

Chapter #13: Biochemistry sundas Saqib

Carbohydrates:- -most abundant class -Gen formula:- $C_x(H_2O)_y$ $6H_2O + 6CO_2 \xrightarrow{6O_2} C_6H_{12}O_6 + 6H_2O$ -monomers and polymers of aldehydes & ketones with numerous hydroxyl groups attached.	Sources of carbohydrates:- Monosaccharide $\rightarrow$ fruits, vegetables, cereals, honey Disaccharides: sucrose $\rightarrow$ sugarcane, sugar beet, fruits Maltose $\rightarrow$ cereals Lactose $\rightarrow$ dairy products Cellulose $\rightarrow$ plants (cotton) Starch $\rightarrow$ cereals (wheat, barley, rice, maize, potato, sweet potato etc.)	$\begin{array}{c} R \\ \\ NH_2 - C - COOH \\ \\ H \end{array}$ Carboxylic acid group. Amino group. Peptide linkage. $\begin{array}{c} O \\ \\ -C-NH- \end{array}$	Fatty Acids:- -Fats & oils refer to as simple lipids. -Esters of fatty acids with trihydroxy alcohol.	Fats A lipid is fat if it is solid at room temp. contain larger portion of saturated fatty acids units.	Oils A lipid is oil if it is liquid at room temp. contain larger proportion of unsaturated fatty acid units.
Classification:- Monosaccharides:- -simplest carbohydrates -cannot be hydrolyzed formula = $(CH_2O)_n$ $n = 3$ to 6 carbons. classified as trioses, tetroses, pentoses & hexoses etc. Glucose & fructose are simple sugars.	Uses of carbohydrates:- -store & transport energy. 1g of glucose gives 15.6 KJ energy. -serve as food source. -serve as structural materials for plants. cellulose is fibre in human diet. we can't digest it but it is imp. helps our intestines move food efficiently & absorbs toxic chemicals. -lower cholesterol, regulates blood pressure. -sucrose is used as common table sugar. -glucose stored in animals muscle & liver cells as glycogen. it serves as long term energy reservoir & can be converted into glucose when needed. -plants store energy as starch. -starch to make rectified spirit by fermentation process. -starch is converted to dextrin as adhesive for stamps & paper glue. -cattle, termites derive nutrition from cellulose.	Sources:- -meat, fish, eggs, milk, cheese. -pulses, beans etc. Uses:- -make muscles, hair, enzymes & repair body tissues. -essential for formation of protoplasm & components of cell. -physical & mental growth. -gelatin obtained by heating bone & tendons in water used in bakery goods. -enzymes catalyze specific biological reactions. -antibodies help to fight against diseases are large protein molecules.	glycerol for this they are called glycerides. -long chain carboxylic acids. -building blocks of lipids. Stearic Acid:- (beef fat) $CH_3-(CH_2)_{16}-COOH$ -more than 1 OH group is glycerol.	soap etc. Functions -vegetable oils are converted into vegetable ghee by catalytic hydrogenation. -manufacture of nail polishes & varnishes. -cholesterol is essential in our bodies for synthesis of several hormones. vitamin D & bile acids.	Hydrogenation:- Addition of hydrogen to an alkene. -takes place in presence of Ni, Pd, Pt as catalysts. -used to make ghee or margarine. -fatty acid component vegetable oils contain C-C bonds (double). When H is added they become saturated & harder.
$\begin{array}{c} H-C-OH \\ \\ H-C-OH \\ \\ H-C-OH \\ \\ H-C-OH \\ \\ CH_2OH \end{array}$ Glucose, aldohexose, aldehyde group.	$\begin{array}{c} CH_2OH \\ \\ C=O \\ \\ OH-C-H \\ \\ H-C-OH \\ \\ H-C-OH \\ \\ CH_2OH \end{array}$ Fructose, ketohexose, ketone group.	Proteins:- complex nitrogenous substances that produce amino acids on complete hydrolysis.	Sources:- -animals, plants marine organisms such as salmon & whales. -milk, butter, ghee, cheese, seeds such as sunflower, corn, cotton, & vegetable oils. Cod liver oil is obtained from salmon & whales.	Nucleic Acid:- -nitrogen containing compounds obtained from pus of infected wounds were called nucleic acid. -vital components of all life.	$C=C + H_2 \xrightarrow{Ni} \begin{array}{c} H \\ \\ -C- \\ \\ H \end{array} - \begin{array}{c} H \\ \\ -C- \\ \\ H \end{array}$
Dextrorotatory sugars:- Some monosaccharides can rotate the plane of polarized light to right (clockwise). Example:- glucose, mannose, galactose. Characteristics of monosaccharides -white crystallized solids. -soluble in water & sweet. -cannot be hydrolyzed. -reducing in nature. Oligosaccharides:- Carbohydrates upon hydrolysis form 2-10 molecules of monosaccharide a simple sugar. Prefixes di, tri, tetra indicate no. of monosaccharide unit. -white crystalline solids. -sweet taste, soluble in water. Glucose, Galactose, Raffinose.	Polysaccharides:- carbohydrates upon hydrolysis form 100-1000 units of simple sugars or polysaccharides.	Functions:- -transport & store oxygen & nutrients. -act as catalyst. -regulate imp. systems in our bodies.	Commercial use of enzymes:- -amylase used in bread making. -Protease & amylase used in detergents to remove food stains from clothes. -lactase in infant foods.	Functions:- -butter, ghee, oils used for cooking in animals layer of fat is present which acts as an thermal insulator. -protect delicate organs from shock & injury. -vitamin A, B, E, K which are essential for health. There are	found in every living cell. -serve as information & control centers. -long chains made up of nucleotides. Nucleotide components: i) Nitrogenous base ii) pentose sugar iii) Phosphate group.
		Characteristics:- high molecular weight polymers. -produce amino acids on hydrolysis.	Lipids:- component of plant or animal tissues that is insoluble in water but soluble in solvents of low	DNA Watson & Crick 1953 two strands twisted around each other.	RNA Walter Sieghed in 1969. single stranded structure.

water.
Glucose, Galactose,
Raffinose
Polysaccharides:- carbohydrates upon hydrolysis form 100-1000 units of simple sugars are polysaccharides.
- starch & cellulose.
- amorphous solids - tasteless
- insoluble in water
- non-reducing in nature

- regulate imp. systems in our bodies.
Characteristics:-
- high molecular weight polymers.
- produce amino acids on hydrolysis.
Amino Acids:- Building blocks of protein
Amino acids our body can synthesize are non-essential rest are essential amino acids.

infant foods.
Lipids:- compound of plant or animal tissues that is insoluble in water but soluble in solvents of low polarity.
- fats & oils
- cholesterol
- sex hormones
- phospholipids
- vitamin (A, D, E, K)

organs from shock & injury
- vitamins A, B, E, K which are essential for health. These are insoluble in water but soluble in lipids.
- provide energy
- manufacture of materials such as

DNA
Watson & Crick 1953
two strands twisted around each other called double helix.
made up of deoxyribose sugar, phosphate unit

Walter Siegel - ed in 1969
Single-stranded structure made up of ribose sugar, phosphate unit & a nitrogen base.

Vitamins:-	Fat Soluble	Water Soluble	Vitamins	Sources	Uses	Diseases	& nitrogen base.
In 1927, C. E. A. Bickman discovered. - necessary growth factors. ⇒ specific organic compounds required by our body to prevent diseases but cannot be produced by our bodies. - taken from diet.	- Dissolves in fat. Vitamin A, D, E, K. - Excess can be harmful. too much causes diseases toxic in excess	- Dissolves in water. Vitamin B, C if taken in excess, secreted out of body not toxic in excess.	A	Milk, butter, fish oils, eggs, fresh green vegetables	Eyes & Skin	Night blindness, Dry skin	carries genetic information
			B (group of vitamin)	whole meal bread, rice, yeast, liver, soybeans, vegetable.	Energy production in cells, nerves, skin	skin diseases, tongue inflammation, anemia, bleeding gums.	Guanine - cytosine Adenine - Thymine
			C	Oranges, lemons, tomatoes, fresh green vegetables.	Blood vessel gums, healing wounds, prevent colds	Scurvy	
			D	Milk, butter, eggs, fish oils	Bones, teeth	Rickets, osteomalacia.	
			E	Whole meal bread, rice, eggs, butter, vegetables	Antioxidant	Haemolysis of red blood cells, sterility.	
			K	Fresh green vegetables, liver.	Clotting of blood	Haemorrhage, delayed blood clotting.	

Side boxes:-

- some vitamins lose their vitamin contents when boiled such as rice, pulses, beans etc.
- Scientists take the human insulin gene for insulin production & paste it to the DNA of E. coli, a bacterium found in our digestive tract.
- 5% m/v aqueous solution of dextrose is used in drip. 5% m/v aqueous solution means 5g of dextrose dissolved in 100cm of water to form solution. This is given to a patient who is dehydrated or not allowed to eat.

SLOS Questions:-
Q:- what is protoplasm?
Q:- How vegetable oil is converted to ghee?
- Differentiate b/w fats & oil?
Q:- Differentiate b/w DNA & RNA?
Q:- Differentiate b/w water & fat soluble vitamins.
Q:- Write sources & uses of vitamins

Q:- what are polysaccharides? what are their properties?
Q:- How is glucose stored in our body?