

KLOKOLA Bitter Classroom

8/11/2024

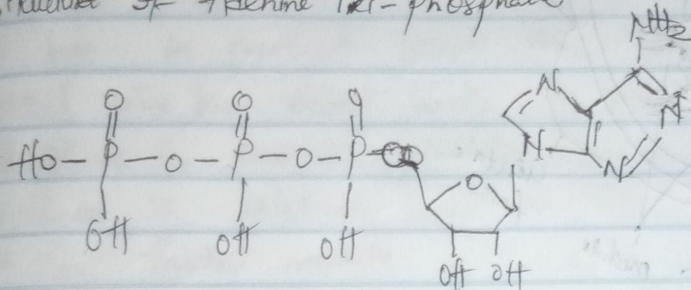
MEDICAL LABORATORY Science

Bot 202

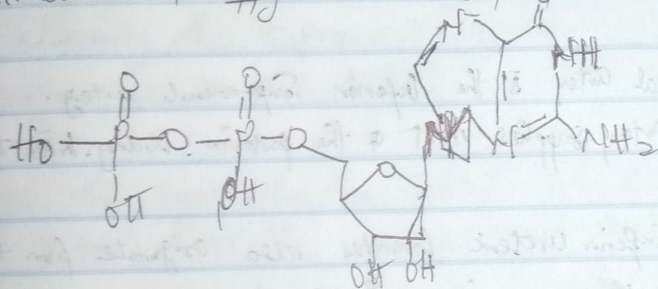
Review and Practice

Draw the structure of the  $\text{ffg}$ ,  $\text{ATP}$ ,  $\text{GDP}$ ,  $\text{CDP}$ ,  $\text{UTP}$ , double stranded DNA

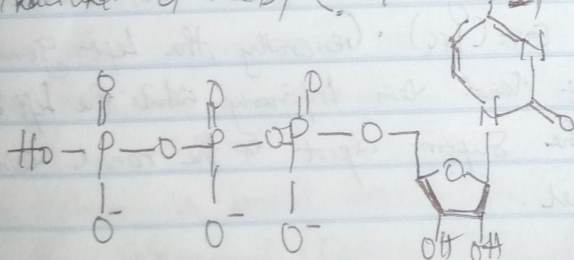
Structure of Adenine Tri-phosphate



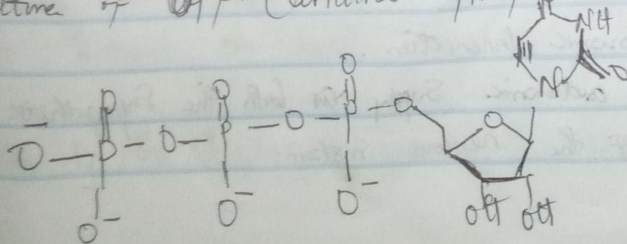
Structure of  $\text{ffg}$  Guanosine diphosphate



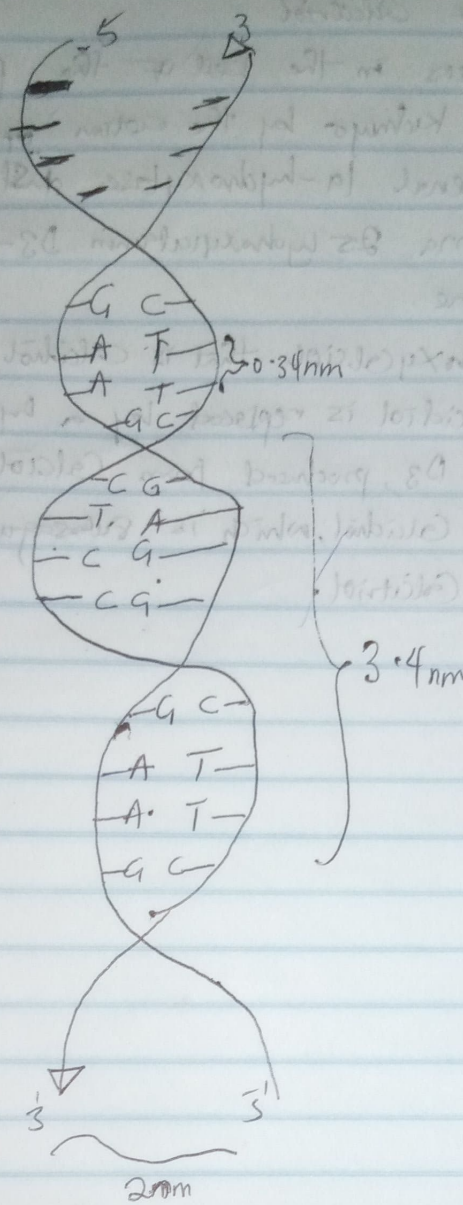
Structure of  $\text{CDP}$  (Cytidine ~~triphosphate~~ diphosphate)



Structure of  $\text{UTP}$  Uridine ~~triphosphate~~ triphosphate



# Structure of a double stranded DNA



## Differentiate Between DNA and RNA Clearly

**DNA** - Deoxyribonucleic acid is a molecule composed of two polynucleotide chains that coil around each other to form a double helix carrying genetic instructions for the development, functioning, growth and reproduction of all known organisms and many viruses.

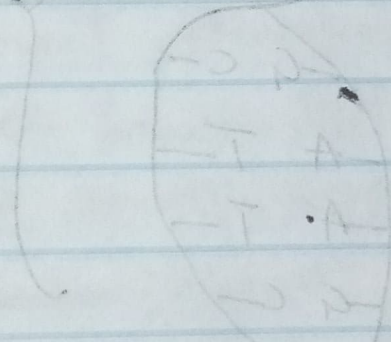
**RNA** is a polynucleic molecule essential in various biological roles in coding, decoding, regulation and expression of genes; a nucleic acid present in all living cells, its principal role is to act as a messenger carrying instructions from DNA for controlling the synthesis of proteins. It is found in nature as a single strand folded onto itself, rather than a paired double strand.

3. Explain the biosynthesis of Calcitriol

Calcitriol is synthesized in the cell of the proximal tubule of the nephron in the kidney by the action of 25 hydroxyvitamin D<sub>3</sub>-1- $\alpha$  by renal 1 $\alpha$ -hydroxylase and tightly regulated by the levels of plasma 25 hydroxyvitamin D<sub>3</sub>-1- $\alpha$ , Calcium and parathyroid hormone.

Calcitriol is 1-hydroxycalcitriol. That is Calcitriol in which the pro $\delta$ -hydrogen of Calcitriol is replaced by a hydroxyl group. It is active form of vitamin D<sub>3</sub>, produced from Calcitriol via hydroxylation in the liver to form Calcitriol; which is subsequently oxidised in the kidney to give Calcitriol.

min. 8.



Coenzymes (are also known as co-factor) are non protein chemical compound or metallic ion that is required for an enzyme's activity as a catalyst, a substance that increases the rate of a chemical reaction, they can be used by multiple types of enzymes and change form the function by activating enzymes or acting as carriers of electrons or molecular groups.

b) Coenzymes form of riboflavin  
flavin mononucleotide (FMN) and flavin adenine dinucleotide  
- Enzymes that uses the coenzymes derived from riboflavin are called flavoproteins. Flavoenzymes participate in redox reactions in numerous metabolic pathways, they are critical for the metabolism of carbohydrates, lipids, and proteins.

- FAD is part of the electron transport (respiratory chain) is central to energy production. In conjunction with cytochrome P-450, flavoenzymes participate also in drug metabolism. Glutathione reductase is an FAD-dependent enzyme that participate in the redox cycle of glutathione.

Q Write on the characteristic component of Nucleotide and Nucleoside unit of RNA

Characteristic component of Nucleotide  
→ a nitrogenous base: Cytosine, Guanine, Adenine or Thymine  
Nitrogenous bases fall into the class of chemical compounds known as organic compounds or those which contain C-N bonds with carbon, hydrogen and oxygen atoms (Purines) and (Pyrimidines) with or without uracil  
→ a five-carbon sugar molecule (deoxyribose)  
It contain 5 carbon atoms that are arranged

from the sugar's pentagonal shape, it's considered a modified sugar due to the fact that it only has four oxygen atoms

a phosphate molecule

This is a molecule containing one atom of phosphorus covalently bound to four oxygen residues, two of which may be expressed as a hydroxyl group. They are relatively reactive molecules that readily form phosphate bonds by the interaction with hydroxyl group

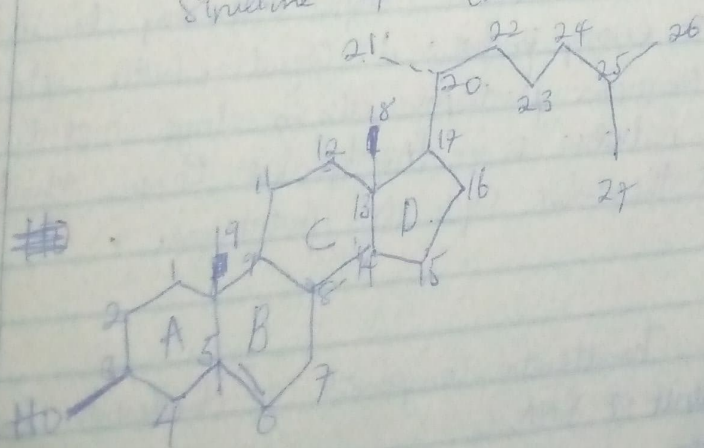
Characteristic Component of Nucleoside unit

Ribose sugar: this is a five-carbon sugar ~~ribose~~

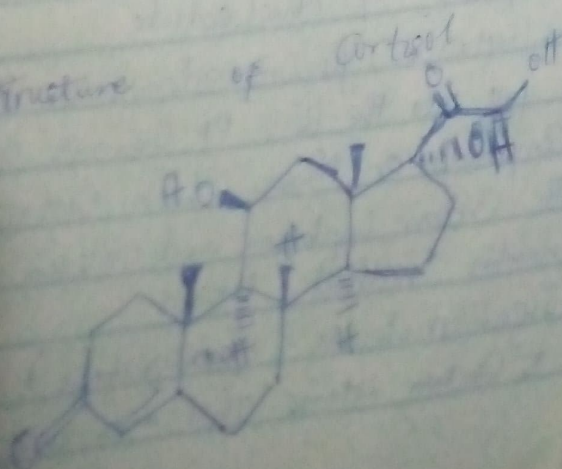
Heterogeneous base (Pyrimidines or Purines)  
Adenine, guanine, thymine, uracil

Structure of Cholesterol and Cortisol

Structure of Cholesterol



Structure of Cortisol



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Vitamins are organic nutrients required in small quantities for biochemical functioning. It cannot be synthesized in our body sufficiently and therefore must be obtained from the diet (food) consumed.

They are classified based on their solubility which are fat soluble vitamins and water soluble vitamins. Fat soluble vitamins are vitamins that are soluble in fat and insoluble in water, and they are majorly stored in the liver. The fat soluble vitamins are not used as coenzyme and it comprises of Vitamin A (Retinol), Vitamin D (Cholecalciferol), Vitamin E (Tocopherol) and Vitamin K (Quinones).

Water soluble vitamins are vitamins that are soluble in water, insoluble in fats. They are not stored and they include Vitamin B<sub>1</sub> (Thiamine), B<sub>2</sub> (Riboflavin), B<sub>3</sub> (Niacin), B<sub>5</sub> (Pantothenic acid), B<sub>6</sub> (Pyridoxine), Biotin, folic acid, Cobalamin (B<sub>12</sub>), and Vitamin C (Ascorbic acid).

### Metabolism of Thiamine

Active form: Thiamine pyrophosphate. It is a coenzyme involved in several enzymatic reactions mainly for oxidative decarboxylation and transketolase reaction. Thiamine pyrophosphate is a coenzyme for pyruvate dehydrogenase complex which catalyses the conversion of pyruvate into acetyl CoA by oxidative decarboxylation.

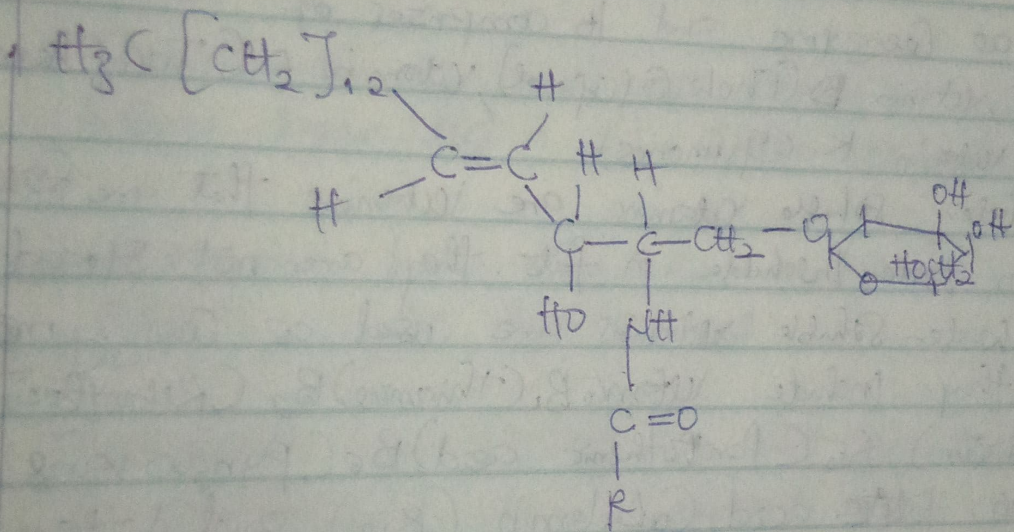
8 glycolipids are lipids with a carbohydrate attached by a glycosidic (covalent) bond. Their role is to maintain the stability of the cell membrane and to facilitate cellular recognition which is crucial to the immune response and in the connections that allow

Cells to connect to one another to form tissues. They provide energy. They act as receptors for viruses and other pathogens to enter cell.

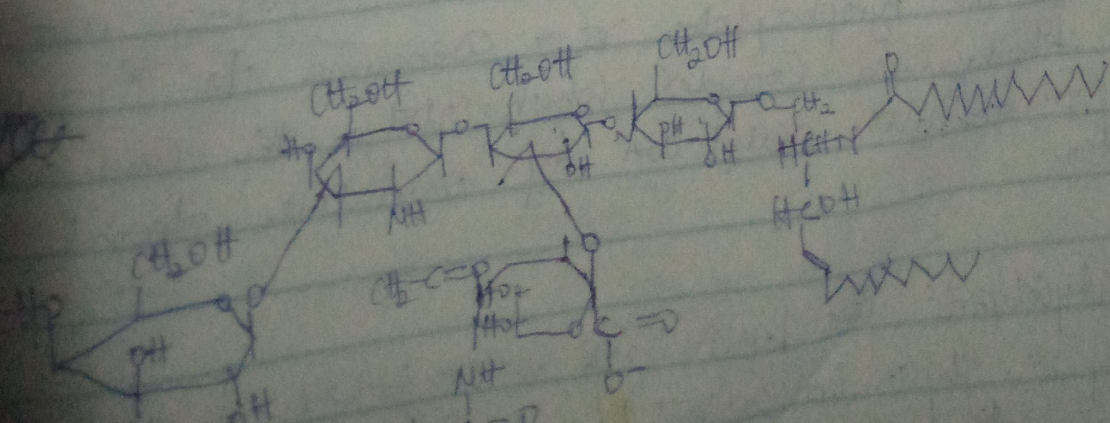
Glycolipids comprised of a hydrophobic lipid tail and one or more hydrophilic sugar group linked by a glycosidic bond.

Various form of Glycolipids are

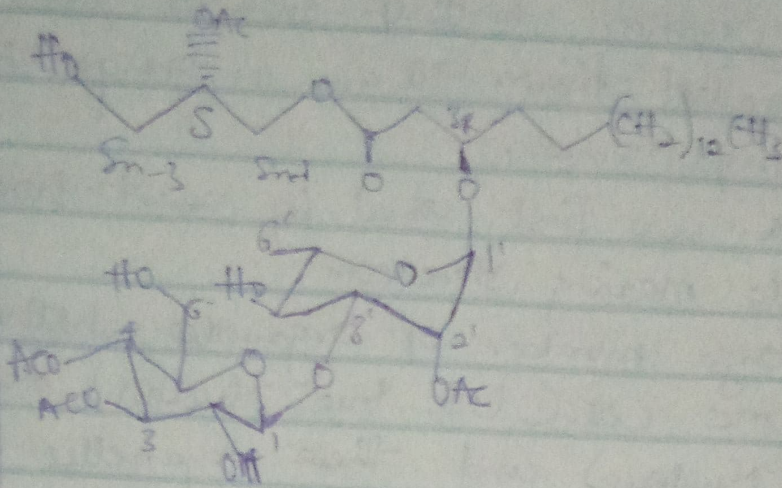
1) Neutral glycosphingolipids - Cerebrosides (monoglycosylceramides)



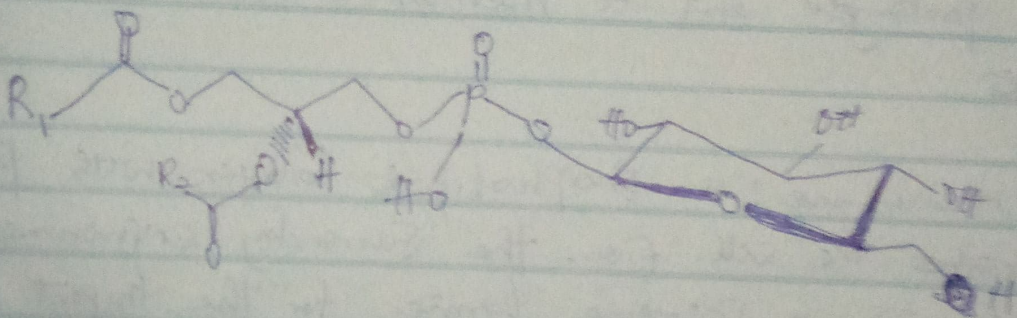
2) Acidic glycosphingolipids : gangliosides



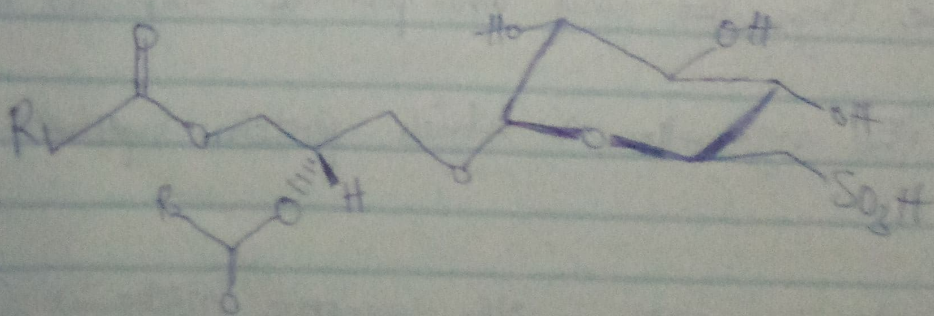
① City glycolipids  
 central glycolipids -



② Glycophospholipids



③ Sulfoglycolipids





9. Cells - this is the basic membrane bound unit that contains the fundamental molecules of life and of which all living things are composed; a single cell is often a complete organism in itself, such as yeast or bacterium; the smallest known cell are a group of tiny bacteria called mycoplasmas.

from the Latin cells meaning storeroom

Cell contain large number of organelles, whether they are prokaryotic cell (lack true nucleus) or eukaryotic (true nucleus) and these organelles are

1. DNA

this is the genetic material contained in one or more chromosomes and located in non-membrane bound nucleoid region in prokaryote and a membrane bound nucleus in eukaryotes

plasma membrane: a phospholipid bilayer with proteins that separates the cell from the surrounding environment. Its function is a selective barrier for the import and export of materials.

Cytoplasm: It is a portion that contain cytosol (fluid portion) which have organelles and other particles suspended in it.

ribosomes: the organelles on which protein synthesis takes place

Nucleus: contains most of the genetic material (DNA) of the cell, it's bounded by nuclear envelope, a double membrane perforated with pores and connected to the rough endoplasmic reticulum membrane system

Cytoskeleton: consist of microtubules, intermediate filaments and microfilaments which together maintain cell shape

anchor organelles and cause cell movement.

mitochondria → are the site of cellular respiration, a process that generate ATP from substrates in reactions using oxygen. Mitochondria contain the enzymes and other components needed for the enzymes complexes that catalyze respiration.

Chloroplast: are plant cell organelles that contain chlorophyll and the enzymes required for photosynthesis. Chloroplasts are large organelles bounded by a double membrane and containing DNA, unlike the mitochondrial double membrane, the inner membrane is not folded.