

BIOLOGY

FIRST YEAR NOTES

-AKSHANSH CHAUDHARY



General Biology Notes, First Edition

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BIOLOGY : General

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 grps. on the basis of their structure.

Taxonomy

(Classificⁿ into grps. on the basis of structures)

Morphology

(Classificⁿ on the basis of ext. structure)

• Phenotype : Study of ext. characters

Anatomy

(Classificⁿ 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 ^{Empirical} ~~Impirical~~ (see spellings)
Direct observation not possible if people are large
- Observation indirectly : eg: effect of light, 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 ~~ex~~ CONTROL EXPERIMENT. i.e. we need to have PLASIBO (empty capsule) :- psychologically cure a person.
• In Plasilbo, 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 hypotheses.
 - It should be done repeatedly till we get an authentic value.

* Verified :- Verified by the board so that it's 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, behaviour, 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:- advertisement.

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"
 - Unique Structural Organisation

Metabolism

Anabolism
(making)
eg: photosynthesis

Catabolism
(breaking)
eg: respirⁿ

Generative

Regenerⁿ
& Growth

Reprodⁿ

Response

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

Individual
Adaptation
• Homeostasis
→ Internal environment
balance

Evolution

* Populⁿ :- 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 lays more eggs
cattle reproduce faster

C.C. = 0.013 @ 150 mag

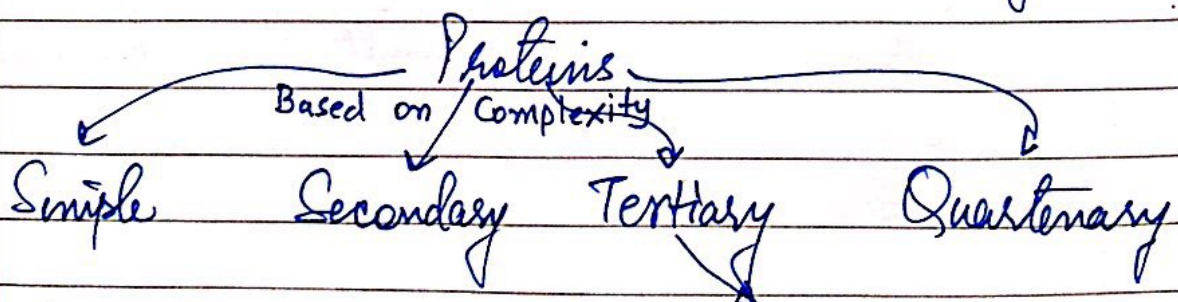
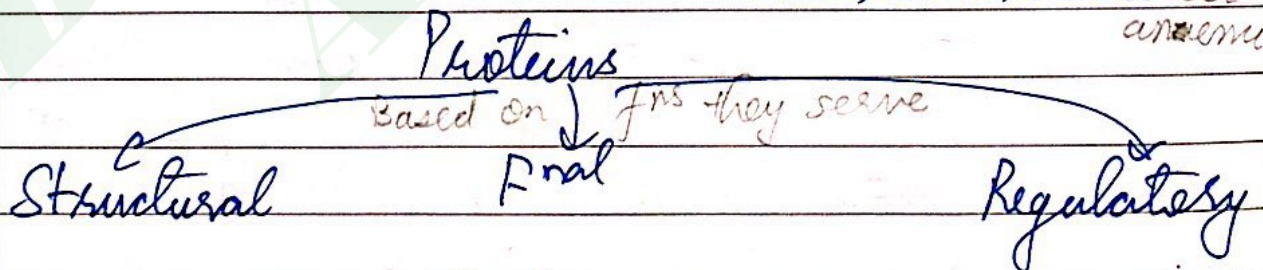
Chapter - 3

★ Final gaps

A : Alcohol/Hydroxyl ($-OH$)
M : Methyl ($-CH_3$)
A : Amine ($-NH_2$)
C : Carboxylic acid ($-COOH$)
P : ~~Phosphate~~ Phosphate ($-PO_4$)
C : Carbonyl gap ($-CO/COH$)

★ β 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



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

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

Carbohydrates

parafocal ✓

parafoal X

★

Lipids

- Non polar molecules (dissolve in ether & CH_4).
- 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 Emulsificⁿ

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

★

LIPIDS

Simple

- eg: Steroids
- They have regulated fⁿ. So, hormonal
 - Prostaglandins: ^oline hormone that controls growth.
 - Androgens: Anabolic & subs. help constructing body.

Complex

- eg: Phospholipids
- Prepare chocolates.
 - waxy subs. → so not good for health.
 - In plant cells.

Neutral

- eg: Triclipids.
- (They give energy)

★ True lipids

Fatty acids

Saturated

→ extracted from animals

→ Solid at RT

(∴ H atoms are more)

eg. Scientific name → Stearic acid

Empirical → 36

Unsaturated

→ from vegetables

→ Liquid at RT

(∴ H atoms are less)

eg. Scientific name → Linoleic acid

Empirical formula → 30

Glycerols

→ Monoglycerols

→ Diglycerols

→ Triglycerols :- 95% of energy is acquired from them

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

formⁿ 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: Hallucinⁿ, swinging mind, aggression.

⑧

Carbohydrates

- Immediate source of energy
- $C : H : O :: 1 : 2 : 1$

Simple or
Monosaccharides

Complex or
Polysaccharides

- * Bondings → Glycosidic bonding by DSP (Dehydrⁿ 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

Nucleic Acids

* Basic component of DNA \rightarrow Nucleotide.

Nucleic acids \rightarrow Sugar
 \rightarrow Phosphate grp
 \rightarrow Nitrogen bases

* Symbols :- $PO_4 \rightarrow O$ Nitrogen bases $\rightarrow \square$

* Ribose $\rightarrow C_5H_{10}O_5$

Sugar (Pentose) $\rightarrow \diamond$

Deoxyribose (one O less) $\rightarrow C_5H_{10}O_4$

Nitrogen bases

Purines
(AG)

Adenine

Guanine

Pyrimidine
(TC) & (U)

Thymin

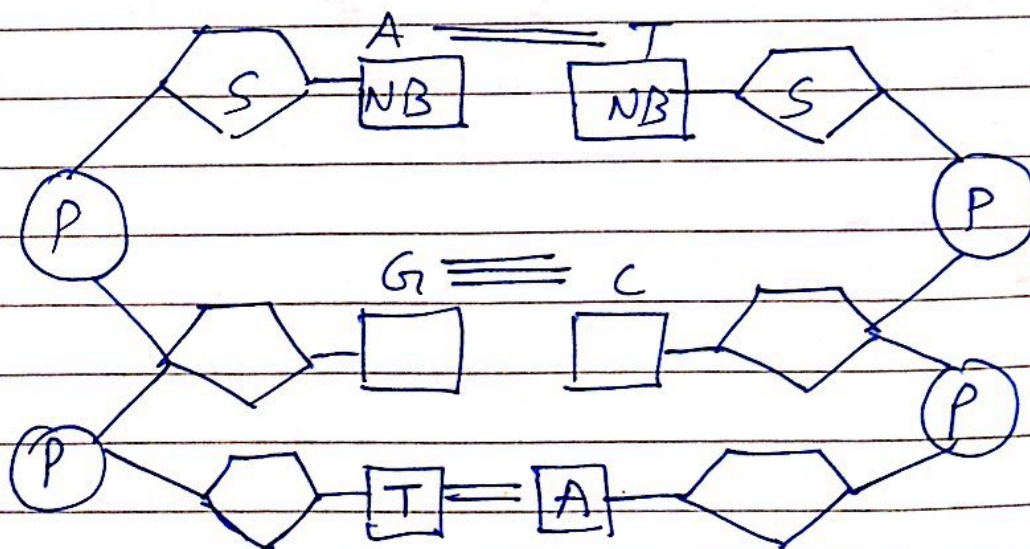
Cytosin

Replaced by
Uracil in RNA.

2 bonds

3 bonds

* Remove phosphate from Nucleotide = Nucleoside.





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 (Locus).

★ Q Characteristic feature of Genes?

- See pg-60 {
- ✓ Store data (info) \rightarrow hidden info \rightarrow ~~Gene~~ Gene
 - ⊙ \rightarrow called as Gene Library (or Gene Pool).
 - ✓ Helps in Protein Synthesis -
 - ✓ Helps in passing characters from 1 generⁿ to another. (2 phases \rightarrow transcription & translation)
 - ✓ Protein synthesis &

★ The replicⁿ 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 & Functions

✓ Organelles

→ Net/web like structure.

* Endoplasmic Reticulum

Rough

Protein synthesis

Smooth

Fat metabolism & detoxification.

* 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 :- 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 prodⁿ :- Syndactylism

Q. Peroxisomes

Comes directly from ER

• Functions fuses
→ lipid metabolism

Lysosomes

Comes from Golgi Apparatus

• Pns fuses

Q. Vacuoles — membranous

• Larger structure

Vesicles

• Small structures

* (Nuclear membrane)

→ Its an organelle. Reason:

→ It has pores & through which RNA escapes (big molecules)

→ Not present in prokaryotes

→ consists of 2 layer membranes.

Q. What are energy converters & how are they diff^t from other organelles?

The 2 energy converters are → mitochondria and Chloroplasts.

1. Diff^t chemical nature.

2. 2 membranous. → Inner membrane enfolds & for increasing more area (Cellular respirⁿ)

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

3. Within them, Ribosomes. ~~and~~ (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 & st. 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.

Puffin

Date _____

Page _____

★ RIBOSOMES

- Non membranous
- Synthesis of protein for ^{Ribosomes are} 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
- mobility
- Cell division
- Transportⁿ → Informⁿ 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 & \Rightarrow protect from eaten by animal.
- Bacteria ^{store} ~~store~~ inclusion crystals, harmful to insects B. thuringiensis

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

Puffin

Date _____

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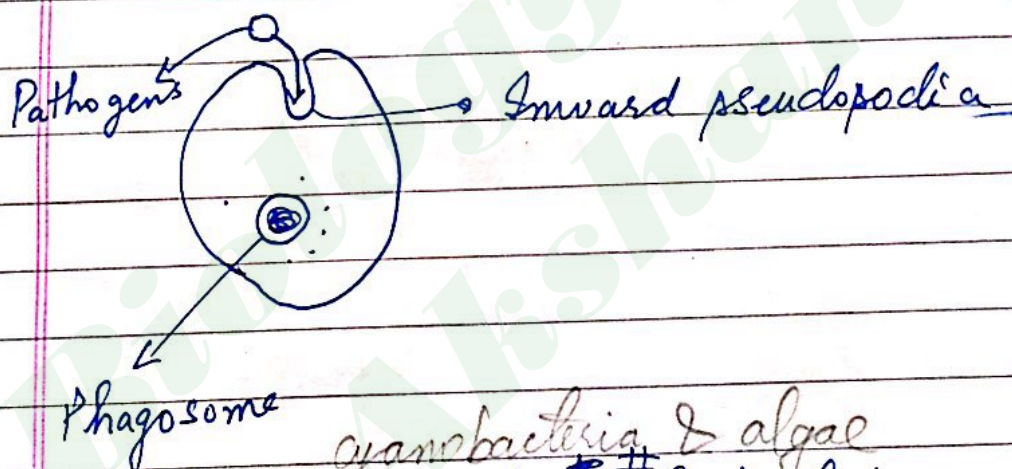
* Solⁿ

Hypertonic

Isotonic

Hypotonic

- * # Turgor effect :- Increase / decrease of size of vacuoles when put in hyper/hypotonic sol^{ns}
- Phagocytosis (Eating cell) : Eating of solid ^{substances}
- Pinocytosis (Cell drinking) : " " " liqd ^{substances}



Q Diff. b/w ^{cyanobacteria & algae} cyano & archi bacteria

also called as ^{life} Extremophiles : can bear temp. cond^{ns}.

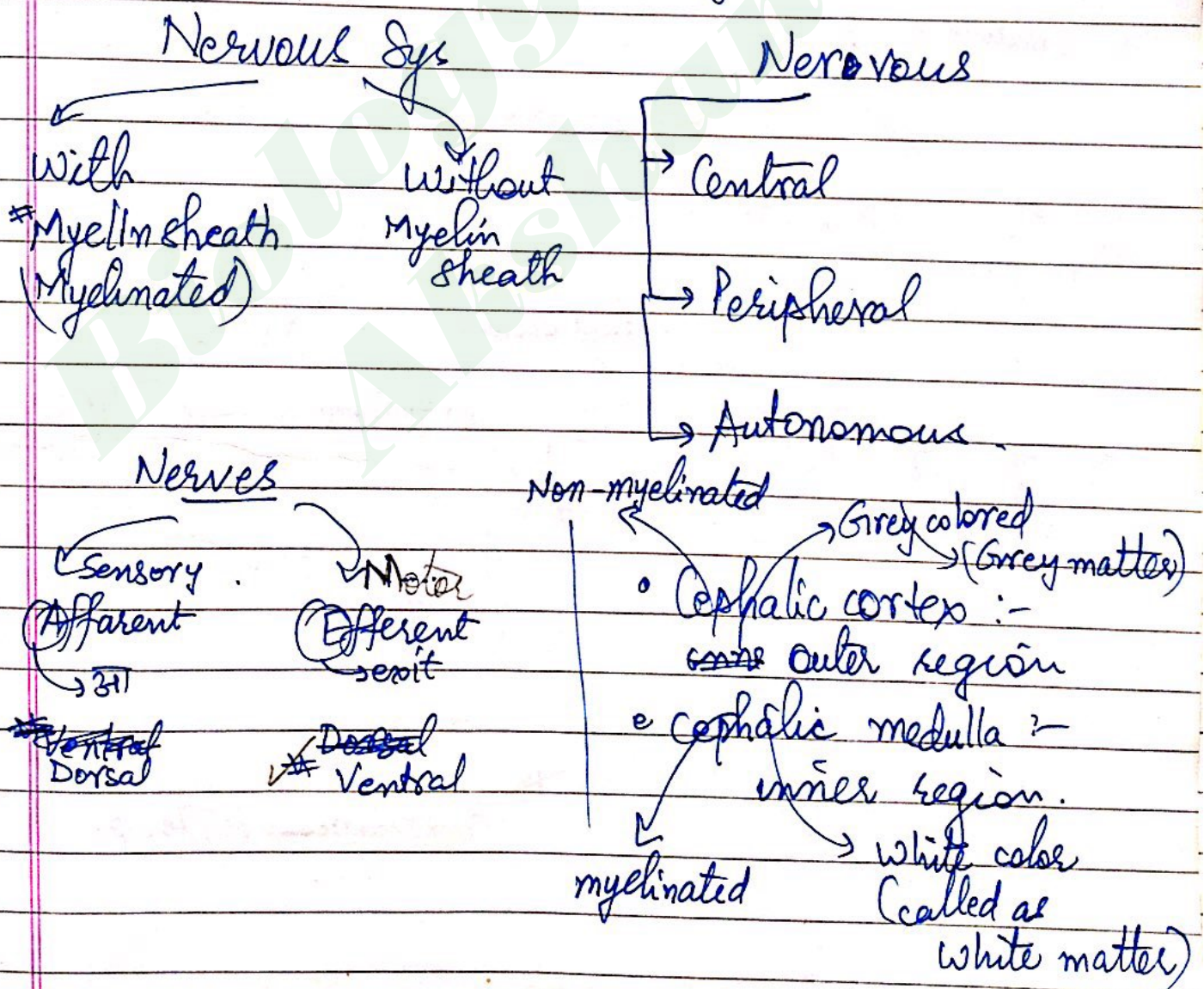
Q # Acclimatize & Acclimatization :- Difference.
(Adaptⁿ) (Suppression)

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

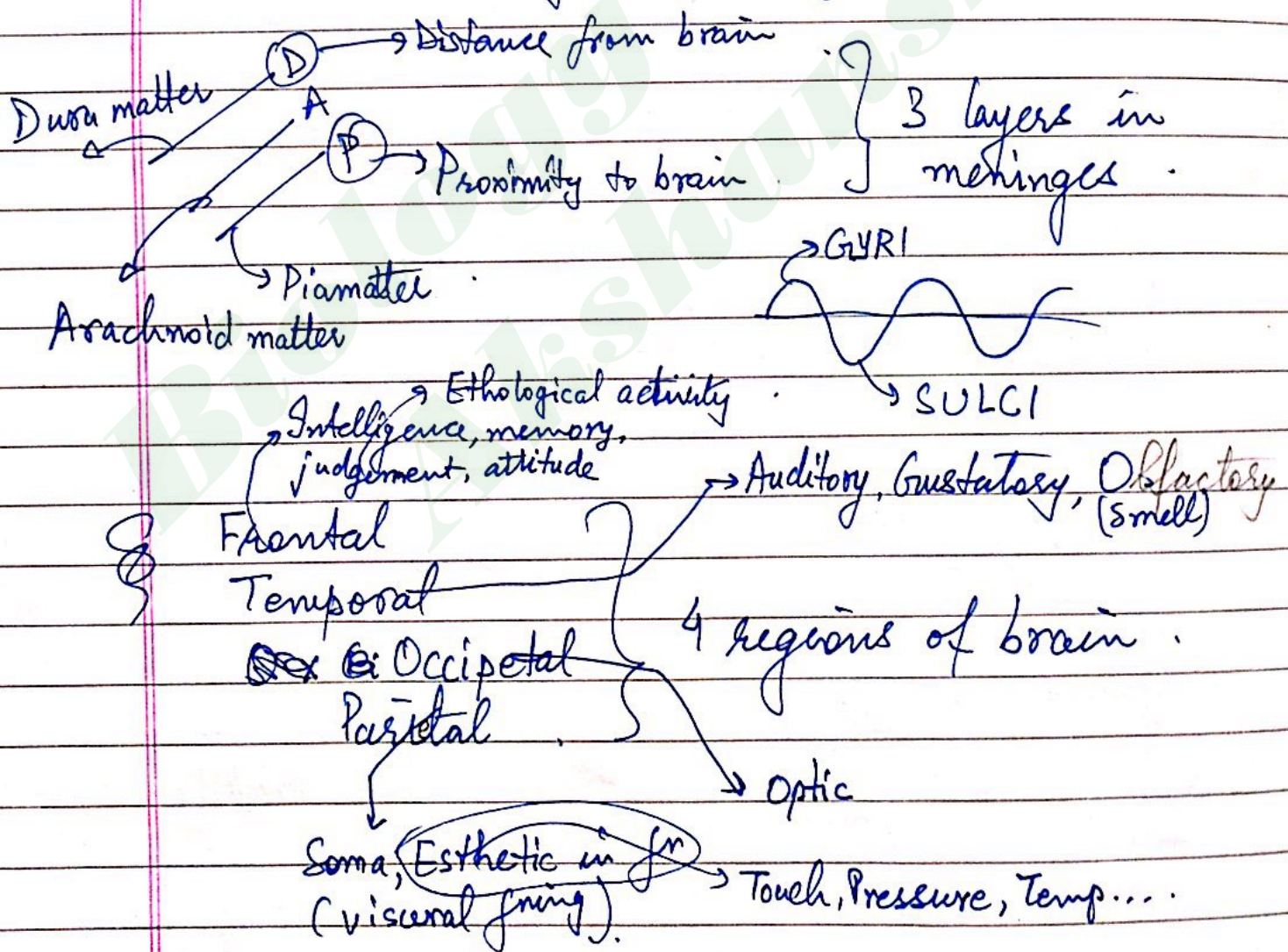
Q & Mitochondrial inheritance — [#] leban disease

Nervous System

- Neuroplasm in neuron is grey colored.
- # Chromatophore / Soma / Nissl's body : Other names of body of a nerve. Neuroplasm
- Saltatory Condⁿ : 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 \rightarrow expands & it needs to expand have more nerves.
- "Innagin" takes place inside the outer portion of brain.
- Brain is covered with Meninges. \rightarrow filled with fluid \rightarrow Cerebro spinal fluid.
- Protection, Nourishment & Shock absorbers.
 - \rightarrow fns of fluid (uses).
 - (Broth \rightarrow pathogens entering fluid in brain).



- Cerebral hemispheres :- 2 halves.

Joined by nerve band ^{called} corpus callosum.

- Inside cortex :- Hypophysis (Pituitary gland)
→ called as Thalamus
→ Guide thalamus.

- Based on fn, brain has 3 regions :-

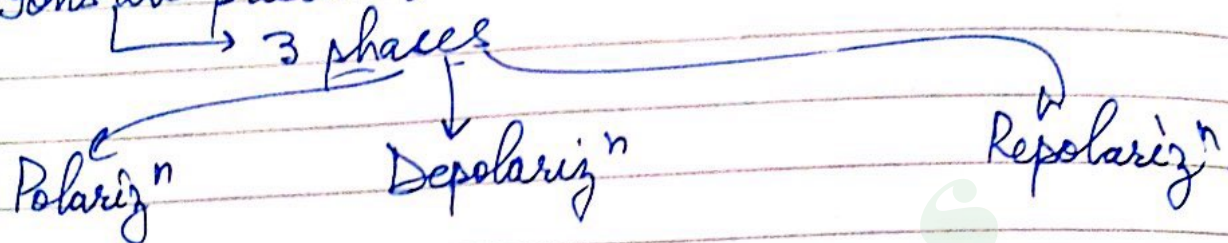
→ Cortex.

→ medulla oblongata → come from brain.

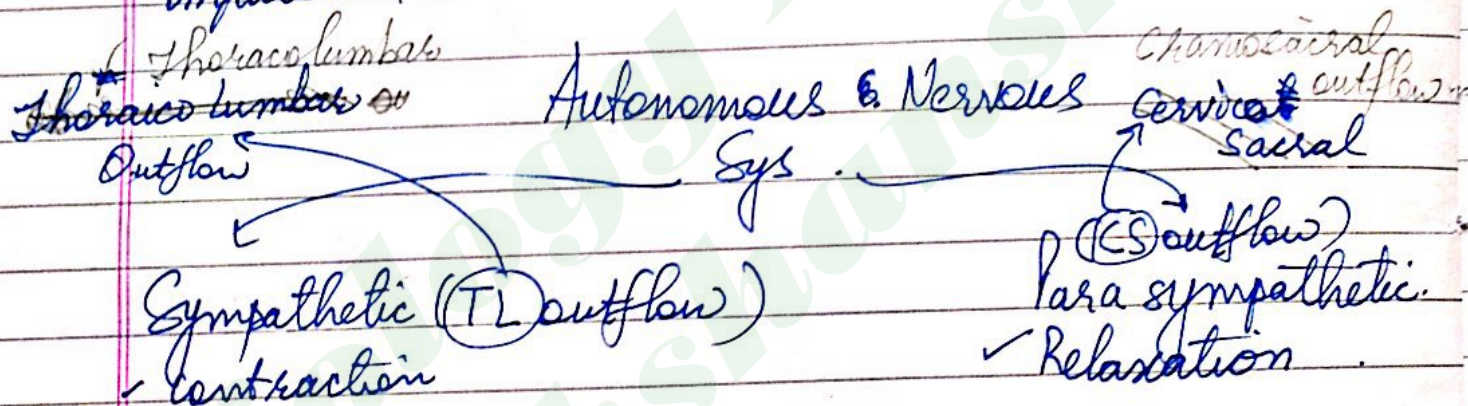
- 13 pairs of ^{cr} cranial nerves that control the body.
Other than human beings → 12.
- 31 pairs of spinal nerves come outside from spinal cord.

One
Of
Our
Teacher
Asks
For

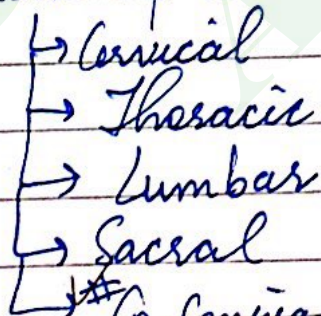
- Ions are present inside the nerve cell.



- Ions pulled outside by Na pump.
- Neurotransmitters are of 2 types:-
Adrenaline & Acetylcholine
- Saltatory movt/condⁿ:- Jumping movt. of nerve impulses



- Regions of Vertebral Column.



Co-conjugate Coccygeal vertebrae (Tailbone)

- Collateral Ganglia:- Outside lumbar & Thoracic region.

* Senses (5)

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

→ Optic

Eye.

↳ 3 outside (outer) layers

Sclera
(Outermost)
Cartilaginous
(Protection)

Choroid
(Middle)
Muscular
(Nourishment)

Retina
(Innermost)

part of brain where optic nerves cross

Optic nerves

OPTIC CHIASMA

also called Superior Colliculus

Brain: TECTUM

(Capturing unit)

Nerves

transparent or translucent third eyelid.

Aqueous humour, Nictitating membrane, Conjunctiva, Lysosomes

• FRIE (CENTRAL) - 4.11

myosin, actin, cell, mitochondria, coagulating dry blood

Inside retina :- VCL (Visual Cell Inner)

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

Color (7) ← Cone - Rhodopsin

Cone

Optic

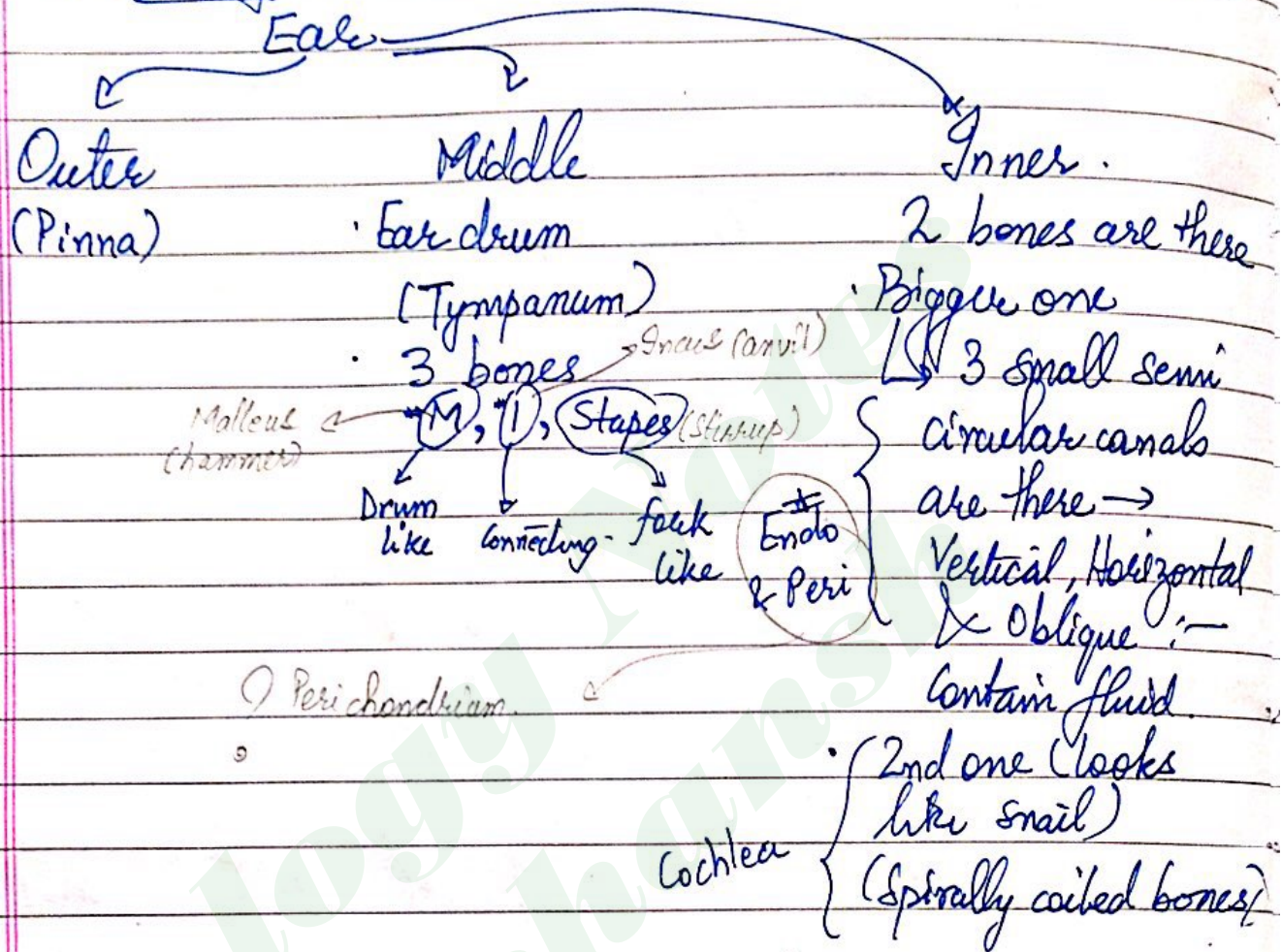
• At yellow spot, cone

Oviparas & # Viviparas
 no embryonic devt. | embryos devt. inside mother's body
 within mother

Puffin

Date _____
 Page _____

* Auditory



* Middle ear opens into ^{Buccal} ~~bad~~ Buccal cavity
 Tube name :- ^{Eustachian} ~~Eustachian~~ canal / tube

Ears & Pharynx are connected through it.

* Blood Vascular System

(CVS : Cardio Vascular System)

Heart → Blood

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 & Renal Portal Sys
liver before heart blood from posterior part of body into them
- Systemic and Pulmonary system circulation
lungs to heart to body body to heart to lungs

- * 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 ⇒ ~~Schaemic~~ Ischaemic disease

- * Coronary ~~Sinus~~ 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
(\because 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~~ ^{heme}/haem, 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

- Phagocytes = Leucocytes + NEB

Thrombocytes
Platelets

Bone marrow
produced in Lymph

- Thymus - Juvenile glands - Present only in children.

Endocrine System

Endocrine Glands.

- Ductless
- Goes 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

or Thalamus gland

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

- Pancreas is both endo & exocrine gland.

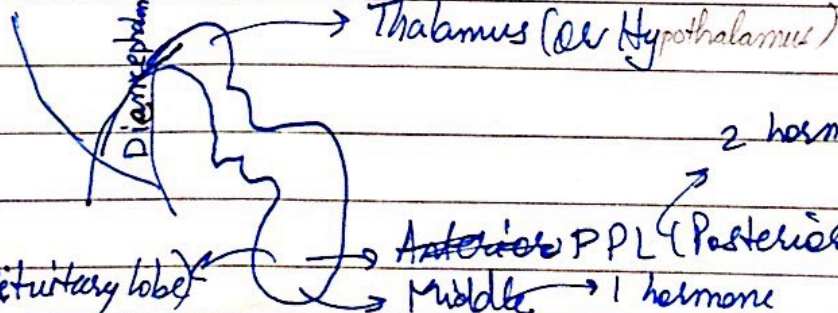
→ Produce Islets of Langerhans

regions of pancreas that contain endocrine cells

- Fastest hormone :- Adrenaline (also called Noradrenaline)

→ PITUITARY GLAND

- Diencephalon:- Behind brain



Learn: Hormones

or (Adeno Hypophysis) 6 hormones

APL (Anterior Pituitary lobe)

Anterior PPL (Posterior)

Middle → 1 hormone

2 hormones

3 hormones

8 Adeno Hypo Physic .

8. Hormones Produced by APL (Adeno Hypophysis)

1. STH : ^{##}Growth hormone - Somatotrophic hormone

→ ^{##}Acromegaly : If STH not produced gradually, that disorder is Acromegaly. → Jaws protruded, feet extended.

→ Dwarfism

→ Gigantism

^{##}Slow :- Very slow .

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

3. Medulla : Secretes adrenaline & noradrenaline .

4. ~~Fol~~ FSH :- Folicle Stimulating Hormones

also called

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

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 ^{Diuretic} Hormone)

→ ③ MTH (Melanocyte Trophic 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 the body
(color of body).
:- Controlled by brain.

Digestive System

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

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

$$\left(\begin{smallmatrix} 2 \\ 2 \end{smallmatrix} \right)$$

$$\left(\begin{smallmatrix} 1 \\ 1 \end{smallmatrix} \right)$$

$$\left(\begin{smallmatrix} 2 \\ 2 \end{smallmatrix} \right)$$

$$\left(\begin{smallmatrix} 3 \\ 3 \end{smallmatrix} \right)$$

$$= 32$$

↳ Incisors

↳ Canines

↳ Premolars

↳ Molars

• Thecodont, Heterodont

These make
salivary
glands

• Sublingual salivary gland :- Below the tongue.

• Parotid salivary gland & Sub[#]mandible salivary gland

- Salivary amylase (or Ptyalin)
- Mastication (or chewing)
- Peristaltic movt. (of Oesophagus)
- Chyme (food that reached stomach)
- Pyloric stomach : last 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.
- ~~Sphincter~~ muscles :- round shaped
- From Jejunum & Ileum :- absorb nutrients & ~~cells~~ by connected blood vessels called ~~mesophagial~~ ^{mesenteric} vessels
- Chud (name of food after it passes stomach)

Q Sources of proteins | carbohydrates | lipids

Milk	✓	×	×
egg	✓	✓	✓
Bread		✓	
Vegetable	✓	✓	
Cereals		✓	

Make this table

- ~~Regurgitating~~ ^{Regurgitating} ~~in~~ ⁱⁿ Birds, grinding of food done by ~~Gizzard~~ ^{Gizzard}
- ~~Regurgitating~~ ^{Regurgitating} : ~~digestion~~ ^{digestion} of food in herbivores.
- ~~Liver~~ ^{Liver}

- Digestive Storage of $C_6H_{12}O_6$ → glycogenolysis
- fat metabolism (food passed/released :- glycolysis)
- Bile contains ~~Bilirubin~~ ^{Bilirubin} (Bleaching/oxidⁿ of haemoglobin makes it green in color → helps in removing bilirubin → kind of excretion)
- Regenerⁿ ~~in~~ ⁱⁿ takes in liver also.

- Excretory system :- or Urinogenital sys.

Respiratory Sys

- Exchange of : gases :- respⁿ/breathing
made of Air sac : O_2 & CO_2 :- cellular respⁿ.
- Alveoli in human respiratory sys.
- Respⁿ done in 3 steps :-
 - Inspirⁿ
 - Expirⁿ
 - Pause

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

Makes
respⁿ
easier

- Dead space :- all space except alveoli (or region) (nowhere else the exchange of gases takes place)

- epistaxis :- nose bleeding. (नासबली)

- Inter costal 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

Muscles
helping
in
breathing

- Abdominal muscles Diaphragm

- Trachea has cartilagenous rings.

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

- Cells present in trachea \rightarrow ~~muc~~ mucus cells, -----

* ERID :-

Experⁿ - Relaxation of Inter costal muscles -
~~Relaxⁿ of di~~ Raising of diaphragm.

- Contraction of lungs \rightarrow called as recoiling of lungs.

[Mitochondria responsible for cellular respiration.

- Cytochrome :- pigment " " " "
- Cyanide blocks mitochondrial enzyme
- Carbon accumulated inside body \Rightarrow pH \downarrow \Rightarrow lethal.
- Don't take water ^{during} ~~vigorous activity~~ - A lot of C in blood \wedge - Blood go to brain with more amt. of water
water goes to intestine directly & then to brain
 \Rightarrow Pressure \uparrow \Rightarrow swelling of blood cells \Rightarrow
unconsciousness / coma
- TB :- Bacteria rupture the lungs by eating the alveolar muscles - forms a bunch.

Annelids - nephridia.

Prawns - green glands.

Arthropods - Malpighian tubules.

Excretory System

- Excretion :- eliminⁿ of unwanted things. IX

* eliminⁿ of nitrogenous waste products ✓
 \rightarrow products :- ^{highly toxic} ammonia, urea, uric acid

Aminotelic animals
- aquatic animals

Ureotelic
- terrestrial animals

Uricotelic animals
- flying animals
- birds
(animals excrete uric acid)

For Urinotelic animals, only one excretory area is there

{ C Coprodeum } Urinogenital & food opening
 { U Urodeum }
 { P Proctodeum }
 ↳ Proctodeal opening
 ↳ Cloaca

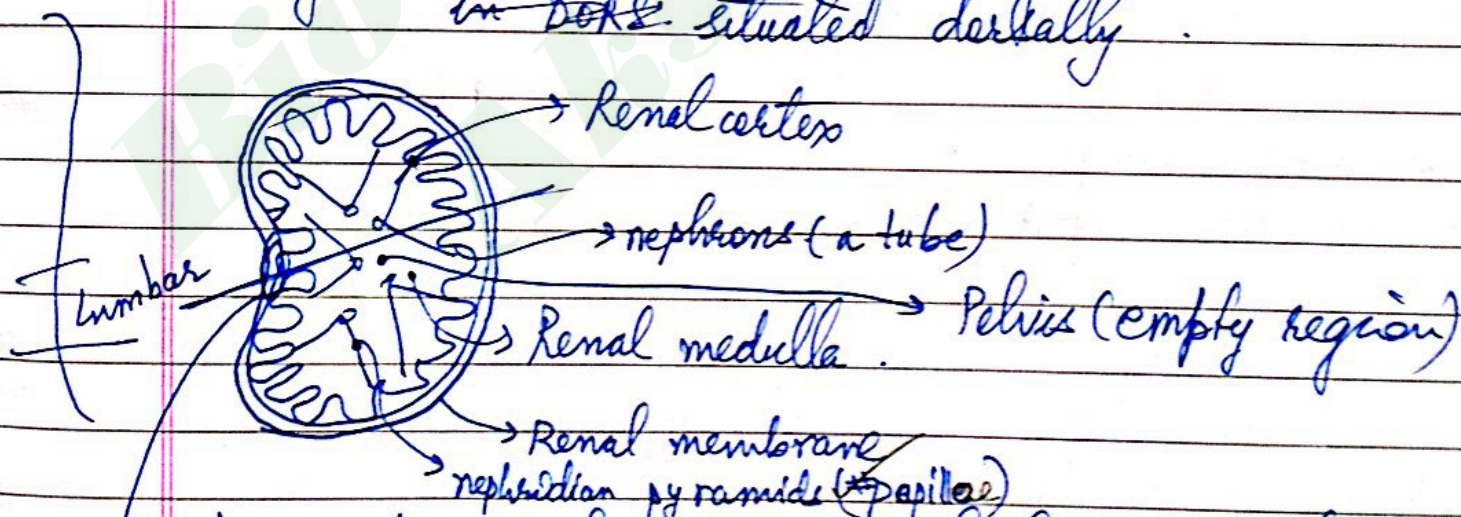
Ques. Organs responsible for excretion in invertebrates:

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

Planaria (Phylum - platyhelminthes)
 ↳ 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 ~~small~~
~~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 nephron

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- Expansion of urinary bladder \Rightarrow ~~causes~~ contraction of ureter.

& vice versa.

- Structure of nephron
 - # Bowman's capsule
 - # ~~Convoluted~~ tube
 - # PCT \rightarrow Proximal Convoluted Tube
 - # DCT \rightarrow Distal " "
 - Descending tube limb
 - Ascending tube limb
 - Collecting duct
 - Loop of Henle
 - # ~~Glomerular~~ 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)
 - # are the tubes coming to collecting duct

→ Anti Diuretic hormone

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

Ch - Evolution & Taxonomy

change unnoticed

classification on the basis of structure

- Learn table (20.1)

→ or Domain

Domine

→ Kingdoms

→ Phylum (Invertebrates, Chordates)

→ Class (~~Invertebrates, Chordates~~)

→ Order

→ Family

→ Genus

→ Species

H
I
E
R
A
R
C
H
Y

- Dorsal ^{notochord} ~~notochord~~, dorsal ^{nerve} cord, ^{pharyngeal} ~~gill~~ slits : 3 imp. characters of chordates :- If they are not there, ⇒ invertebrates

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

- Mammals: have mammary glands, they are viviparous, have hair distribⁿ throughout body, pinna (outer ear).
↳ divided on the basis of

Order: Primus
Family: Hom[#]inida
Genus: Homo
Species: Sapiens

- Gibbon[#], Gorilla[#], Chimpanzee[#], Orangutan[#]:

Genus (Homo): Size of brain & thumb ^{big callosom} → Homo characters (things that differ us from _____).

Family (Hom[#]inida): Characters differentiating us & _____ from other families :- Quadruples[#] → can also stand erect.

- Phylogeni :- trying to connect ~~connect~~ b/w groups.
- Paleontology :- Study of fossils.
- Archeopteria :- Shows connection b/w groups.
- Origimogenesis[#]

- 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:- formⁿ, breakdown, reassembly of molecules to provide organisms with essential energy & building blocks are called — — —
- Anabolism , catabolism
 - ↳ आना , घटित .
 - ↳ energy requiring process .
 - ↳ energy released
- Enzymes are charged \because they contain amino acids (which are zwitter ionic).
- binding ^{site} ~~fit~~ \Rightarrow 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 . }
 - ↳ ase . }
 - Glycogen Synthetase
 - Synthetase .
- Exceptions in enzyme naming: Pepsin & Trypsin, Renin.
- Cofactors (help enzymes) \rightarrow organic or inorganic.
- Coenzymes (") \rightarrow organic
- Vit A, K, E, D :- Insoluble in water .
- other Vitamins :- Water soluble.
- NADPH / NADP
- FAD, NAD⁺ . • Cofactors in all helping enzymes .

autoradiography

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- 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-phosphoglycerdehyde (PGAL) is the major product of Calvin Cycle (not glucose).

* Restriction enzymes :- Cut ^{DNA} at ^{only} specific base pair sequence ^{sites} from total. These are specific in action.

Reference Book

Ch-16

Gene Technology

R-DNA Technology or Recombinant DNA Test

• Definⁿ :- 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

(For multiple copy production)
(For storing & make more copies) → Host : E. coli (best source) (yeast, mammalian cells, insects)

→ DNA libraries

Genomic

c-DNA

→ complementary DNA

• Technique : 4 steps

1) Cleavage → Cut Source DNA & vector DNA
R-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. Put Antibiotic would kill microorganisms. The organisms that are not killed are resistant & they have R-DNA (Plasmid). Hence, they can be known & separated.

• Applic^{ns}

* Recombinant DNA : genetically engineered DNA formed by recombining fragments of DNA from diff^t organisms.

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

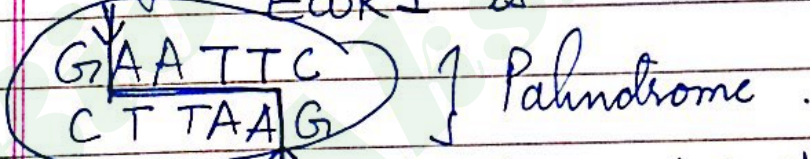
* We need to cut our vector DNA with the same restriction enzymes. ∴ the source DNA & vector DNA must have same shape so that vector DNA can carry the source DNA for cloning.

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

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

* Recognition sequence for Restriction enzyme

ECOR I is



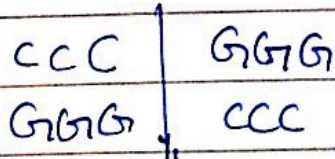
after cut → cut ends are called sticky ends (can be ligated easily)
cut in a zig zag fashion

→ G A A T T C
C T T A A G

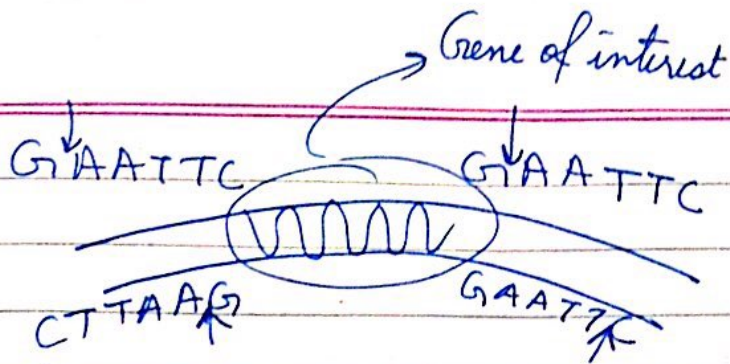
TYPE-2 enzyme

Sma - I

eg: AluI



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 replicⁿ
- : 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.

DNA

- ✓ { • If non degraded → colorless → DNA of interest 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 ~~major~~ 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 & γ -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.