

# BIOLOGY

## FIRST YEAR NOTES

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## General Biology Notes, First Edition

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# BIOLOGY : General

Biology

Morphology :- Study of structure, study of ext. structure

Anatomy :- Study of internal structures

Phenotype :- External characters

Genotype :- Internal

Physiology :- Study of functioning of the body

Taxonomy :- The branch of biology concerned with the classification of organisms into groups on the basis of their structure.

## Taxonomy

(Classific<sup>n</sup> into groups on the basis of structures)

Morphology

(Classific<sup>n</sup> on the basis of ext. structure)

• Phenotype : Study of ext. characters

Anatomy

(Classific<sup>n</sup> on the basis of int. structure)

• Genotype : Study of internal characters

\* Science :- Anything done systematically.

O : Observation

P : Prediction/Hypothesis

T : Testing

C : Comparison

V : Verified & applied

Scientific methodology

Q. Diff b/w hypothesis & prediction?

## \* Observation

- Direct : called as <sup>Empirical</sup> ~~Impirical~~ (see spellings)  
Direct observation not possible if people are large
- Observation indirectly : eg: effect of light, ~~gravity~~ gravity etc. in a movement. These observations are done on the basis of getting information from other sources.

## \* Prediction

\* Hypothesis :- It is a scientific statement. You can expect ans from it. It has sense.

\* Prediction : It should give an evidence  
 • It should be authentic  
 • It should be repeatable, i.e., we should be able to repeat that anywhere else.

\* Prediction : Prediction is basic reasoning.

\* Testing : We need to have ~~an~~ CONTROL EXPERIMENT. i.e. we need to have PLASIBO (empty capsule) :- psychologically cure a person)  
 • In Plasio, we prove the hypothesis by seeing the results.  
 • Statistically testing of the expt  
 → ANOVA :- Analysis of Variants  
 → Student T-test

- \* Comparison :- Present before gathering of the field.
- Compare with current facts and hypothesis.
  - It should be done repeatedly till we get an authentic value.

\* Verified :- Verified by the board so that its accepted.

\* Paleontology

\* Paleontology :- Study of fossils.

Science

It is known what it is.

Non-Science

Evidence is there.

But, it ~~is~~ can't be repeated.

eg:- evolution, era of reptiles, etc.

Evidence is there in the form of fossils.

Some sort of authenticity is there.

eg:- Psychology, behaviours can't be proved correctly. climatic change → all prediction. Can't be repeated.

Non-Sci. can be produced in a lab with a model.

Pseudo Science

Taking the advantage of sc. (concepts & reality of sc.) &

cheating the people.

eg:- advertisements misuse of a concept by people.

eg:- Fair & lovely, calcium capsules →

not reqd from that source

only

- \* Attributes of life .
- Metabolic Activities
- Generative "
- Responsive "
- Control " / Coordin<sup>n</sup> .
- Unique Structural Organisation

### Metabolism

Anabolism  
(making)  
eg: photosynthesis

Catabolism  
(breaking)  
eg: respic<sup>n</sup>

### Generative

Regener<sup>n</sup>  
& Growth

Reprod<sup>n</sup>

### Response

Irritability  
Types → ~~Short~~ Short term  
→ long term

Individual  
Adaptation .  
• Homeostasis  
→ Internal environment  
balance .

Evolution

\* Popul<sup>n</sup> :- Includes 3 basic things :-  
✓ Time ✓ Place and ✓ Number .

## Significance of Science.

Food

Health

- Both things help us live longer

⇓  
Population Increase.

ex :- dairy cows give more milk  
chicken<sup>hen</sup> lays more eggs  
cattle reproduce faster

~~C.C = D.O.T.B @ TSD mag~~

## Chapter - 3

### ★ Final gaps

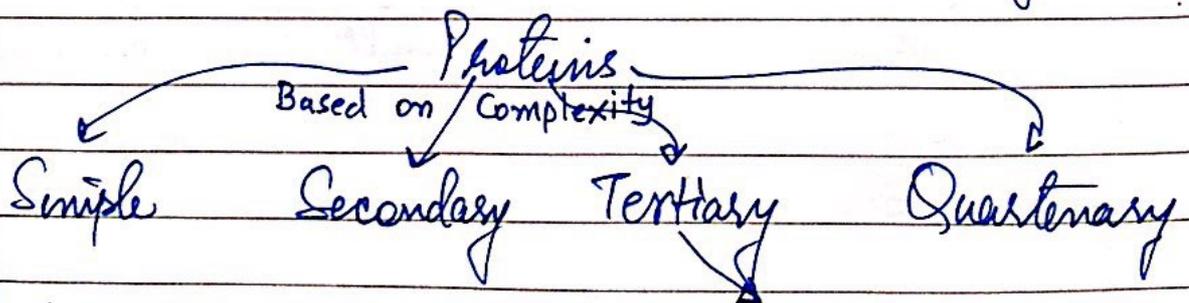
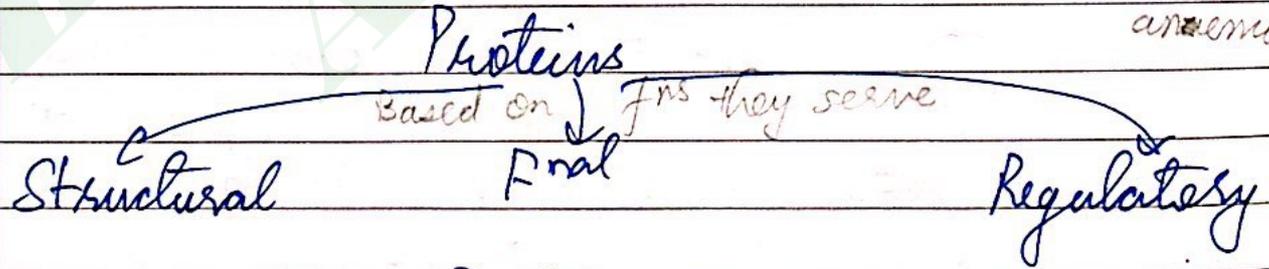
- A : Alcohol / Hydroxyl (-OH)
- M : Methyl (-CH<sub>3</sub>)
- A : Amine (-NH<sub>2</sub>)
- C : Carboxylic acid (-COOH)
- P : ~~Phosphate~~ Phosphate (-PO<sub>4</sub>)
- C : Carbonyl gap (-CO/COH)

★  $\beta$  chain comes out of the nucleus during protein synthesis.

146  
 → 164 amino acids are present in it

Sometimes the sequence of amino acids is changed, it leads to diseases (3 diseases → learn that)

→ BSE, CJD, & sickle cell anaemia



★ ~~Mag~~ Major pigment in cell :- CYTOCHROME (in Mitochondria)

- \* Light sensitive substances are kept in Amber bottle (Brown colored bottle).

## Carbohydrates

parafocal ✓

parafoval X

★

## Lipids

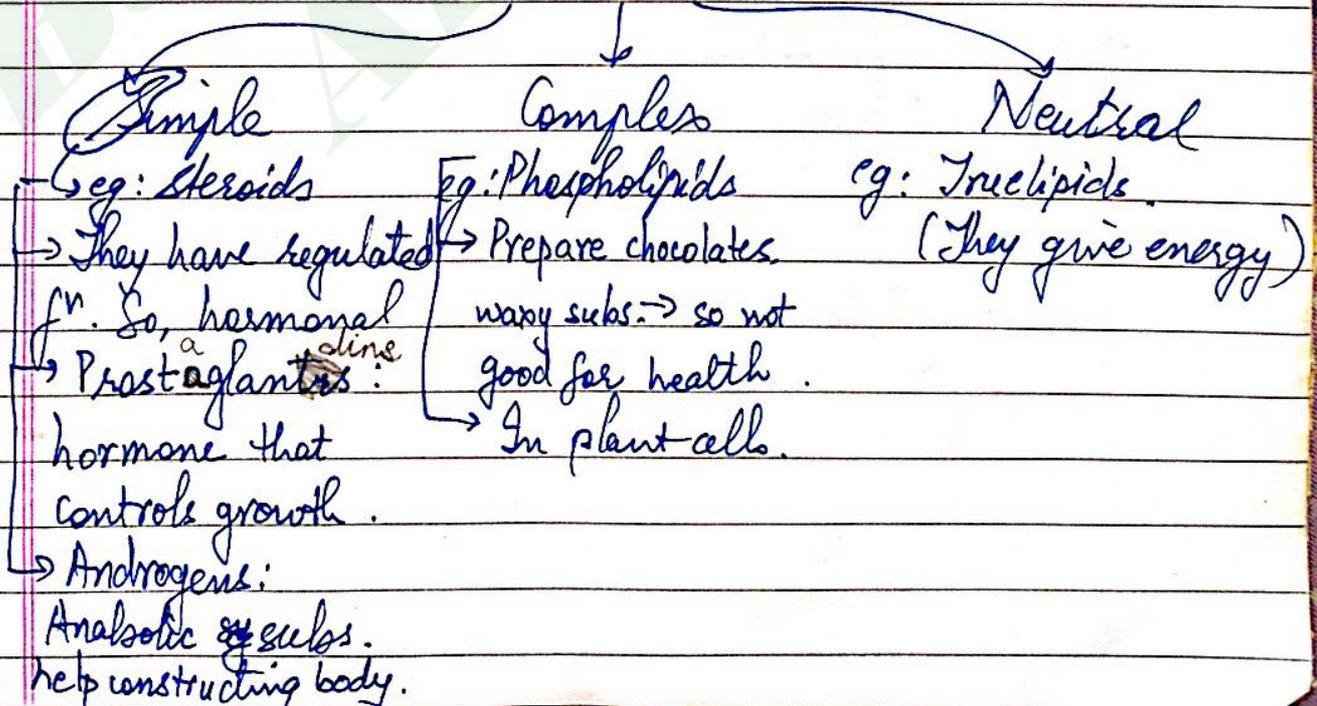
- Non polar molecules (dissolve in ether & CH<sub>4</sub>).
- They are large molecules
- It has C, H, O, N (& P) molecules present.
- It stores energy.
- It gets impregnated. It gives a protection & at the same time, has harm at some situations.

- \* Fats get digested by Emulsific<sup>n</sup>

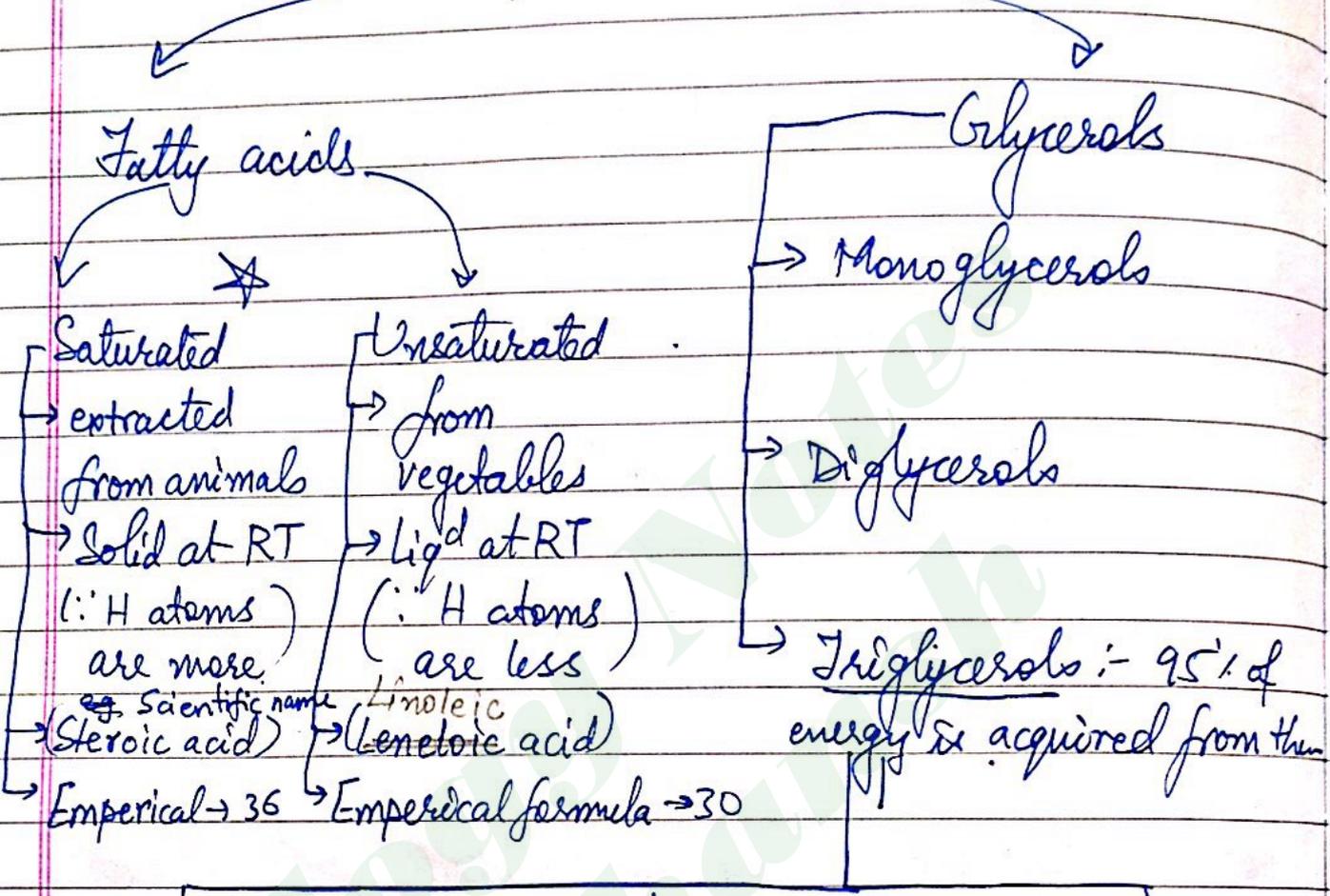
- \* POIKILOOTHERMS: Adjust body temp. as per surroundings. ~~by~~ by organisms.

★

## LIPIDS



# ★ True lipids



↓  
**HDL**  
 (High Density Lipoproteins)  
 (healthy)  
 • They can be easily swept away.

↓  
**LDL**  
 Low Density Lipoproteins

↓  
**VLDL**  
 Very Low Density Lipoproteins  
 (lethal → unhealthy) or harmful  
 • They go inside the body (impregnated) leading to **Atherosclerosis**

form<sup>n</sup> of layer in blood vessels

- Androgens may be harmful when taken from outside:

→ Females: Hirsutism (appearance of facial hair), atrophy (weakness) of ~~working~~ reproductive organs, voice changes.

→ Males: Hallucin<sup>n</sup>, swinging mind, aggression.

## Carbohydrates

→ Immediate source of energy  
 → C : H : O :: 1 : 2 : 1

Simple or  
Monosaccharides

Complex or  
Polysaccharides

- \* Bondings → Glycosidic bonding by DSP (Dehydr<sup>n</sup> synthesis Process)
- \* Pentose → Helps in making/constructing Nucleic acids
- \* The more you go sweeter, more you go carcinogenic
- \* Fructose is the healthiest sugar
- \* Types of carbohydrates present in our body.
- \* Anything not having taste is good for health.





One helical round  $\rightarrow$  10 ladders  
 $= (3.4 \times 10 \text{ Å}) = 34 \text{ Å}$

★ Loci :- ~~Place~~ Place in chromosomes where genes are located is called as Loci (Locals).

★ Q Characteristic feature of Genes?

See  
Pg-60

- ✓ Store data (info)  $\rightarrow$  hidden info  $\rightarrow$  Gene
- ⊙  $\rightarrow$  called as Gene Library (or Gene Pool).
- ✓ Helps in Protein Synthesis -
- ✓ Helps in passing characters from 1 gener<sup>n</sup> to another. (2 phases  $\rightarrow$  transcription & translation)
- ✓ Protein synthesis &

★ The replic<sup>n</sup> in Nucleus occurs & comes out in 3 forms

- Messenger RNA
- Transfer RNA (translator)
- Ribosomal RNA

★ Q Importance of genes.

★ Q Types, fns & differences of RNA.

# Cell Structure & Junctions

✓ Organelles

→ Net/web like structure.

\* Endoplasmic Reticulum

Rough

Protein synthesis

Smooth

Fat metabolism & detoxification  
exms.

\* Waste products are of 3 types :-

△ Ammonia (toxic → most)

△ Urea (toxic → least)

△ Uric acid (toxic → less)

\* Detoxification takes place in the liver (in smooth ER)

\* CYCLOSIS :- Within cells, most of molecules & organelles is called \_\_\_\_\_.

\* Golgi Apparatus

Uses :-

1. Modifies the molecules entering the cell.
2. Manufactures polysaccharides & lipids.
3. Packages molecules within sacs.

Form<sup>n</sup> :- The membranes of ER break out & club together to form it.

→ Formed from Golgi bodies

\* Lysosomes :-

Uses :- Digestion

• Destroy pathogens

• Destroying membranes (i.e. shapes them)

\* Lack of lysosome prod<sup>n</sup> :- Syndactylism

Q Peroxisomes

• Comes directly from ER

• Functions fuse  
→ lipid metabolism

Lysosomes

• Comes from Golgi Apparatus

• P<sup>ns</sup> fuse

Q Vacuoles

• Larger structure

membranous

Vesicles

• Small structures

\* (Nuclear membrane)

→ Its an organelle. Reason:

→ It has pores through which RNA escapes

→ Not present in prokaryotes

→ consists of 2 layer membranes.

(big molecules)

Q. What are energy converters & how are they diff<sup>t</sup> from other organelles?

The 2 energy converters are → mitochondria and chloroplasts.

1. Diff<sup>t</sup> chemical nature.

2. 2 membranous. → Inner membrane enfolds for increasing more area (cellular resp<sup>n</sup>)

\* Plasmolysis :- Death of a cell is called. }  
∴ It is in case of cell, it is called } Puffin for plants  
Haemolysis. } for animals

3. Within them, Ribosomes & ~~AT~~ (an organelle) is present. ~~Some~~ ~~Sometimes~~ DNA are also present.
4. These 2 structures have a certain degree of independence from rest of the cells.

- These organelles don't reproduce

### \* Mitochondria

↳ consists of an outer membrane & inner folded membrane. Individual folds of the inner membrane are called cristae.

↳ no. of mitochondria varies from 10-1000.

- Cells that are involved in activities requiring more energy — require more mitochondria.  
eg: - muscle cells.

### \* Chloroplast

↳ Inside the chloroplast, there are membranes throughout, forming network & stacks of folded membranes.

In some areas, these membranes are stacked up or folded back on themselves called GRANA.

- Conc. chlorophyll molecules called Thylakoids are attached to the grana, the space b/w the grana, which has no chlorophyll is known as stroma.

→ Crenation → Nucleolus is birth place of ribosomes.

## \* RIBOSOMES

- Non membranous
- Synthesis of protein for <sup>Ribosomes are</sup> responsible for that.
- Each ribosome has 2 subunits: a large one and a small one.

\* Microtubules, Microfilaments, Intermediate filament.

Together called as - CYTOSKELETON of cell

## § Functions

- Structure
- motility
- Cell division
- Transport<sup>n</sup> → Inform<sup>n</sup> also.

## \* Centrioles

- Array of 2 sets of microtubules at right angles to each other makes up Centrioles.
- Placed cylindrically.

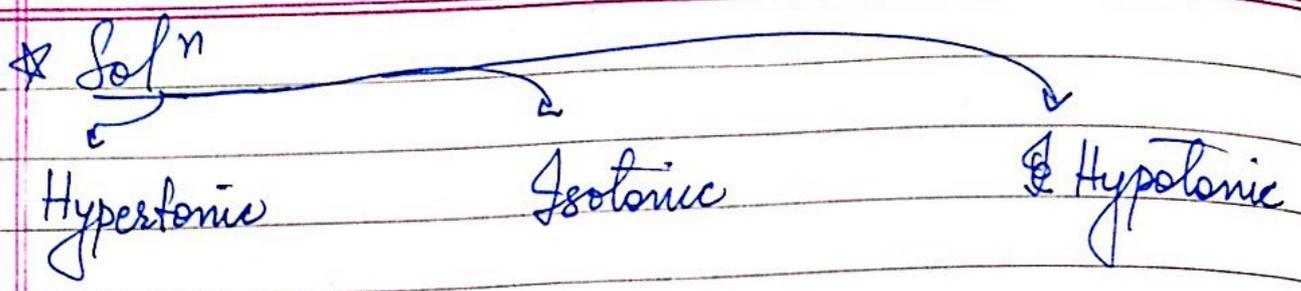
## \* Cilia & Flagella

- ↳ It has 9 cylindrically arranged microtubules. But, 2 more are present. That is major diff. These 2 extra structures are called # AXOSOME (Axoneme)

## \* Inclusions

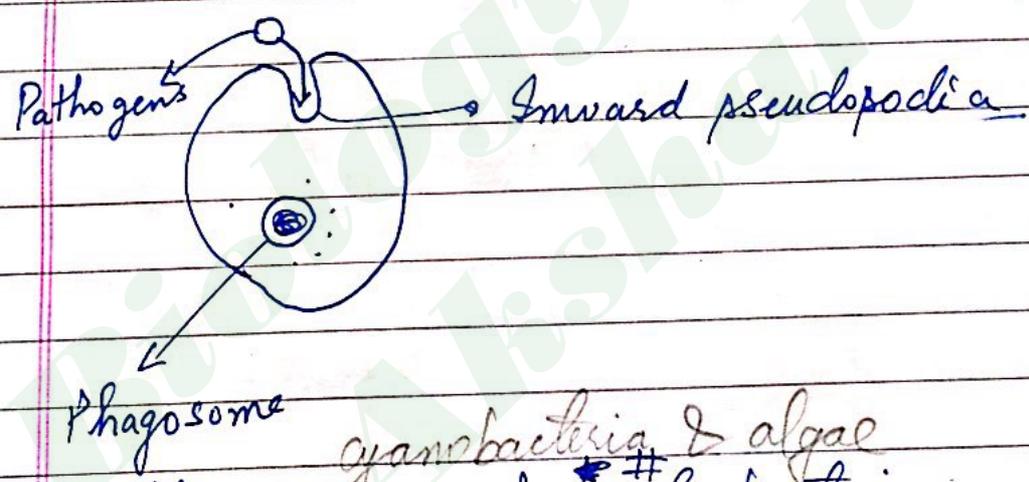
- Uses:-  $\text{Ca}(\text{CO}_3)_2$  crystals are formed making leaves sour in taste & ⇒ protect from eaten by animal.
- Bacteria store inclusion crystals, harmful to insects B. thuringiensis

\* Ghost cells :- Bursting out of the cells leaving the CATINT.



\* # Turgor effect :- Increase / decrease of size of vacuoles when put in hyper/hypotonic sol<sup>ns</sup>

- Phagocytosis (Eating cell) : Eating of solid <sup>substances</sup>
- Pinocytosis (Cell drinking) : " " " liqd <sup>substances</sup>



Q Diff. b/w cyano & archi bacteria

also called as Extremophiles : can bear temp. cond<sup>ns</sup>.

Q # Acclimatize & Acclimatization :- Difference.  
 (Adapt<sup>n</sup>) (Suppression)

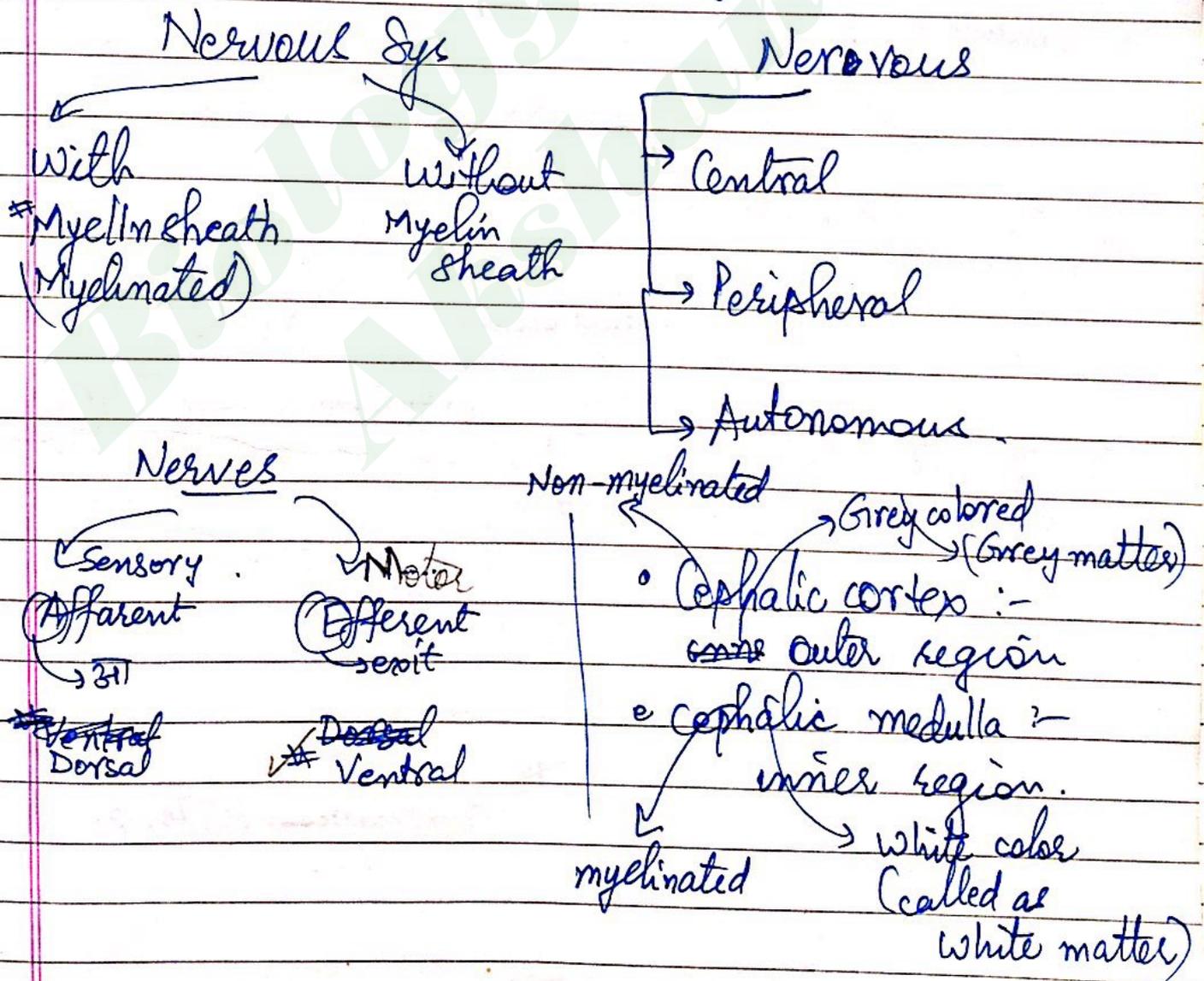
Q Diff. b/w membranous & non-membranous.  
 In them, what are single & double organelles?

Q & Mitochondrial inheritance → # Leban disease

S.No. 11

# Nervous System

- Neuroplasm in neuron is grey colored.
- # Chromatophorin / Soma / Nissl's body : Other names of Neuroplasm  
→ body of a nerve.
- Saltatory Cond<sup>n</sup> :- Jumping motion of message.
- Synapsis :- Connection b/w 2 nerve endings.
- 2 enzymes carried by synaptic cavity :-  
Adrenaline & ACH (Acetylcholine hormone)
- NM Junction :- Neuromuscular junction.



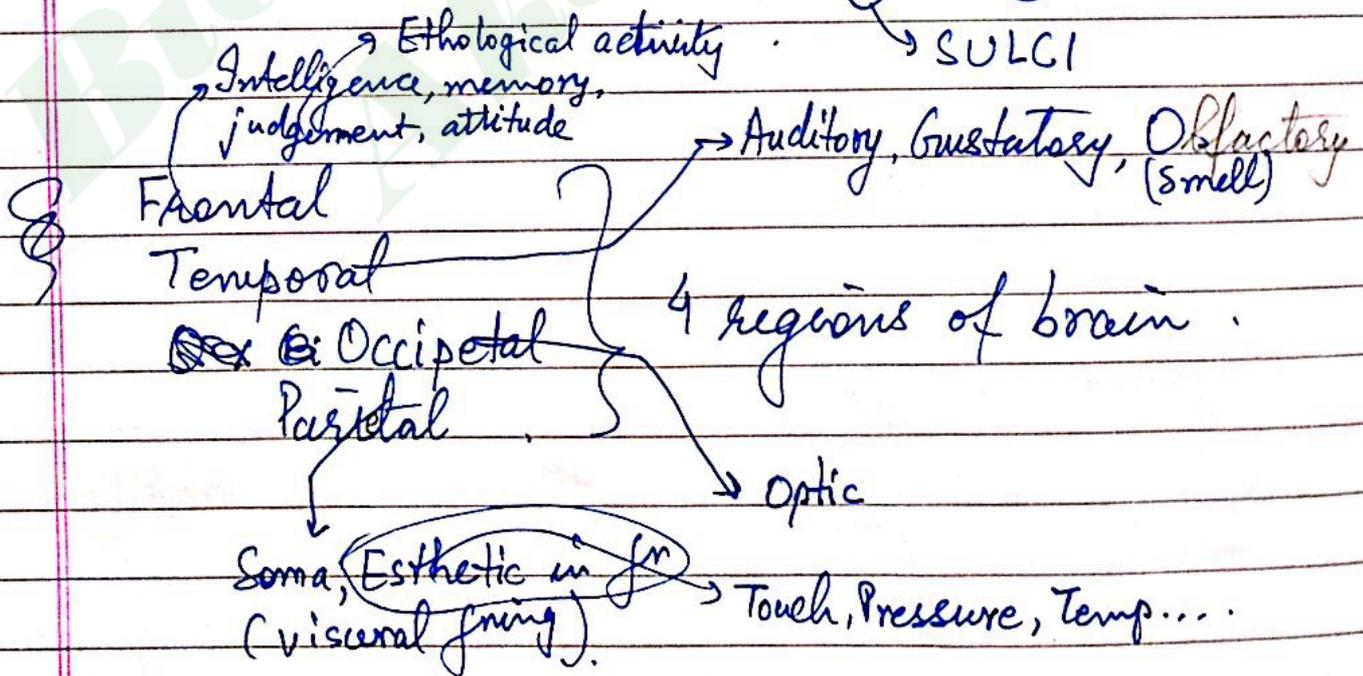
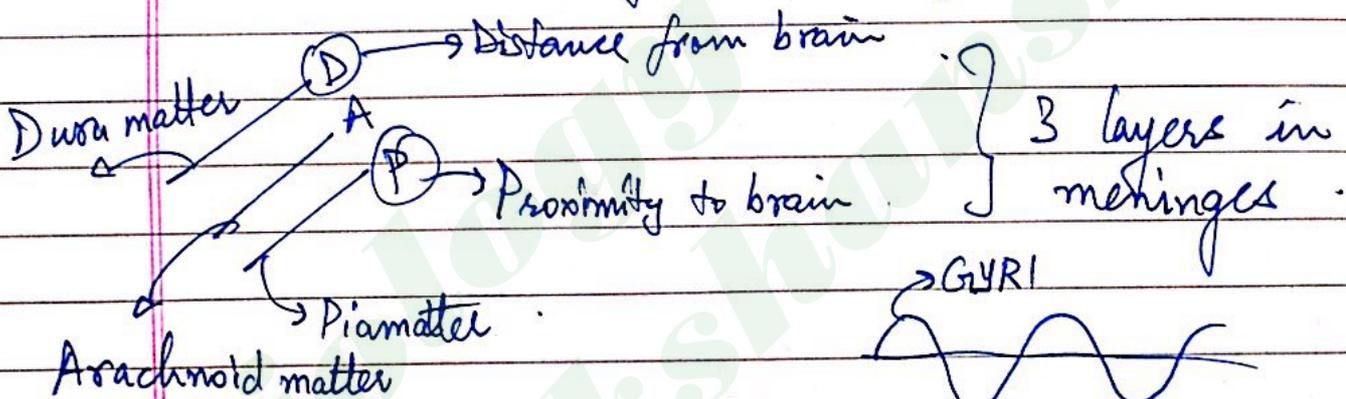
- Why outside myelinated - Brain grows → expands & it needs to expand have more nerves.

• Imagin<sup>n</sup> takes place inside the outer portion of brain.

- Brain is covered with Meninges. → filled with fluid → Cerebro spinal fluid.

- Protection, Nourishment & Shock absorbers.

↳ fns of fluid (uses)  
(Broth → pathogens entering fluid in brain)



- Cerebral hemispheres :- 2 halves.

Joined by nerve band  $\xrightarrow{\text{called}}$  corpus callosum.

- Inside cortex :- Hypophysis (Pituitary gland)  
 $\xrightarrow{\text{called as}}$  Thalamus  $\rightarrow$  Guide thalamus.

- Based on fn, brain has 3 regions :-

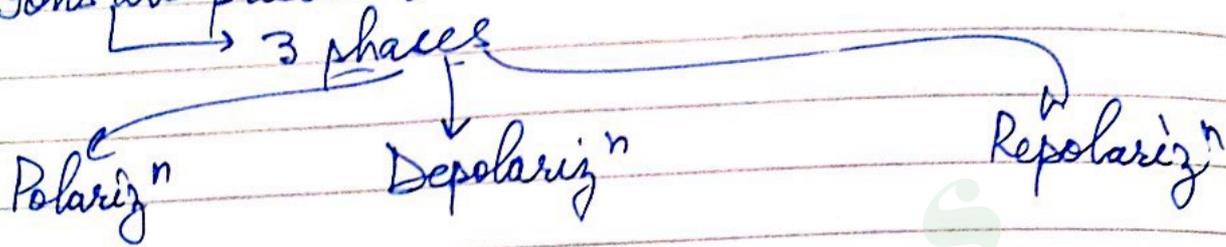
$\xrightarrow{\hspace{2cm}}$  Cortex.

$\xrightarrow{\hspace{2cm}}$  medulla oblongata  $\rightarrow$  come from brain.

- 13 pairs of <sup>cr</sup> cranial nerves that control the body.  
Other than human beings  $\rightarrow$  12.
- 31 pairs of spinal nerves come outside from spinal cord.

One  
Of  
Our  
Teacher  
Asks  
For

- Ions are present inside the nerve cell.

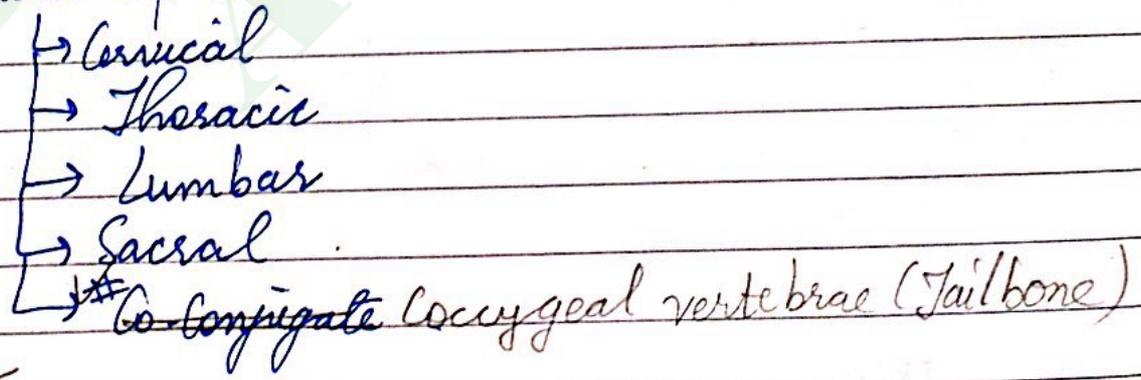


- Ions pulled outside by Na pumps.
- Neurotransmitters are of 2 types:-  
 Adrenaline & Acetylcholine

• Saltatory movt/cond<sup>n</sup> :- Jumping movt. of nerve impulses



- Regions of Vertebral Column.



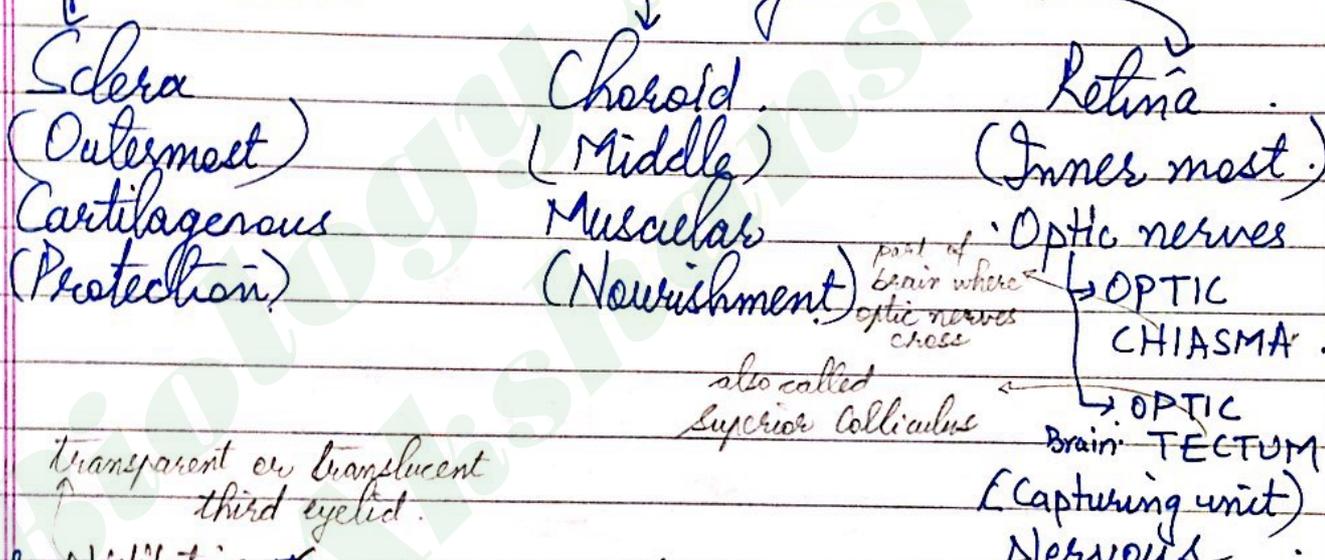
- Collateral Ganglia :- Outside lumbar & Thoracic region.

# \* Senses (5)

- Optic
- Auditory
- Olfactory
- Gustatory (Chemoreceptors in taste buds)
- Tactile

## → Optic Eye.

↳ 3 outside (outer) layers



transparent or translucent third eyelid.

Aqueous humour, Nictitating membrane, Conjunctiva, Lysosomes

• EPICENTRAL - 4.11

• Inside retina := VCL (Visual Cell Layer)

Intensity (Amplitude) Rod cells - Active in DIM light (not color)

Color (λ) Cone - Rhodopsin

• At yellow spot, cones make



# Heart

- Pericardium ← Outer covering of heart.
- Inter Auricular Septa → No valves (IAS)
- Inter Ventricular Septa → No valves (IVS)
- Right auriculo ventricular septum → 3 valves are there

- Left Auriculo Ventricular septum → 2 valves  
 Tricuspid  
 Bicuspid (or Mitral)

- Chordae tendineae (heart strings)
- Chordae tendineae :- muscles (thickest) in ventricles

- Truncus Arteriosus :- Aorta sending pure blood to the body (Starts from left ventricle)

- Hepatic Portal Sys <sup>liver before heart</sup> & Renal Portal Sys <sup>blood from posterior part of body into them</sup>
- Systemic and Pulmonary system circulation

- \* Varicose veins ← faulty veins whose valves don't work well & ∴ ~~some~~ bidirectional flow of blood inside it.

- \* Coronary arteries :- vessels supplying blood & nutrition to heart

When these vessels get blocked ⇒ <sup>Ischaemic</sup> Schemic disease

- Coronary <sup>lymphatic</sup> Sinus :- Lymphatic opening in heart
- 10% ↑ in BP with every 10 yrs. ∴ Blood vessels become thicker.

Truncus arteriosus :- A congenital heart disease in which a single blood vessel (truncus arteriosus) comes out of the right and left ventricles, instead of normal 2 (pulmonary artery & aorta)

collection of veins forming a large vessel that collects blood from myocardium of the heart.

# Blood

## Study of blood :- Haematology

Plasma

... called as  
cells: Formed elements  
(∵ they are formed when req'd)

- Group O :- Absence of antigens & antibodies  
→ Blood Group.
- Ca :- req'd for blood clotting.

Erythrocytes  
~~WBC~~ RBC

- Don't have nucleus (except camel)
- Have pigment inside called ~~haem~~ <sup>heme/haem</sup>, made of iron.
- Outside surface contains antigens made of Acid Mucopolysaccharides (AMPS)
- Oval shaped. Sometimes gets bent → Sickle cell.
- It determines blood group.

Leucocytes  
~~RBC~~ WBC

- No shape. Called as amoeboid.
- has nucleus.

Granulated ~~Non~~ granulated

N → Neutrophils  
E → Eosinophils  
B → Basophils.

Lymphocytes

Monocytes

Bone marrow  
produced in Lymph

- Phagocytes = Leucocytes + NEB

- Thymus - Juvenile glands - Present only in children.

# Endocrine System

## Endocrine Glands.

- Ductless
- Go through blood stream to the target
- ↳ Production can be in any way

- 8 major glands
  - \* ↳ Pituitary & Pineal glands
  - ↳ Thyroid & Para thyroid
  - ↳ Thymus - Above renal gland
  - ↳ Adrenaline (Suprarenal gland)
  - ↳ Gonads (male & female)
    - Testes
    - Ovary

Exocrine glands with duct, opens into buccal cavity eg: Pancreas, liver

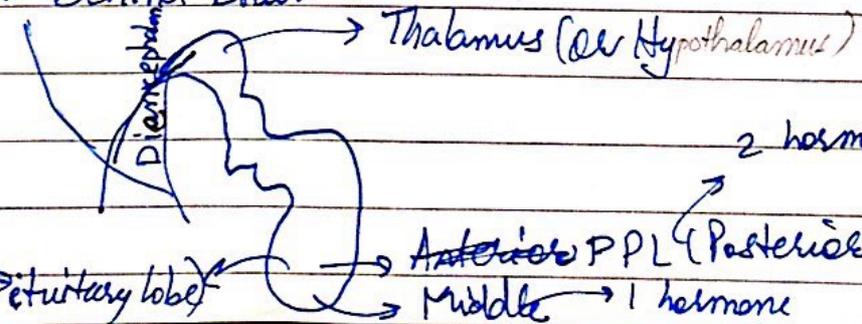
- Pancreas is both endo & exocrine gland
- ↳ Produce Islets of Langerhans

regions of pancreas that contain endocrine cells

◦ Fastest hormone :- Adrenaline (also called Noradrenaline)

## ↳ PITUITARY GLAND

◦ Diencephalon :- Behind brain



◦ Learn :- Hormones

or (Adeno Hypophys) → 6 hormones

APL (Anterior Pituitary lobe)

Anterior PPL (Posterior) } 3 hormones  
Middle → 1 hormone

## 8 Adeno Hypo Physic .

### 8 Hormones Produced by APL (Adeno Hypophysic)

1. STH : <sup>#</sup>Growth hormone - Somatotrophic hormone
- ↳ Acromegaly : If STH not produced gradually, that disorder is Acromegaly. → Jaws protruded, feet extended.
  - ↳ Dwarfism <sup>#</sup>slow :- Very slow.
  - ↳ Gigantism.

### 2. TSH : Thyroid Stimulating Hormone.

- ↳ Deficiency in thyroid.
- children: ↳ Pot bellied, Pigeon chested.
- ↳ Excess production
- ↳ Exophthalmic goitre.

### 3. ACTH :- Adreno Cortico Tropic hormone.

- Fight
  - Flight
  - Fright
- } FFF hormone.
- Types
- ↳ Glucocortico
  - ↳ Mineralocortico
  - ↳ Sex cortico

Medulla : Secretes adrenaline & noradrenaline.

### 4. FSH :- Follicle Stimulating Hormones

- also called (Gonadotrophic hormone)
- ↳ production of gametes :- Gametogenesis.
  - ↳ Testosterone in males
  - ↳ Progesterone in females
- } types.

### GTH 5. Luteinising Hormones. (LH)

- ↳ Luteotrophic hormone (LTH) → also called Prolactin gland.
- (∵ produces milk for new born babies)

## § Posterior Pituitary lobe (PPL)

Hormones released

→ ① Oxytocin

↳ Released both in males & females (more in females)

→ ② ADH (Anti <sup>Diuretic</sup> Hormone)

→ ③ MTH (Melanocyte Tropic Hormone)

↳ middle layer hormone → Stimulating

• Oxytocin

↳ Connection with nervous sys.

• ADH (also called VASOPRESSIN)

↳ anti diuretic (urine production controlled)

↳ controls excretion

• MTH :- cells responsible for giving color to in the body (color of body).

:- controlled by brain.

## Digestive System

• Maxilla & Mandible are the upper & lower jaws of oral or buccal cavity resp.

$$2 + 1 + 2 + 3 = 8 \times 4 = 32$$

$$\left( \begin{array}{c} 2 \\ 2 \end{array} \right) \left( \begin{array}{c} 1 \\ 1 \end{array} \right) \left( \begin{array}{c} 2 \\ 2 \end{array} \right) \left( \begin{array}{c} 3 \\ 3 \end{array} \right) = 32$$

↳ Incisors

↳ Canines

↳ Premolars

↳ molars.

• Thecodont, Heterodont

These make Salivary glands

• Sublingual salivary gland :- Below the tongue.

• Parotid salivary gland & Submandible salivary gland

- Salivary amylase (or Ptyalin)
- Mastication (or chewing)
- Peristaltic movt. (of Oesophagus)
- Chyme (food that reached stomach)
- Pyloric stomach (part of stomach → lower → away from heart)
- HCl, Pepsin & Renin :- stomach's enzymes & acid
- Stomach connected to liver via Hepatic duct
- Pancreatic amylase goes to stomach via hepatic duct.
- <sup>1</sup> Sphincter muscles :- round shaped
- From Jejunum & Ileum :- absorbs nutrients & ~~carbs~~ by connected blood vessels called <sup>2</sup> Mesophagial vessels
- Chud (name of food after it passes stomach)

Q Sources of proteins, carbohydrates, lipids

	proteins	carbohydrates	lipids
Milk	✓	✓	×
egg	✓	✓	✓
Bread		✓	
Vegetable	✓	✓	
Cereals		✓	

Make this table

- In Birds, <sup>1</sup> grinding of food done by <sup>2</sup> Gizzard
- <sup>3</sup> Regurgitating :- <sup>4</sup> defec of food in herbivores.

§ Liver

- Digestive Storage of  $C_6H_{12}O_6 \rightarrow$  glycogenolysis
- fat metabolism (food passed/released :- glycolysis)

- Bile contains <sup>5</sup> Bilirubin (Bleaching/oxid<sup>n</sup> of haemoglobin makes it green in color → helps in removing bilirubin → kind of excretion)
- Regener<sup>n</sup> in takes in liver also.

- Excretory system :- or Urogenital sys.

## Respiratory Sys

- Exchange of gases :- resp<sup>n</sup> / breathing
- made of Air sac :-  $O_2$  &  $CO_2$  :- cellular resp<sup>n</sup>.
- Alveoli in human respiratory sys.
- Resp<sup>n</sup> done in 3 steps :-
  - Inspir<sup>n</sup>
  - Expir<sup>n</sup>
  - Pause

- Lungs covered with Pleural membrane
- Left side liver
  - Bigger
  - 3 lobes
- Right side liver
  - Smaller
  - 2 lobes

Makes resp<sup>n</sup> easier

← To accommodate space :- only reason  
 • Dead space :- all space except alveoli (or region) nowhere else the exchange of gases takes place

• epistaxis :- nose bleeding. (जठरसोर)

Muscles helping in breathing }  
 • Intercostal muscles : In b/w ribs : 11 strips of muscles forming a cage :- controlled by Nervous sys :-  
 • Involuntary muscles : soft  
 → Turns to voluntary during heavy muscular activity

• Abdominal muscles Diaphragm

• Trachea has cartilagenous rings.

Imp ICILID : Inhaling/Inspiration - Contraction of Intercostal muscles - lowering of Diaphragm - Increase of Volume occurs

o Cells present in trachea → ~~muc~~ mucus cells, -----

★ o ERID :-

Exp<sup>n</sup> - Relaxation of Inter costal muscles —  
~~Relax<sup>n</sup> of di~~ Raising of diaphragm.

o Contraction of lungs → called as recoiling of lungs.

# [ o Mitochondria responsible for cellular respiration.

o Cytochrome :- pigment " " " "

o Cyanide blocks mitochondrial enzyme

o Carbon accumulated inside body ⇒ pH ↓ ⇒ lethal.

o Don't take water <sup>during</sup> ~~vigorous activity~~ - A lot of C in blood  
water goes to intestine directly & then to brain  
 Blood go to brain with more amt. of water  
 ⇒ Pressure ↑ ⇒ swelling of blood cells ⇒

~~once~~ unconsciousness / coma

o TB :- Bacteria rupture the lungs by eating the alveolar muscles — forms a bunch.

Annelids - nephridia.

prawns - green glands.

Arthropods - Malpighian tubules

## Excretory System

o Excretion :- elimin<sup>n</sup> of unwanted things. X

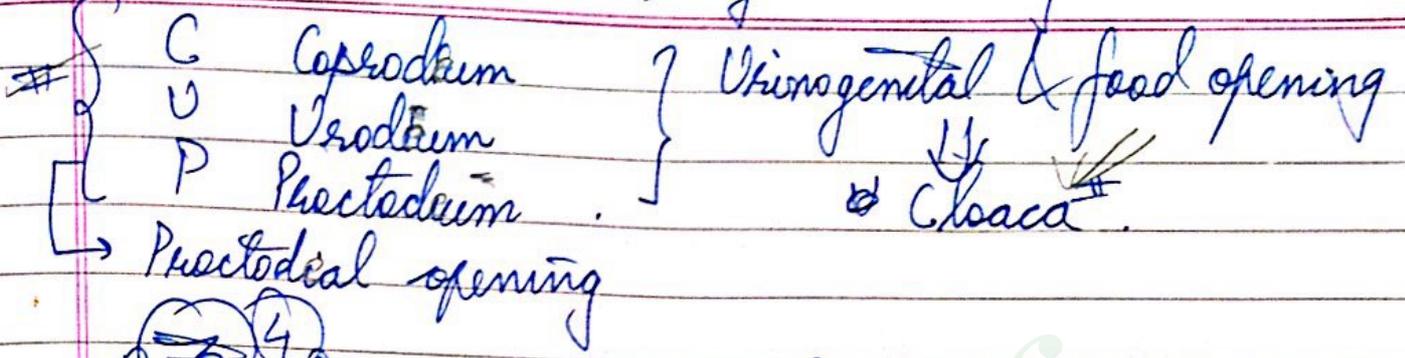
↳ ~~elimin<sup>n</sup> of nitrogenous waste products~~ ✓  
 products :- <sup>highly toxic</sup> ammonia <sup>+++</sup>, urea <sup>+</sup>, uric acid <sup>++</sup>

Ammonotelic animals  
 - aquatic animals

Ureotelic  
 - terrestrial animals

Uricotelic animals  
 - flying animals  
 - birds  
 (animals <sup>excrete</sup> ~~secrete~~ uric acid)

For Urinotelic animals, only one excretory area is there



Organs responsible for excretion in invertebrates:

- (1) Contractile vacuoles
- (2) Flame cells
- (3) Nephridia
- (4) Malpighian tubules

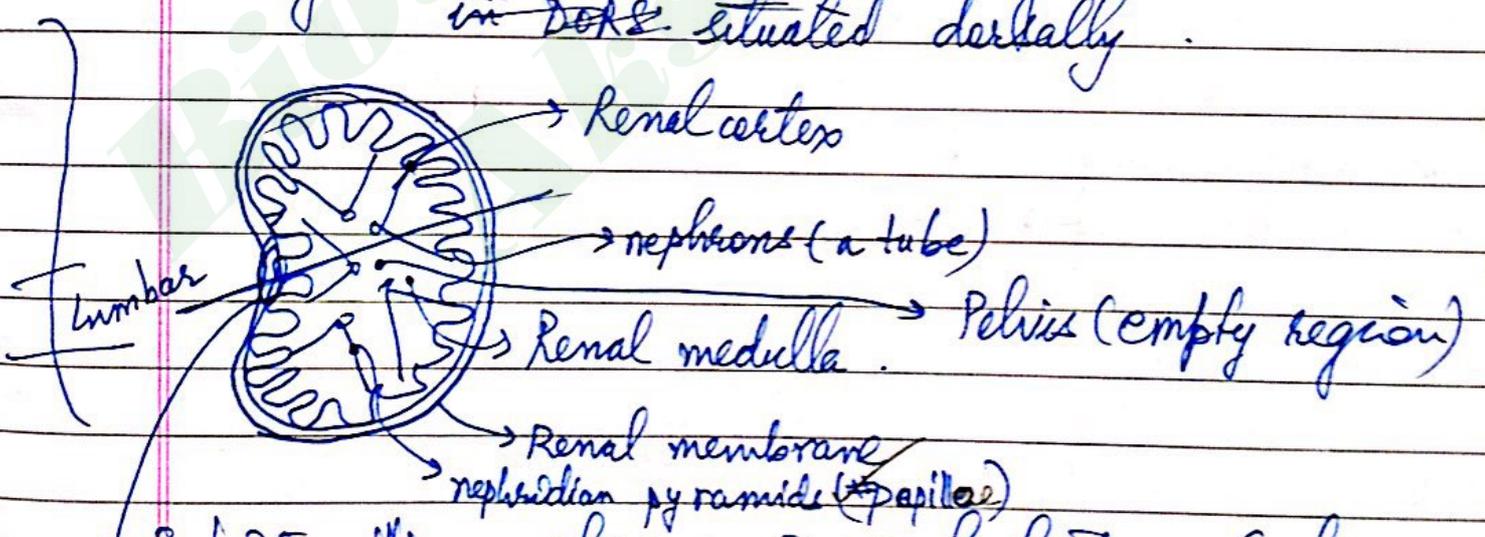
Planaria (Phylum - platyhelminthes)

glandular - excretion by flame cells (Its flagella flickers like flame)

Nephridia :- way of excretion by Annelids (phylum)

Malpighian tubules :- way of excretion by Arthropods

Kidneys :- located in lumbar region usually in ~~DORS~~ situated dorsally.



1.25 million nephrons in each kidney (of a normal human)

Sphincter muscles in urinary bladder

Micturition - Removal/voiding of urine - done by muscular & nervous sys. in body.

60% nephrons a bit into medulla - cortical nephrons  
 deep into medulla. Juxta medullary nephrons

Expansion of urinary bladder  $\Rightarrow$  ~~causes~~ contraction of ureter.  
 & vice versa.

- Structure of nephron
  - # Bowman's capsule
  - # ~~Convolution~~ <sup>convoluted</sup> tube
  - # PCT  $\rightarrow$  Proximal Convoluted Tube
  - # DCT  $\rightarrow$  Distal " "
  - Descending tube limb
  - Ascending tube limb
  - Collecting duct
  - Loop of Henle
  - # ~~glomerular~~ <sup>glomerular</sup> tubules
  - # Afferent & Efferent tubules

In Bowman's capsule to Collecting Duct.

- $\rightarrow$  Small opening
  - $\rightarrow$  Filter proteins molecules 1st.
  - If proteins come through that opening  $\Rightarrow$  disease  $\rightarrow$  albuminuria.
- $\rightarrow$  Goes to duct
  - $\rightarrow$  minerals & nutrients absorbed.
  - Sugar not absorbed  $\rightarrow$  diabetes.
  - # Insipidus diabetes Insipidus
  - # Melitus diabetes Mellitus
- $\rightarrow$  Collecting duct
  - $\rightarrow$  Rest everything absorbed by ADH
  - # Vasopressin (Brings ADH from brain)
  - # all the tubes coming to collecting duct

→ Anti Diuretic hormone

- ADH :- maintains the ~~see~~ retention & release of water

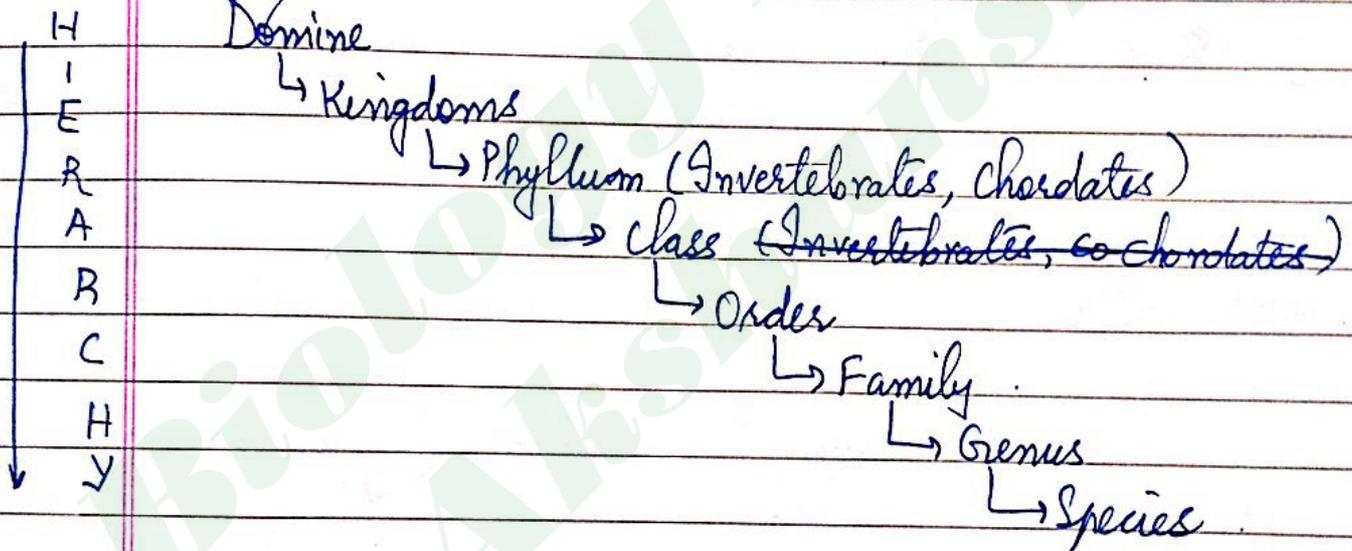
# Ch - Evolution & Taxonomy

change unnoticed

classification on the basis of structure

- Learn table <sup>#</sup> (20.1)

<sup>#</sup> → ~~or~~ Domain



<sup>notochord</sup>  
Dorsal <sup>#</sup> notochord, dorsal <sup>nerve cord</sup> cord, <sup>pharyngeal</sup> ~~for~~ gill slits : 3 imp.  
characters of chordates :- If they are not there, ⇒ invertebrates

- <sup>#</sup> Squiden octopus :- Molluscs that move very fast
- <sup>#</sup> Echinodermata :- 100% aquatic ; marine ; dorso-ventrally compressed.
- Learn further classes of Invertebrates & Chordates.

- Mammals :- have mammary glands, they are viviparas, have hair distrib<sup>n</sup> throughout body, pinna (outer ear).  
↳ divided on the basis of

Order : Primus  
Family : Homi<sup>#</sup>neda  
Genus : Homo  
Species : Sapiens

- Gibbon<sup>#</sup>, Gorilla<sup>#</sup>, Chimpanzee<sup>#</sup>, Orangutan<sup>#</sup> :

Genus (Homo) : Size of brain & thumb <sup>big callosom</sup> → Homo characters  
(things that differ us from \_\_\_\_\_).

Family :- Characters differentiating us & \_\_\_\_\_ from other families :- Quadruples<sup>#</sup> → can also stand erect.

- Phylogeni :- trying to connect ~~connect~~ b/w groups.
- Paleontology :- Study of fossils.
- Archeopteria :- Shows connection b/w groups.
- Originogenesis<sup>#</sup>

- How to study evidences about history of classes :-

fossils, life cycle, comparative anatomy  
(not physiology → physiology means action, how can we see action in dead animal), biochemical & molecular comparison.

# Ch-5

- Biochemical rxns:- form<sup>n</sup>, breakdown, reassembly of molecules to provide organisms with essential energy & building blocks are called ---
- \* ◦ Anabolism , catabolism
  - ↳ आवृत्ति → energy requiring process.
  - ↳ क्षय → energy released

- Enzymes are charged ∴ they contain amino acids (which are zwitter ionic).
- binding <sup>site</sup> ⇒ perfect fit (By Induced fit hypothesis).
- active site :- new bonds formed or broken.
  - ↳ active site could sometimes be binding site in certain enzymes.

## Naming enzymes

Name of molecule } eg:- DNA polymerase  
 Type of rxn } Glycogen Synthetase  
 ase }

Synthetase.

- Exceptions in enzyme naming: Pepsin & Trypsin, Renin.
- Cofactors (help enzymes) → organic or inorganic.
- Coenzymes ( " ) → organic
- Vit A, K, E, D :- Insoluble in water  
 other vitamins :- water soluble.
- NADPH / NADP
- FAD, NAD<sup>+</sup> ∴ Cofactors in all helping enzymes.

## autoradiography

Puffin

Date \_\_\_\_\_

Page \_\_\_\_\_

- turnover no. of substrate molecules :-  
No. of binding & active sites present on enzymes on which substrate molecules bind in a given time.

Q. Why store food in low temp?  
enzymatic action is very slow.

Q. High fever should be avoided. why?  
High fevers tend to damage proteins in brain.  
If any damage happens, no replacement.

→ is glyceraldehyde-3-phosphate (G-3-P)

\* 3-phosphoglyceraldehyde (PGAL) is the major product of Calvin Cycle (not glucose).

\* Restriction enzymes :- cut <sup>DNA</sup> at <sup>only</sup> specific base pair sequence <sup>sites</sup> from total. These are specific in action.

## Reference Book

Ch-16

# Gene Technology

## R-DNA Technology or Recombinant DNA Test

◦ Defin<sup>n</sup> :- Gene Tech. / R-DNA

◦ Tool kit, requirements :-

→ Source DNA : Isolate, Gene of Interest

(Molecular scissors) → Restriction Enzymes / Endonucleases (Ligase)

(Carrier) → Vector / Cloning vehicle → Plasmids

→ Phages → prokaryotic

(Few multiple copy production) → Host : E. coli (best source) (yeast, mammalian cells, insects)

(Few cloning & make more copies) → DNA libraries → Genomic → C-DNA → complementary DNA

◦ Technique : 4 steps

- 1) Cleavage → cut source DNA & vector DNA
- 2) Recombinant DNA molecule → source + vector DNA
- 3) Cloning → with host & DNA libraries
- 4) Selection & screening → Done :- I don't know whether all the cultured bacterial cells have the R-DNA. So, it is reqd. Done with the help of antibiotic resistance. Antibiotic would kill microorganisms. The organisms that are not killed are resistant & they have R-DNA (Plasmid). Hence, they can be known & separated.

◦ Applic<sup>ns</sup>

\* Recombinant DNA: genetically engineered DNA formed by recombining fragments of DNA from diff<sup>t</sup> organisms.

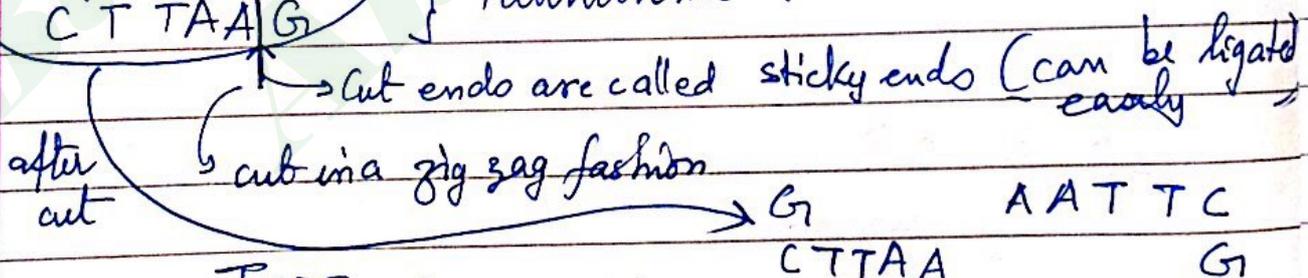
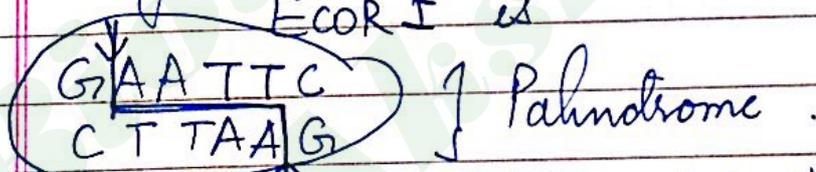
\* Humulin is the 1st recombinant insulin that was made available on the market commercially.

\* We need to cut our vector DNA with the same restriction enzymes. ∴ the source DNA & vector DNA must have same shape so that vector DNA can carry the source DNA for cloning.

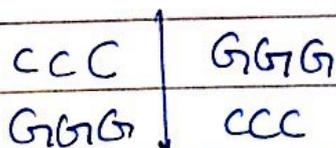
\* Genome: sum total of all the genes for an organism / thing.

\* ~~E. coli~~ TYPE-1 enzyme → eg: EcoRI

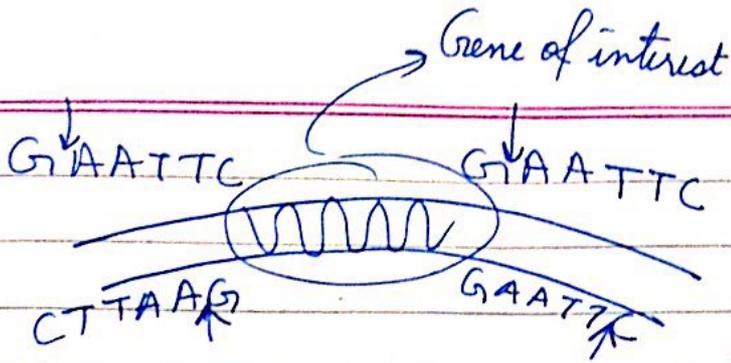
\* Recognition sequence for restriction enzyme  
EcoRI is



TYPE-2 enzyme → eg: AluI  
Sma-I



Cuts in the centre & ends are called blunt ends.



\* The process is also called HOST Restriction & because host DNA gets modified.

\* Plasmids

- : Small, circular
- : used to clone relatively small pieces of DNA, upto 10 Kb (kilobases)
- : ORI : origin of replic<sup>n</sup>
- : selective/selectable marker
- : MCS : multiple cloning sites :- region where a DNA of interest is inserted. In MCS, there are a no. of unique restriction sites.

\* Lac Z is responsible for producing beta galactosidase  
 ↳ If Lac Z is final, it transcribes & enzyme is produced.

DNA

- X { • If colony are grown to X-gal, sugar will be degraded & color of colony → blue.
- ✓ { • If non degraded → <sup>or white color</sup> colorless → DNA of interest ~~absent~~ present

## \* Phage

: linear DNA

: Virus of a bacteria; Extrachromosomal DNA in bacteria  $\rightarrow$  Plasmids

: Can carry up to 40 Kb.

\* The cells of vertebrates possess glycoproteins.

These are made by ~~the~~ Major histocompatibility complexes (MHCs). These glycoproteins are called as MHC proteins. For humans, these are called Human Leukocyte antigens (HLA).

\* Receptor: an organ having nerve ending that respond to stimulus.

\* Cell mediated Immune response

$\rightarrow$  Secretion of regulatory molecule called as CYTOKINES. (Lymphokines if secreted by lymphocytes).

Cytokines naming

$\rightarrow$  Named as INTERLEUKINS followed by a no. to indicate whose amino acid sequence has been determined.

\* Helper T-cells secrete cytokines known as macrophage colony-stimulating factor &  $\gamma$ -interferon to promote activity of macrophages. They also release

interleukin-2  $\rightarrow$  cytotoxic T-cells stimulated.

\* Drug cyclosporin inhibits graft rejection by inactivating cytotoxic T-cells.

\* Antibodies are proteins in a class called immunoglobulins (Ig).

$\hookrightarrow$  IgM, IgG, IgD, IgA, IgE.

IgM or IgD : B cell surface.

IgM : complement proteins.

IgG : bind to antigens  $\rightarrow$  mark & promote phagocytosis.