Coordination:

Integration

different systems

Nervous	Chemical.
→ Neuron	→ Glands
→ Electrical	→ Harmones
→ Fast	→ slow
→ Temporary changes	→ Permanent changes

Nervou Co-ordination:

Transducers

Receptors:
→ Recieve stimulus
→ Detectors

Thermo: → ΔT
↳ eyes X

Chemo: → chemicals
↳ Osmoreceptors (H·T)
↳ Olfactory → Nose
↳ Gustatory → Tounge

Photo receptors:
↳ least → eyes
→ electromagnetic

Mechano: physical
↳ pressure
↳ posture
↳ vibration → Ionic receptor
↳ blood → baro receptors

Noci: → Pain
↳ Brain
↳ Urinary bladder } Absent

Neuroglia
→ Non excitatory
→ No nerve impulse generation
→ 50%
→ Supportive
↳ Nutrition
↳ Protection
↳ Insulation

Neuron
→ Excitatory
→ N·I generate & conduct
→ 50%
→ Message conduction

CNS
→ Astrocytes
→ Oligodendrocytes

PNS
→ Schawon cells
→ satellite cells.

Touch > Noci > Cold 10 times > Heat.

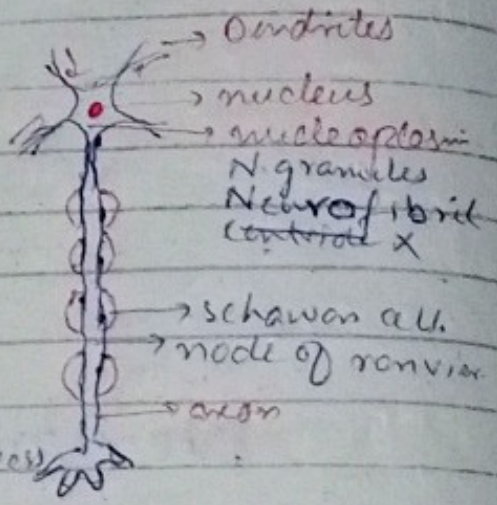
Receptor can be;
→ Nerve end
→ Cell
→ Tissue
→ Organ
↳ largest → skin

centriole absent in plants mein

Neuron: Excitatory cell.

Nerve impulse → generate + conduct

3 parts → Dendritic
→ Cell body
→ Axon

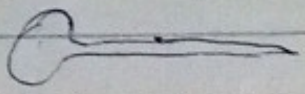


Cytoplasmic Process:

Dendrites: Spiny appearance

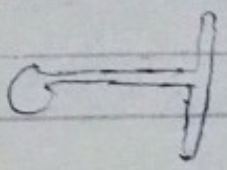
Axons: fibrous
↳ message away.

→ Unipolar: Cell body + 1 cell process

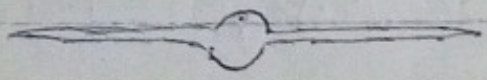


↳ Absent in vertebrates

→ Pseudounipolar: 1 C.B + 1 C.P

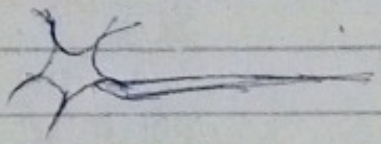


→ Bipolar: 1 C.B + 2 C.P



↳ Retina.

→ Multipolar: 1 C.B + many C.P



By Function:

→ Sensory: (Afferent) "A for arrival"
↳ Receptor & CNS
↳ Recieve

→ Inter / Relay / Associative
→ CNS → sensory
→ Link → Motor
→ Analyze, process, decision.

→ Motor / Efferent "E for exit"
→ Effector & CNS ↳ Carry message

Effectors:

Responder
- Muscles
- Glands

Channels:

→ In neurolemma

Pumps
→ Active transport (ATP)
- Na^+
- K^+

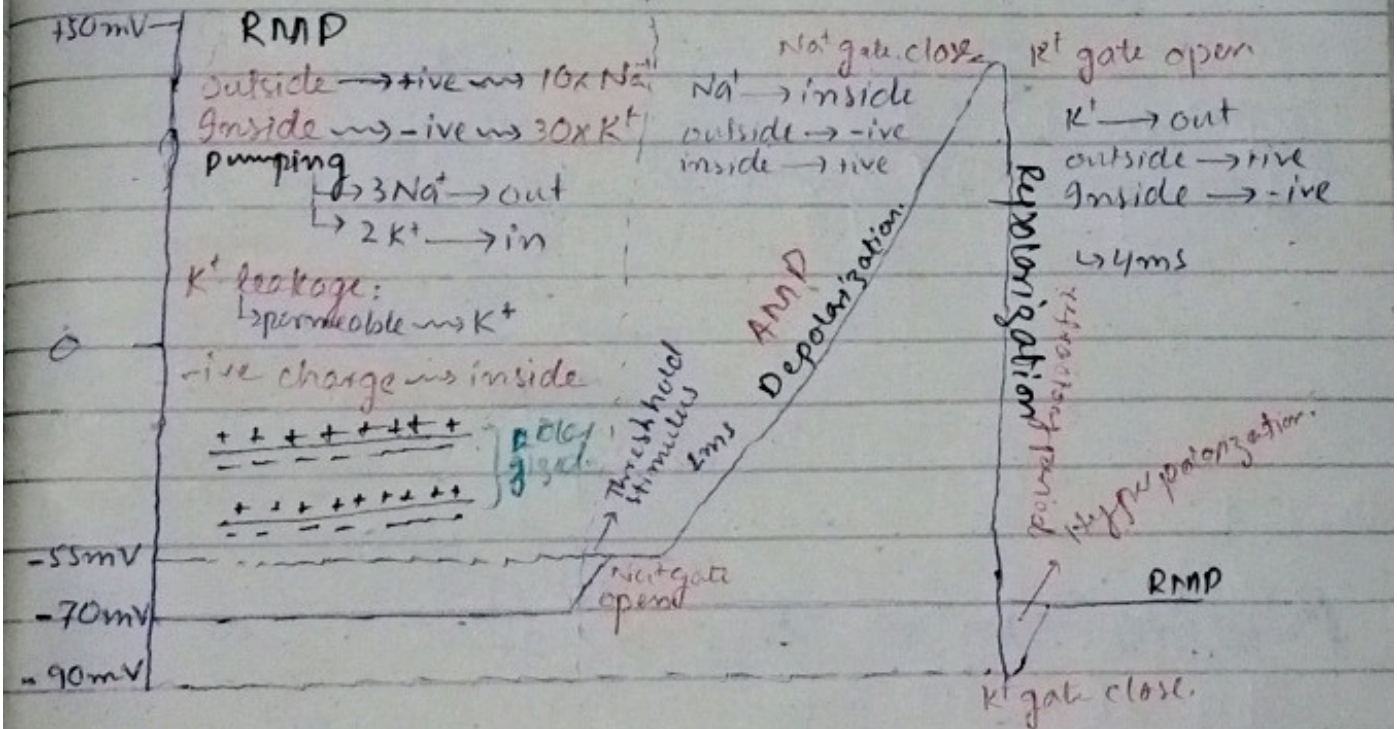
Gates
→ Passive transport ATP ✗
- N.V.R.G → open → K^+ leakage
- V.R.G → open → specific voltage → Na^+, K^+

Nerve Impulse:

→ Electrochemical wave
- generate
- Travel → neuron length

Na^+ extracellular fluid, chemicals | neurolemma | K^+ intracellular fluid

- membrane potential.



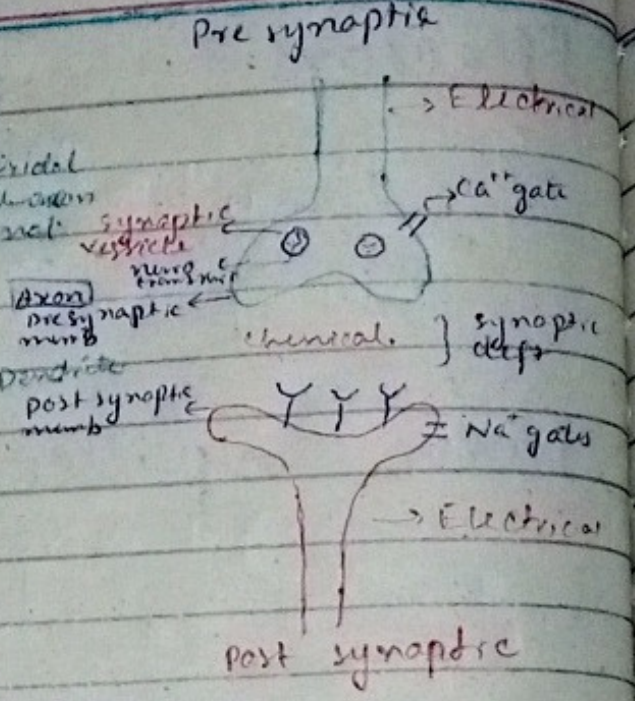
Speed:

→ Diameter ∝ speed ↑

→ Myelination
- → non myelenated (continuous) 1-2 m/s
- → myelenated 100-120 m/s
  - → saltatory / jumping nerve

Synapse → Junction

Neuron → Neuron (Neuronal synapse) → Dendritic / Dendrodendritic / Axonal
Neuron → Muscle (Neuromuscular synapse)



→ Action Potential arrives
→ Ca^{++} gates open
→ Ca^{++} move → Interacellular fluid.
→ Ca^{++} conc.↑ → I.C.F ↗
→ Synaptic vesicles → moves
→ Synaptic vesicles → fuse pre synaptic memb
→ Neuro transmitter Release → synaptic cleft
→ Neurotransmitter Bind → Receptor.
→ Na^{+} gates open
→ Depolarization
→ Action potential generated.

→ synaptic cleft → anatomical
→ Synapse → physiological

Electrical → gap junction
Chemical → Action Potential generation

→ Action potential transfer → 0.2nm

Neuro Transmitter:

Chemical messanger.

Composition
→ acetylcholine
→ amino acid.
→ peptides
→ biogenic amines
→ gases

Function
Inhibitory: Pass – X → Hyperpolarization → endorphins → natural pain reliever
Excitatory: Pass ✓ → Depolarization.

Location
CNS → monoamine oxidase → Adrenaline → enzyme
PNS → esterase → Acetylcholine → enzyme

CNS

Brain: → ectoderm

Intro:
- → master organ
- → controls everything
  - ↳ Analyze → process → decision
  - ↳ storage → memory
  - ↳ emotions
  - ↳ Thinking.
- → Skull → ~~occur~~ location → Dorsal, Hollow
  - ↳ 4-ventricles.

Protection:
- Skull → Cranium
- Meninges → layers
  - → Dura → Thickest
  - → Arachnoid → Web like
  - → Pia → Thinest → surrounds the brain.
  - → act as cushion.
- CSF → b/w arachnoid & piamatter.
  - ↳ Blood plasma. (Ultrafiltration)
    - ↳ lymph
      - ↳ glucose↑
      - ↳ H_2O

Divisions:

Fore brain
Largest.

Cerebrum
- → Largest
- → Convulsions
  - Sulcus: narrow, shallow
  - Fissure: Deep depression.
- 4 Lobes
  - → Frontal
  - → Temporal
  - → Parietal
  - → Occipital
- Fissure → Right Hemisphere ⇄ Left Hemisphere
  - Left part
  - Right part
- Regions: sensory, associated, motor
- Functions: Thinking, understanding, reasoning, judgment

Thalamus
- → Below cerebrum
- 1st relay center.
- Hypothalamus
  - → Homeostatic function
  - → Thirst
  - → Hunger
  - → sleep & awake cycle
  - → Menstrual cycle
  - → Nervous coordination
    - Link
    - chemical coordination
  - → Neurosecretory factors and hormones.

Limbic System
- Amygdala
  - → almond shape
  - → Emotions
    - → Fear
    - → Rage & revenge
    - → Happiness
    - → Punishment
    - → Pleasure
    - → Pain → sexual arousal
- Hippocampus
  - ↳ 2 horns
  - ↳ Long term memory.

Brain stem: medulla → pons, midbrain
or
Brain stalk:

Brain gate: medulla.

Mid brain:

→ Reduced → Human
→ 2nd relay center.
→ Reticulate formation
↳ network.

↓ Auditory & visual reflex
↓ screening system.

Hind brain.

Pons.
→ Pattern
↳ breathing
↳ Heart beat
→ Transition state
↳ sleep & awake

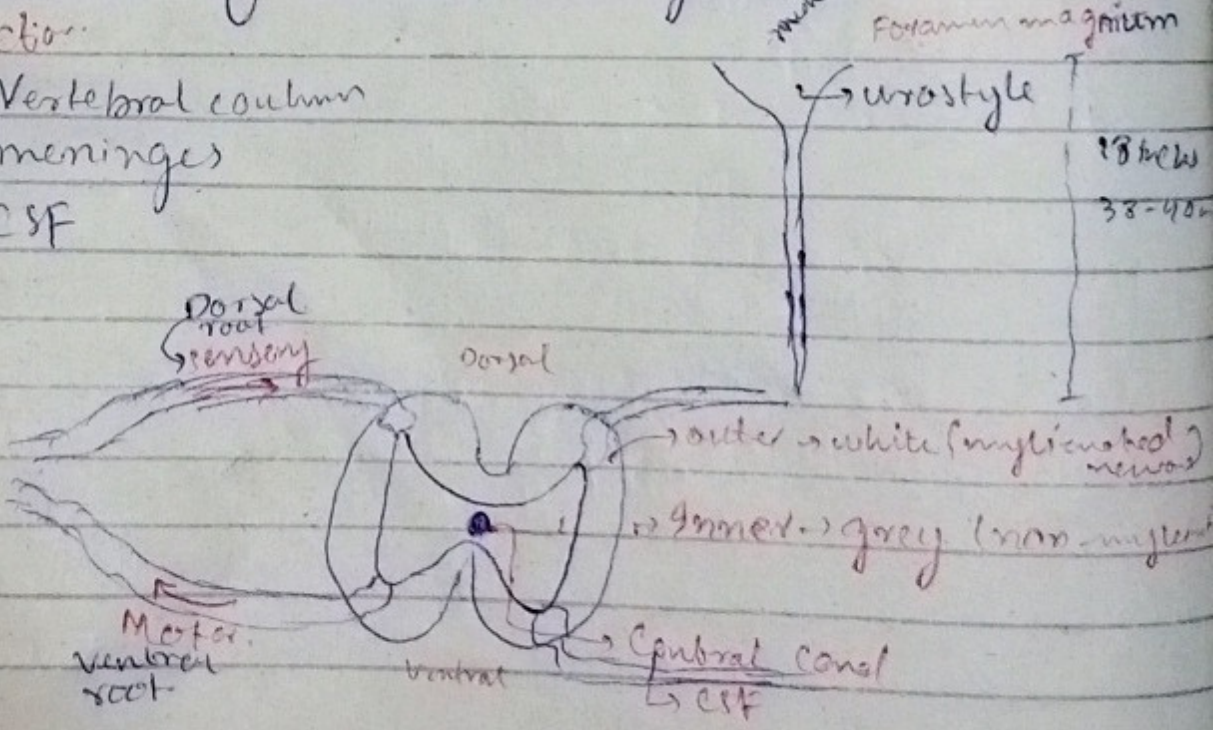
Medulla.
→ Autonomic function
↳ Swallowing
↳ Vomit
↳ peristalsis
↳ Sneezing
↳ Coughing
↳ Hiccups
↳ B.P
↳ Breathing rate
↳ heart rate
↳ reflexes.

Cerebellum
→ 2nd largest part.
→ present on side from pons & medulla
→ Complex coordinating activities
↳ walking
↳ swimming
↳ cycling
↳ writing, riding
→ Behavioral memory

Spinal Cord:

↳ Extension of medulla oblangata.

Protection
↳ Vertebral column
↳ meninges
↳ CSF



collection of cell bodies of CNS
↳ nuclei.

Reflex Functions:
→ Reflexes
→ Sesory (Afferent)
→ Motor (Efferent)

Reflexes:
↳ Quick, involuntary responses. without brain

Reflex action:
→ Physiological unit

Reflex arc:
→ anatomical unit.
Receptor → sensory neuron → Inter neuron
Effector ← Motor neuron ←

simple
→ Hand withdraw
→ Patellar reflex
→ monosynaptic

complex
→ gastrovascular
→ swallowing
→ peristalsis
→ Bi synaptic.

PNS:

Ganglia
↳ collection of cell bodies.
↓
Plexus

Nerves
Dendrites, Axons } wrap by central tissue.
↓
Function:
Sensory → (Afferent)
Mixed → (Inter)
Motor → (Efferent)

Origin 43 pairs (86)

Cranial
→ Brain
→ 12 pair (24)
Sensory: I, II, VIII (12)
Motor: III, V, VI, XI, XII (3+5+6+11+12)
35 pairs ← Mixed: IV, VII, IX, X (4)

Spinal
→ Spinal cord
→ 31 pair (62)
C-8
T-12
L-5
S-5
C-1

PNS
↓
Sensory.
Motor
↓
Somatic
→ Skeletal muscle
Autonomic
↓
Sympathetic
→ Emergency
→ Flight
→ Fight
→ Fright
Para
Normal

solar plexuses:
1: stomach 2: liver
3: Adrenal gland

vagus nerves 10th cranial nerve
↳ parasympathetic
1: heart 3: stomach
2: lungs 4: Liver

Autonomic

Sympathetic → pre synaptic long → Para sympathetic

Emergency
→ F ↳ Flight
↳ Flight
↳ Fight

Normal
Rest & digest

Promote	Inhibit
→ Pupil - Dialate	→ salivation
→ Bronchi dialate	→ peristalsis
→ Heart beat ↑	→ uresis
→ Blood supply ↳ skeletal muscle	→ Blood supply ↳ digestive tract

Promote	Inhibit
→ salivation	→ Pupil dialate
→ peristalsis	→ Bronchi dilate
→ Uresis	→ Heart beat ↓
→ Blood supply ↳ digestive tract	→ blood supply ↳ skeletal

Chemical Coordination

Posterior Lobe:

Pituitary gland → (Hypophysis cerebri)
↳ 0.5g
↳ attach with hypothalamus with infundibulum

↳ Aglandular
↳ Store & release hypothalmic hormones.

ADH

Water absorption.
→ H_2O ↓ ADH ↑
→ ADH ↑ H_2O Absorption ↑ concentrated.
→ ADH ↓ H_2O Absobtion ↓ Dilute

Diabetes insipidus
→ Distal convoluted tubes and collecting ducts.

Oxytocin

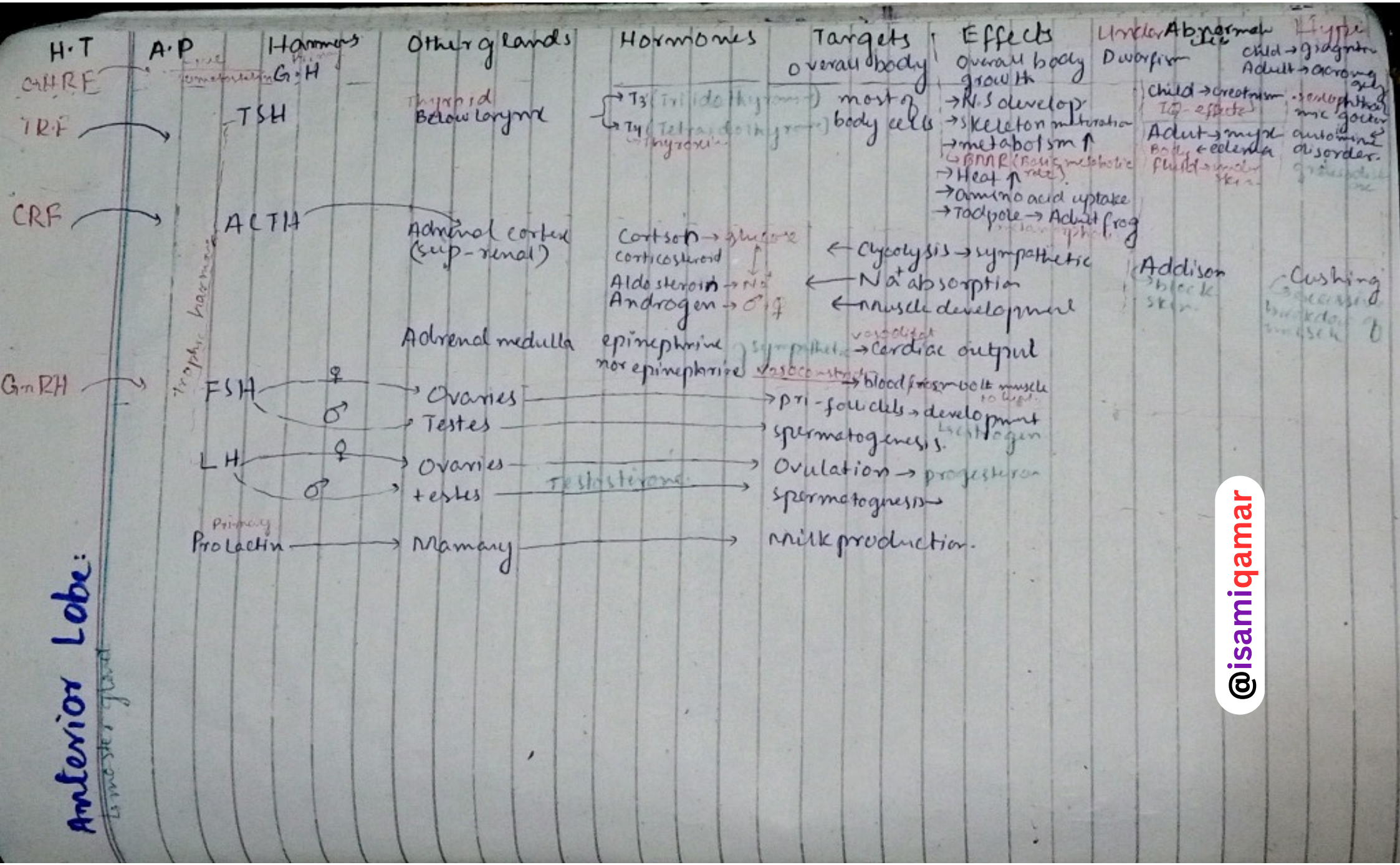
Release → mechanical stimulus
↳ Cervix → pressure.
↳ facilitates → parturation.
↳ Milk ejection
↳ Suckling action
↳ Male → ejaculation.

Oversecretion → uterus wall will rupture.
Undersecretion → Uterus will not contract → C-section

Median lobe:

MSH → Melanocytes → Melanin → Darker
U.V radiation absorb

♂ ↓ environmental addison.
♀ ↓ pregnancy addison


Anterior Lobe:
H·T
A·P
Harmons
Other glands
Hormones
Targets
Effects
Under
Abnormal
GHRF
GH
TRF
TSH
Thyroid
Below larynx
T3
T4
most of body cells
overall body growth
→ N.S develop
→ skeleton maturation
→ metabolism ↑
→ BMR
→ Heat ↑
→ amino acid uptake
→ Tadpole → Adult frog
Dwarfism
child → cretinism
Adult → myxe
Hyper
child → gigantism
Adult → acromegaly
CRF
ACTH
Adrenal cortex (sup-renal)
Cortisol → glucose
corticosteroid
Aldosteroid → Na+
Androgen → ♂ ♀
← Glycolysis → sympathetic
← Na+ absorption
← muscle development
Addison
Cushing
Adrenal medulla
epinephrine
nor epinephrine
→ Cardiac output
→ blood from gut to muscle
GnRH
FSH
♀ → Ovaries
♂ → Testes
→ pri-follicles → development
→ spermatogenesis
LH
♀ → Ovaries
♂ → testes
→ Ovulation → progesteron
→ spermatogenesis
Testosterone
Prolactin
Mamary
→ Milk production.

→ Hypocalcemic agent

→ Hypercalcemic agent

Calcitonin ⇌ Antagonistic ⇌ Parathormone.

→ Release when Ca^{++} conc. is rised.

→ Thyroid gland.

→ Its purpose is to decrease Ca^{++} level.

→ Release when Ca^{++} conc. is low.

→ Parathyroid gland.

→ Its purpose is to increase Ca^{++} level in blood.

Inhibitory:
- Ca^{++} absorb
  - → kidney
  - → small intestine

Promote
- → osteoblast absorb Ca^{++}
  - → form osteocyte

Inhibitory.
- → Bone uptake

Promote
- → Ca^{++} absorb
  - → S. intestine
  - → Kidney tubule

Hypo
- → Hypocalcemia
  - → N.S & muscular system disturb.
- → Kidney stone.

Hyper.
- → Hypercalcemia
  - → Tetany
  - → N.S disturbance

Islets Of Langerhans. (endocrine function)

α-cells (Glucagon)

→ Glucose level ↓

→ Glucose ↑

Promote
- → glycogenolysis
- → Gluconeogenesis
- → glucose absorbtion

Inhibit
- → glucose secretion → kidney.
- → glycogenesis

β-cells. (Insulin)

Release → Glucose level ↑ (Hyperglycemia)

Purpose → Glucose ↓

Promote
- → Uptake of glucose ↑
- → glycolysis
- → glucose → glycogen, A. acid, lipid.

Inhibit
- → glucose absorbtion → kidney tubule
- → glycogenesis
- → gluconeogenesis
- → lipolysis

Hypo (Hypoglycemia)
- → Diabetes
- polyurea (glycosuria)
- polydipsia
- polyphagia
- → blurry vision
- → unconsciousness

Hyper
- → Hypoglycemia
  - → Diabetes
- → nervous system retardation.

Stomach → gastrin

Duodenum → secretin

Kidney → renin, calcitriol, erythropoietin

Pineal gland → melatonin (sleep & awake cycle)

Thymus → thymosin

Brain → endorphins (natural pain killer)