

reactions similar to those of non-enzymatic browning.

Thursday
2-09-24

HEALTH :

Health is defined by WHO as a state of complete physical, social, and mental well-being. And not merely the absence of any disease and infirmity.

The essential requirement of health :

- optimal growth & development.
- Maintenance of structural integrity & functional capacity of body.
- Ability to withstand the process of aging with minimal loss of ability.
- Ability to fight diseases by resisting infection.
- ~~Ability to fight disease~~
- Resisting the effect of ~~not~~ environmental pollutants & toxins.

#

Nutrition

Latin word.

It is derived from a Latin word which means feed, nourish and is a science of foods, nutrients & other substances they contain and their actions within the body.

#

Malnutrition

Malnutrition • results from lack, excess or imbalance of nutrients in the diet. It includes undernutrition & over nutrition.

- undernutrition is ↓
Insufficient supply of essential nutrients and
- overnutrition refers to excess intake of one or two nutrient.

#

what are nutrients?

Nutrients are substance required by the body to perform its basic functions. Most nutrients are obtained from our diet since the human body does not synthesize or generate in our body.

Nutrient provide 3 major functions to our body.

- They provide energy & contribute to body structure & regulate chemical processes in the body.
There are 6 classes of nutrients required for body to function properly:

carbohydrates	vitamins
lipids	minerals
proteins	
water	

Food may also contain non-nutrients such as:

- anti oxidants
- phyto chemicals
- Natural toxins or additives

Macronutrient:

Nutrients that are needed in large amount are called ~~as~~ macronutrients.

There are 3 class of macronutrients:

- carbohydrates
- lipids
- proteins.

Micronutrients:

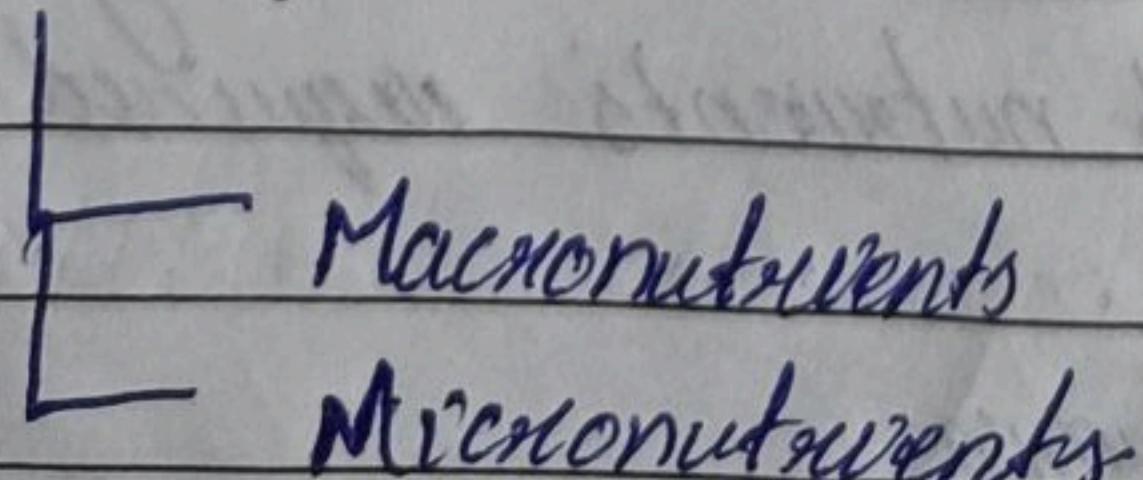
Nutrients that are smaller amount.

Micronutrients are essential for carrying out ~~body~~ bodily functions but are required by body in smaller amount.

They include:

- vitamins
- minerals.

1) Classification of foods on the basis of nutrients



Classification of food :

2) By origin —

Plants

Animals

Direct

Indirect

3) By Function (3 types)

① → Energy yielding food : This group includes food rich in carbohydrates, fats, Proteins.

(i) cereals, pulses, roots & tuberous

(ii) Fats, oils, pure carbohydrates (sugar)

^{building}

② → Body building food : Food such in proteins

↳ Milk, egg, meat & fish are such in proteins & have all essential amino acids.

↳ Pulses, nuts, oilseeds are such in proteins but not contain all amino acids

③ → Protective foods : Food such in proteins, vitamins & minerals have regulatory functions in body like maintaining heart beat, water balance temp. etc.

Protective foods: They are classified into two types

- Foods such in vitamins, proteins, minerals
 - 1 have high biological value.
(fish, milk, egg)
- Foods such in certain vitamins & minerals only.
(green leafy vegetables & fruits)

4) on the basis of nutritive value (5 types)

- ① — Cerele grains & products - they include food like rice, wheat, ~~mango~~, barley, oats, etc.
 - Main nutrients provided are energy, proteins, fats, vit. (B₁, B₂), folic acid, iron & fibers.

And provide 70 - 80% of calories.

- ② — Pulses and legumes : It include foods like Dals. They are rich in energy, proteins, fats, vitamin (B₁, B₂), folic acid, calcium, iron & fibers.

19-24% of calories.

- ③ — Milk & meat products

(4)

Fruits & vegetables

- vitamins, minerals,
- Phytochemicals (disease preventing)

(5)

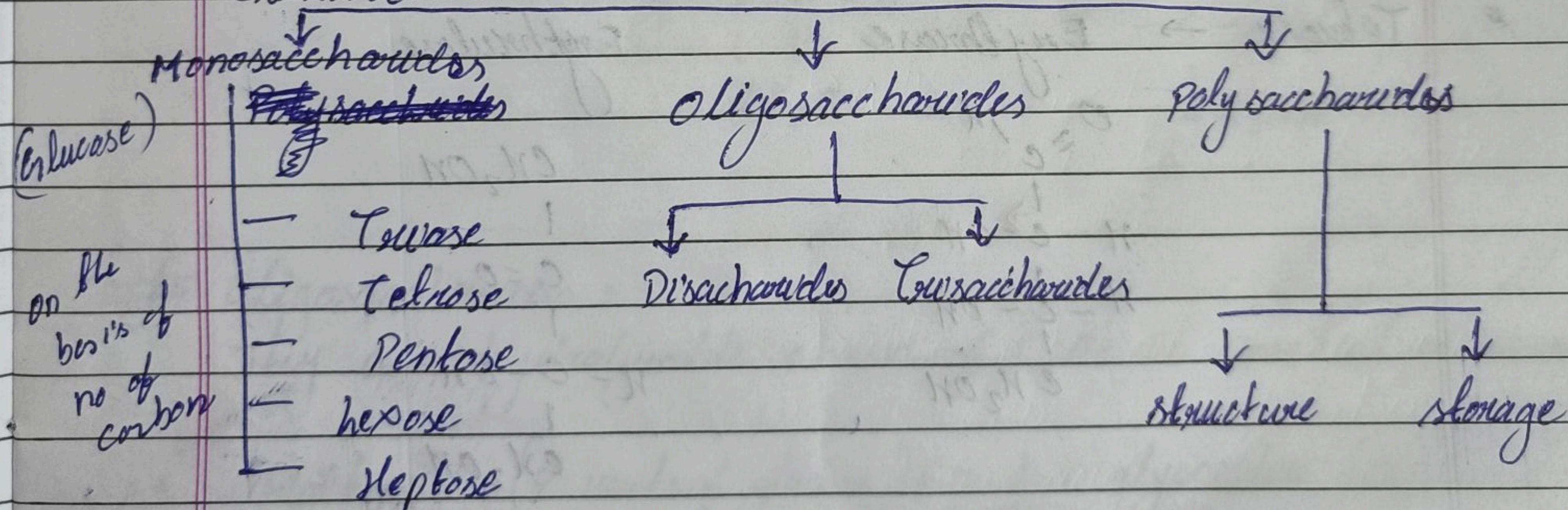
Fats & sugars

- fat soluble vitamins

18-09-24# carbohydrates (hydrates of carbon) $[C_x(H_2O)_y]$

Define → Carbohydrates are poly hydroxy aldehyde or ketone or the compounds that can be hydrolysed to them.

Classification



Monosaccharides.

These are simplest carbohydrates that cannot be hydrolysed further.

Aldose

Ketone

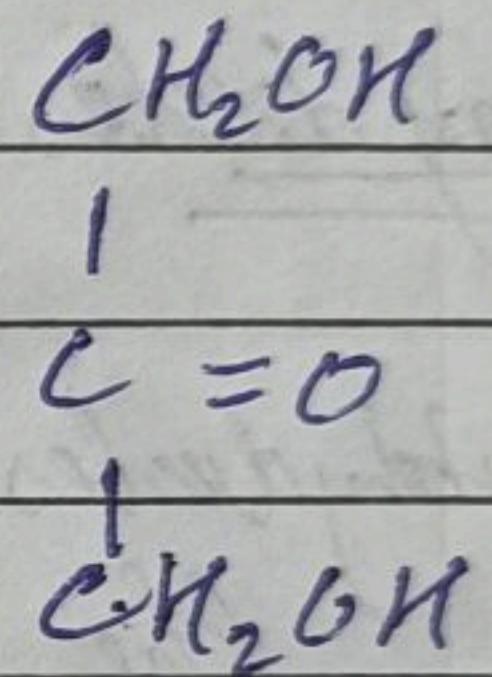
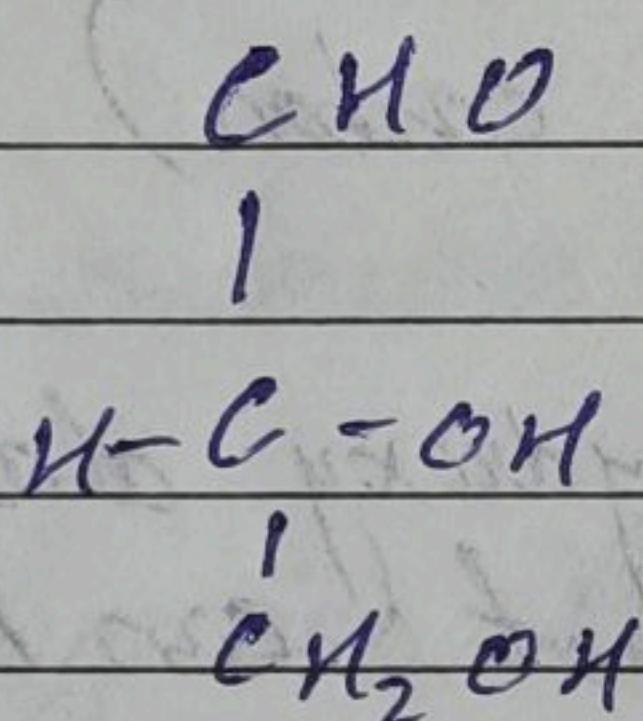
on basis of group.

Monosaccharides

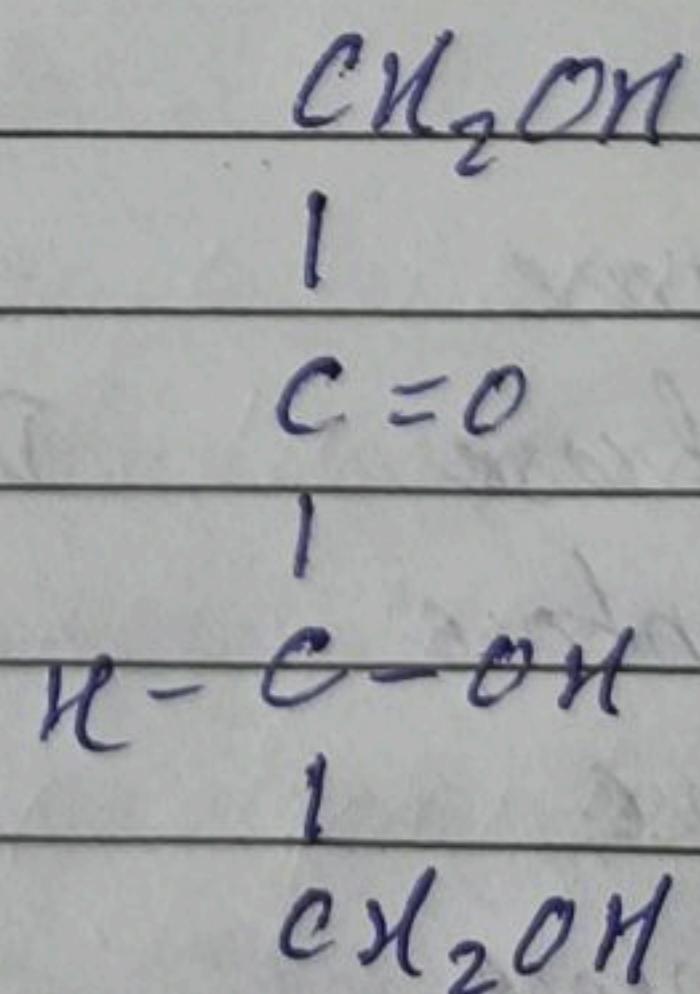
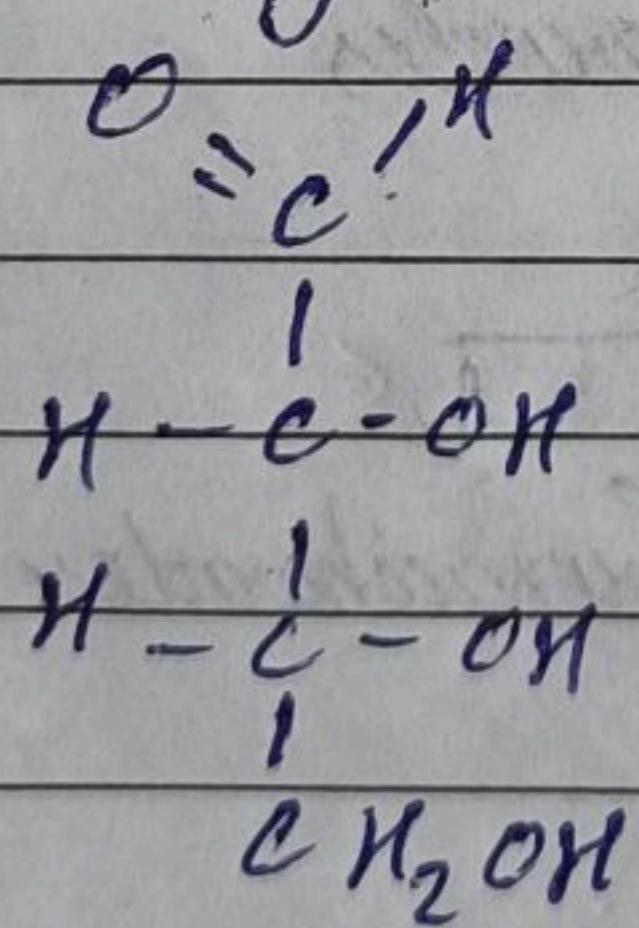
on the basis of group

Aldose
ketose

* Glucose \rightarrow Glyceraldehyde · Dihydroxyacetone



* Fructose \rightarrow Erythrose Erythulose



#

aldose

ketose

Tetrose

4C - Erythrose

Erythulose

Pentose

5C

Ribose

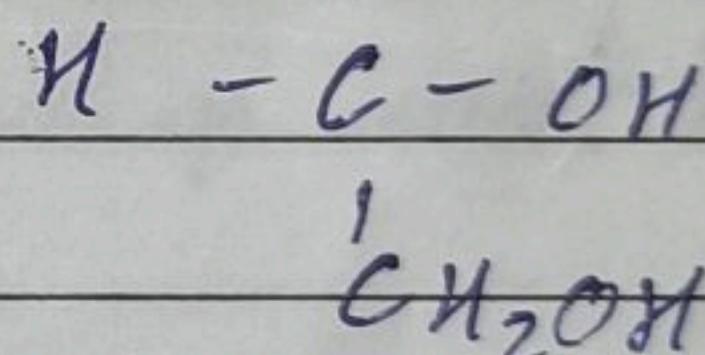
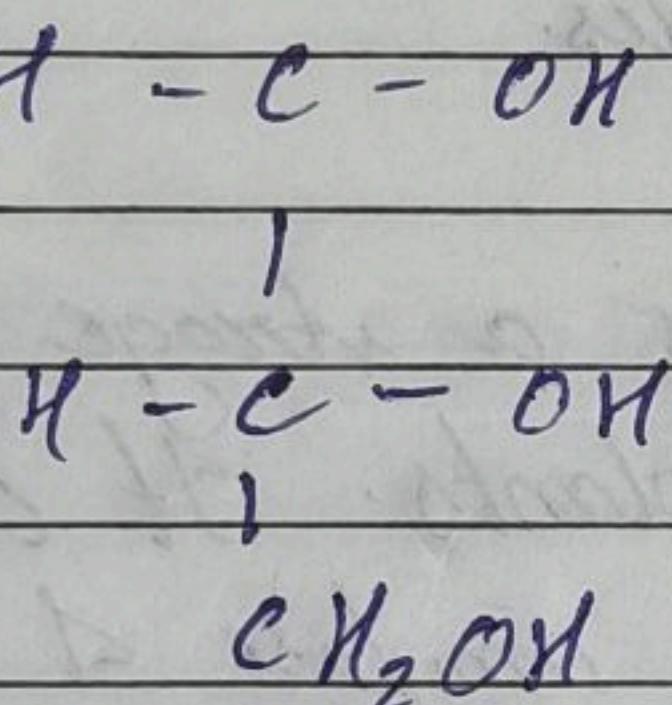
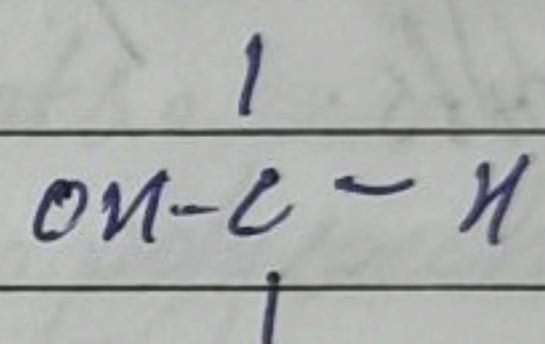
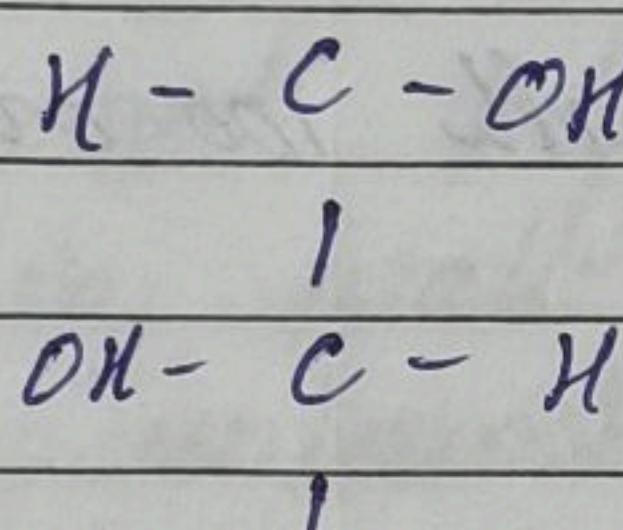
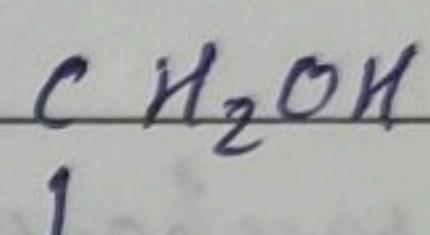
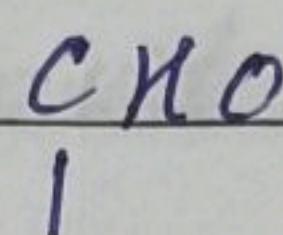
Ribulose

Hexose

6C

Glucose

Fructose



Oligosaccharides :

They are hydrolyzable chain of 2-10 units (monosaccharides)

• Maltose (2 units of glucose) $\xrightarrow{\alpha-1,4}$ glycosidic linkage• Lactose (Glucose + galactose) $\xrightarrow{\beta-1,4}$ glycoside "• Sucrose (Glucose + Fructose) $\xrightarrow{\alpha-1,2}$ glycoside "

Reducing sugar

Non-reducing sugar

- one free ketone group available.

~~sucrose~~
Maltose, lactose,
monosaccharides.

Maltose sucrose
lactose

Polysaccharides

They are polymers with 100 or 1000 monosaccharides units.

* storage polysaccharides

- starch - It is a storage form of glucose in plants. It contains mixture of amylose & amylo pectin

→ Amylose is linear unbranched polymer of α -d glucose units in repeating sequence of $\alpha-1,4$ glycosidic linkage.

→ Amylo pectin is the branched polymer of α -d glucose with $\alpha-1,4$ glycosidic linkage and $\alpha-1,6$..

That occurs at interval of 25-30 glucose residues

→ Glycogen is the storage form of glucose in animals. It is highly branched form of amylopectin, α -1,4 branching occurs every 8-10 glucose residues. and ~~that~~ later are in glycosidic linkage.

wednesday
18-09-24

* structural polysaccharides

A] Homo polysaccharides

(i) The most abundant polysaccharides is cellulose

$\xrightarrow{\text{cellulose}}$ It is present in wall of plants.

It is linear - unbranched homo polysaccharides.

(ii) Chitin

It is a linear - homo polysaccharide and is present in exoskeleton of insects.

B] Hetero polysaccharides

→ These are composed of repeating disaccharides units that consists of acidic sugar - linked with amino acids sugar

→ Hyaluronic acid → It is present in eye & synovial fluid

Ex heparin - It is anti-coagulant

Function of Carbohydrates:

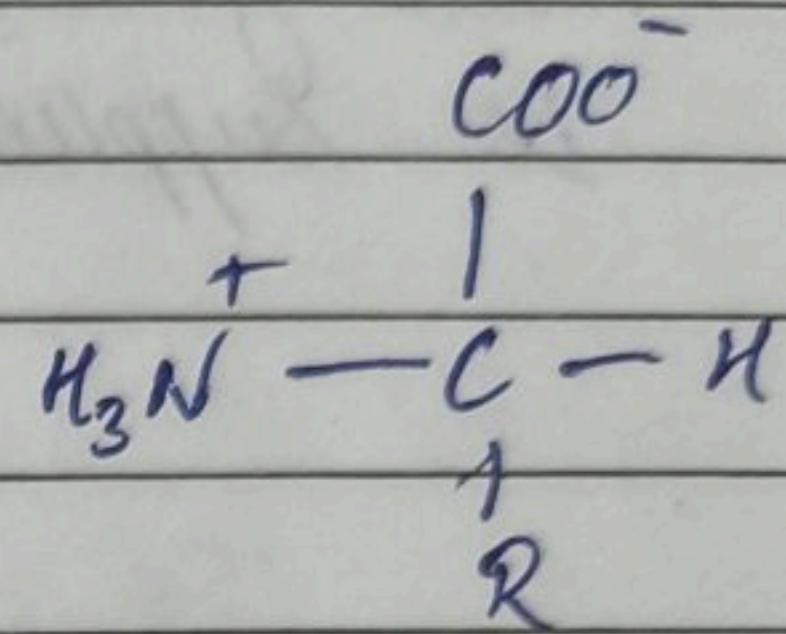
- i) Provides instant energy to body.
- ii) Act as reserve food for body emergency.
- iii) They form other biomolecules like fat.
- iv) It helps in detoxification of body.
- v) It acts as constituent of genetic material.
- vi) Gives mechanical strength to body.

Protein & Its classification :

Proteins are polymer of amino acids, there are compounds containing C, H, O, & N.

They ~~are~~ serve as monomers of protein and are composed of :

- Amino group.
- carboxyl ~~atom~~ group
- Hydrogen atom
- & a ~~one~~ side chain



A] Proteins : on the Basis of side chain
on presence of R-group

Basic amino acid	aromatic amino acid	Non-polar amino acid	Polar amino acid	acidic amino acid
-Lysine	-Phenylalanine	-glycine	-serine	-Glutamate
-Arginine	-Tyrosine	-Alanine	-Threonine	-Aspartate
- Histidine	-Tryptophan	-Valine	-Cysteine	
		-Leucine	-Asparagine	
		-Isoleucine	-Glutamine	
		-Methionine		
		-Proline		

37

Based upon the nutritional requirements amino acids are divided into 3 groups:

(i)

Essential amino acids: These amino acids that are non synthesised in the body and are required to be supplied in the diet.

There are 8 essential amino acids:

- Methionine
- Threonine
- Tryptophan
- Valine
- Leucine
- Isoleucine
- Lysine
- Phenylalanine

(ii)

Semi-Essential amino acids: These are not essential for normal body functions, but requirement increases during growth, pregnancy & lactation.

For example:

- Arginine
- Histidine

(viii) Non-essential amino acids : These are generally synthesised by the body & are not required in diet.

- Glycine
- Alanine
- Asparagine
- Glutamine
- Proline

c) Based on shape & solubility :

(i) Fibrous : These are long rod-shaped molecules that are insoluble in water & physically tough.
For example : Keratin

↳ protein present in hair
skin & nail.

(ii) Globular : These are compact spherical molecules that are usually water soluble.

ex : Hemoglobin
Myoglobin

Protein are classified in two forms :

(i) Simple protein : contains only amino acids.

(vi) Conjugated Protein : ~~not~~ consists of simple protein combined with non-protein component.
Thus can be a carbohydrate or a metal ion.

Function of Protein :

- Growth & development of body
- Replace worn out cells
- Muscle building
- Transport of various gases, waste products & Biomolecules.
- Regulation of Body Functions
- Protein acts as storage of Iron & calcium
in the form of haemoglobin & Caeser (\rightarrow in milk)
- Provides defence to the body in the form of antibodies.
- Helps in muscle contraction (Actin & Myosin)

Biological value of Protein:

It is the measure of proportion of absorbed protein from a food which becomes incorporated into organisms body.

It is a number from 100 to 0.

like protein in eggs have highest Biological value

O.O. 94

Lipids :

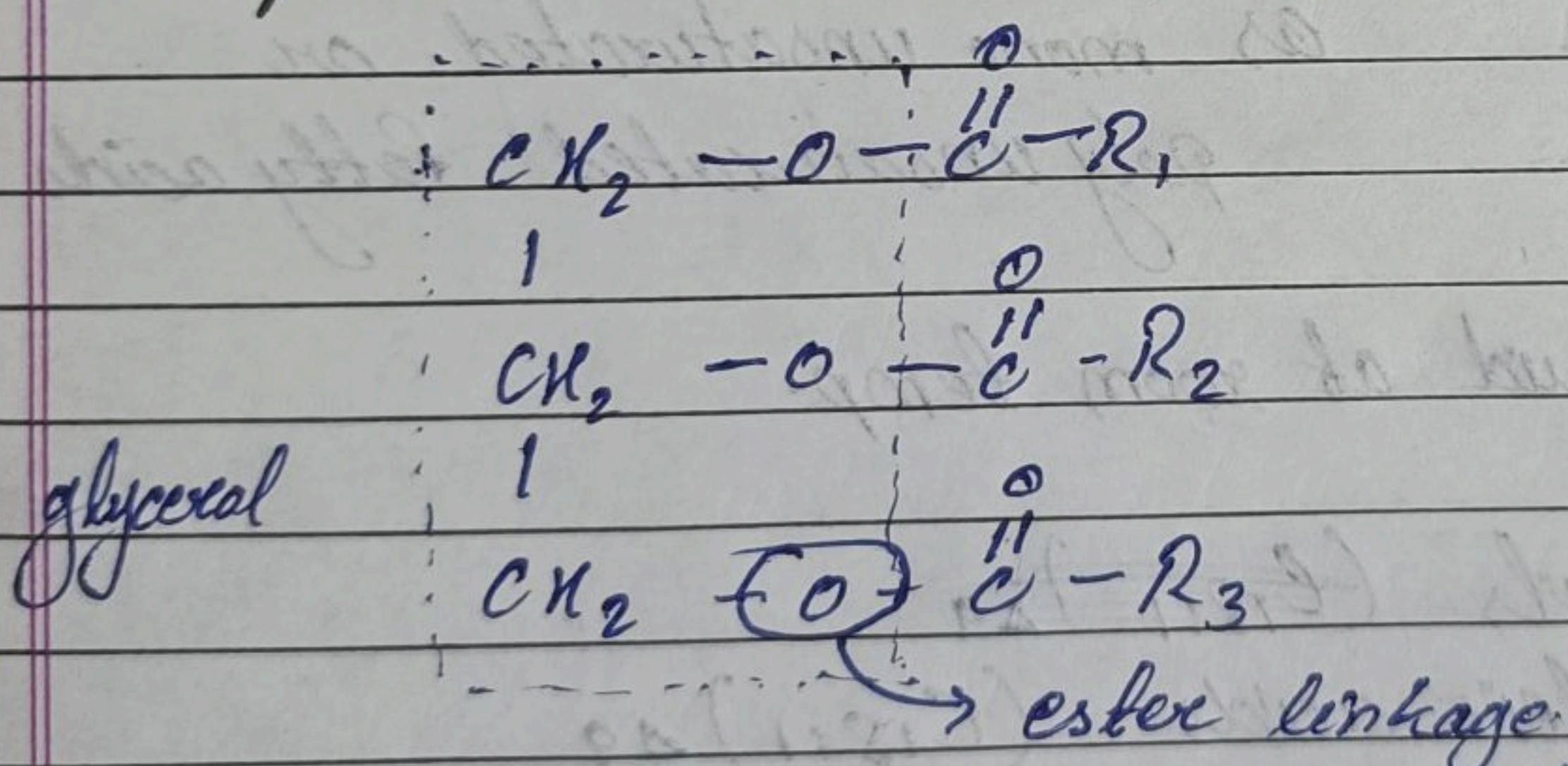
They are chemically diverse group of organic compounds insoluble or poorly soluble in water and readily soluble in non-polar solvents such as chloroform, ether, Benzene.

They are hydrophobic in nature

Lipids are classified into three categories:

- (i) Simple
- (ii) Complex
- (iii) Derived

(i) Simple (Fats & waxes)

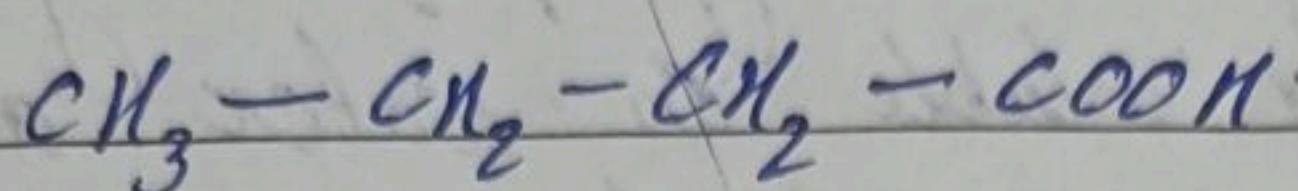


(a) Fats : They are esters of fatty acids with glycerol. They are also known as triglycerides.

Fatty acids : They are simplest form of lipids & they have long NC chain of carboxyl group. They are divided into two categories :

- saturated fatty acids
- unsaturated fatty acids.

- saturated fatty acids: they have no double bonds in their chain.



ex: 12C - lauric acid

14C - Myristic acid

16C - Palmitic acid

18C - Stearic acid

They are solid at room temp.

- unsaturated fatty acids: they have one or more double bond & are called as mono unsaturated or poly unsaturated fatty acids

These are liquid at room temp.

Example : oils (~~C_{18:1}~~)₂₉

oleic acid (C_{18:1})₁₉

linoleic acid (C_{18:2})_{19,12}

linolenic acid (C_{18:3})_{19,12,15}

Arachidonic acid (C_{20:4})_{15,8,11,14}

- (b) Waxes: They are esters of long chain of saturated & unsaturated fatty acids with long chain alcohol.

(ii) Complex lipids

These are esters of fatty acids containing groups like phosphoric acid, carbohydrate group in addition to alcohol and fatty acid.

Example : glycolipid
phospholipid.

(iii) Derived lipids

They consists of fatty acids, glycerol and sterol

Example : cholesterol
vitamin D

* Fatty acids

Essential Non-Essential

(a) Essential Fatty acids

These fatty acids cannot be synthesised in body and need to be taken in diet.

Example : linoleic acid
linolenic acid
Arachidonic acid

These are also known as poly unsaturated fatty acids
Its sources are fish, walnut, flaxseed.

They promote growth & maintain integrity.

(b) Non-Essential fatty acids

These fatty acids can be synthesised by body.

Example : Palmitic
Stearic

Functions of lipids

- They serve as storage form of metabolic fuel.
- They serve as transport form of metabolic fuel.
- They provide structural component of membrane
- They have protective action in bacteria & insects
- Biological lipids serve as pigments, hormones ; signalling molecules & as co-factors.

Fruits and vegetables

Minimal Processing:

(i) Sorting & Grading

↳ on the basis of density, size & they are sorted

Grading - differentiated on the basis of quality.

(ii) washing:

using water or using chemicals:

→ Sodium hypochlorite (1x.)
→ Potassium permanganate.

(iii) Size reduction:

- ↳ Peeling removing unwanted material (improve appearance)
- ↳ Pitting removing middle seeds part (inseparable)
- ↳ Slicing

Types of peeling : (5)

- (i) Flash peeling: used for root crops. (heat treatment)
- (ii) knife peeling (hand): used for citrus & fruits.
- (iii) Abrasion peeling: mainly for potato
- (iv) Caustic peeling: used for guava (lye peeling) caustic soda used
- (v) Flame peeling: used for onion & garlic.

(iv) Blanching: mild heat treatment to inactivate enzymes.

- Polyphenol oxidase is major enzyme that causes enzymatic browning in fruits.
- Pectin Methyl Esterase | These removes the cloudiness, Polygalacturonase texture & flavours in fruit juices.
- Boiling water or steam is used for blanching.
- Green colour also enhances during blanching.

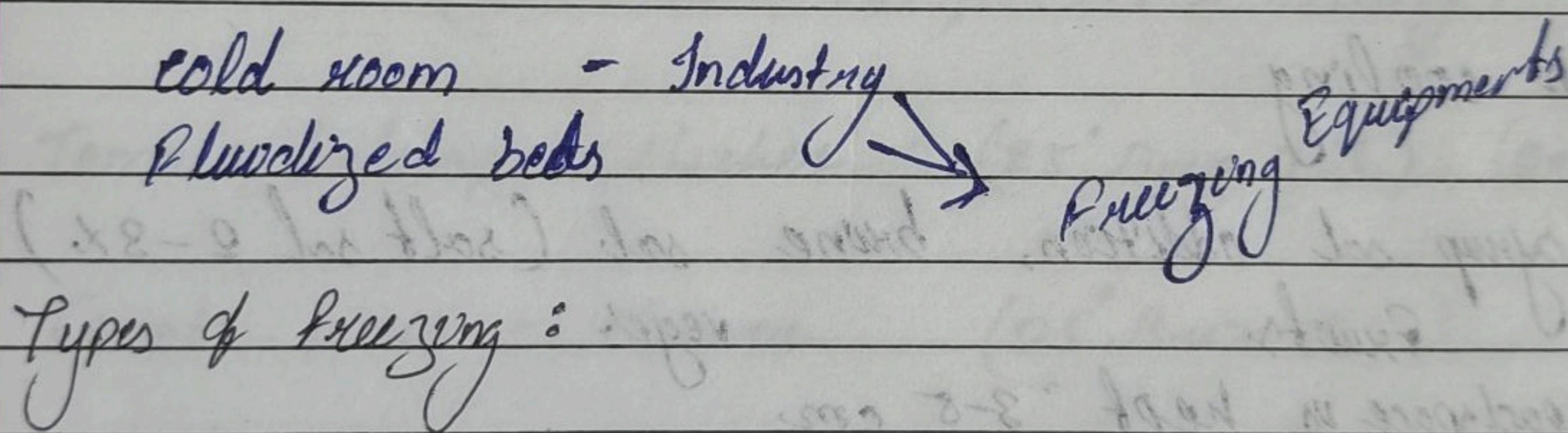
(v) Ripening

Ethylene causes ripening.

- Fruits are generally removed unripe from crops improving shelf life.
- Ripening is done according to requirement by ethylene treatment.
- Some products requires more ripened fruits:
 - ↳ Jam, Jelly, ~~marmalade~~ marmalade.
- Calcium Carbide was used on old times.
Not now ~~as~~ because it causes harmful effect.

(vi) Freezing

- Food are stored at -18°C .
- quality is mostly retained.
- texture is retained.
- Handling & transportation gets difficult.
- IQF - Individual quick freezing
 - cold air is passed over product
 - Freezing process gets faster.



- (i) Batch $0 \text{ to } -40^{\circ}\text{C}$ 30 min
- (ii) sharp $-15 \text{ to } -29^{\circ}\text{C}$ 3 to 12 hrs.
- (iii) cryogenic -196
 - ↳ liquid Nitrogen
- (iv) dehydro freezing
 - ↳ first 50% of moisture is removed.

16 Oct 84 wednesday.

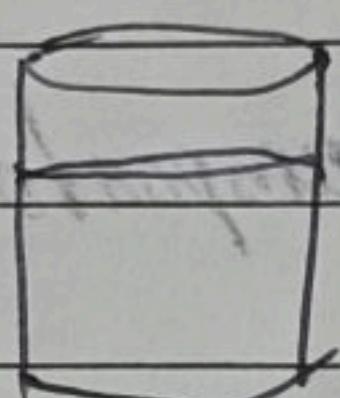
- Q Types of dryer commonly used

- Pluvdezed bed dryer
 - Spray dryer atomization
 - Freeze dryer

~~#~~ Canning

- Washing

 - ① washing, sorting, size and
 - ② blanching - pre-treatment.



headspace \rightarrow 3-5 cm

- net water
 steam

7 80-85 °C

5-10 min

- (iii) then cooling

- ④ syrup sol addition, brownie sol (soft sol 2-8x)
Ferments
vege.

Neck space is kept 3-8 cm

- (v) Exhausting, Vacuum creation - ~~removal~~ removal of air)

-  seeking

- (vii) Sterilize the can (auto clove). Retauching.

- (run) cooling Fixed Pressure 191 psu

- Jam - fruit pulp (high pectin content). sugar + acid.
- Jelly - fruit juice (pectin co. almost same acidity).
- Marmalade - It contains peel pieces in jelly
- Candies - fruit & vegetable is put in strong sugar sol.
- Squash - ~~Squash~~ $(45^{\circ}\text{Brix} - \text{TSS})$ (1% acidity) [concentrate form Sulphur dioxide & sodium Benzoate. of juices]
- Condel - all suspended particles are removed from the juices.
 $(30^{\circ}\text{Brix} - \text{TSS})$ (1.5% acidity)
- Tomato ketchup - thicker $(25^{\circ}\text{Brix TSS})$ (0.9 - 1.4% acidity)
- Tomato sauce - thinner $(25^{\circ}\text{Brix TSS})$

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Topic:- Vitamins & Mineral including name of the vitamin, sources, function and deficiency diseases.

VITAMINS

	Name of the Vitamin	Dietary source	Functions	Deficiency disease
1.	Vitamin A (Retinol)	Liver, Fish oil, Carrot, Milk & fruit etc.	Vision and growth, Build the body.	Night blindness, Xerophthalmia, Keratinisation of skin.
2.	Vitamin D (calciferol)	Fish oil, Liver, Milk, egg yolk, (Exposure to sunlight)	Absorption and Maintenance of Calcium.	Rickets, weight loss, mental & physical growth retardation.
3)	Vitamin E (Tocopherol or alpha-tocopherol)	Cereal germ oils like wheat germ oil and corn germ oil, soyabean oil.	Antioxidant, essential for normal reproduction in several species of animal and also in human beings.	Reproductive failure, liver necrosis, Muscular dystrophy.
4)	Vitamin K (phylloquinone)	Occurs widely in plant foods, especially in leaf vegetable like spinach, cabbage etc.	Essential for blood clotting by increasing the prothrombin level in blood.	Deficiency leads to increase blood clotting time. This may lead to haemorrhage conditions.

	Name of the vitamin	Dietary source	Functions	Deficiency disease
5.	Vitamin B ₁ (Thiamine)	Whole cereals pulses, eggs, Pork & nuts.	For Nerve function, appetite & normal digest digestion.	Beriberi disease, oedema.
6.	Vitamin B ₂ (Riboflavin)	Liver, egg, white bread, yeast, Milk.	Concerned in the regulatory function of insulin.	Itching and burning of the eye, cheilitis.
7.	Vitamin B ₅ (Pantothenic acid)	Dried yeast, rice, wheat, egg, fish.	It has a role in the utilization of Carbohydrates and fats.	Headache, fatigue, thymus, weakness, change in spinal cord.
8.	Vitamin B ₆ (Pyridoxine hydrochloride)	Meat, Milk, Egg, Cereals, whole grain.	Pyridoxal phosphate helps in transamination reaction, porphyrin synthesis.	Degeneration of the nerves, Inrat, Anemia, Dermatitis and convulsions.
9.	Vitamin B ₁₂ (cyanocobalamin)	Kidney, Liver, Egg, cheese, Milk, fish etc.	Co-enzyme in amino acid Metabolism, Red blood cells maturation.	Pernicious anaemia, skin lesions, loss of sense of limbs, depression.
10.	Vitamin C (Ascorbic Acid)	Citrus fruit (orange, lemon etc), Tomato, amla, leafy vegetable.	<ul style="list-style-type: none"> Rapid healing of wounds. For carbohydrate & cholesterol metabolism. 	Weakness, loose teeth - swollen joints and haemorrhage in tissue.
11.	Niacin (Nicotin Acid)	Yeast, liver, meat, whole grain, fresh Pork and Poultry	Normal function of the skin, intestinal tract and the nervous system.	The other symptoms are irritability, mental anxiety & depression and dementia.

e. this may lead to scurvy

Vegetable diet health, Ni...
exothermic process) Sweating
we are / cold

Name of the vitamin	Dietary source	Functions	Deficiency disease
12. Biotin	Peanuts, egg yolk, liver, Peas, Milk, chocolate, cauliflower.	Help in maintaining the skin structure and is necessary for normal gestation	Biotin deficiency does not occur in human frequently.
13. Folic Acid	Dried yeast, green leafy vegetable, soy bean, cabbage, Liver and kidney.	Growth of skin and hair, essential for reproduction in animal	Megaloblastic anaemia, Inadequate supply of Vitamin cause glossitis.

Mineral

Name of the Minerals	Food Sources	Functions	Deficiency disease
1. Iron	Red meat, egg, green leafy vegetable cereals.	Oxygen transport, Energy production, brain development, immune function.	Anemia, Restless legs syndrome, Attention deficit hyperactivity disorder (ADHD).
2. Calcium	Dairy product, green leafy vegetable, Nuts, seed and fish.	Bone and tooth health, Nerve function, hormone regulation.	Osteoporosis, osteomalacia.
3. Phosphorous	Meat, fish, egg, whole grain, Nuts and processed food.	Bone and teeth health, energy production, kidney and nerve function, cell membrane function.	Bone pain, fatigue loss of appetite, Muscle weakness, bone fractures.
4. Magnesium	Whole grain, legumes, Nuts and seeds, Avocados, Chocolate,	Energy production, Muscle relaxation, Blood sugar control, bone health.	Weakness, Muscle cramps, fatigue, Vomiting, Nausea, seizures.

	Name of the Minerals	Dietary sources	Functions	Deficiency disease.
5.	Sulfur	Meat, Egg, Nut and seeds, cabbage, broccoli, cauliflower.	skin health, immune function, Antioxidant, Protein synthesis.	Hair loss, Joint pain, Brittle Nails, Skin problem.
6.	Sodium and Potassium	All foods fruit and vegetable are rich source	Maintenance of osmotic pressure, cell volume and membrane potential.	Sodium; sweating, vomiting or diarrhea due to sodium loss. Potassium; Fatigue, Weakness, heart beat irregular and constipation.
7.	Iodine	Seafood, Diary Product, egg & iodized salt.	Growth and development thyroid hormone production, brain development.	hypothyroidism, cretinism, Infertility, cretinism, Miscarriage.
8.	Copper	Dark Chocolate, meats, Nut and seeds, whole grain.	Iron metabolism, Energy production, Bone health, Brain development.	Anemia, hair loss, skin problem neurological problem.
9.	Selenium	Whole grain, Sea food, Meat, egg, Brazil nut.	Fertility and reproduction, Cancer prevention, cardiovascular health.	Infertility, Kashan diseases, thyroid dysfunction, risk of cancer.
10.	Cobalt & Maganes.	Cobalt; Meat, Egg, Diary product, Legumes and Nut and seeds.	DNA synthesis, Energy Metabolism, DNA synthesis	Cobalt; Pernicious anemia, Neurological problems.
		Magnes; Whole grain, Nuts and seeds, Tea, dark leafy vegetable	Bone health, Energy production, Antioxidant activity, blood clotting.	Bone abnormalities, Impaired fertility and Neurological problems.

hemorrhage
itch

"sodium \Rightarrow Sweating,
osmotic Pressure, Vomiting,

Vegetable protein