PO}_4$, Potassium Chloride (KCl_3), Sodium Nitrate (NaN_3) etc.
- They dissolve readily in water and immediately available to plants for uptake.
- Examples are sodium nitrate, mined rock, phosphate and limestone.

Advantages of inorganic fertilizers.

- It promotes protein synthesis.
- It also increases chlorophyll synthesis
- It increases the growth of stem and leaves
- High amount of phosphorus result in healthier roots and more flowers.

Q6: Enlist environmental hazards related to use of chemical fertilizers.

Ans: Environmental hazards related to use of fertilizers are:

- Increasing the salinity and acidity of soil.
- The quantities of fertilizers affect the soil nutrients holding capacity.
- Some nitrogen fertilizer may cause emission of the greenhouse gases (nitrogen oxide).
- NO^-3 leaching into drinking water cause cancer and other health problems.
- Its high solubility also causes eutrophication (increase algal growth on the surface of water) and cause the death of aquatic organisms like fish etc.
- Bad smell from manure affects air quality.
- Increase the pathogens which cause diseases in human and animals.



Q7. Define carbohydrate and its types?

Ans: Meaning:

- Carbo mean carbon
- Hydrates mean water.

Definition:

Carbohydrates are organic compounds mainly composed of carbon, hydrogen and oxygen.

OR

Carbohydrates are poly hydroxyl derivatives of aldehyde and ketones.

Explanation:

The ratio of hydrogen and oxygen in water is 2:1. Thus the ratio of Hydrogen and oxygen in carbohydrate is equal to the ratio of H and O in water. Therefore, carbohydrate is commonly called hydrated carbon.

Sources:

Major sources of carbohydrates are rice, sugar honey, potato, bread and cereal etc.

General formula:

General formula is $(\text{CH}_2\text{O})_n$ where “n” stands for number.

Classification:

- Monosaccharide's e.g., glucose, fructose, galactose
- Disaccharides / oligosaccharides e.g., maltose, sucrose.
- Polysaccharides e.g. starch, glycogen.

Function of carbohydrates:

i. Source of energy:

Carbohydrates provide energy during cellular respiration. About 2/3 of the total calories every animal consume daily are from carbohydrates. One gram of carbohydrates produces about four kilocalories of energy.

ii. Building materials:

In plants cell wall is composed of cellulose which is polysaccharide

iii. Storage molecules:

Excess of glucose in plant is converted into starch. While in animals' surplus glucose is stored in liver in the form of glycogen.

Q8. Write note on protein?

Ans: Protein:

Meaning:

The word protein is derived from Greek word proteios means "substance of first importance".

Building blocks:

The building blocks of proteins are Amino-acid. There are over twenty different types of amino acid.

General formula of Amino Acid:

- -COOH is called carboxyl group.
- -H₂N is called Amino group
- "R" Alkyl group.

Peptide bond:

In protein amino acids are linked through peptide bonds.

Sources:

- Plant sources:** beans, pulses, cereals and dry fruits.
- Animals' source:** milk poultry, fish, meat.

Shape:

Proteins may be fibrous e-g keratin in hairs or may be globular e.g., haemoglobin.

Importance of Proteins:

i. Source of energy:

Protein acts as a source of energy. One gram of protein provides 1 kilo calories of energy.

ii. Building materials:

Protein makes body parts such as muscles, tendons, hairs, nails, hoof etc.

iii. Essential components:

Protein is an essential component of cell membrane, cytoplasm and organelles.

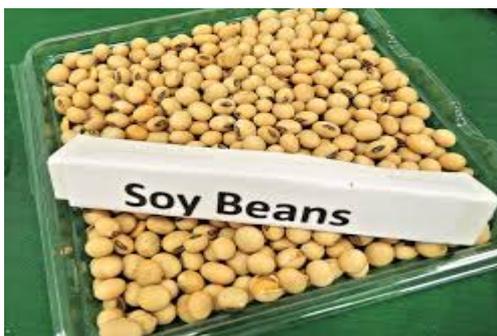
iv. Source of chemical components:

Source of antibiotics, enzymes, hormone

Source of proteins:

Plant Source: Beans, Pulses and fruits.

Animal Source: Cheese, Milk, Poultry, fish meat.



Q9. Write a comprehensive note on fats?

Ans: Fats (Lipid):

Fats belong to a group of organic compounds called lipid. They are made up of fatty acid and glycerol. They contain carbon, hydrogen and oxygen.

Sources:

Butter, Oil, cheese, Meat, Dry Fruits, milk, ghee, egg yolk etc.

Characteristics of fats:

- i. They may be liquid or solid at room temperature.
- ii. Fats serve both structural and metabolic function.
- iii. Fats are stored in the cells of adipose tissue.
- iv. They cannot be prepared by body and obtained from food sources.

Function of Fats:

i. Source of energy:

Fats are source of energy. One gram of fats provides 9 kilo calories of energy.

ii. Building materials:

Essential component of cell membrane and also maintain healthy skin and hair.

iii. insulation:

Fats insulate the body organs against shock and also maintain body temperature.

iv. Others:

Fats help in digestion, transport of vitamins A,D,E and K in the body.



Q10. Define vitamins and its types?

Vitamins:

Organic substances which are essential in small amount for the regulation of normal functioning of the bodies.

Types on the basis of solubility:

i. Water soluble vitamins:

Vitamins B and C are water soluble vitamins they cannot stay as much in our body.

ii. Fats soluble vitamins:

Vitamins A,D,E,K are fats soluble vitamins. Fat soluble vitamins stay for a few days while some for six months and can use them when needed.

Q11. Write the sources, importance and deficiency symptoms of vitamin A, and vitamin D?

Ans: Vitamin "A":

It is fat soluble vitamin.

Chemical name:

The chemical name is retinol because it helps in the functions of the retina of eye.

Sources:

Animal Sources: Chicken liver, cod liver oil, eggs, butter cheese etc.

Plant Sources: sweet potato, carrots, pumpkins, spinach etc....

Metabolic Role:

- i. It helps to see in dim light.
- ii. It is involved in normal cell differentiation.
- iii. It supports reproductive process and bone growth.
- iv. It is essential for body immune function.

Deficiency symptoms:

- i. Deficiency causes night blindness.
- ii. Decreases the immune power of the body.
- iii. Its deficiency also causes rough and dry texture to skin.
- iv. The attack of viral disease will be increases. e.g. measles and chickenpox etc.



Vitamin “C”:

It is water soluble vitamin.



Chemical name:

It is also called Ascorbic Acid.

Source:

Orange, lemon, graphs, leafy vegetables, beef liver, tomato, strawberries and Guava etc.

Metabolic Role:

- i. Vitamin “C” is needed for the growth and repair of tissues in all parts of the body.
- ii. Vitamin “C” is essential for healing of wound.
- iii. It is also essential for maintaining bones and teeth.
- iv. It blocks the damage caused by free radicals. This causes cancer, heart diseases, Aging and Arthritis.
- v. Vitamin C in WBC,s enables the immune system to function properly.

Deficiency symptoms:

- i. Bleeding of gums.
- ii. Nose bleeding.
- iii. Inflammation of the gum (gingivitis).
- iv. Dry and splitting hairs
- v. Dry and scaly skin
- vi. Decrease wound healing rate.

- vi. High blood pressure, stroke, cancer.

Vitamin “D”:

It is also fats soluble vitamins

Chemical Name:

Calciferol

Sources:

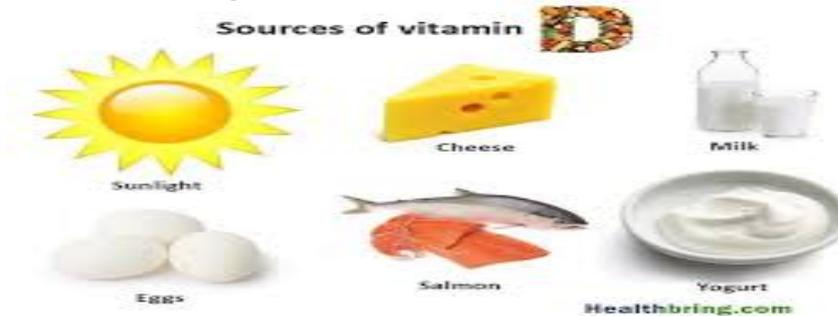
Egg yolk, liver oil, cheese, fortified bread, fortified margarine. It is also synthesis by skin when UV radiations from sun are used to convert cholesterol derivatives into vitamin D.

Metabolic Role:

- if. Vitamin “D” helps in the absorption of calcium and phosphorous.
- ii. Vitamin “D” helps to regulate blood level of calcium and phosphorous.
- iii. It helps in the normal function of muscles and nerves.
- iv. It keeps the bones strong.

Deficiency symptoms:

- i. Long term deficiency of Vitamin “D” affects the bones.
- ii. In children vitamin “D” deficiency leads to rickets.
- iii. Rickets is a condition in which bones become weak and bow under pressure.
- iv. In adults vitamin “D” deficiency causes osteomalacia or soft bones.
- v. increasing the risk for fractures in bones.



Q 12: Define minerals? Enlist some minerals needed for our body.

Ans: Minerals:

Mineral are inorganic elements that originate in the earth and cannot be made in the body.

Source:

Most of the mineral in the human diet come directly from the plants and water, or indirectly from animal's source.

Types:

Mineral are categories into major minerals and trace minerals.

i. Major minerals:

Those minerals that are required in the amount of 100 mg or more per day are called major minerals e.g. sodium, potassium, chloride, calcium, magnesium, phosphorous and Sulphur.

ii. Trace minerals:

Those minerals that require in amounts less than 100mg per day.e.g. fe, zinc, Cu, Cr, ,I, Mg and Mo.

Importance:

Minerals both major and trace play vital roles in human health like.

- Sodium, potassium and chloride are important for muscle contraction, nerve impulse transmission, heart function and blood pressure.
- Calcium and phosphorous help in the development and maintenance of bones and teeth.
- Iodine essential for normal thyroid function.

- Iron is the central component of haemoglobin that transport oxygen in blood.

Q13: Write the sources Role and deficiency symptoms of calcium.

Ans: Calcium:

It is one of the most important and abundant minerals in human body. About 99% of the body calcium is stored in bone tissue. The remaining 1 % of the body calcium circulates in the blood and other body fluid.

Source:

Daily products like milk and cheese are the major source of calcium. Other source is egg yolk, beans, nuts, cabbage etc.

Metabolic Role of calcium:

- Calcium is essential for the development and maintenance of bones.
- It is also essential for teeth formation.
- It play important role in blood clotting.
- It also play role in the transmission of nerve impulses, muscle contraction and other metabolic activities.
- It is also needed for Activation of several enzymes.

Deficiency symptoms:

- Nails become brittle and skin becomes dry.
- Muscles cramps and eyes twitching occur.
- Its deficiency also causes rickets osteoporosis.
- Bones also becomes soft.
- Wounds heal slowly.

Q14: Write the sources, Role and Deficiency symptoms of iron?

Ans: Iron:

It is also an important major type of mineral.

Sources:

Red meat, fish, bens, dried fruits, green vegetables and apple.

Metabolic Role of Iron:

- Iron helps in transportation and storing of oxygen.
- it is the component of haemoglobin in red blood cells and myoglobin in muscle cells.
- Cellular energy also requires iron which act as enzyme cofactor.
- It also supports immune system.

Deficiency symptoms:

- Its deficiency cause anemia (decrease in the amount of RBCs or haemoglobin in the blood).
- The patient feels fatigue, weakness and rapid heartbeat.

Q15: What is dietary fiber? Discuss the role of dietary fiber in balance diet.

Ans: Dietary fiber:

It is also known as “roughage” or “bulk”. It is the part of human food that is indigestible. Dietary fiber found only in plant food and it moves undigested through the stomach and small intestine and then into the colon.

Types:

There are two types of dietary fibers.

i. Soluble dietary fiber:

Soluble dietary fibers break down as it passes through the digestive tract, forming a gel.

Source: Oat, bean, and barley.

ii. Insoluble dietary fiber:

Insoluble fiber do not dissolve in water and travels through small intestine quickly.

Source: Wheat bran, whole grain seed, cereal, skin of many fruits and vegetables.

Role of Dietary fibers:

- i. It prevents and relieves constipation and reduces the risk of hemorrhoids (Swollen anal tissue).
- ii. It controls weight by creating feeling of fullness.
- iii. It takes some acids away in the stool.
- iv. It lowers blood cholesterol level.
- v. It also lowers blood sugar level.
- vi. Insoluble fibers minimize exposure to carcinogens.
- vii. It also speeds up the passage of food through the gut.
- viii. Increasing stool bulk and making stools softer and easier to pass.

Q 16: Write the importance of water?

Ans: Water is the most abundant substance in human body. Our body contain about 70% water.

Source:

Daily water intake such as natural water, milk, juicy, fruits and vegetables.

Importance of water:

- i. Water is the best solvent and generally called universal solvent. It dissolves many substances like sugar, salts etc.
- ii. It helps in the transport of material across the cell membrane.
- iii. Minerals are transported from roots to leaves through water.
- iv. it provides hydrogen for making glucose during photosynthesis.
- v. Water regulated body temperature. It absorbs and release heat very slowly.
- vi. It helps in the removal of nitrogenous waste and toxic materials from the body.
- vii. Water acts as a reactant in many metabolic reactions e.g. in hydrolysis reaction.
- viii. Water also acts as a lubricating medium. It is the major part of mucous and another lubricating medium. It is the major part of mucous and other lubricating fluids.

Q17: Define balance diet? Write its importance.

Ans: Balance diet:

A balanced diet may be defined as

“The diets which contain all the essential nutrients like carbohydrates, fats, protein, mineral, vitamin and fiber in the correct proportions for the normal growth and development of the body is called balanced diet”

OR

The diet which contains all the necessary components of food in correct proportion is called balanced diet.

Explanation:

The balance diet is must for balance activity of life such as growth, health, reproduction. If any component is missing then the body will suffer from many health abnormalities like kwashiorkor, marasmus and Goiter etc. Therefore, balance diet maintains health, growth and reproduction etc.

Example:

If there is not enough protein in our diet, we will not be able to grow properly and to repair ourselves i.e., wounds will not heal properly.

Diet and energy requirements:

Diet and energy requirements are always related to age, gender and activity of individual.

i. Relationship of energy requirement with age:

An adult needs less food per kg of their body weight, but a growing boy or girl needs more food per kg weight. Children need more calcium and iron for their growing bones and red blood cells respectively.

ii. Relationship of energy requirement with gender:

Gender has an impact on the requirements of a balanced diet. Women have comparatively less metabolic rate than the men of the same age and weight. Men need a balanced diet that provides comparatively more energy than the women require.

iii. Relationships of energy requirement with activity:

People have different lifestyle and varied nature of work. A man with sedentary habit does not require as much energy as the man who remains physically active for most of the day.

Recommended daily requirements of Carbohydrates, Proteins and Fats for adults.

	Percentage of daily diet	Male (80 Kg) Sedentary	Male (80kg) Active	Female (65kg) sedentary	Female (65kg) Active
Carbohydrates	45-65%	264-382g	344-500g	215-310g	280-404g
Proteins	10-15%	58-88g	76-115g	48-72g	62-93g
Fats	20-35%	54-95g	70-123g	44-77g	57-100g

Q18: Define Malnutrition. Discuss the types of malnutrition?

Ans: Malnutrition:

A diet which is missing in one or more essential nutrient cause malnutrition.

The condition caused by an improper or insufficient diet is called malnutrition.

Explanation:

Most commonly malnourished people either do not have enough calories in their diet, or eating a diet that lacks protein, vitamin or trace element.

Types:

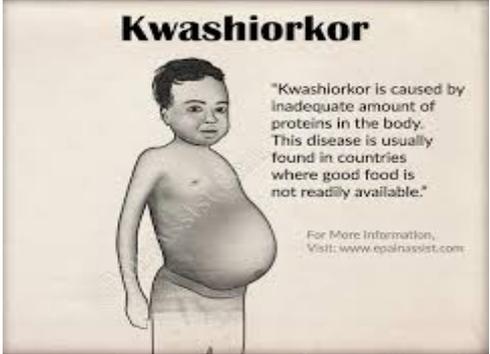
Malnutrition may be in the form of

- i. Protein energy malnutrition (PEM)
- ii. Mineral deficiency disease (MDD)
- iii. Over intake of nutrients (OIN)

1. Protein energy malnutrition. (PEM):

The terms protein-energy malnutrition applies to a condition in which the body is not getting required amounts of proteins or any energy producing nutrients (carbohydrates, lipids and proteins). Two important diseases associated with PEM are marasmus and kwashiorkor.

	Marasmus	Kwashiorkor
i	It occurs in children due to very low intake of carbohydrates, proteins and fats.	It occurs in children or adults due to inadequate intake of proteins.
ii	Marasmus occurs in children below the age of one year	Kwashiorkor occurs in children or the age of 1-5 years.
iii	This disease is more common in town and cities where breast feeding is Discontinued quite early.	This disease is more common in villages where there are small gap period b/w Successive pregnancies.
iv	No swelling of body take place	Swelling of body occur due to retention of fluid.

v	Wasting of muscles is quite evident	Wasting of muscles is not evident
vi	Skin does not change colour and do not break.	Skin change colour and become broken and scaly
vii	It can be treated by adding all nutrients to the diet.	It can be treated by adding proteins to the diet.
		

2. Mineral Deficiency diseases (MDD):

When the concentration of minerals is less than normal amount. It causes mineral deficiency diseases. Minerals deficiencies lead to variety of disease such as:

- i. Anemia
- ii. Beriberi
- iii. Osteoporosis
- iv. Goiter

i. Anemia:

Anemia is the most common of all mineral deficiency disease. The term anemia literally means “a lack of blood”. The condition is caused when the number of red blood cells is reduced to level lower than the normal.

Symptoms:

The common symptoms of anemia are constant fatigue and weakness, prolonged anemia results in hair loss, brittle hair and nail.

Treatment:

It can be treated by using diet containing proper amount of iron, folate and vitamin B₁₂.

ii. Osteoporosis:

Meaning:

- Osteo men bone
- Porous mean pore.

Definition:

The disorder of bones in which the bones become thin, soft, reduces in mass, start bending and can easily be broken.

Cause:

It is caused due to the deficiency of calcium or vitamin D in blood.

Symptoms:

In this disease the bones become porous and light.

Treatment:

It is treated by taking calcium rich food such as milk, butter, egg yolk or by using calcium dose and taking regular exercise.

iii. Goiter:

Goiter is a condition caused by an insufficient amount of iodine in the diet. Iodine is used by the thyroid gland to produce hormone that control the body normal growth. If sufficient iodine is not available in a person's diet the thyroid gland becomes enlarged and it result swelling in the neck. This condition is known as goiter.



3. Over intake of Nutrients:

Over intake of nutrients is a form of malnutrition in which more nutrients are taken than the amount required for normal growth, development and metabolism

Over intake of nutrients cause a number of health problems.

i. Obesity:

- It occurs due to over intake of carbohydrates and fats.
- Obesity is also known as mother of diseases.
- Obese people may suffer from hypertension, liver, renal and heart disorder.

ii. Hypervitaminosis "D":

- It causes due to over intake of Vitamins "D".
- Over intake of Vitamin "D" also causes nausea. Fatigue, vomiting and renal disorder etc.

iii. Hypervitaminosis "A":

- It is caused due to over intake of Vitamin "A".
- It leads to dry itchy skin. Painful swelling of legs and hands, enlargement of spleen etc.

Q19: What are the causes of malnutrition:

Ans: Causes of malnutrition:

- i. Malnutrition occurs due to lack of knowledge about proper and balance diet.
- ii. It causes due to poor absorption of food from the GIT (Gastro intestinal tract).
- iii. It cause due to problems of economy especially in underdeveloped countries.
- iv. Famines also cause malnutrition. (Famine is the lack of enough food to feed all the people living in an area)

Q20: Define digestion, ingestion, absorption, assimilation, egestion?

Ans: Digestion:

The break down of large, complex, non diffusible and insoluble food into small, simple, diffusible and soluble form by the action of enzyme is called digestion.

Ingestion:

Taking in of food in oral cavity is called ingestion.

Absorption:

The movement of soluble and diffusible food from the digestive tract into the blood is called absorption.

Assimilation:

It is the process in which digested food becomes part of a cell.

Egestion:

The removal of undigested food from the body is called egestion.

Q21. Describe the structure of human digestive system in detail?

Ans: Structure of human digestive system:

Human digestive system consists of the following two parts

- i. Alimentary Canal.
- ii. Associated glands.

i. Alimentary canal:

Definition:

A long coiled tube extending from mouth to the anus is known as alimentary canal.

Other names:

It also knows by the following names:

- Gastro intestinal tract.
- Digestive tract.

Part of alimentary canal:

Alimentary canal consists of following parts.

- i. Oral cavity (Buccal cavity)
- ii. Pharynx
- iii. Esophagus
- iv. Stomach
- v. Small intestine
- vi. Large intestine

i. Oral cavity:

Oral cavity is the first part of the alimentary canal which receives the food.

Parts:

It consists of the three important organs.

- a. Teeth
- b. Tongue
- c. Salivary glands.

a.Teeth:

The teeth of mammals are specialized to perform particular function.

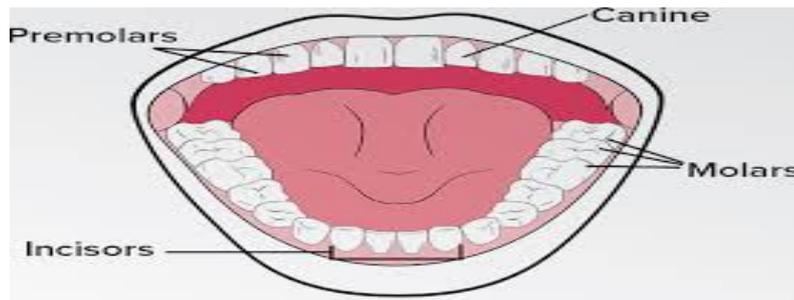
Function:

Teeth are used for cutting, biting and grinding of food.

Type of teeth:

It has the following main types and has following functions.

- Incisor teeth adapted for cutting and biting.
- Canine teeth for tearing.
- Molar and premolar for grinding and mastication of food.



Tongue:

Tongue is the muscular organ containing taste buds.

Function:

- It lubricates the food to make bolus and help in swallowing process.
- It also helps in mixing of food.
- Taste bud help us to sense the taste of food.

D. Salivary gland:

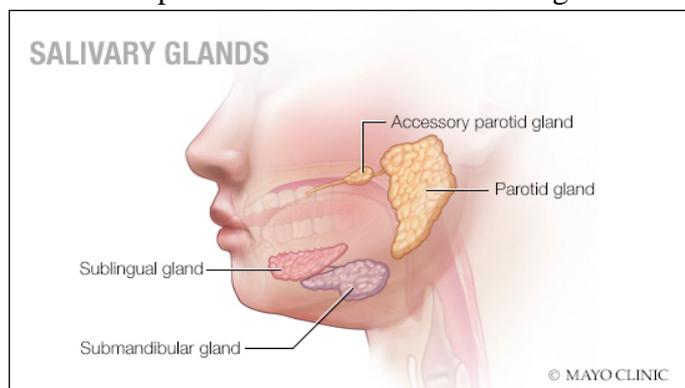
The glands present in oral cavity which secrete **Saliva** called salivary glands. There are three pair of salivary glands in oral cavity.

Saliva:

Composition:

It contains molecule of water, mucous, salt and other digestive enzymes.

- Mucus lubricates the food.
- Sodium bicarbonate (NaHCO_3) kills the germs and bacteria present in food.
- Salivary amylase enzyme helps in digestion of starch and glycogen.
- Maltase helps in conversion of maltose to glucose.



ii) Pharynx:

The oral cavity open into pharynx and the tongue pushes the food into pharynx.

Location: pharynx is present at the back of oral cavity.

Function: From pharynx, the food is passes to esophagus by a process called peristalsis.

iii. Oesophagus.

It is muscular tube, extending from pharynx into the stomach.

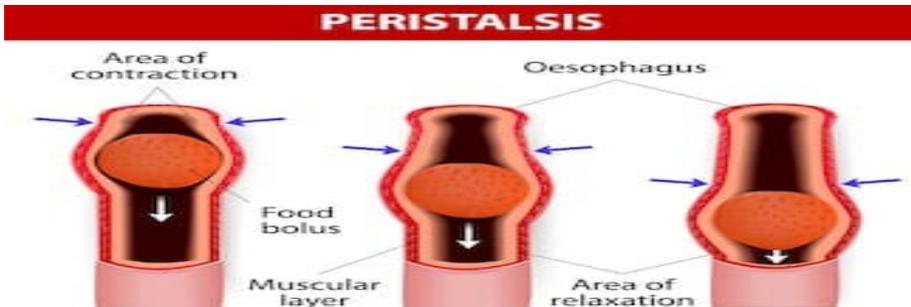
Size: Oesophagus is about 10-inch-long tube.

Location: it runs through the neck a thorax between the trachea and vertebral column.

While passing through oesophagus food experience one of the following processes.

a. Peristalsis:

It is the process by which food moves downward in forward direction by the alternate contraction and relaxation of the muscular wall of digestive tract.



b. Anti-peristalsis:

The opposite movement of foods (upwards) in digestive tract is called antiperistalsis. It causes vomiting.

iv. Stomach:

Stomach is a sac like organ of the alimentary canal.

Location:

It is located in abdominal cavity between the esophagus and intestine.

Size: It is about 12 inches long and 6 inches wide at the widest point.

Capacity:

The Capacity of stomach is 1 liter.

Sphincter:

It the opening of stomach guarded by muscles. Stomach has two sphincters

a) Pyloric Sphincter:

At the end of stomach pyloric sphincter is present which connect stomach with small intestine.

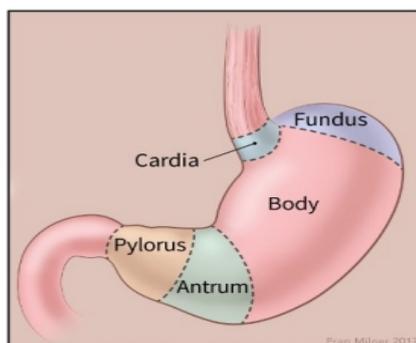
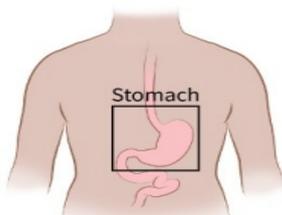
b) Cardiac sphincter:

It is present between esophagus and stomach.

Function of sphincter: Sphincter prevents the back movement of food.

Gastric gland:

The inner walls of the stomach have many glands called gastric glands. These glands secrete gastric juice.



Composition of gastric Juices:

Gastric juice is composed chiefly of mucous, hydrochloric acid and pepsinogen.

- Mucous forms a coating on the inner walls of stomach. It protects the inner lining or stomach from HCL and enzymatic action of pepsin.
- Pepsinogen is inactive form of enzyme. It is converted to its active form pepsin by the action of HCl.
- Pepsin partially digests the protein portion of the food into peptide chains.
- The digested food forms a thick soap like fluid known as acidic chyme. This process occurs in two to four hours and then passes the chyme to small intestine in 20 to 30 minutes.

V) Small intestine:

Stomach opens into small intestine. Small intestine is elongated and narrow coiled tube. It has three main parts.

i. Duodenum (associated glands)

ii. Jejunum

iii. Ileum

i. Duodenum:

- It is the first part of small intestine.
- It is about 12 inches long and curved like “C”.
- It receives chyme from the stomach.
- In duodenum, the chyme receives the bile from the liver and pancreatic juice from the pancreases.

Two important associated glands open to duodenum are,

a. Liver

b. Pancreas

a. Liver:

Colour: It is large reddish-brown gland.

Largest gland: it is the largest gland of the human body.

Weight: In adult human its weight is about 1.5kg.

Position: It lies beneath the diaphragm on the right side of the abdomen.

Lobes: It consists of two main lobes the right larger and the left smaller lobe.

Gall bladder: It is pear shaped greenish yellow sac that lies along the right lobe of liver on the ventral side.

Function: Gall bladder stores and concentrates the bile.

Secretion of liver:

Liver secretes bile which is stored in gall bladder when the gall bladder contracts the bile is released into the duodenum through the bile duct.

Bile:

Bile is a green alkaline fluid without any enzyme. The bile contains water, sodium carbonate, excess of calcium and the breakdown products of haemoglobin.

Role of liver in digestion:

- Bile breaks larger fats into smaller droplets. This process is called emulsification.
- It converts ammonia to a less toxic form urea.
- Formation of red blood cells in fetus.

- Convert carbohydrates and proteins into fats.
- Stores fat soluble vitamins (A,D,E,K)
- Manufacture blood clotting protein fibrinogen.
- In cold temperature liver carries out basic metabolism at faster rate and so produce heat.
- Liver makes vitamin A from carotene.

b. Pancreas: Pancreas is a leaf like gland.

Position:

It lies beneath the stomach.

Colour: It is yellowish in colour.

Size: It is 7 inch long 1.5 inch wide.

Secretion: Pancreas secretes pancreatic juice. Pancreatic juice contains sodium bicarbonate and enzymes. Sodium bicarbonate neutralize the acidity of chyme while enzyme consist of three types. These enzymes are

- a. Trypsinogen
- b. Pancreatic Amylase
- c. Lipase

a. Trypsinogen:

It is inactive form of enzyme. It is converted to active form by the action of enterokinase. The Active form is called trypsin. Trypsin helps in digestion of proteins.

b. Pancreatic Amylase:

The pancreatic Amylase converts starch into simple form called maltose.

C. Lipase: Lipase convert fats into fatty Acid and glycerol.

ii. Jejunum:

It is the second part of the small intestine and comes after duodenum. It secretes intestinal juice to perform the breakdown of food. It is about 2.4m long.

iii. ileum.

It is the last part of small intestine and about 2.6m long. The gland of ileum secretes intestinal Juice which contains many enzymes such as erepsin, Maltase, sucrase and lactase.

- a. **Erepsin:** It converts protein into amino acids.
- b. **Maltase:** It converts maltose into glucose.
- c. **Sucrase:** It converts sucrose into glucose and fructose.
- d. **Lactase:** It converts lactose into glucose and galactose.

Absorption of food:

After the complete digestion of food amino acid, simple sugar, glycerol and fatty acids are absorbed from the small intestine into blood capillaries present in villi.

Villi:

The inner lining of small intestine has many folds. These folds have millions of fingers like projections called villi. The outer epithelium of each villus is made of a single layer of cells.

Microvilli:

The epithelium of villi also contains microscopic projections called microvilli.

The microvilli greatly increase the surface area of the villus. Inside villus, there are blood capillaries and a small lymphatic vessel called lacteal. During absorption, the simple sugar, amino acids vitamins, minerals and water enter the blood capillaries in villi. These capillaries open in hepatic portal vein which carries nutrients to the liver. Fatty acid and glycerol are absorbed into the lacteal which pour them into the blood stream.

vi) Large intestine:

Large intestine is the last organ of digestive system where undigested food is collected and converted into faeces. The large intestine is about 1.5m long and consists of caecum, appendix, colon and rectum.

i. Caecum:

It is the first part of the large intestine. It is the junction between small intestine and colon. It collects and stores materials from small intestine and moves materials toward the colon.

ii. Appendix:

It is a finger-like projection arising from the caecum in the human body. Its function is unknown while in animals it digests cellulose. The inflammation of appendix is called appendicitis that is removed through surgery.

iii. Colon:

It is the longest part of large intestine and is like an inverted "U" shape.

Parts: It consists of the following four parts.

a) Descending colon:

This colon goes downward on the left-hand side of the abdomen.

b) Transverse colon:

Transverse means across, this part of the colon extends across the abdomen from right to left.

c) Ascending colon:

Starts at the caecum at the bottom right-hand side of the abdomen and ascends towards the liver.

d) Sigmoid colon:

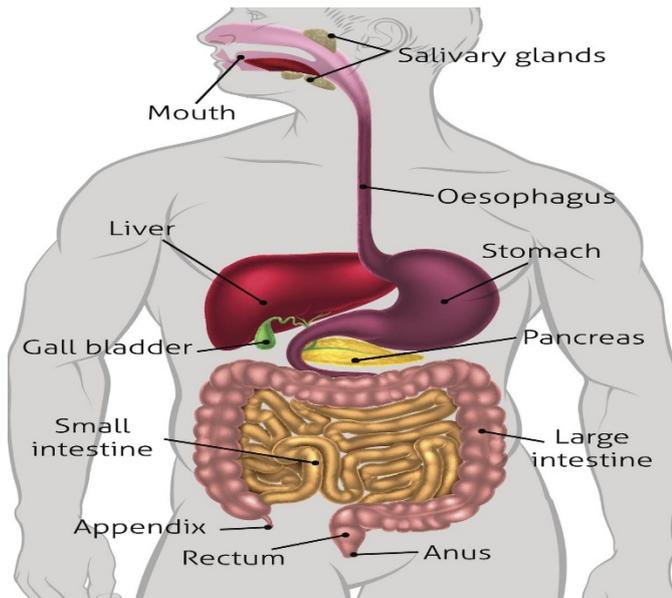
It is located on the bottom left-hand side of the abdomen. It is an S-shaped connection between the descending colon and the rectum.

iv. Rectum:

It is the last part of the large intestine that stores undigested food. It opens into the anus which removes the faeces from the body, called egestion.

Function of large intestine:

- i.** Reabsorbs water and maintains the fluid balance of the body.
- ii.** Absorb certain vitamins.
- iii.** Processes undigested materials (fiber)
- iv.** Store waste products before they are eliminated.
- v.** Many bacteria live in the colon. They produce vitamin "K" which is necessary for the coagulation of blood.



Q22: Discuss some disorder of gut?

Ans: Disorder of Gut:

Any defect occur in the digestive system is called disorder of gut. Some common disorders of digestive system are,

- i. Constipation**
- ii. Diarrhea**
- iii. Ulcers**

i. Constipation:

The condition in which the faeces become dry, hard, defecation occur irregularly and difficulty is known as constipation.

Symptoms:

- Passing hard or dry stools three times a week or less than three times a week.
- Unusual staining at stool.
- Abdominal bloating or discomfort.
- It causes depression and headache.
- It also causes inflammation of blood vessel at the anus.

Cause:

- Frequent use of spicy food.
- Insufficient fluid intake.
- Less intake of vegetables and dietary fiber.
- Excessive use of food stuff that tends to create dryness of mucus membrane.

Treatment:

- Constipation is treated by taking more dietary fiber and water along with diet.
- Laxative medicines are also used to treat constipation.

Prevention:

- Increase your intake of liquid.
- Eating fibrous food like cereals, vegetable and fruits.
- Don't use laxative unnecessarily.

ii. Diarrhea:

Diarrhea is condition in which the sufferer has frequent watery stool.

Symptoms:

- Diarrhea cause dehydration and loss of minerals which lead to kidney failure.
- It causes weakness and disturbs the contraction of muscle (heart muscles) due to imbalance of salt in the blood.
- A person with diarrhea typically passes stool more than three times per days.
- Abdominal pain, nausea and vomiting.

Causes:

Diarrhea is usually related to a bacterial, viral or parasite infection e.g. bacteria including salmonella and Escherichia coli. Parasite like Entamoeba histolytic, virus like retrovirus.

Treatment:

- It is treated by consuming adequate amounts of water preferably mixed with salts and nutrients to replace the loss.
- When diarrhea is due to bacterial infection, it is treated by administration of antibiotics.

Prevention:

- Water should be boiled before using.
- Unhygienic food and water should not be consumed.
- Fruit juice, soft fruit and vegetable that contain potassium help restore electrolyte levels.

iii. Ulcers:

The inner wall of the digestive tract (stomach + duodenum) is covered with mucous to protect it from enzyme. When the mucus breakdown and the digestive enzyme eats away the wall of stomach or duodenum which results in sore called ulcers.

Types:

There are two types of ulcer.

i. Gastric ulcer:

Ulcer that occurs in stomach is called gastric ulcer.

ii. Duodenal ulcer:

Ulcer that occurs in first part of the small intestine beyond the stomach is called duodenal ulcer.

Symptoms:

- Burn feeling in stomach that last between 30 minutes and hours.
- The patient feels stomach pain, abdominal pain, blood in faeces.
- Appetite and weight loss are other symptoms.

Cause:

The main cause of the breakdown of the mucosa layer are bacteria, drugs cigarette smoking long term use of anti-inflammatory medicine (like aspirin) and prolong tension.

Prevention:

- Smoking, drinking alcohol, coffee tea and stress should be avoided.
- Also avoiding spicy and acidic food.

SHORT QUESTIONS

b. Give short answers to the following questions.

Q1: List all parts (in order) of the human digestive system through which food actually passes?

- Ans:**
- i. Oral cavity.
 - ii. Pharynx,
 - iii. Oesophagus
 - iv. Stomach
 - v. Small intestine (Duodenum, Jejunum, ileum).
 - vi. Large intestine, rectum, anus.

Q2: How is food mechanically broken-down during digestion?

Ans: The physical breakdown of food into small pieces is called mechanical digestion.

Mechanical digestion starts from oral cavity.

- Teeth help in grinding, cutting, biting and mastication of food.
- Tongue help in chewing of food.
- Also, during peristalsis breakdown of food occur.
- In stomach by contraction and relaxation of smooth muscles the food is converted into acidic chyme and then passes into small intestine.

Q3: How does the digestion and absorption of fats differ from the digestion and absorption of carbohydrates and protein?

Ans: Digestion and absorption of fats:

- Bile is secreted from liver that acts on fats which is broken down into water soluble fats (emulsification)
- Digestion of fats occurs in duodenum through lipase enzyme
- After digestion fatty acid and glycerol are the end products of fats that absorbed into the lacteal and join the blood stream.

Digestion and absorption of Proteins:

- Digestion of proteins occur in stomach by pepsin enzyme
- Pancreatic juice contains trypsin that acts on proteins and converts it into dipeptides and amino acids.
- Absorption of amino acid occurs in small intestine by villi.

Digestion and absorption of carbohydrates:

- Digestion of proteins occur in stomach by pepsin enzyme
- Pancreatic juice contains trypsin that acts on proteins and converts it into dipeptides and amino acids.
- Absorption of amino acid occurs in small intestine by villi.

Digestion and absorption of carbohydrates:

- Salivary glands secrete saliva that contains amylase which digests starch.
- Pancreatic juice contains amylase that converts sugar into glucose.
- Digested carbohydrates than absorbed in small intestine (villi).

Q4: Enlist five environmental hazards related to the use of fertilizer?

Ans: See Q No. 6

Q5: What is malnutrition? Why it is considered to be a health hazard?

Ans: Lack of proper nutrition is called malnutrition. It may be due to

- Not having enough food to eat.
- Not eating enough of the right things.
- Unable to use the food eaten.

Malnutrition is considered to be a health hazard because it leads to serious health problems.

Malnutrition may be in the form of

- i. PEM (Protein energy malnutrition) e.g., marasmus, Kwashiorkor.
- ii. MDD(mineral deficiency disease) e.g. anemia, beriberi, goiter.
- iii. OIN (over intake of nutrients) e.g., obesity, hypertension.

Q5: Discuss the role of dietary fibers in balanced diets?

Ans: Role of Dietary fibers:

- i. It prevents and relieves constipation and reduces the risk of pile.
- ii. It controls weight by creating feeling of fullness.
- iii. It takes some acid away in the stool.
- iv. It lowers the cholesterol level in blood.
- v. It also lowers the sugar level in blood.

Long Question

C. Give detailed Answers to the following Question.

Q1: Overtake of nutrition can lead to serious health disorders. Evaluate the statement by give example?

Ans: See Q No. 18.

Q2: List down major enzymes in human digestive system. Elaborate their role in digestion?

Ans: The enzymes which help in the digestion of food are called digestive enzymes. Some of the enzymes in human digestive system are:

i. Salivary amylase/ptyalin:

Saliva contains enzyme like “amylase” that converts starch into maltose.

ii. Maltase:

Saliva also contains maltase which converts maltose into glucose.



iii. Pepsinogen:

Gastric Juice of stomach contains pepsinogen. Pepsinogen change into pepsin by HCL which converts protein into peptide.

iv. Pancreatic amylase:

The pancreatic juice of pancreas secretes “Pancreatic amylase” that convert starch into maltose.

v. Trypsinogen:

Pancreas also secretes trypsinogen which converts into trypsin by duodenal enzyme. Trypsin converts protein into peptide and amino acids.

vi. Lipase:

Pancreas also secretes lipase. Lipase act on emulsified fats and convert into fatty acid and glycerol.

vii. Duodenal enzyme:

Small intestine also secretes some enzyme. These are,

- **Erepsin:** Erepsin convert peptide into amino acid.
- **Maltase:** Maltase convert maltose into glucose.
- **Sucrase:** Convert sucrose into glucose and fructose.
- **Lactase:** Convert lactose into glucose and galactose.

Q3: Explain the importance of water in the human body.

Ans: See Q No. 16

Q4: Explain the role of oral cavity and pharynx in the digestive system.

Ans: See Q No. 21

Q5: Describe the structure of a villus, including the roles of capillaries and lacteals?

Ans: See Q No. 21