

BIOCHEMISTRY

MULTIPLE CHOICE QUESTIONS

- It is responsible for the transmission of genetic information:
(a) Nucleic acid (b) Acetic acid (c) carbonic acid (d) oxalic acid
- Carbohydrates are synthesized by plants through:
(a) photosynthesis (b) respiration (c) oxidation (d) breathing
- Carbohydrates are _____ molecules:
(a) macromolecules (b) micro molecules (c) mili molecule (d) mono molecule
- The glucose is further polymerized to form:
(a) starch & cellulose (b) starch & protein
(c) lipids & carbohydrates (d) carbohydrates
- Monosaccharides are _____ sugars:
(a) simplest (b) complex (c) normal (d) none of these
- The important monosaccharides are:
(a) hexoses (b) trioses (c) dextrose (d) fructose
- Carbohydrates are
(a) crystalline solid (b) amorphous solid (c) semisolid (d) both a & b
- Monosaccharides consists of no. of carbon atoms:
(a) 3 to 9 (b) 3 to 6 (c) 4 to 8 (d) 6 to 8
- Carbohydrates are _____ in water:
(a) soluble (b) insoluble (c) moderately soluble (d) sparingly soluble
- Monosaccharides cannot be :
(a) hydrolyzed (b) evaporated (c) condensed (d) dehydrolyzed
- Maltose a disaccharides of two _____ molecules:
(a) glucose (b) starch (c) fructose (d) sacrose
- Nature of polysaccharides is:
(a) non-reducing (b) reducing (c) oxidizing (d) non oxidizing
- Polysaccharides is _____ solid:
(a) amorphous (b) crystalline (c) dual nature (d) soft solid
- Source of simple sugar is:
(a) honey (b) meat (c) fish (d) beaf
- It is pure cellular:
(a) cotton (b) silk (c) ebonite (d) nylon
- Starch is found in:
(a) cereal (b) honey (c) potato (d) pulse
- Carbohydrates is directly used by:
(a) muscles (b) bones (c) cartilages (d) heart
- Carbohydrates regulate the amount of _____ in our body:
(a) sugar level (b) energy level (c) urine level (d) growth level

19. **Energy provided by carbohydrate is :**
 (a) 17 K joule (b) 18 K joule (c) 34 K Joule (d) 436 K joule
20. **Dextrose solution contain _____ calories of energy:**
 (a) 170 (b) 180 (c) 350 (d) 10
21. **Amino acids are linked with each other through:**
 (a) peptide linkage (b) covalent linkage (c) hydrogen bond (d) ionic bond
22. **Percentage of protein in dry weight of cell is:**
 (a) 50 % (b) 90 % (c) 60% (d) 40%
23. **Amino acids are _____ of protein:**
 (a) building block (b) non-building block (c) cement (d) bonds
24. **Protein are essential for the formation of:**
 (a) protoplasm (b) cytoplasm (c) ectoplasm (d) endoplasm
25. **These are proteins:**
 (a) hides (b) hooves (c) bones (d) caudals
26. **It is found in bones:**
 (a) proteins (b) lipids (c) carbohydrates (d) organic acids
27. **Gelatin is used in:**
 (a) bakery items (b) plastic (c) glass items (d) gems
28. **Lipids are made of:**
 (a) fatty acids (b) ascorbic acid (c) fatty acid (d) amino acids
29. **Fats exists in:**
 (a) semi solids (b) Amorphous solids (c) solid (d) liquid
30. **Oil exists in:**
 (a) solids (b) semi-solid (c) amorphous solid (d) liquid
31. **Fats and oils are _____ food:**
 (a) moderate energy (b) high energy (c) low energy (d) zero energy
32. **It is poor conductor:**
 (a) fats (b) lipids (c) carbohydrates (d) proteins
33. **Butter and fats are obtained from:**
 (a) milk (b) eggs (c) meat (d) fish
34. **Plants synthesize:**
 (a) oil (b) ghee (c) custard (d) yogurt
35. **Marine source of oil is:**
 (a) Solomon (b) tiger (c) snake (d) salamander
36. **Solomon and Wales oil is used as:**
 (a) Bar. B. Q. (b) medicine (c) food (d) lemonoid
37. **Margarine is produced by adding _____ to vegetable oil:**
 (a) nitrogen (b) chlorine (c) hydrogen (d) carbon
38. **Esters of butanoic acids have _____ smell:**
 (a) pungent (b) rotten egg (c) foul (d) fruity
39. **Ethyl butanoate smells like:**
 (a) apple (b) pineapple (c) cherry (d) guava

40. _____ is essential component living cells:
 (a) organic acid (b) oleic acid (c) nucleic acid (d) acetic acid
41. DNA structure was discovered in :
 (a) 1953 (b) 1919 (c) 1983 (d) 1913
42. RNA stands for:
 (a) mafenemic acid (b) steric acid (c) ribonucleic acid (d) nucleic acid
43. RNA role as:
 (a) synthesizer (b) messenger (c) transporter (d) all above
44. vitamins were discovered in:
 (a) 1912 (b) 1914 (c) 1932 (d) 1924
45. Accessories growth factors later named vitamins by:
 (a) Drude (b) Loren (c) Funk (d) De'duve
46. Fat soluble vitamins are:
 (a) A, F, D, C (b) B, C (c) A, B, C (d) K, D, E
47. Funk discovered vitamin:
 (a) B₁(thiamin) (b) C (creatinin) (c) B,(sucrose) (d) urea
48. Deficiency of vitamin D cause:
 (a) rabies (b) rickets (c) kidney stone (d) Arthritis
49. Disease of deficiency of vitamin A is:
 (a) deafness (b) eye inflammation (c) baldness (d) rickets
50. Vitamin C is also called:
 (a) nucleic acid (b) garlic acid (c) Ascorbic acid (d) maleic acid

ANSWER KEY

1	a	14	a	27	a	40	c
2	a	15	a	28	c	41	a
3	a	16	a	29	c	42	c
4	a	17	a	30	d	43	b
5	a	18	a	31	b	44	a
6	a	19	a	32	a	45	c
7	d	20	a	33	a	46	d
8	a	21	a	34	a	47	a
9	a	22	a	35	a	48	b
10	a	23	a	36	b	49	b
11	a	24	a	37	c	50	c
12	a	25	a	38	d		
13	a	26	a	39	b		

SHORT QUESTION

CARBOHYDRATES

Q.1 Define carbohydrates.

Ans. Definition: Carbohydrates are macromolecules defined as polyhydroxy aldehyde or ketones.

Classification: Carbohydrates classified into:

1. Monosaccharides
2. Disaccharides (Oligosaccharides)
3. Polysaccharides

Q.2 Give the characteristics of disaccharides.

Ans. Characteristics:

- On hydrolysis disaccharides give 2 to 9 units of monosaccharides.
- Disaccharides are easily soluble in water.
- These are carbohydrates are white crystalline solids.
- They are sweet in taste.
- They may be reducing or non-reducing.

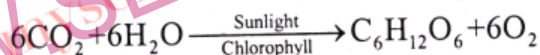
Example:

- Maltose
- Sucrose
- Lactose

Q.3 Give the balanced equation for the formation of glucose.

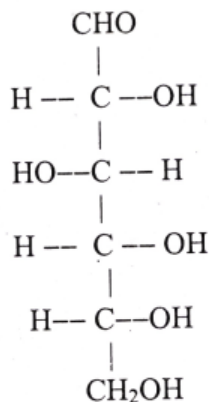
Ans. Glucose is form from carbon dioxide and water in the presence of sunlight and green pigment chlorophyll.

Reaction



Q.4 Draw the cyclic structure of glucose.

Ans. Structure of glucose:

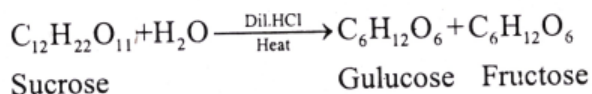


Cyclic Structure of Glucose

Q.5 Give the balance equation for the hydrolysis of sucrose.

Ans. On hydrolysis sucrose produces one unit of glucose and one unit of fructose.

Reaction



PROTEINS

Q.1 Which elements are found in proteins?

Ans. Proteins consist of following elements.

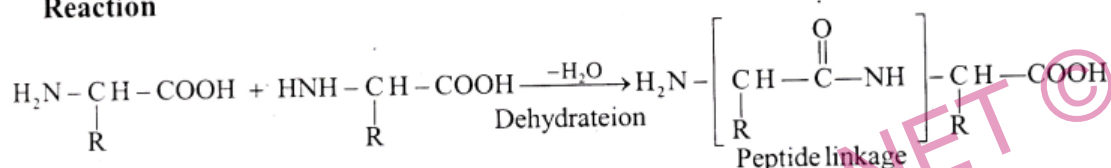
- Carbon
- Hydrogen
- Oxygen
- Sulphur
- Nitrogen

Q.2 How amino acids are bonded with each other?

Ans. Amino acids are linked through peptide linkage.

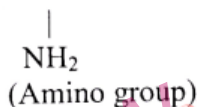
Formation: Peptide linkage (bond) is formed by the elimination of water molecule between the amino group of an amino acid and carboxyl group of another such as:

Reaction



Q.3 Give the general formula of amino acids.

Ans. (Side chain) R – CH – COOH (Carboxylic group)



Side chain "R" is different for different 20 kinds of amino acids.

Q.4 What do you mean by non-essential amino acids?

Ans. **Definition:** Non-essential amino acids are those amino acids which our body itself produced or synthesized.

Synthesis by human body: Ten out of twenty amino acids can be synthesized by human body.

LIPIDS

Q.1 What is difference between ghee and oil?

Ans.

Ghee	Oil
<ul style="list-style-type: none"> • It exists in solid form at room temperature. • It is the type of lipids which is extracted from the animals. • These are the triglycerides of unsaturated fatty acids. 	<ul style="list-style-type: none"> • It exists in liquid form at room temperature. • It is the type of lipid which is only extracted from the plants. • These are the triglycerides of saturated fatty acids.

Q.2 Give the characteristics of fats.

Ans. **Characteristics of fats**

- Fats are the esters of long chain carboxylic acids with glycerol.
- Fats exist in solid form at room temperature.
- Fats are the triglycerides of saturated fatty acids.

Q.3 Give the sources and uses of animals fats.

Ans. Sources:

Animal fats are found in:

- Adipose tissue cells
- Butters
- Ghee
- Butter and ghee is obtained from milk which is secreted by animals.

Uses:

- Animal fats are uses in soap industry.
- Butter and ghee (animals fats products) are used for cooking and frying of food for preparing bakery products and sweets.

Q.4 Plants are the source of oil, justify.

Ans. Plants synthesize oils and store them in seeds.

Example:

- Sunflower oil
- Coconut oil
- Ground nut oil
- Corn oil

Uses: These oils are used as vegetable oils or ghee for cooking and other products.

VITAMINS

Q.1 What are the disadvantages of fats soluble vitamins?

Ans. Definition: The vitamins which dissolve in fats are called fat soluble vitamins. These are vitamin A, D, E and K.

Disadvantages of fats soluble vitamins: The disadvantages of these vitamins are that if these vitamins are taken in large quantity, they accumulate in the body and cause diseases.

Q.2 What are advantages of water soluble vitamins?

Ans. Definition: The vitamins that dissolve in the water are called water soluble vitamins.

Advantages of water soluble vitamins: Water soluble vitamins are rapidly excreted from the body. Hence, these vitamins are not toxic even if taken in large quantity.

Example:

- Vitamin-B complex
- Vitamin-C

Q.3 Give examples of fats soluble vitamins.

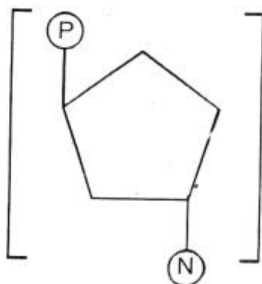
Ans. These are the fats of soluble vitamins:

- Vitamin-A
- Vitamin-D
- Vitamin-E
- Vitamin-K

Q.4 What are the components of nucleotide?

Ans. The nucleotides consist of three components.

- (i) Nitrogenous base
- (ii) A pentose sugar
- (iii) A phosphate group



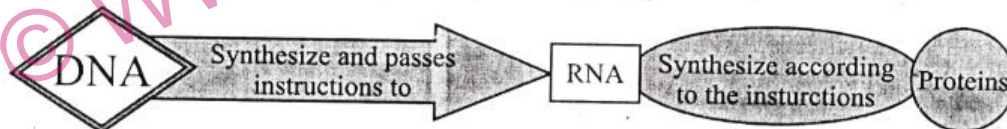
Q.5 What is the function of DNA?

Ans.

- DNA is the permanent storage place for genetic information in nucleus of a cell.
- It carries genes of specific trait. (Errors introduced in genes causes genetic diseases).
- It controls the synthesis of RNA.
- It carries and stores all genetic info of all.

Q.6 Why RNA is called a messenger?

Ans. As the DNA stores genetic information and passes this information to RNA, then RNA reads, decodes and uses this given information to synthesize new proteins. That's why we can say that RNA works like a messenger. The whole activity of DNA depends upon the RNA.



LONG QUESTIONS

INTRODUCTION

Biochemistry is a field that has a great importance today. It deals with the naturally occurring macromolecules such as carbohydrates, proteins, lipids, nucleic acids and vitamins. These macromolecules are synthesized by living organisms from simple molecules present in the environment. Macromolecules are essential for us as they are reservoirs of energy. For example, carbohydrates we eat, provide us energy. Lipids are major source of energy. They are stored in the body to provide emergency energy supplies. They help us to work during tough times. Proteins not only provide us energy, they help us stay strong by forming new bones and muscular tissues. Moreover, proteins protect us against the diseases. Nucleic acids are responsible for transmitting genetic information from generation to generation.

13.1 CARBOHYDRATES

Q.No.1 What is meant by carbohydrates? How it is synthesized? Give its classification in detail.

Definition

Carbohydrates are macromolecules defined as polyhydroxy aldehydes or ketones. They have general formula $C_n(H_2O)_n$.

Synthesis

Carbohydrates are synthesized by plants through the photosynthesis process from carbon dioxide and water in the presence of sunlight and green pigment chlorophyll. The glucose is further polymerized to form starch and cellulose.



Classification

Carbohydrates are classified as

- Monosaccharides
- Oligosaccharides
- Polysaccharides

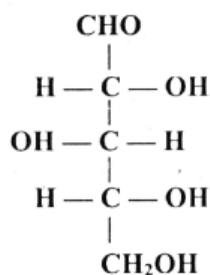
13.1.1 Monosaccharide

Definition

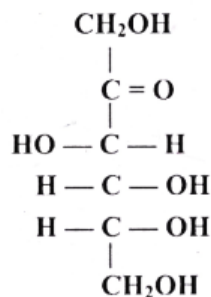
Monosaccharides are the simplest sugars which cannot be hydrolyzed. They consist of 3 to 9 carbon atoms.

Classification

- They are classified according to the number of carbon atoms in their molecules as trioses, tetroses, pentoses, hexoses, and so on.,
- The important monosaccharides are hexoses like glucose and fructose, etc.
- Glucose is a pentahydroxy aldehyde while fructose is a pentahydroxy ketone having the open chain structures as follows and general formula $C_6H_{12}O_6$.



Glucose



Fructose

Properties

- Monosaccharides are white crystalline solids.
- They are soluble in water and have a sweet taste.
- They cannot be hydrolyzed.
- They are reducing in nature, therefore, these are called reducing sugars.

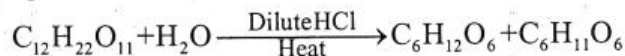
13.1.2 Oligosaccharides

Definition

Oligosaccharides give 2 to 9 units of monosaccharide on hydrolysis.

Classification

- They are classified as disaccharides, trisaccharides, tetrasaccharides, etc., depending upon the number of units they produce on hydrolysis.
- The most important oligosaccharides are disaccharides like sucrose
- On hydrolysis, sucrose produces one unit of glucose and one unit of fructose.



Properties

- These carbohydrates are white, crystalline solids easily soluble in water.
- They are also sweet in taste.
- They may be reducing or non-reducing.

13.1.3 Polysaccharides

Definition

Polysaccharides are macromolecular carbohydrates consisting of hundreds to thousands of monosaccharide.

Properties

- They are amorphous solids.
- They are tasteless and insoluble in water.
- They are non reducing in nature.

Examples

- Starch
- Cellulose

Q.No.2 Explain the sources and uses of Carbohydrates.

13.1.4 Sources and Uses of Carbohydrates

Carbohydrates range from simple to complex ones. They have varied sources and uses.

Sources of simple sugars:

Glucose, fructose and galactose are found in fruits, vegetables, honey and cereals.

Disaccharides are sucrose, lactose, and maltose.

- **Sucrose** is found in sugar beet, sugar cane, and fruits.
- **Lactose** consisting of glucose and galactose is the main sugar in milk and dairy products.
- **Maltose**, a disaccharide of two glucose molecules, is found in cereals.

Polysaccharides are starch and cellulose.

- **Starch** is found in cereal crops; wheat, barley, maize, rice, etc.
- **Cotton** is pure cellulose.

Our body uses carbohydrates in the form of glucose.

- Glucose is the only form of carbohydrates that is used directly by muscles for energy.
- It is important to note that brain needs glucose as an energy source, because it cannot use fat for this purpose.

Uses to body by carbohydrates

Besides, the energy providing materials, carbohydrates also provide the following usage our body.

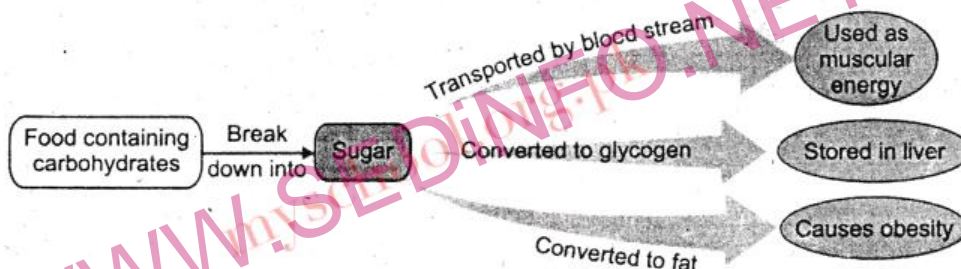
- They regulate the amount of sugar level in our body. Low sugar level in body results in hypoglycemia.
- They provide essential nutrients for bacteria in intestinal tract that helps in digestion.
- Dietary fiber helps to keep the bowel functioning properly.
- Fiber helps in lowering of cholesterol level and regulates blood pressure.
- Carbohydrates protect our muscles from cramping.

How carbohydrates are used as a source of energy?

DO YOU KNOW

Carbohydrates as source of energy

Carbohydrates provide 17 kilo joules of energy per gram. We take carbohydrates as food. Long chains of starch (carbohydrates) are broken down into simple sugars (glucose) by digestive enzymes. The glucose is absorbed directly by small intestine into the blood stream. Blood stream transports the glucose to its place of use, e.g., muscles.



What is meant by intravenous therapy?

DO YOU KNOW

The Use of Dextrose in Drips

Dextrose is crystallized glucose (natural sugar found in starchy foods). It provides simple carbohydrates to the body that can be easily broken down and processed. Dextrose solution is available in several concentrations. For example, five percent dextrose solution (D5W) consists of 5 grams of dextrose in each 100 mL of solution. It is used to provide fluid replacement and energy to the body. It contains approximately 170 calories of energy, but does not contain electrolytes. Therefore, electrolytes are added according to requirements in solution. Dextrose is given to patients directly into vein called intravenous (IV) therapy. It is commonly called drip system. It is the fastest way to deliver fluids, electrolytes and medications throughout the

13.2 PROTEIN

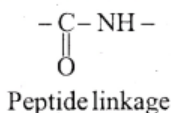
Q.No.3 Define protein and explain its properties.

Definition

Proteins are highly complicated nitrogenous compounds made up of amino acids.

Composition

Proteins consist of carbon, hydrogen, oxygen, nitrogen and sulphur. They are polymers of amino acid. Amino acids are linked with each other through peptide linkage. Protein has more than 10,000 amino acids. All proteins yield amino acids upon hydrolysis



Properties

- Proteins are present in all living organisms.
- They make up bulk of the non-bony structure of the animal bodies.
- They are major component of all cells and tissues of animals.
- About 50% of the dry weight of cell is made up of proteins.
- They are found in muscles, skin, hair, nails, wool, feathers, etc.

Q.No.4 What are amino acids? Explain the amino acids are the building blocks of protein.

Amino acids

Amino acids are organic compounds consisting of both amino and carboxyl groups. They have the general formula:

(side chain) R-CH-COOH (carboxylic group)

NH₂ (amino group)

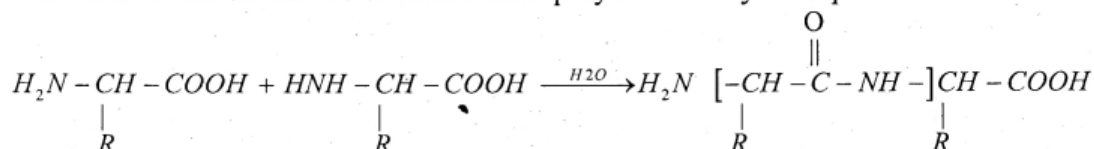
Side chain 'R' is different for different amino acids.

Explanation

There are 20 amino acids. Ten out of twenty amino acids can be synthesized by human body. These amino acids are called non-essential amino acids. While other ten which cannot be synthesized by our bodies are called essential amino acids. Essential amino acids are required by our bodies and must be supplied through diet.

13.2.1 Amino acids are Building Blocks of Proteins

Two amino acids link through peptide linkage. Peptide linkage (bond) is formed by the elimination of water molecule between the amino group of one amino acid and carboxyl acid group of another. When thousands of amino acids polymerize they form protein.



Q.No.5 Explain the sources and uses of proteins.

13.2.2 Sources and Uses of Proteins:

Proteins make up more than 50% of the dry weight of animals. Each protein has its source and carries out a specific function. Sources and uses of protein are as follows:

- Sources of animal's proteins are meat, mutton, chicken, fish, eggs. These are used as food by human beings as they are essential for the formation of protoplasm.

- Enzymes are proteins that are produced by the living cells. They catalyze the chemical reactions taking place in the bodies. They are highly specific and have extraordinary efficiency. Many enzymes are used as drugs. They control the bleeding and treat blood cancer.
- Hides are proteins. These are used to make leather by tanning. Leather is used to make shoes, jackets, sports items, etc.
- Proteins are found in bones. When bones are heated they give gelatin. Gelatine is used to make bakery items.
- Plants also synthesize proteins, such as pulses, beans, etc. These are used in food.

13.3 LIPIDS

Q.No.6 What are lipids? Explain it's properties.

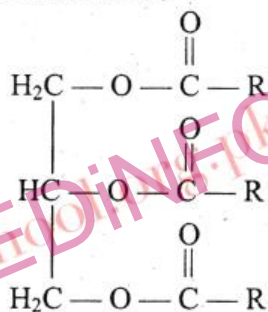
Definition

Lipids are macromolecules made up of fatty acids. Lipids include oils and fats.

Composition

Oils and fats are esters of long chain carboxylic (fatty) acids with glycerol. The esters are made of three fatty acids, therefore, they are called triglycerides.

General formula of triglycerides is as under.



Properties of oil

- Oils exist in liquid form at room temperature.
- They are triglycerides of unsaturated fatty acids.

Properties of fats

- While fats exist in solid form at room temperature.
- They are triglycerides of saturated fatty acids.

13.3.1 Fatty Acids

Fatty acids are building blocks of lipids. They are long chain saturated and unsaturated carboxylic acids.

Example

$\text{C}_{15}\text{H}_{31}\text{COOH}$ Palmitic acid

$\text{C}_{17}\text{H}_{35}\text{COOH}$ Stearic acid

These acids form esters (oils or fats) with glycerol in the presence of mineral acids.

Q.No.7 Explain the sources and uses of Lipids.

13.3.2 Sources and Uses of Lipids

Fats and oils are high energy foods. They are source of vitamins A, D and they are used to build brain cells, nerve cells and cell membranes. They are insoluble in water but soluble in organic solvents. The fats stored in the body insulate it as these are poor conductor of heat and electricity.

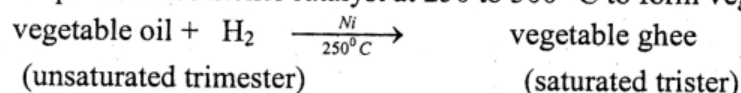
Fats and oils are synthesized naturally by animals, plants and marine organisms.

Uses

- Animal fats are found in adipose tissue cells. Animals secrete milk from which butter and ghee is obtained. Butter and ghee are used for cooking and frying of food, for preparing bakery products and sweets.
- Animal fats are used in soap industry.
- Plants synthesize oils and store them in seeds, such as, sunflower oil, coconut oil, groundnut and These oils are used as vegetable oils or ghee for cooking and other purposes.
- Marine animals like salmon and whales are also source of oils. These oils are used as medicines, e.g., cod liver oil.

Hydrogenation of vegetable

Vegetable oils are trimer of glycerol and fatty acids of unsaturated long chains. These oils are hydrogenated in the presence of nickel catalyst at 250 to 300 °C to form vegetable ghee.



INTERESTING INFORMATION

- Margarine is produced by adding hydrogen to vegetable oil at 200 °C in the presence of catalyst. Greater the amount of hydrogen is added, the more solid the margarine becomes.
- Rancid butter has a foul smell because of botanic acid. However, the esters of botanic acid have fruity smell. For example, methyl butanoate smells like apples and ethyl butanoate smells like pineapple.

13.4 NUCLEIC ACIDS

Q.No.8 What are Nucleic acids? Explain its types in detail.

Nucleic acids are essential components of every living cell. They are generally long chain molecules made up of nucleotides.

Composition

Each nucleotide consists of the components are:

- Nitrogenous base
- Pentose sugar
- Phosphate group

Types

There are two types of nucleic acids:

- Ribonucleic acid (RNA)
- Deoxyribonucleic Acid (DNA)

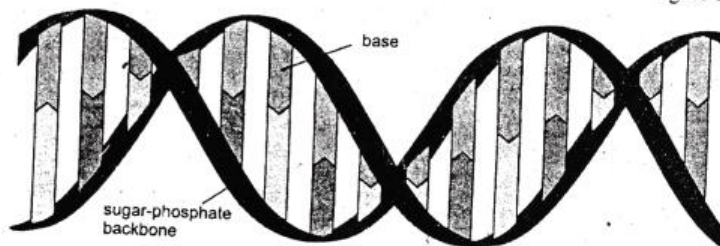
13.4.1 Deoxyribonucleic Acid (DNA)

DNA consists of deoxyribose sugar. Its structure was discovered by J. Watson and F. Crick in 1953.

Composition

- It is long double stranded molecule consisting of two chains.
- Each chain is made up of sugar, phosphate and a base.
- The sugar and phosphate groups make the backbone of the chains and two chains are linked through bases.

- The chains are wrapped around each other in a double helix form.



Importance of DNA

DNA is the permanent storage place for genetic information in the nucleus of a cell.

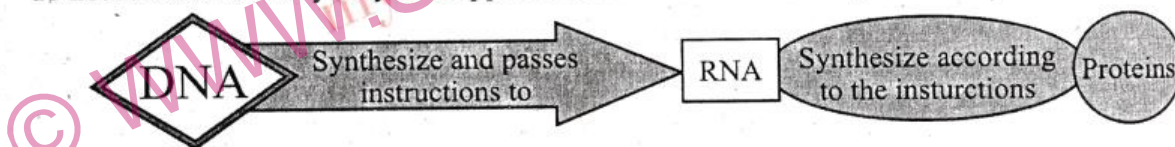
- It carries and stores all genetic information of the cell.
- It passes the information as instructions from generation to generation how to synthesize particular proteins from amino acids.
- These instructions are genetic code of life.
- They determine whether an organism is a man or a tree or a donkey and whether cell is a nerve cell or a muscle cell.

Specific sequence

The sequence of nitrogenous bases in DNA determines the protein development in new cells. The function of the double helix formation of DNA is ensuring that no disorder takes place. DNA carries genes that control the synthesis of RNA.

Genetic disease

Errors introduced into the genes synthesize faulty RNA. It synthesizes faulty proteins that do not function the way they are supposed to. This disorder cause genetic diseases.



13.4.2 Ribonucleic acid (RNA)

It consists of ribose sugar. It is a single stranded molecule. It is responsible for putting the genetic information to work in the cell to build proteins. Its role is like a messenger.

Transcription and protein synthesis

RNA is synthesized by DNA to transmit the genetic information. RNA receives, reads, decodes and uses the given information to synthesize new proteins. Thus RNA is responsible for directing the synthesis of new proteins.

13.5 VITAMINS

Q.No.9 What are Vitamins? Explain its types and importance in detail.

In 1912 Hopkins noticed that in addition to carbohydrates, proteins and fats there are other substances needed for normal growth. Although these substances were needed in small quantity, yet these substances were called Accessory Growth Factors. Later Funk proposed the name 'Vitamin' for these substances. He discovered Vitamin B 1 (Thiamin).

13.5.1 Types of Vitamins

Vitamins are divided into two types:

(i) Fat Soluble Vitamins

The vitamins which dissolve in fats are called fat soluble vitamins.

Types

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

Excess of vitamins cause disease

If these vitamins are taken in large quantity, they accumulate in the body and cause diseases.

Example

Accumulation of vitamin D in the body causes bone-pain and bone-like deposits in the kidney. However, their deficiency also causes diseases.

Sources, uses and diseases because of deficiency are provided in the Table.

No.	Vitamin	Sources	Uses	Diseases
i	Vitamin A	Dairy products, eggs, oils and fats, fish. It can also be obtained from the beta-carotene found in green vegetables, carrots and liver.	Maintains the health of the epithelium and acts on the retina's dark adaptation mechanism.	Night blindness, eye inflammation.
ii	Vitamin D	Fish liver, dairy products, oils and fats. Vitamin D is formed in the skin when it is exposed to sunlight.	Has a role in the absorption of calcium which is essential for the maintenance of healthy bones.	Rickets

(ii) Water Soluble Vitamins

Definition: The vitamins that dissolve in water are called water soluble vitamins.

Sources: These vitamins are B complex (this include 10 vitamins) and vitamin C (ascorbic acid).

Advantages: Water soluble vitamins are rapidly excreted from the body. Hence these vitamins are not toxic even if taken in large quantity. However, their deficiency causes disease.

13.5.2 Importance of Vitamins

- Each vitamin plays an important role in the healthy development of our body.
- Natural vitamins are organic food substances found only in plants and animals. Our body is unable to synthesize vitamins. Because of this, they must be supplied either directly in the diet or by way of dietary supplements. They are absolutely necessary for our normal growth.
- Vitamins cannot be assimilated without ingesting food. This is why, it is suggested that vitamins must be taken with meal. They help to regulate our body's metabolism.

INTERESTING INFORMATION

Cancer is caused by damage to DNA or interfering with the mechanism of its replication or passing information. So, by understanding the mechanism of action of DNA, cancer can be cured.

Q.No.10 Write down the commercial use of enzymes.

Commercial uses of enzymes

Enzymes are used on commercial scale for different purposes. Common types of enzymes and their role in industry is described as:

Enzymes as a yeast

Enzymes present in the yeast are commercially used for the fermentation of molasses and starch to produce alcohol (Ethanol). These enzymes are diastase, invertase and zymase.

Microbial enzymes

Microbial enzymes are used in detergents (powder or liquid). Upases decompose fats into more water soluble compounds. Amylase removes starch based stains. Cellulase degrades cellulose to glucose, a water soluble compound. Bacterial proteases break down protein stains on the clothes. Thus, enzymes containing detergents clean effectively and remove all stains and dirt.

Enzymes used as purification of fruit juices

Enzymes are used for the purification of fruit juices. They are added to fruit that has been crushed like grapes. This increases the yield of the juice extracted by removing suspended particles. It also improves the colour derived from the fruit skins.

Amylase enzymes

Amylase enzymes are used in bread making because they can yield more starch of the flour. Even they are efficient enough to convert starch to sweet glucose syrup. This can be used as sweetener in the food as well as bread making.

Lactase enzyme

Lactase enzyme is used to increase sweetness in ice cream. As lactose in milk is broken down to galactose and glucose, which are sweeter than lactose.

Enzymes in dairy industry

In the dairy industry some enzymes are used for the production of cheeses, yogurt and other dairy products while others are used to improve texture or flavors of the products.

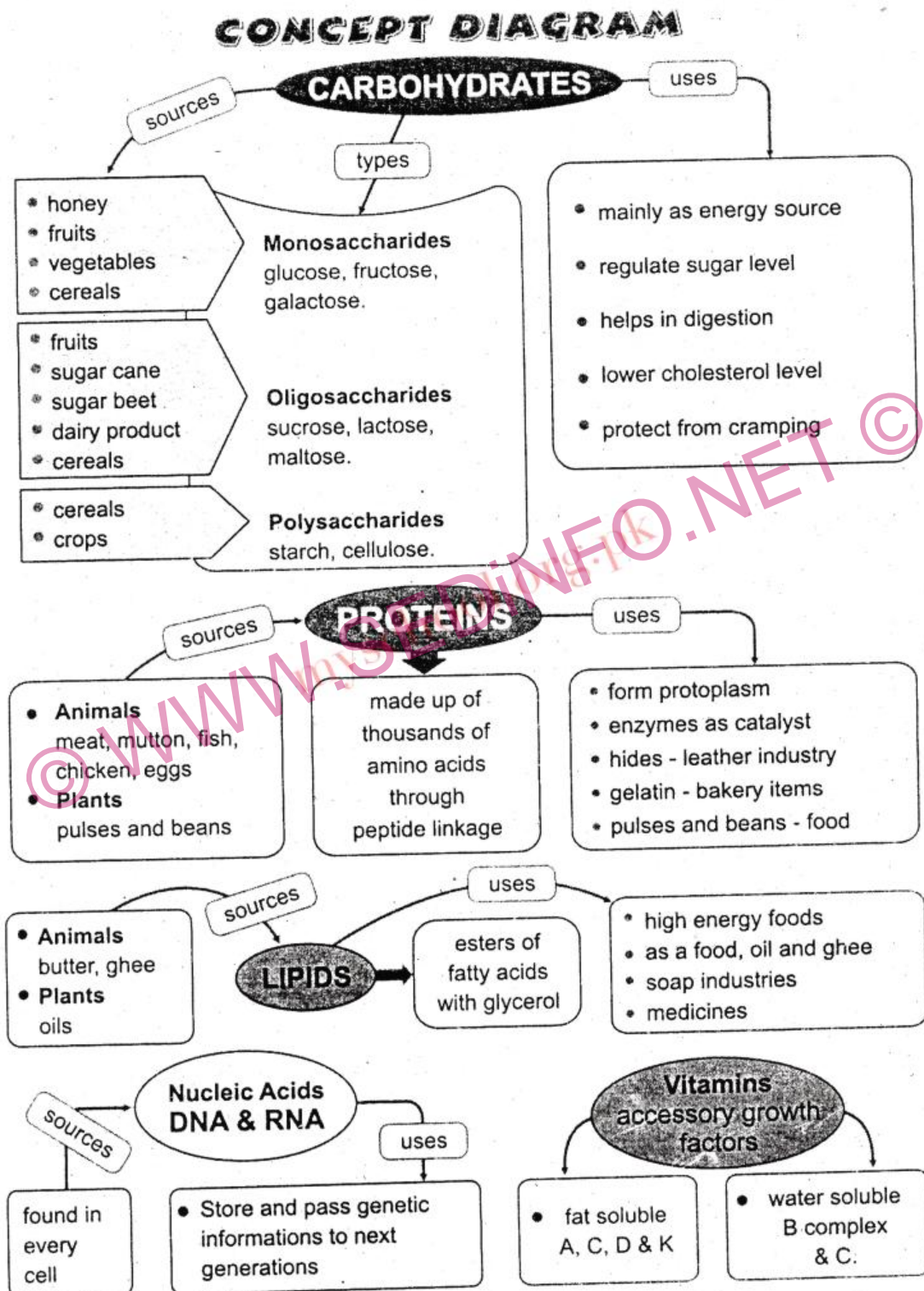
SKILLS

Solubility of starch and sugar

Solubility of starch and sugar in water can be checked in laboratory as well as at home. Starch is insoluble in water while sugar is soluble: in water forming a clear solution in water.

Denaturing of Protein

Denaturing of protein means precipitation or coagulation of protein. It can be carried out by heating or changing pH. A simple common method for denaturing of protein is boiling of an egg. White viscous fluid (albumen) present in an egg is protein. When egg is boiled for a few minutes, albumen coagulates i.e., solidifies.



EXERCISE

MCQ'S

1. Carbohydrates are synthesized by plants through photosynthesis process. Which requires the following except:
 (a) CO₂ and water (b) presence of sunlight
 (c) O₂ (d) chlorophyll
2. Which of the following is a disaccharide?
 (a) glucose (b) fructose (c) sucrose (d) starch
3. Photosynthesis process produces
 (a) starch (b) cellulose (c) sucrose (d) glucose
4. Which one of the following is tasteless?
 (a) starch (b) glucose (c) fructose (d) sucrose
5. When glucose and fructose combine they produce:
 (a) starch (b) cellulose (c) sucrose (d) none of these
6. Glucose is:
 (a) hexahydroxy aldehyde (c) pentahydroxy aldehyde
 (b) hexahydroxy ketone (d) pentahydroxy ketone
7. Thousand of the amino acid polymerize to form
 (a) carbohydrates (b) proteins (c) lipids (d) vitamins
8. Which one of followings is a triglyceride?
 (a) carbohydrates (b) proteins (c) lipids (d) vitamins
9. Enzymes are proteins which have the following properties except:
 (a) they catalyze reaction (b) they are highly non-specific
 (c) they are highly efficient (d) they are produced by living cells
10. Which one of the following vitamins is water soluble?
 (a) vitamin A (b) vitamin C (c) vitamin D (d) vitamin E
11. Which one of the following is a fat soluble vitamin?
 (a) A (b) E (c) K (d) All of these
12. Which one of the following is not the characteristics of monosaccharide?
 (a) white crystalline solids (b) soluble in water
 (c) hydrolysable (d) reducing in nature
13. Which one of the following statements about glucose and sucrose is incorrect?
 (a) soluble in water (b) naturally occurring
 (c) carbohydrates (d) disaccharides
14. Which one of the following is a reducing sugar?
 (a) glucose (b) maltose (c) sucrose (d) starch
15. The most important oligosaccharide is:
 (a) sucrose (b) glucose (c) fructose (d) maltose
16. Night blindness is because of deficiency of:
 (a) vitamin A (b) vitamin E (c) vitamin C (d) vitamin D
17. The organic compounds used as drugs to control bleeding are:
 (a) vitamins (b) proteins (c) lipids (d) glycerides
18. Deficiency of Vitamin E causes
 (a) rickets (c) anemia in babies
 (b) scurvy (d) night blindness

19. **Lipids are macromolecules. They have characteristics except one of the following:**
 (a) they are high energy foods (b) they are soluble in water
 (c) they are poor conductor of heat (d) they are esters of fatty acids
20. **Vitamins are Accessory Growth Factors. They play important role in our body like:**
 (a) provide energy to the body (b) insulate our body from electric shock
 (c) build brain cells (d) regulate metabolic process

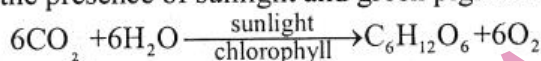
ANSWER KEY

1	a	4	a	7	b	10	b	13	d	16	a	19	b
2	c	5	c	8	c	11	d	14	a	17	b	20	d
3	d	6	c	9	b	12	c	15	a	18	c	KIPS	

SHORT QUESTIONS

Q.1 How Plants synthesize carbohydrates?

Ans. Carbohydrates are synthesized by plants through photosynthesis process, from carbon dioxide and water in the presence of sunlight and green pigment chlorophyll.



Q.2 Give the characteristics of monosaccharides.

Ans.

- Monosaccharides are the simplest sugars which cannot be hydrolyzed.
- They are usually white crystalline solids.
- They are soluble in water.
- They have sweet taste.
- Monosaccharides are reducing sugars.

Example:-

- Trioses
- Tetroses
- Glucose
- Fructose

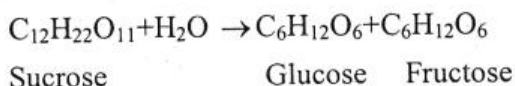
Q.3 What is difference between glucose and fructose?

Ans.

Glucose	Fructose
• Glucose is pentahydroxy aldehyde in nature.	• Fructose is pentahydroxy ketone in nature.
• It has six headed (hexagonal) like cyclic structure.	• It has five headed (pentagonal) like cyclic structure.
• It has aldehydic functional group.	• It has ketonic functional group.
• Less sweet in taste.	• More sweet in taste.

Q.4 Give an example of a disaccharide. How it IS hydrolyzed into monosaccharides?

Ans. The most common example of disaccharide is sucrose. When it hydrolyse it produce one unit of glucose and one unit of fructose.



Q.5 Give the characteristics of polysaccharides.

Ans.

- Polysaccharides are macromolecular carbohydrates.
- They are amorphous solids.
- They are non-reducing in nature.

Example

- Starch
- Cellulose

Q.6 Where the proteins are found?

Ans.

- Proteins are present in all living organisms.
- They make up bulk of the non-bony structure of the animals.
- They are major components of all cells and tissues of animal.
- They are found in muscles, skin, hair, nails, wool and feathers etc.

Q.7 Describe the uses of carbohydrates.

Ans.

- They provide essential nutrient nutrients to bacteria in intestinal tract that helps in digestion.
- Carbohydrates regulate the amount of sugar level in our body.
- Dietary fibre helps to keep the bowel functioning properly.
- Carbohydrates protect our muscles from cramping.
- Fibrous carbohydrates lowering the cholesterol level and regulates.

Q.8 Lactose is disaccharide. Which monosaccharide is present in it?

Ans.

Lactose consisting of glucose and galactose is the main sugar in milk and dairy products.

Q.9 Why the ten amino acids are essential for us?

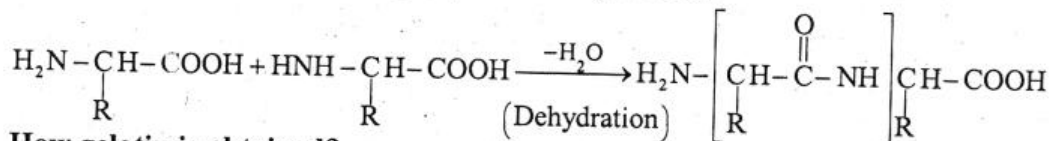
Ans.

Ten out of twenty amino acids can not be synthesized by our body. These amino acids are essential amino acids, must be supplied through diet to fulfill the requirement of our body. While other ten are called non-essential amino acids because these are synthesized by human body and not be required to be taken through diet.

Q.10 How proteins are formed?

Ans.

Amino acids are the building blocks of proteins. Two amino acids link through peptide linkage is formed by the elimination of water molecule between the amino group of one amino acid and carboxyl acid group of another, such as:



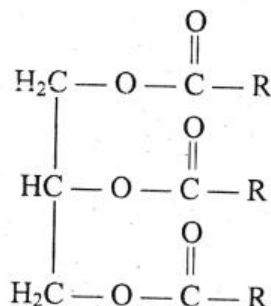
Q.11 How gelatin is obtained?

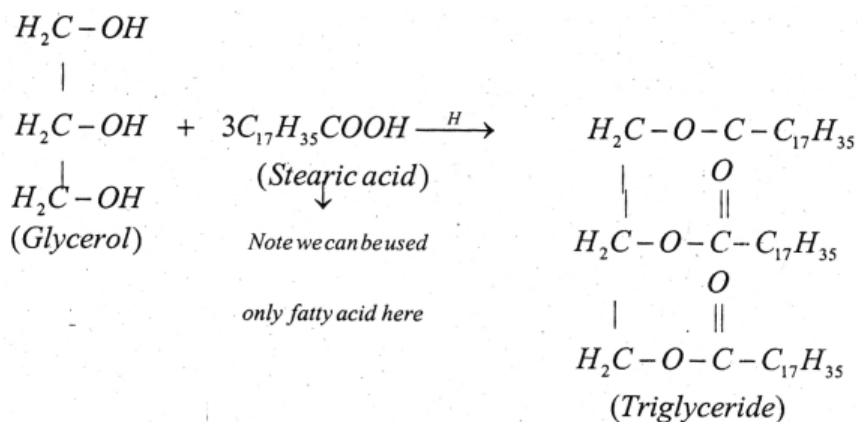
Ans.

When bone's protein is heated it gives gelatin. Gelatin is used to make bakery items.

Q.12 Give the general formula of the lipids.

Ans. The general formula of lipids.





Q.13 Name two fatty acids with their formulae.

Ans.

Palmitic acid = $C_{15}H_{31}COOH$

Stearic acid = $C_{17}H_{35}COOH$

Q.14 Give the types of vitamins.

Ans. Vitamins are divided into two types:

(i) **Fat soluble vitamins**

- Vitamin A
- Vitamin D
- Vitamin E
- Vitamin K

(ii) **Water soluble vitamins:**

- Vitamin B-complexes
- Vitamin C

Q.15 What is the significance of vitamins?

Ans. • Vitamins play an important role in the healthy development of our body.

- Vitamins help to regulate our body's metabolism.
- They assist the food for formation of bones and tissues.
- Vitamins are absolutely necessary for our normal growth.
- Vitamins are helpful for carbohydrates and intracellular metabolisms.

Q.16 Describe the sources and uses of vitamin A.

Ans. Sources:

- Dairy products, eggs, oils and fats, fish.
- It can also be obtained from the beta carotene found in green vegetables, carrots and liver.

Uses:

- It maintains the health of epithelium.
- It controls (effects) the retina's dark adaptation mechanism.

Q.17 Deficiency of vitamin K leads to which disease?

Ans. Deficiency of vitamin K causes bleeding due to delayed clotting. That shows the signs of bruising easily and having nose bleeds.

Q.18 Justify water soluble vitamins are not injurious to health.

Ans. The vitamins that dissolve in water are called water soluble vitamins. Vitamins are rapidly excreted from the body, hence, these are not toxin even if taken in large quantity.

Example:

- Vitamin B Complex
- Vitamin C

Q.19 What do you mean by genetic code of life?

Ans. "Genetic Code of Life" means those specific instructions which passes from generation to generation, to synthesize the particular proteins from amino acids. It determine whether an organism is a man, a tree, or a donkey.
DNA is considered the genetic code of life.

Q.20 What is the function of DNA?

Ans.

- DNA is the permanent storage place for genetic information.
- DNA carries genes of specific trait. (Errors introduced in genes causes gentic diseases)
- DNA controls the synthesis of RNA

Q.21 How you justify RNA works like a messenger?

Ans. DNA stores genetic information and passes this information to RNA, then RNA reads, decodes and uses this given information to synthesize new proteins. That's way we can say that RNA works like a messenger.

The whole activity of DNA depends upon the RNA.

LONG QUESTIONS

Q.1 What are carbohydrates? How monosaccharides are prepared? Characteristics.

Ans. See Questions No. 1

Q.2 Explain oligosaccharides.

Ans. See Questions No. 1

Q.3 What are polysaccharides? Give their properties.

Ans. See Questions No. 1

Q.4 Explain the sources and uses of proteins.

Ans. See Questions No. 5

Q.5 Explain that amino acids are building blocks of proteins.

Ans. See Questions No. 4

Q.6 Explain the sources and uses of lipids.

Ans. See Questions No. 7

Q.7 Give the importance of vitamins.

Ans. See Questions No. 9

Q.8 Describe the sources, uses and deficiency symptoms of water soluble vitamins.

Ans.

Vitamin	Sources	Uses	Diseases
Vitamin B (Thiamine)	Yeast, egg yolk, liver, wheat, nuts, red meat & whole cereals	Carbohydrate metabolism	Fatigue, irritability loss of appetite
Vitamin B ₂ (riboflavin)	Liver, eggs, whole ureals, fruits, yeats	Intracellular metabolism	Glossitis (inflammation of tongue) anemila dermatitis.
Vitamin B ₁₂	Liver, red meat, dairy products & fresh	Essential for manufacturing of genete material in cells, Involved in production of WBC's	Pernicious anemia, retarded growth
Vitamin C (Ascorbic acid)	Green vegetables citrus fruits	Essential for maintainance of bones, teeth, and gum, ligaments	Survey (bleeding and spon givens of gums)