FREE NOTES · NCERT + NEET LEVEL

# Neural Control & Coordination

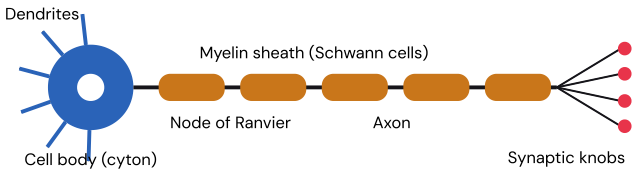
Neural system, neuron ki banawat aur types, nerve impulse ka banna aur chalna, synapse, central neural system (forebrain, midbrain, hindbrain).

01 Neural system
02 Neuron
03 Nerve impulse
04 Synapse
05 Brain: forebrain
06 Midbrain aur hindbrain
07 Extra: ANS, reflex arc, sense organs
08 Important Q&A
09 Common mistakes
10 Practice (NEET style)
11 Quick revision

## 01 Neural system

- Hydra: neurons ka network. Insects: brain + ganglia. Vertebrates: kaafi viksit.
- Insaan: **CNS** (brain, spinal cord; soch-samajh aur control) aur **PNS** (baaki saari nerves). PNS fibres: afferent (tissues → CNS) aur efferent (CNS → tissues).
- PNS: **somatic** (CNS → skeletal muscles) aur **autonomic** (CNS → involuntary organs, smooth muscles): sympathetic aur parasympathetic.
- Visceral nervous system = viscera ke liye PNS ka hissa.

## 02 Neuron

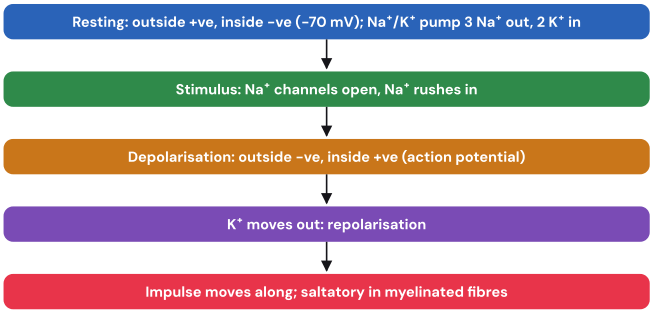



Myelinated neuron ki banawat

- Cell body me cytoplasm, organelles aur **Nissl's granules**; dendrites impulse cell body ki taraf; axon door le jaata, synaptic knobs pe khatam (neurotransmitter vesicles).
- **Multipolar** (ek axon, 2+ dendrites: cerebral cortex), **bipolar** (ek axon, ek dendrite: retina), **unipolar** (ek axon: embryonic stage).
- **Myelinated**: Schwann cells myelin sheath banate; beech ke gap = nodes of Ranvier (spinal aur cranial nerves). **Non-myelinated**: bina myelin ke Schwann cell (autonomic aur somatic neural systems).

## 03 Nerve impulse

- Resting membrane: $K^+$ ke liye zyada permeable, $Na^+$ ke liye lagbhag nahi, andar ke negative proteins ke liye bilkul nahi. Axoplasm: $K^+$ zyada, $Na^+$ kam. ECF: $Na^+$ zyada.
- **Polarised** state = resting potential; $Na^+/K^+$ pump (3 $Na^+$ bahar, 2 $K^+$ andar) se.
- Stimulus ⇒ $Na^+$ andar ⇒ **action potential** (nerve impulse). Current agli jagah, phir dohrata.
- $K^+$ permeability badhne se resting potential wapas.



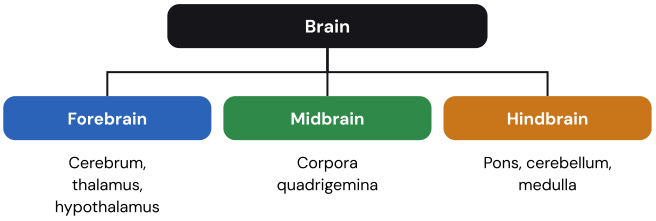

Nerve impulse ka banna

## 04 Synapse

| Feature | Electrical synapse | Chemical synapse |
|---|---|---|
| Gap | Membranes bahut paas | Pre aur post-synaptic membranes ke beech synaptic cleft |
| Transmission | Seedha current; tez | Neurotransmitters (jaise acetylcholine) exocytosis se, receptors pe judkar ion channels kholte |
| Kitna milta | Hamare system me kam | Aam |

Post-synaptic neuron me naya potential excitatory ya inhibitory ho sakta.

## 05 Brain: forebrain




Insaani brain ke parts

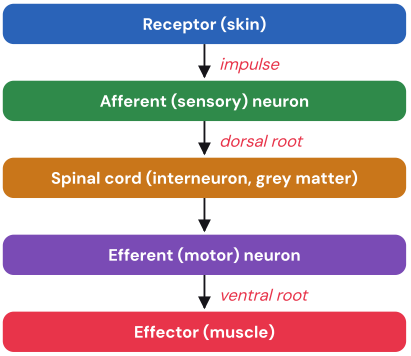
- Skull aur **cranial meninges** se suraksha: dura mater (bahar), arachnoid (beech, patli), pia mater (andar, brain se chipki).
- **Cerebrum**: do hemispheres, **corpus callosum** se jude; cerebral cortex (grey matter, convolutions) me motor, sensory aur association areas (memory, baat-cheet). Tracts ke fibres = white matter.
- **Thalamus**: sensory aur motor signals ka bada coordinating centre. **Hypothalamus**: body temperature, bhookh-pyaas control; neurosecretory cells hypothalamic hormones chhodte.
- **Limbic system** (amygdala, hippocampus, hypothalamus ke saath): sexual behaviour, emotions (khushi, gussa, dar), motivation.

## 06 Midbrain aur hindbrain

- **Midbrain**: thalamus/hypothalamus aur pons ke beech; isme se **cerebral aqueduct**; upar ke chaar lobes = **corpora quadrigemina**.
- **Hindbrain**: **pons** (alag regions jodne wale fibre tracts), **cerebellum** (bahut convoluted surface, zyada neurons ki jagah; coordination aur balance), **medulla oblongata** (spinal cord se juda; saans, cardiovascular reflexes, gastric secretions control).
- **Brain stem** = midbrain + pons + medulla; brain aur spinal cord jodta.

## 07 Extra: ANS, reflex arc, sense organs

| Asar | Sympathetic ("fight or flight") | Parasympathetic ("rest and digest") |
|---|---|---|
| Pupil | Phailti | Sikudti |
| Dhadkan | Badhti | Ghatti |
| Saliva, pachan | Kam | Zyada |
| Bronchi | Phailti | Sikudti |
| Neurotransmitter (organ pe) | Noradrenaline | Acetylcholine |




Reflex arc (knee-jerk jaisa)

- Neurotransmitters: excitatory (acetylcholine, noradrenaline, glutamate) vs inhibitory (**GABA**, glycine). Dopamine, serotonin bhi brain me.
- **CSF** choroid plexus banata; brain ko gaddi. **Blood–brain barrier**: tight junctions + astrocytes.
- Embryonic brain: prosencephalon (forebrain) → telencephalon + diencephalon; mesencephalon (midbrain); rhombencephalon (hindbrain) → metencephalon (pons, cerebellum) + myelencephalon (medulla).
- Aankh (purana syllabus): cornea, iris, lens; retina me rods (kam roshni, rhodopsin) aur cones (rang); fovea = sabse saaf; blind spot = photoreceptors nahi. Kaan: pinna → auditory canal → tympanum → malleus, incus, stapes → cochlea (organ of Corti: sunna); vestibular apparatus (santulan).

## 08 Important Q&A

**Q1.** Myelinated fibres me conduction tez kyun?

Impulse ek node of Ranvier se doosre pe koodta (saltatory), poori membrane pe nahi chalta.

**Q2.** Resting membrane potential kis wajah se?

Ions ka asamaan bantwara: andar $K^+$ zyada, bahar $Na^+$ zyada, $Na^+/K^+$ pump se; membrane $K^+$ ke liye zyada permeable.

**Q3.** Body temperature aur bhookh kaun control karta?

Hypothalamus.

## 09 Common mistakes

- Kehna ki pump 2 $Na^+$ bahar, 3 $K^+$ andar (3 $Na^+$ bahar, 2 $K^+$ andar).
- Corpora quadrigemina ko hindbrain me rakhna (midbrain).
- Dura mater ko sabse andar kehna (pia mater hai).
- Sochna ki dendrites impulse door le jaate.

## 10 Practice (NEET style)

1. Do hemispheres ko jodne wala?
2. Retina me neuron?
3. Saans ka centre?
4. Myelin sheath ke gaps?
5. Neuromuscular junction ka neurotransmitter?

**ANSWERS**

1) Corpus callosum · 2) Bipolar · 3) Medulla oblongata · 4) Nodes of Ranvier · 5) Acetylcholine

## 11 Quick revision: exam se 5 minute pehle

**NEURON**

- Dendrite → cyton → axon
- Multipolar cortex, bipolar retina
- Myelin Schwann cells se

**IMPULSE**

- Resting −70 mV, andar −ve
- $Na^+$ andar = depolarisation
- 3 $Na^+$ bahar, 2 $K^+$ andar

**FOREBRAIN**

- Corpus callosum
- Thalamus relay
- Hypothalamus temp, bhookh

**HINDBRAIN**

- Cerebellum balance
- Medulla saans, heart
- Brain stem = mid + pons + medulla

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.