

Chapter # 21

"Biochemistry"

EXERCISE

Q.2 Give brief answers for the following questions.

(i) What do you understand by the word "Biochemistry"?

Biochemistry is a hybrid science. Biology is the science of living organisms while chemistry is the science of atoms and molecules. Hence, biochemistry is the science of atoms and molecules in living organisms.

It is the branch of science in which we study different molecules that occur in living organisms with their chemical reactions.

(ii) Briefly state the functions of carbohydrates?

The main functions of carbohydrates are:

- They spare protein that is the building block of body tissues.
- They metabolized the fats properly while in excess, fats caused a disease called ketosis.
- They are the source of energy for brain.
- They are necessary for the regulation of nerve tissues.
- They regulate bacterial growth for digestion in intestine.
- They help to prevent constipation, lower the risk of many diseases, such as cancer, diabetes etc.

(iii) Name the classes and sub-classes of proteins?

The classes and sub-classes of proteins are:

① Simple proteins:-

→ Albumin, Globulins, Glutelins & Histones.

② Conjugated proteins:-

→ Nucleoprotein, Mucoprotein, Glycoprotein & phosphoprotein.

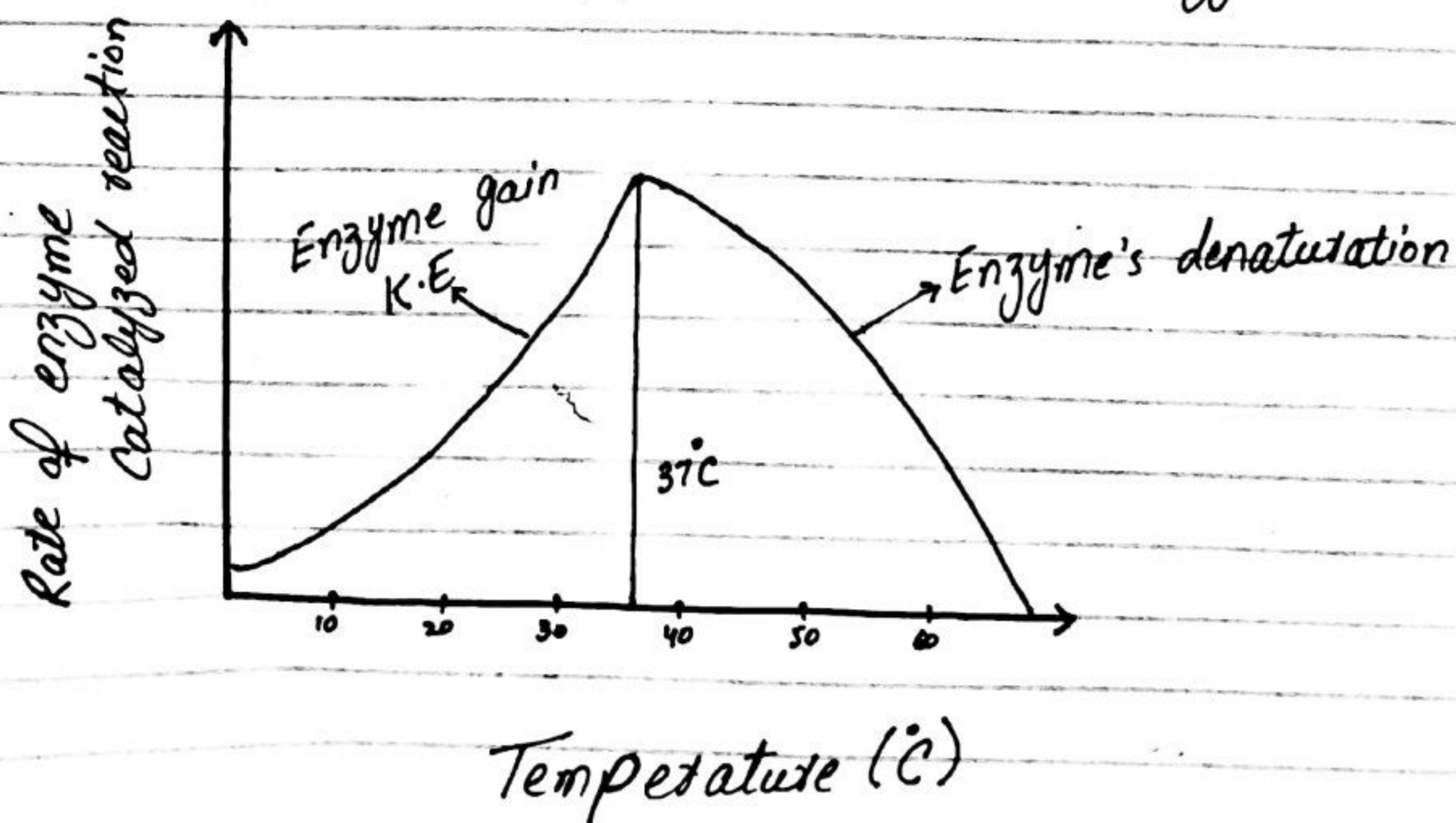
③ Derived proteins:-

→ Proteans, proteoses, peptones & peptides.

(iv) In a range of $0-35^{\circ}\text{C}$, the rate of reaction of an enzyme is proportional to temperature. Justify it.

When temperature is increased to a certain limit, it provides the activation energy & kinetic energy to the reaction. Hence, reactions are accelerated.

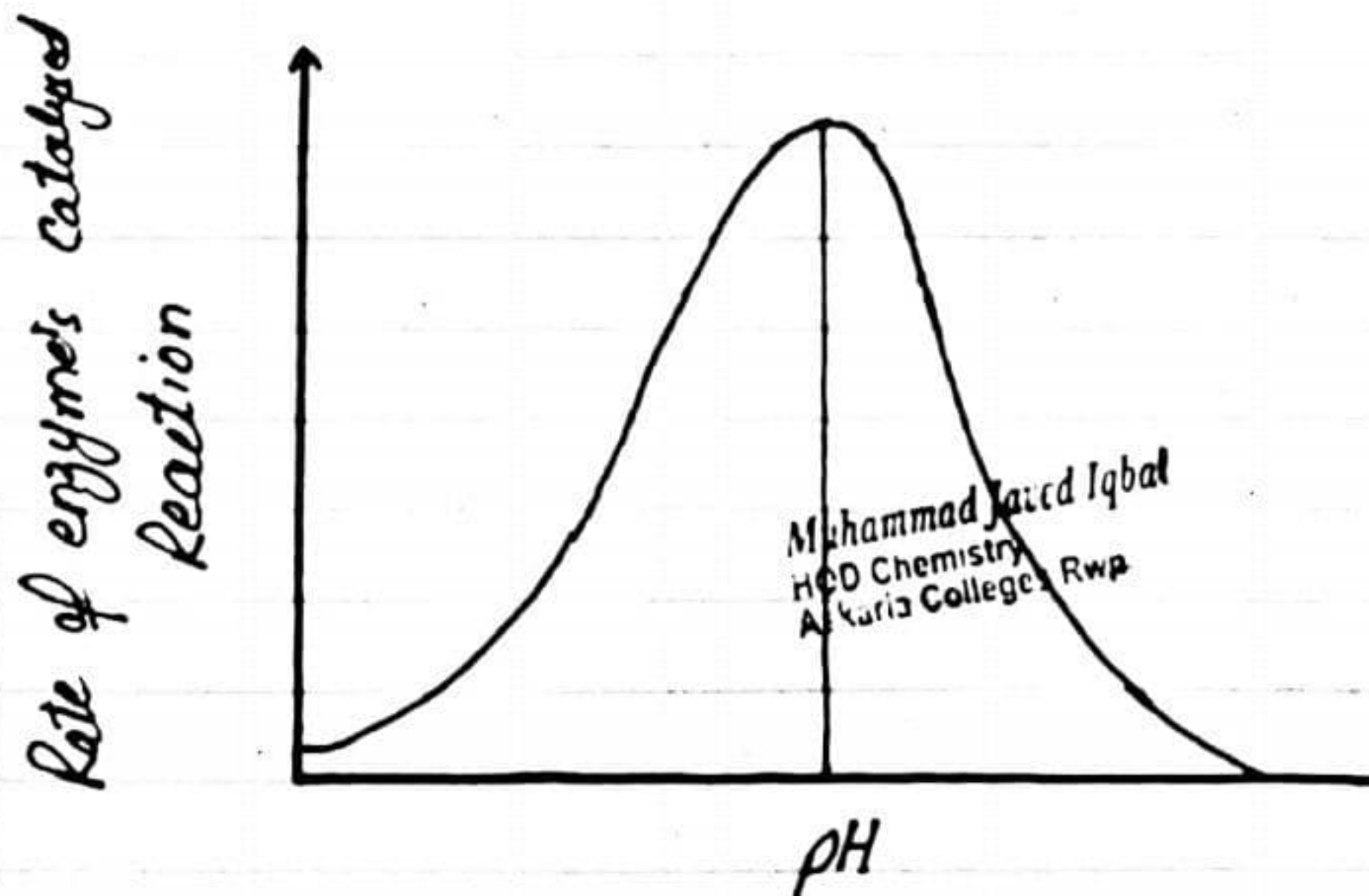
But, when temperature raised well above the optimum value, this increase the vibration of atoms of enzyme but it lost the globular structure of enzyme. And this process is called denaturation of enzyme. It results the rapid decrease in enzyme's action.



(v) How does pH effect enzyme Activity?

All enzymes work properly at their optimum pH. A slight change in pH can disturb the enzymes activity. Every enzyme has its specific pH.

e.g → Pepsin has low pH and work in Stomach.
→ Trypsin has high value of pH & works in small intestine.



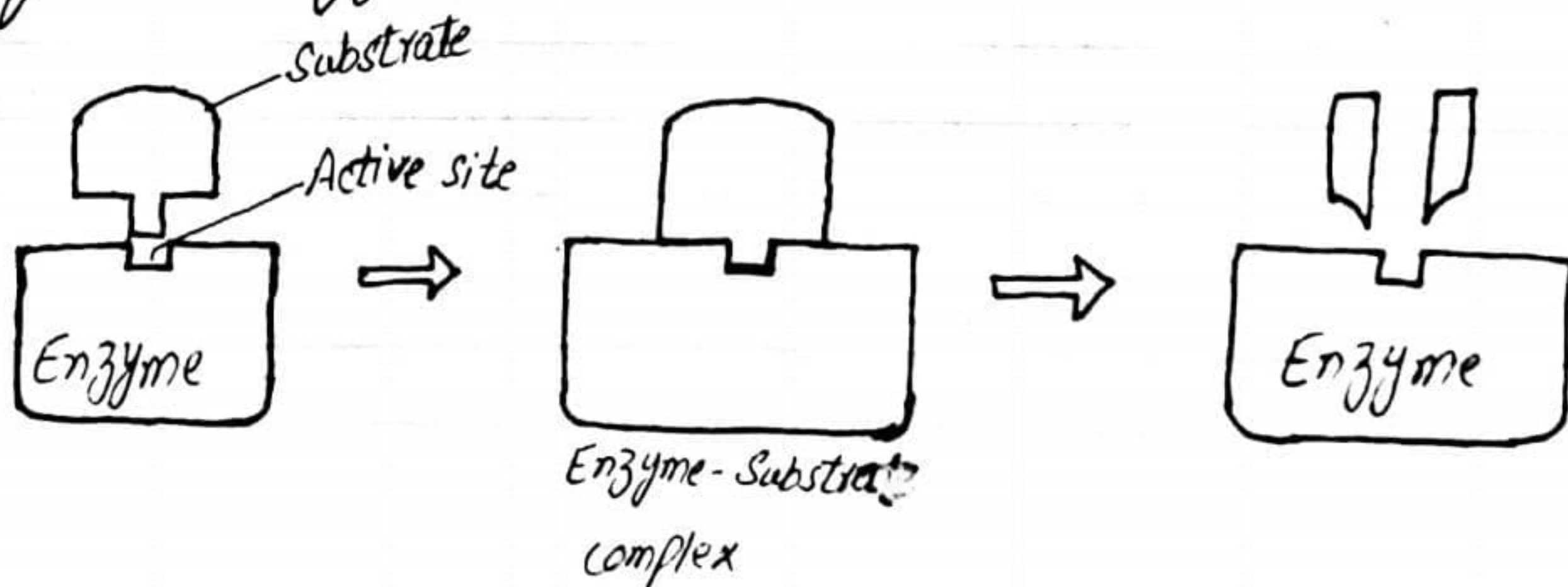
pakcity.org

(vi) Describe lock and key mechanism of enzyme action.

In 1894, a German chemist Emil Fischer proposed a model called lock and key model.

This model states that "both enzyme & substrate have specific shape and they exactly fit in one another."

Basically, this model explains the specificity of an enzyme.



(vii) What is the main use of enzyme in paper industry?

The main use of enzyme in paper industry is:

It breaks starch to minimize its viscosity that is used in paper production.

(viii) Define Co-factor & Co-enzyme.

→ The non-protein part of the enzyme is known as Co-factor. It is responsible for the proper functioning of enzyme.

→ If non-protein part is loosely attached to the protein part it is called Co-enzyme.

(ix) Shortly explain the only property that all the lipids have in common.

→ The only property that is common in all lipids is hydrophobic.

→ The word hydro means 'water' & phobic means 'hating'. Hence, it's mean that hydrophobic is a "water hating".

→ Due to this property lipids are insoluble in water.

→ Due to this they prevent to form bond with hydrogen & from being electrically charged.

(xiii) Explain the structural components of DNA & RNA.

There are three main structural components of DNA & RNA.

① Five Carbon Sugar or Pentose Sugar.

② Nitrogenous bases.

③ Phosphate group.

DNA & RNA have little change in nitrogenous bases & in 5-C sugar.

DNA contain Thymine, Guanine, Adenine & Cytosine while RNA has Uracil instead of thymine. RNA contains Ribose sugar while DNA contain deoxyribose sugar.

(IX) Define lipids & state the difference b/w fat and oil.

→ The word lipid comes from Greek word lipos means fat.

→ Lipids are naturally occurring organic compounds present in animals & plants.

→ They are composed of glycerol & fatty acids.

Fats: They have high melting & boiling point.

Lipids containing saturated fatty acids are called fats. They are solid at room temperature.

Oil:

"Lipids containing unsaturated fatty acids are called oils." They are liquid at room temperature.

They have low melting & boiling point.

Briefly state how vitamin D is formed in human body?

Dehydrocholesterol-7 is a naturally occurring molecule in human skin. When sun light falls on the skin this molecule is converted into Vitamin - D.

→ It is also produced by vitamin-D fortified milk.

(X) State the difference b/w the chemical structure of DNA & RNA?

DNA
→ It is a double stranded

RNA
→ It is single stranded.

- It contains ribose sugar.
- Adenine, Thymine, Guanine and cytosine nitrogenous bases are present.
- It contains deoxy ribose sugar.
- Adenine, Uracil, Guanine & Cytosine are presents.

(xi) Briefly state why minerals are important for human life?

Minerals are important for human life due to some following reasons:

- They maintain all physiological processes.
- They act as a catalyst.
- They are responsible for the transmission of message.

(xii) Name different routes for the loss of Zinc from human body?

Different routes for the loss of zinc from human body are:

- Through gastrointestinal tract
- Through biliary & intestinal secretion.
- Through urine & by surface losses.

Q3. Give detailed answers for the following questions.

(i) Describe different classes of Carbohydrates. Organic compounds containing Carbon, Hydrogen & oxygen are called Carbohydrates.

- They have general formula $C_n(H_2O)_n$.
- Carbohydrates are polyhydroxy compound of aldehydes or ketones.
- Carbohydrates are classified into three types.

Mono Saccharides:-

"Those carbohydrates which do not hydrolyze into simpler unit are called monosaccharides."

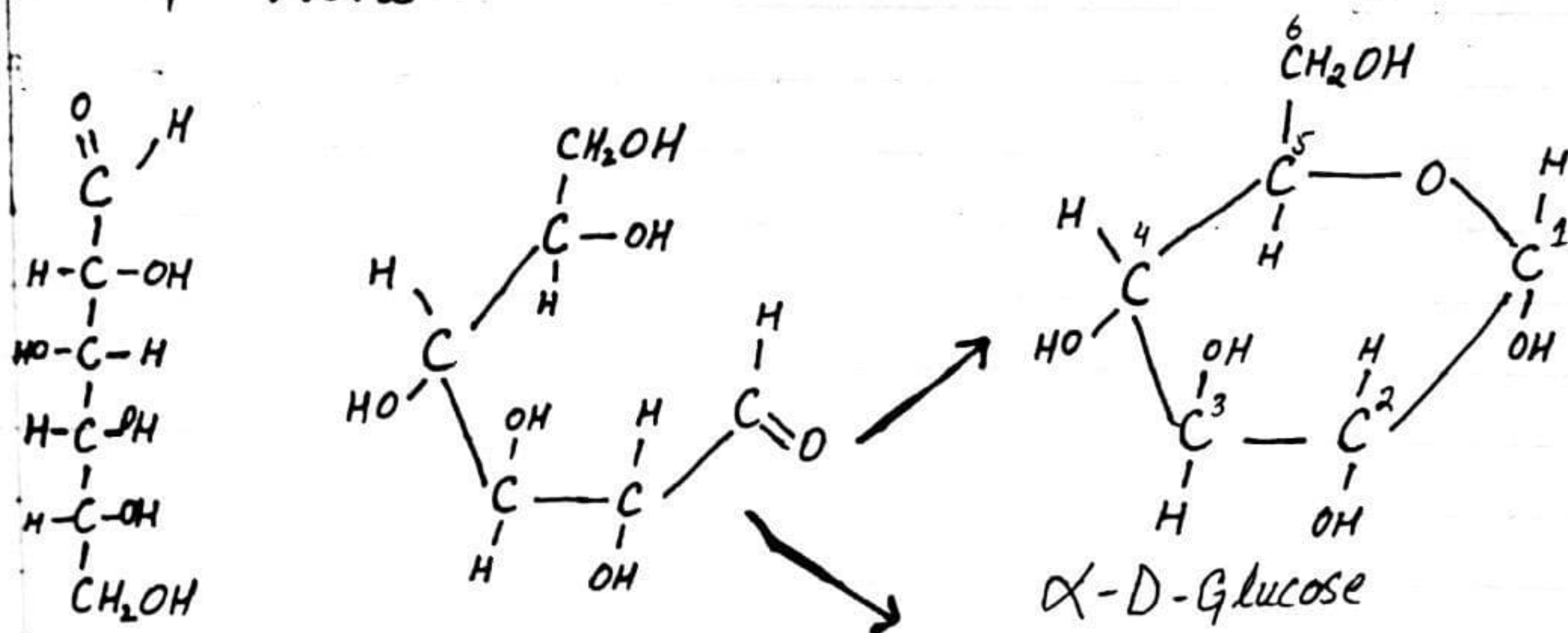
e.g

Glucose, Galactose & Fructose.

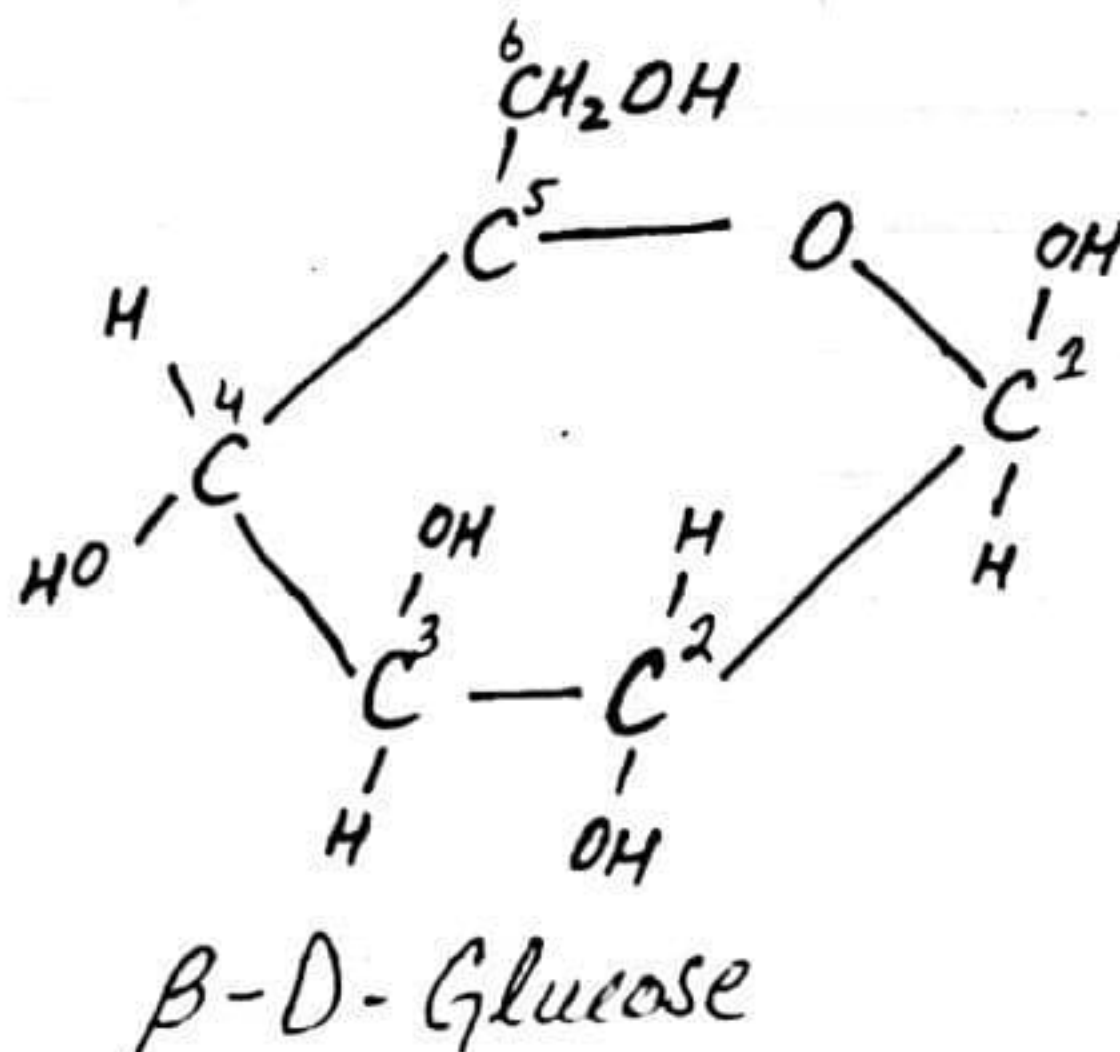
→ Glucose is naturally present in honey & corns.

→ Galactose can be found in milk & dairy products.

→ Fructose can be obtained from vegetables & fruits.



Glucose



→ Glucose contain aldehydic group.

⑥ Disaccharides:-

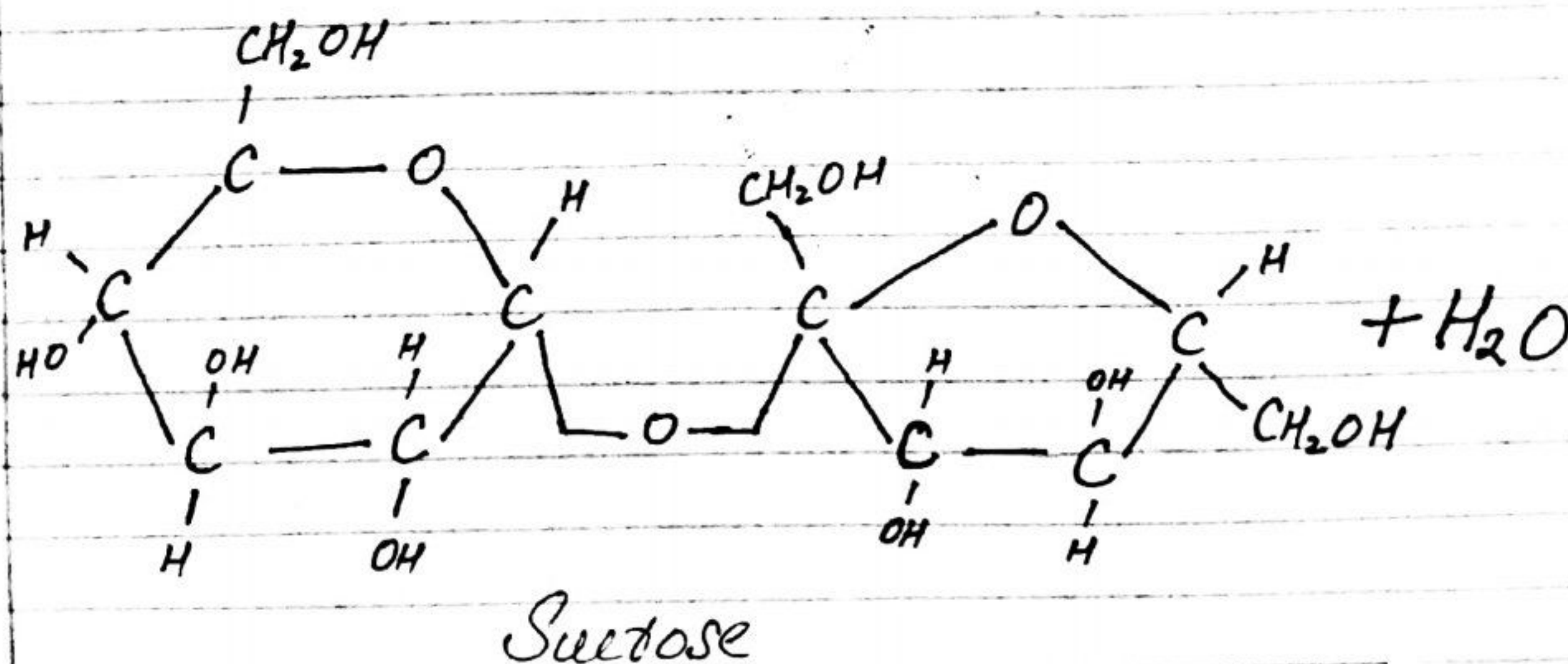
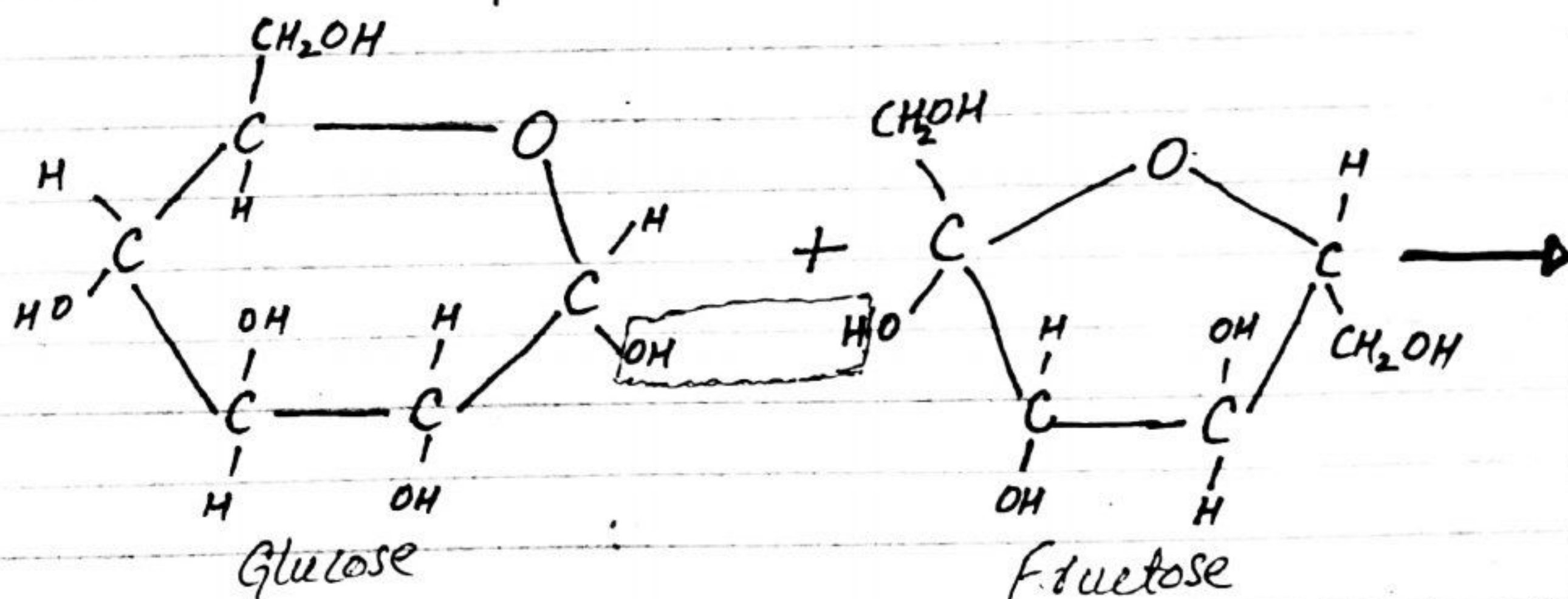
"Two monosaccharide molecules bonded together to form disaccharide."

e.g Lactose, Maltose & Sucrose.

→ Lactose can be found in milk.

→ Sucrose is present in Sugar cane, sugar beet, mango, pineapple, almond & apricot.

Sucrose = Glucose + Fructose

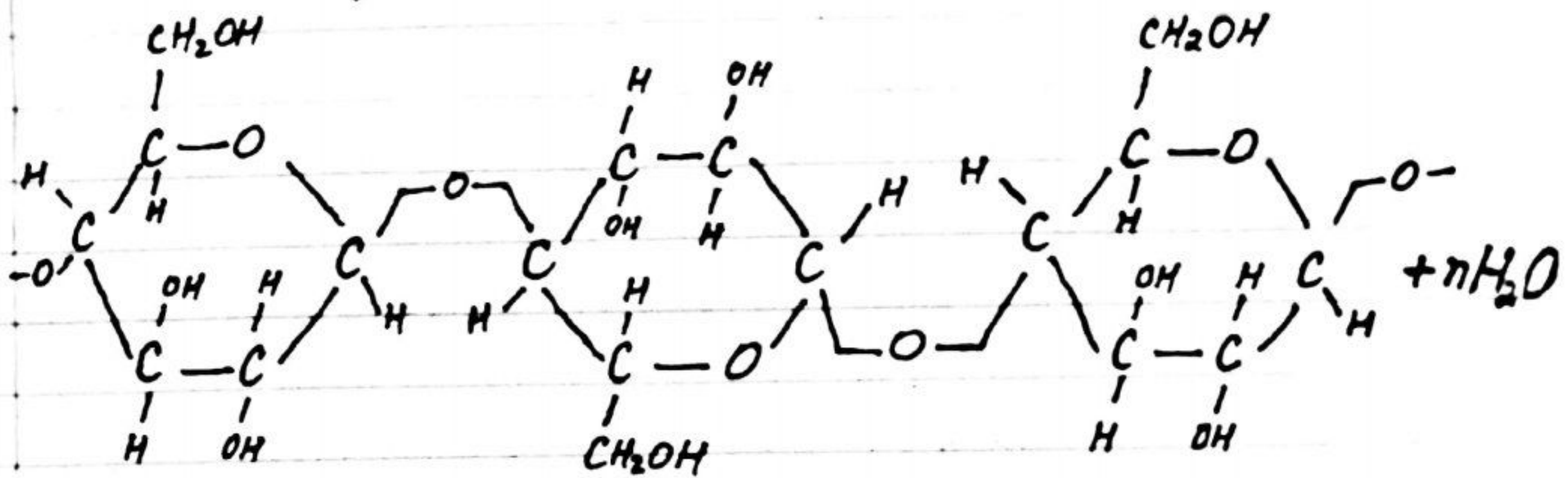


© Polysaccharide:-

The carbohydrates that give monosaccharides on hydrolysis are called polysaccharides.

e.g Starch & Cellulose.

Structure of cellulose is:



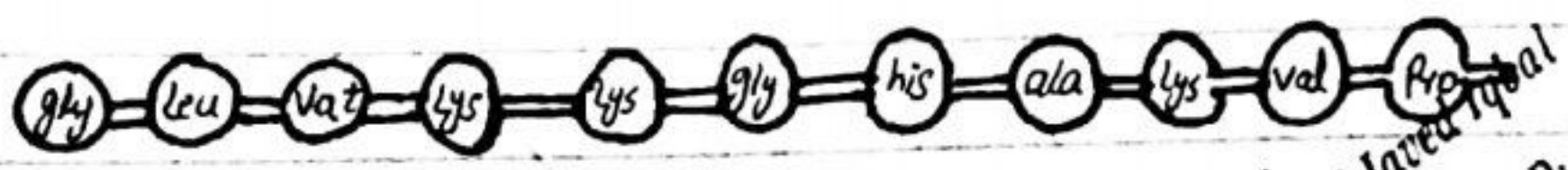
Q. (2) Explain the structure of proteins.

"Those molecules that yield amino acids on complete hydrolysis are called proteins."
 → The structure of protein depends upon arrangement of polypeptide chain.

The four structures of proteins are:

(i) Primary structure:-

"That structure which contains the sequence of amino acid in a peptide chain is called primary structure."

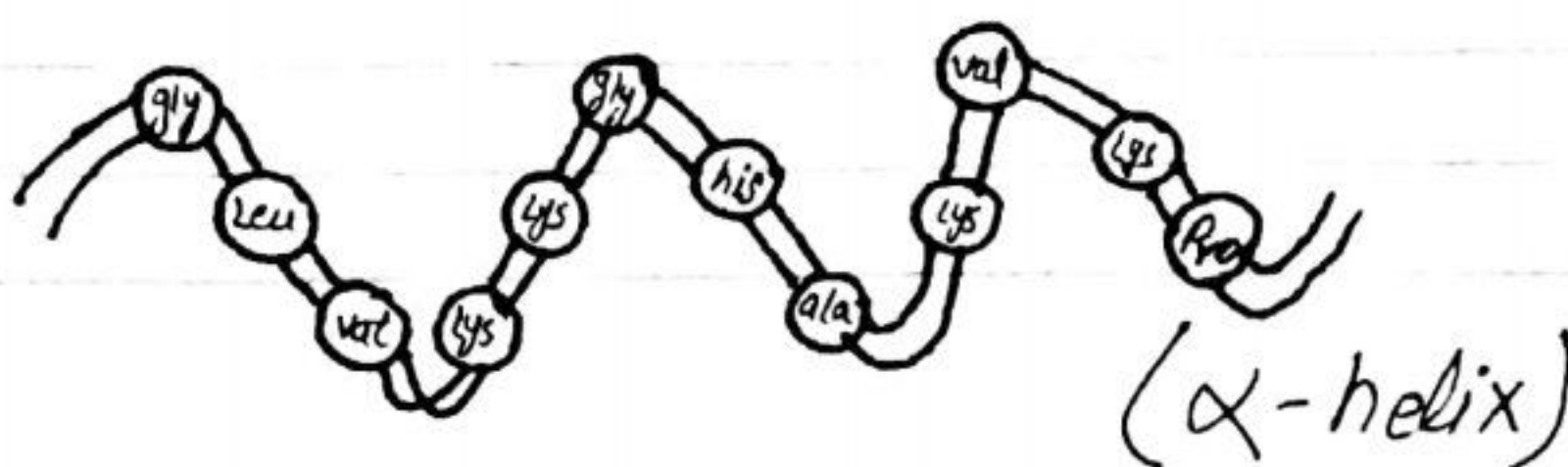


(Amino acid sequence)

Muhammad Javed Iqbal
 OD Chemistry
 Askaria Colleges Rwp.

(ii) Secondary structure:-

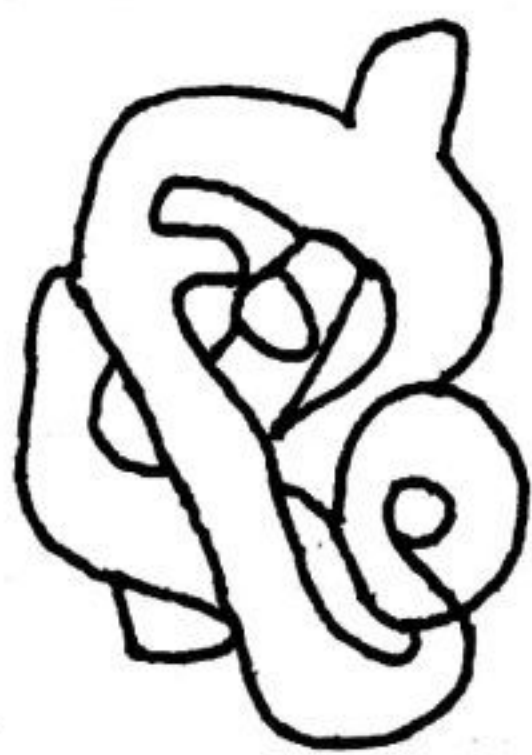
"That structure in which polypeptide chain is in spiral or zig-zag fashion is called secondary structure."
 → Hydrogen bonding is present in it.



©

Tertiary structure:-

That structure in which polypeptide chain is present in the form of folding or in twisting manner is called tertiary structure."



(folded peptide)

④

Quaternary proteins:-

That structure in which protein is present in multi-subunit complex is called Quaternary structure."



(Protein having more than one Amino Acids)

Q3 What is the nutritional importance of Lipids?

The nutritional importance of lipids are:

- They provide energy to our body.
- They gives more calories as compared to carbohydrates.
- Our body needs fats to absorb fat-soluble nutrients such as Vitamin A, D & E.
- They help to lower the blood cholesterol level.
- Omega-6 & omega-3 helps in hormone synthesis & for healthy brain.
- Omega-6 & Omega-3 can be obtained from vegetables and walnuts respectively.
- Some lipids help to reduce the risk of heart disease.

→ Cholesterol is a food of some fatty animals.

Q.4 Explain the structures of Nucleic Acid.

The molecule that preserve heredity information and that transcribe & translate information in a specific way is called nucleic acid."

→ The structure of nucleic acid was found by P.A. Levene.

There are two types of nucleic acid

- ① Deoxy Ribo Nucleic acid (DNA)
- ② Ribo Nucleic acid (RNA)

Deoxy Ribo Nucleic acid (DNA):

→ It is made up of repeating units called nucleotides.

→ It contains three main components.

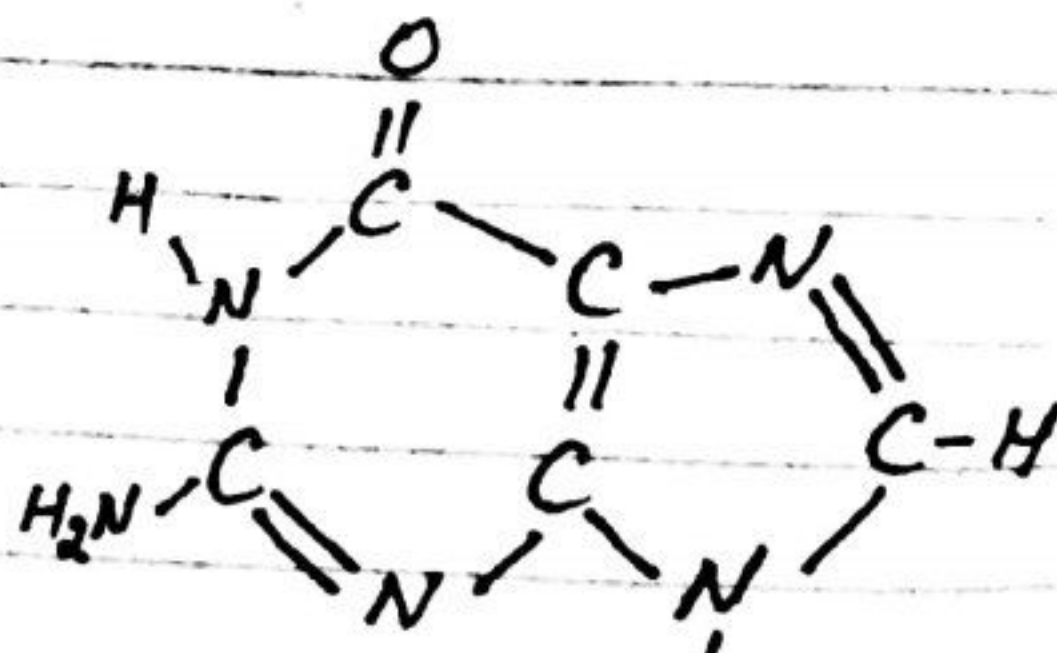
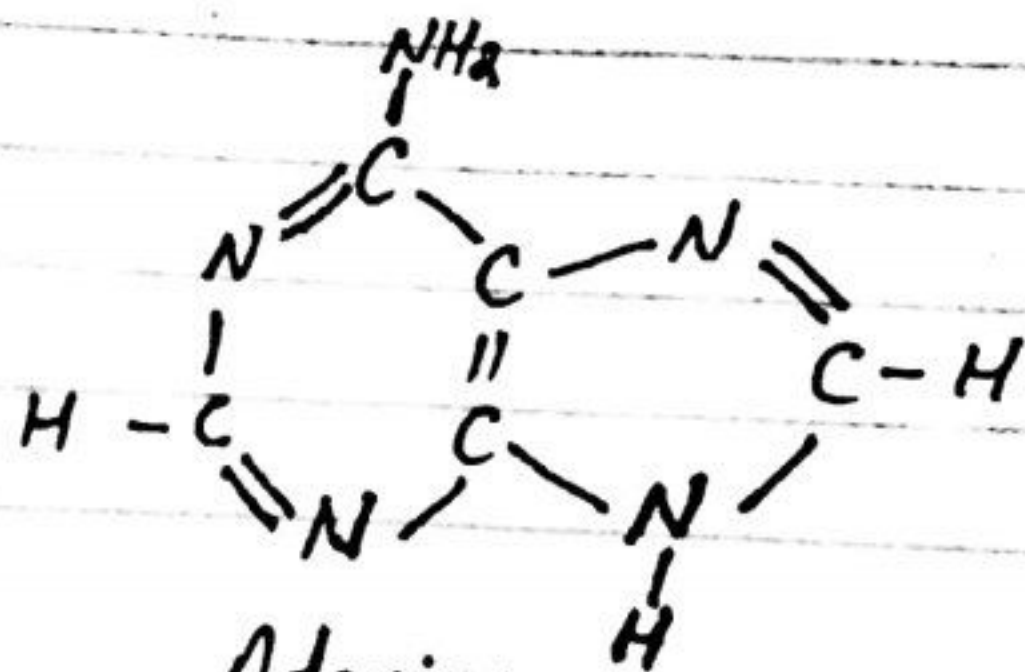
- ① Five Carbon Sugar or pentose sugar.
- ② Nitrogenous bases.
- ③ Phosphate group.

→ DNA is a double stranded.

→ PO_4 group is attached at 5' end and $-\text{OH}$ group is attached at 3' end of the DNA molecule.

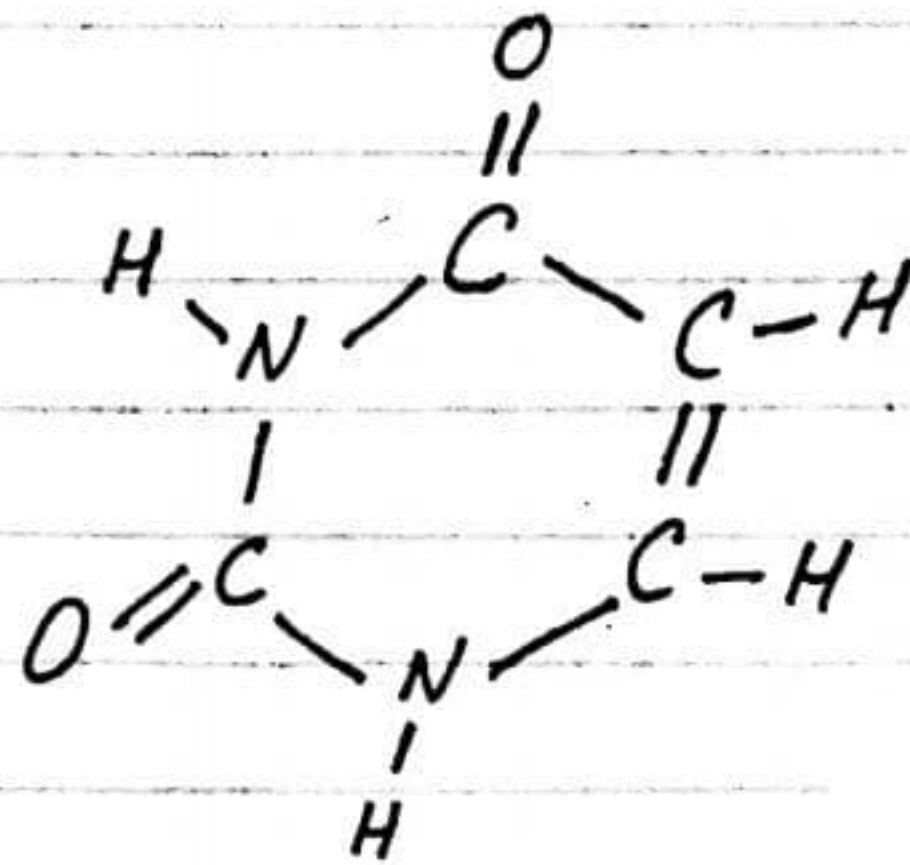
→ It contains purines & pyrimidine.

* Purines contain Adenine & Guanine.



Ribo Nucleic Acid (RNA):

- It is a single strand.
 - It contains ribose sugar.
 - It contains purines & pyrimidine.
- In RNA, purines are same as purines in DNA. While in pyrimidine RNA contains uracil instead of thymine.



Uracil



Q.5 Describe four important minerals & their sources.

The four important minerals and their sources are:

① Calcium:-

- It is important for bone growth & formation.
- It is also important for blood clotting, nerve & muscles functioning.

Sources:-

It is found in milk, cheese, egg yolk, beans, nuts & cabbage.

Deficiency:-

Its deficiency can cause spasms of arms & legs muscles; bones softening, rickets, poor growth, osteoporosis & mental depression.

⑥ Iron:-

→ It combines with protein & copper to make hemoglobin.

Sources:-

It can be obtained from red meat, egg yolk, wheat, fish & mustard.

Deficiency:-

It's deficiency may result in fatigue, skin's paleness, constipation & anemia.



⑦ Phosphorus:-

→ It helps in metabolic processes.

e.g. contraction of heart muscles.

Sources:-

We can obtain phosphorus from egg yolk, cheese, milk & cabbage.

Deficiency:-

It's deficiency can cause bones' pain, irregular breathing, fatigue, anxiety, and skin sensitivity.

⑧ Zinc:-

→ It is important for immunity.

→ It maintains normal vitamin A level.

Sources:-

Zinc can be obtained from oyster, red meat, chicken, bean, nuts and dairy products.

Deficiency:-

It's deficiency may result in poor growth, rashes, hair loss, diarrhea, sterility, loss of appetite, poor learning ability and anemia.