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CHEMISTRY

Class 10th (KPK)

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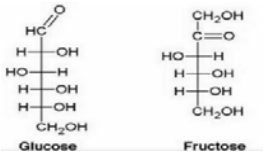
UNIT 13
BIOCHEMISTRY

Q1. Differentiate between glucose and fructose?

Ans: Difference between glucose and fructose:

Glucose and fructose are hexoses having same molecular formula $C_6H_{12}O_6$. The main difference between these two compounds is that glucose is pentahydroxy aldehyde having aldehydic functional group, while fructose is pentahydroxy ketone having ketonic functional group.



Q2. Write down four uses of lipidsAns: i. Source of energy:

Lipids are good source of energy. One gram of lipids contains approximately twice more energy than a gram of carbohydrates and protein.

Ii. As **a part of protoplasm:**

lipids are an important part of cell-protoplasm and plasma membrane.

iii. Act as a solvent:

lipids act as a solvent for some vitamin like A, D and E.

iv. Thermal insulator:

In mammals, a layer of fats is present under the skin. This layer acts as a thermal insulator. They insulate the body from excessive heat or cold.

Q3. How do you differentiate between simple and complex lipids?

Ans: Simple Lipids:

The type of lipids which produce fatty acids and alcohol upon hydrolysis are called simple lipids. They are also known as triglycerides.

Example: Fats, oils and waxes.

Complex Lipids:

The types of lipids which produce fatty acids, alcohols and some other substance upon hydrolysis are known as complex lipids.

Example: phospholipids, Glycolipids, Sullpholipids

Q4. What is meant by denaturing of protein?

Ans: Denaturing of protein: The process in which protein lose their natural structure by heat or some chemical substance is called\denaturing of protein.Due to denaturing the function of protein is disturbed and they cannot perform their normal function.

Example: When egg is heated its protein (albumin) becomes hard thus denaturing of its protein occurs.

Q5. How would you classify vitamins?

Ans:Classification of vitamins:

There are two types of vitamins.

i. Fats soluble vitamins ii. Water soluble vitamins

i.Fats Soluble Vitamins:

Vitamins which dissolve in fats are called fat soluble vitamins. These vitamins are a, D, E and K.

ii. Water Soluble Vitamins:

Vitamins which dissolve in water are called water soluble vitamins. These vitamins are B-complex and Vitamin c. Vitamin B–complex include eight vitamins i.e. B_1, B_2, B_3, B_5, B_6, Boltin, Folic acid and B_{12}.

Q6. Vitamin are vital for us?

Ans: Vitamins are vital for us because it plays an important role in the healthy development and growth of our body. Our body needs a small amount of vitamins and minerals every day to remain healthy, function properly and prevent in future from health problems. It also play important roles in bodily function such as metabolism, immunity and digestion.

Q7.Write down the of sucrose hydrolysis

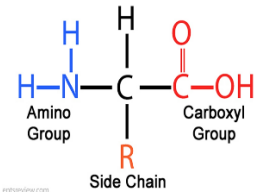
Ans: Hydrolysis of sucrose: On hydrolysis sucrose produce one unit of Glucose and one unit of Fructose.

$C_{12}H_{22}O_{11} + H_2O \rightarrow C_6H_{12}O_6 + C_6H_{12}O_6$

Sucrose + H_2O → Glucose + Fructose

Q8. Draw the general formula of amino acid. Identify the different parts and functional groups present in it.

Ans: General formula of amino acid: Amino acid is an organic compound having central carbon atom called alpha carbon, which is attached to basic amino group (NH_2), acidic carboxyl group (COOH), a side chain alkyl group (R) and hydrogen atom.



Q9. Briefly describe the sources and deficiency symptoms of Vitamin A.

Ans: Vitamin A.

Vitamin A is fat soluble which is important for growth, vision and immune system.

Sources:

Vitamin A is found in milk, butter, fish oils, eggs, fresh green vegetables and fruits.

Deficiency Symptoms: Deficiency of Vitamin A cause night blindness, dry skin, burning and irritation of eyes.

Q10. Identify the different sources of proteins? Also, list the four uses of protein?

Ans: Sources of proteins: There are two main sources of protein animal sources and plant sources.

i. Animal Sources of Protein:

Animal sources of proteins are fish, meat, eggs, milk cheese etc.

ii. Plant Sources of Proteins:

pulses and beans are the plant sources of proteicarn and are used as a food source.

Important function of protein: Some important function of protein are given below.

I. as Oxygen carrier: Haemoglobin is a protein which carries oxygen to all cells of body.

ii. Body structure: Skin, nail, hair, hoofs, horns and feather are composed of proteins.

iii. Growth: Proteins are essential for the physical and mental growth especially in children.

iv. Enzymatic action: Enzymes are proteins, which are produced by the cells of living organisms.

Enzymes catalyze the biochemical reactions going on in our bodies.

v. As Body regulators: Hormones and enzymes are the chemical regulators of the body.

vi. Body Defense System: The antibodies that help us to fight against diseases are large proteins molecules

LONG QUESTIONS

Q1. What function do carbohydrates perform in living organisms?

Ans: Function of carbohydrates:1. Source of energy:

Carbohydrates are used by our body as a rich source of energy.

2. Source of food:

Carbohydrates are used as a source of food. For example, many vegetables fruits and cereals contain carbohydrates. It is also used as a common sweetener for food.

3. Structural material:

Carbohydrates serves as a structural material in living organism. For example, plant cell wall is made up of cellulose similarly exoskeleton of insects is made up of chitin.

4. Energy reservoir:

Glucose is stored in animal muscles and liver cell in the form of glycogen. It serves as a long term energy reservoir in the body, converted back into glucose when needed. Plants store excess energy in the form of starch.

5. Medicinal Uses: Constipation and diarrhea are mainly controlled bythe use of carbohydrates fibers.

Q2. (a). Distinguish between monosaccharaides, disaccharides and polysaccharides and also give example of each one.

Ans: Carbohydrates:

Definition: "Polyhydroxy ketones or polyhydroxy aldehydes are called carbohydrates".

Polyhdroxy means having many hydroxyl groups.

Common name: Carbohydrates are commonly known as sugars.

Composition: Carbohydrates are poly functional (alcohol+aldehydes or ketones) organic compounds which mainly consist of carbon, hydrogen and oxygen some time along with nitrogen (chitin) or sulphur (keratin sulphate).

Classification of carbohydrates: Carbohydrates are classified into the following three groups:

1. Monosaccharides 2. Oligosaccharides 3. Polysaccharides

Their detail is given below:

1. Monosaccharides:

Definition: "The simplest carbohydrates which cannot be further hydrolyzed into smaller units are called monosaccharides".

General formula: They have the general formula of $C_n (H_2O)_n$ where n=3, 4, 5 and so on.

Composition: Monosaccharides are either aldoses having aldehydic functional group (for example glucose) or ketoses having ketonic functional group for examples glucose) or ketoses having ketonic functional group for example fructose.

These may be trioses ($C_3H_{12}O_6$), tetroses ($C_4H_8O_4$), pentoses ($C_5H_{10}O_5$) and hexoses ($C_6H_{12}O_6$).

General properties of monosaccharides: Some general properties of monosaccharides are:

i. Solubility: They are soluble in water.

ii. Physical state: They are crystalline solid at room temperature.

iii. Taste: They have sweet taste.

iv. Colour: They are colourless.

v. hydrolysis: They cannot be hydrolyzed further**.**

Examples: Some examples of carbohydrates along with their structures are given below:

In straight forms these structures can be written as following

2. Oligosaccharides: "Carbohydrates containing two to nine monosaccharide units are called oligosaccharides." OR
"The carbohydrates which yield two to nine monosaccharide units on hydrolysis in the presence of an acid or enzyme are called oligosaccharides."
Formation: They are formed when two to nine monosaccharide molecules combine with each other by the loss of water molecules. These molecules are bonded with each other through glycosidic linkage.
Types: Oligosaccharides have many types but two of them are described below:
a. Disaccharides: "Those oligosaccharides which consist of two monosaccharide units are called disaccharides."
Examples:

Disaccharides		**Monosaccharides**
Maltose	→	Glucose+Glucose
Lactose	→	Glucose+Galactose
Sucrose	→	Glucose+Fructose

b. Trisaccharides: "Those oligosaccharides which consist of three monosaccharide units are called trisaccharides."
Examples: Reffinose, kestose and maltotriose ($C_{18}H_{32}O_{16}$) etc.
General properties of oligosaccharides: Some general properties of oligosaccharides are:
i. Solubility: They are soluble in water.
ii. Physical state: They are crystalline solids.
iii. Taste: They are sweet taste.
iv. Colour: They are colourless.
v. Hydrolysis: They give two to nine monosaccharide units on hydrolysis.
3. Polysaccharides: "The biopolymers of monosaccharides which consist of 100 or more monosaccharide units joined together through glycosidic linkage are called polysaccharides." Polysaccharides have high molecular weight and they hydrolyzed to give many molecules of monosaccharides e.g.
General properties of polysaccharides:
i. Physical state: They are amorphous solids.
ii. Taste: They are tasteless and are called non-sugars.
iii. Solubility: They are insoluble in water.
iv. Hydrolysis: They give many molecules of monosaccharides on hydrolysis.
Examples: Cellulose, starch, dextrin and glycogen etc. are the examples of polysaccharides.
Function: Polysaccharides perform two main functions in animals and plants.
i. They are used as energy storage of cell.
ii. They are used as structural unit of cell

2. B. How carbohydrates are important to living organisms?
Ans: Importance of Carbohydrates: Carbohydrate**s** are very important to living organism because they perform very important function in living organism such as,
1. Source of energy:
Carbohydrates are used by our body as a rich source of energy.
2. Source of food:
Carbohydrates are used as a source of food. For example many vegetables fruits and cereals contain carbohydrates. It is also used as a common sweetener for food.

3. Structural material:
Carbohydrates serves as a structural material in living organism. Forexample plant cell wall is made up of cellulose similarly exoskeleton of insects is made up of chitin.

4.

Energy reservoir:
Glucose is stored in animal muscles and liver cell in the form of glycogen. It serves as a long term energy reservoir in the body, converted back into glucose when needed. Plants store excess energy in the form of starch.

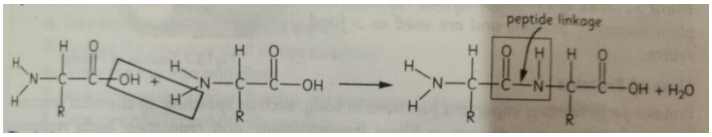
5. Medicinal Uses:
Constipation and diarrhea are mainly by the use of carbohydrates fibers.

Q3. a. How are proteins important to living organism?

Ans: Importance of proteins: Proteins are very important to living organisms because it performs many important function in body. Some important function of protein are given below.
i. As Oxygen carrier: Haemoglobin is a protein which carries oxygen to all cells of body.
ii. Body structure: Skin, nail, hair, hoofs, horns and feather are composed of proteins.
iii. Growth: Proteins are essential for the physical and mental growth especially in children.
iv. Enzymatic action: Enzymes are proteins, which are produced by the cells of living organisms. Enzymes catalyze the biochemical reactions going on in our bodies.
v. As Body regulators: Hormones and enzymes are the chemical regulators of the body.
vi. Body Defence System: The antibodies that help us to fight against diseases are large proteins molecules.

3. b. Explain the nature of bonding in protein?
Ans: Nature of bonding in Protein:
In protein three types of bonding may occur.

1. Peptide Bonding 2. Hydrogen bonding 3. Disulphide bridges
1. Peptide Bonding: The bonding between carbonyl group (-C=O) and NH group are called peptide bonding. Amino acid are linked together through peptide bonding to form proteins.



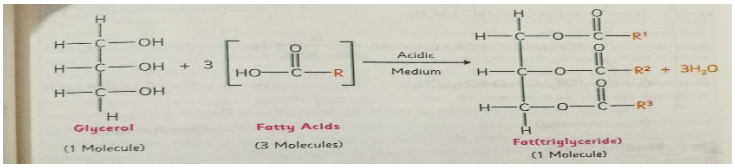
2. Hydrogen bonding:
The hydrogen bonding is formed between O of carbonyl group (-C=O) and h of –NH- group in proteins.

3. Disulphide bridges/bonding:
The disulphide bonds occur only in sulphur containg protein. In these –SH- group are bonded to form disulphide linkage,–H-S-S-H

Q4. a.Define the term Lipid?
Ans: Lipid:
Origin of word lipid: the word lipid is derived from Greek word lipose which means **fat**.
Definition: lipids are defined as biological molecules obtained from plant and animal tissue which are

not soluble in water but are soluble in non-polar organic solvents, such as alcohol, chloroform, ether etc.

Composition of lipids: lipids are generally composed of carbon, hydrogen and oxygen. Generally, lipids are esters of long chain fatty acids and alcohols. These esters are made up of three fatty acids, therefore they are called triglycerides.



4. b. Distinguish between fats and oils.

Ans:

Fats	Oils
Those triglycerides which contain higher proportion of saturated fatty acidscomponents are called fats.	Those triglycerides which contain higher proportion of unsaturated fatty acids components are called oils.
They are solid or semi-solid at room temperature	They are liquid at room temperature
Fats are mainly present in animals.	Fats are mainly present in plants and fish.
Fats have high melting point	Oils have low melting point

4 C. List four foods you eat that contain lipids.
Ans: Food that contain lipids:
foods that contain lipids are Milk, butter, Peanut, groundnut, walnut and coconut.

4. d. How lipids are important to our body?
Ans: Important functions of Lipids: lipids perform many important function in the body. Which are given below**;**

1. Source of energy: The most important function is the long-term storage of energy. One gram of fats contains approximately twice more energy than a gram of carbohydrates and protein.
2. Thermal insulator:
In mammals, a layer of fats is present under the skin. This layer acts as a thermal insulator. They insulate the body from excessive heat or cold.
3. Protective layer:
the fatty tissue in our body are made from lipids. A protective layer of fat around our heart, kidneys etc. reduces the impact of any external jerk or shock.
4. Regulatory hormone:
lipids such as Cholesterol etc. act as hormones to regulate body function.

Q4.a. how would you justify DNA as a genetic code of life?
Ans; DNA has the ability to store and transmit genetic information. The genetic information for the cell are present in DNA. The genetic information for the cell are present in the form of special codes.

These molecules are translated and expressed by synthesis of specific proteins. These proteins perform various function according to the direction which are given by the codes present in DNA.

4. b. Distinguish between DNA and RNA.
Ans:

DNA	RNA
DNA is double-stranded structure	RNA is single-stranded structure
In DNA the pentose sugar is deoxyribose	In RNA the pentose sugar is ribose
In DNA the nitrogen bases are adenine, cytosine, guanine and thymine	In RNA the nitrogen bases are adenine, cytosine, guanine and uracil

4. c. Explain the function of DNA.
Ans: Function Of DNA:
Genetic information: DNA has the ability to store and transmit genetic information. The genetic information for the cell are present in DNA. The genetic information for the cell are present in the form of special codes.

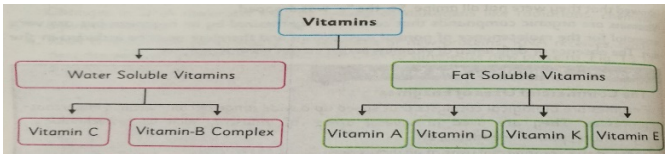
Protein synthesis: DNA also instructs how to synthesize a particular protein from a particular amino acids. These instruction are known as genetic code.

Mutation: Mutation is a sudden chemical change in a DNA molecule that can lead to the synthesis of protein with different amino acid sequence a DNA molecule that can lead to the synthesis of protein with different amino acid sequence. Changes in DNA molecules. Changes in DNA molecules may be caused by mutagens like radiations, chemical agents or viruses.

Q5.a. Define the term Vitamins and classify it.
Ans: Vitamins:
Origin of word vitamin: The word vitamin was originally vitamin, because the first one that was found was amine hence the name vital amine or vitamin, subsequently studies of other such substances showed that they were not all amine, so the “e” were dropped.
Definition of vitamin: Vitamins are organic compound that cannot be synthesized by an organism but are very essential for the maintenance of normal metabolism and therefore must be included in the diet.
Classification of vitamins:
There are two types of vitamins.
i. Fats soluble vitamins ii. Water soluble vitamins
i.Fats Soluble Vitamins:
Vitamins which dissolve in fats are called fat soluble vitamins. These vitamins are vitamins A, vitamins D, vitamins E and vitamins K.

ii. Water Soluble Vitamins:

Vitamins which dissolve in water are called water soluble vitamins. These vitamins are B-complex and Vitamin c. Vitamin B–complex include eight vitamins i.e. B_1, B_2, B_3, B_5, B_6, Boltin, Folic acid and B_{12}.



Q5.b.Explain the importance sources of vitamins.

Ans: Sources of different vitamins are given below.

Sources of vitamin A: Vitamin A is found in milk, butter, fish oils, eggs, fresh green vegetables and fruits.

Sources of vitamin B: Vitamin B is found in bread, rice, yeast, liver, milk, meat, fish, eggs, soybean oil, and fresh green vegetables.

Sources of vitamin C: Vitamin C is found in citrus fruits (oranges, lemons) tomatoes, fresh green vegetables.

Sources of vitamin D: Vitamin D is found in milk, butter, eggs, fish oils, vegetables.

Sources of vitamin E: Vitamin E is found in bread, rice, eggs, liver, butter, fresh green vegetables, and corn and soybean oil.

Sources of vitamin K: sources of vitamin K are fresh green vegetables, liver, egg yolk, meat and cheese.

Q5.c. Write down the names of five Vitamins and their importance.

Ans: Importance of vitamins:

there are different vitamins present in our body. Each vitamin plays an important role the development and growth of our body. Importance of different vitamins are given below.

Importance of vitamin A: Vitamin A is necessary for vision. It also keeps the cornea moist.

I**mportance of vitamin B:** Vitamin B helps to regulate nerve impulse transmissions.

Importance of vitamin C: Vitamin C is necessary for the formation of blood, improvement of the immune system and protection against illness, including the common cold.

Importance of vitamin D: Vitamin D regulates blood calcium, necessary for proper bones and tooth growth.

Importance of vitamin E: Vitamin E has been considered responsible for youth preserving and defender against the carcinogenic (cancer-causing) effects of certain chemicals.

TOPIC WISE QUESTIIONS

Q1. Write the sources of carbohydrates.
Ans: Sources of carbohydrates:
Carbohydrates are the most abundant class of Carbon, hydrogen, and oxygen containing compounds. It ranges from simple to complex units.They have varied sources**.**
Sources of monosaccharides: they are found in fruits, vegetables and cereals. They are also found in honey.

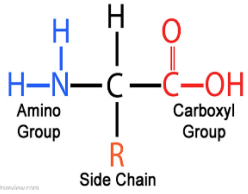
Sources of disaccharides: Sucrose are present in sugarcane, sugar beet, and fruits (mango, pineapple). Lactose are found in milk and dairy product and maltose are present in cereals.
Sources of Polysaccharides: Polysaccharides are cellulose and starch.
Cellulose is obtained from plants, for example, cotton is pure cellulose.
Starch is found in cereal crops, for example, potatoes, wheat, barely, maize, rice etc.

Q2. Define and explain term protein...Ans: Origin of word protein: The word protein is derived from Greek word “Proteios” which means of prime importance**,** because they are essential for the growth and maintenance of life.

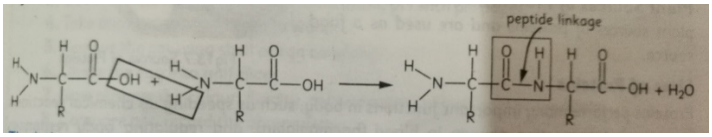
Definition: The complex nitrogenous compounds that are made up of amino acids present in all living organisms.

Composition of Protein: Proteins consist of carbon, hydrogen, oxygen, nitrogen and sometime consists of sulphur. About 50-55% of the dry weight of the cell is made up of proteins.

The building block of proteins:
The building block of proteins are amino acids.Amino acid is an organic compound having central carbon atom called alpha carbon, which is attached to basic amino group (NH_2), acidic carboxyl group (COOH), a side chain alkyl group (R) and hydrogen atom.



Amino acids are joined together by peptide linkage in protein polymer.



Q3. Write down the sources of Lipids. **Sources of Lipids:** Lipids obtained from animals, plants and marine organisms. For example, salmon and whales are rich source of cod liver oil.
Animal’s sources: Milk is a rich source of animal fat from which butter, ghee, cheese etc. are obtained.

Plants Sources: seeds of many plants such as sunflower, corn, cotton, peanut, ground nut, walnut, coconut etc. are good source of lipids.

Q4. What is nucleic acid? Describe its composition, types and uses.

Ans: Nucleic acid:

Discovery: nucleic acid were first discovered in the nuclei of white blood cells in 1868 and in sperm head in 1872 by Johannes Friedrich Miescher, a Swiss physician and biologist.

Definition: Complex organic compound consisting of nucleotides which synthesize proteins and transmit characters from parents to offsprings are called nucleic acid.

Explanation: Nucleic acid are found in each and every living cell as well as in viruses. They are essential part of genes.

Composition of Nucleic acid: Nucleic acid are composed of units called nucleotides. These nucleotides are composed of three distinct parts:

i. Sugar: nucleotides consists of five carbon sugar which may be ribose (RNA) or deoxyribose (DNA).

ii. A nitrogen-containing bases of five types, uracil, cytocine, thymine, adenine and guanine.

iii. Phosphate group: Third part is phosphate group**.** .

Types of nucleic acid: Naturally occurring nucleic acid are of two types.

i. Deoxyribonucleic acid (DNA) ii. Ribonucleic acid (RNA)

i. Deoxyribonucleic acid (DNA):

Discovery: DNA was first discover by Watson and Crick in 1953.

Definition: DNA is a double-stranded structure composed of deoxyribose sugar, phosphate group and four nitrogenous bases. The four nitrogenous bases present in DNA are adenine, cytocine, thymine, and guanine.

Explanation: pentose sugar and phosphate group make the back bone of each strand. Two strand are linked together through bases. The strands are held together by hydrogen bonds.

Function of Nucleic acid:

Function of DNA:

Genetic information: DNA has the ability to store and transmit genetic information. The genetic information for the cell are present in DNA. The genetic information for the cell are present in the form of special codes.

Protein synthesis: DNA also instructs how to synthesize a particular protein from a particular amino acids. These instruction are known as genetic code.

Mutation: Mutation is a sudden chemical change in a DNA molecule that can lead to the synthesis of protein with different amino acid sequence a DNA molecule that can lead to the synthesis of protein with different amino acid sequence. Changes in DNA molecules. Changes in DNA molecules may be caused by mutagens like radiations, chemical agents or viruses.

Function of RNA:

RNA is responsible for directing the synthesis of new proteins**.** RNA receives, reads, decodes and uses genetic information from DNA to synthesize

Q5. Briefly describe the sources and deficiency symptoms of Vitamin A.

Ans: Vitamin A.

Vitamin A is fat soluble which is important for growth, vision and immune system.

Sources:

Vitamin A is found in milk, butter, fish oils, eggs, fresh green vegetables and fruits.

Deficiency Symptoms:
Deficiency of Vitamin A cause night blindness, dry skin, burning and irritation of eyes.

Vitamin B Complex.
Vitamin B Complex is water soluble and consist of Vitamin B_1, B_2, B_3, B_5, B_6, Boltin, Folic acid and B_{12}. They are important for energy production, nerves and cells,
Sources: Vitamin B is found in bread, rice, yeast, liver, milk, meat, fish, eggs, soybean oil, and fresh green vegetable.
Deficiency Symptoms:
Deficiency of Vitamin B cause skin diseases, tongue/lips inflammation, anemia, bleeding gums and beriberi.

Vitamin C.
Vitamin C is water soluble which is important for blood vessels, gums, healing wounds and preventing cold.
Sources:
Vitamin C is found in citrus fruits (oranges, lemons) tomatoes, fresh green vegetables
Deficiency Symptoms:
Deficiency of Vitamin C scurvy and pain in joints.
Vitamin D.
Vitamin D is fat soluble which is important for bones and teeth.
Sources:
Vitamin D is found in milk, butter, eggs, fish oils, vegetables.
Deficiency Symptoms:
Deficiency of Vitamin D cause Rickets, osteomalacia.
Vitamin E.
Vitamin E is fat soluble which acts as an antioxidant.
Sources:
Vitamin E is found in bread, rice, eggs, liver, butter, fish, soybean oil, and fresh green vegetables.
Deficiency Symptoms:
Deficiency of Vitamin E causes anemia and sterility.
Vitamin K.
Vitamin K is fat soluble which is important for blood clotting.
Sources:
Vitamin K is found in liver, egg yolk, meat, cheese, fresh green vegetables.
Deficiency Symptoms:
Deficiency of Vitamin D cause Rickets, osteomalacia.