# EEG → Brain wave medical test

↳ Electrodes via scalp
↳ Hair is dry & oil free. Since many electrodes inserted

Normal Brain wave → 30 Hz

Elipsy Brain → Burst of abormial spikes

EEG of babies is irregular → outlier maybe

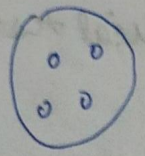
30-60 min to perform EEG

Not good for a person with elipsy.

Tumor or stroke → very Low EEG freq

Helps give a general overview but does not specify or pinpoint the exact location.

16 - 25 electrodes. while testing.



→ Find area to put the electrodes
→ Forehead - Nose maybe.
→ Electrode put on chest to record the electrogram.

**Sites where electrodes are inserted**

↳ F: Frontal — T: Temporal
Fp: Frontopolar — C: central
P: Parietal — O: Occipital
A: Auricular (ear electrode)

↳ we can also even more localise the location
such as T3, T4, T5

Even number → Right side of head.
Odd Number → Left side of head.

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Ways to connect EEG
↳ Records brain waves using amplifiers.
↳ on a bipolar montage → electrode input 1 of one channel & input 2 of another

→ Being able to tell the exact location of electrical activity ("Localisation") is critical, being able to interpret EEG meaningfully.

↳ Localising in Bipolar montages
- By identifying the phase reversal.
- A deflection within a chain pointing to opp direction.

→ In referential montage
- All waves move in a positive/same dir
- when +ve wave and we see a change then deflection downard
- Electrode with maximum negative activity in referential montage.

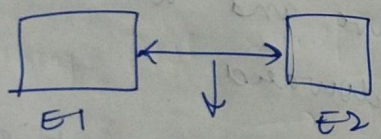
## HOW TEST IS SETUP

↳ Relative position lines to pin point exact locations.

↳ 21 recording electrodes + 1 ground electrodes

→ And one EKG electrode for eye movement

**Amplification** → Measure activity of one electrode relative to another.




Common data is eliminated and hence makes easier.

→ Improves signal to noise ratio in recording

Filtering is done to just get 1–30 Hz range.

**Filtering** → Low freq (Slow waves)
→ High freq (Fast)
→ Notch filter (Narrow region)

Identifying the head region with phase reverse.

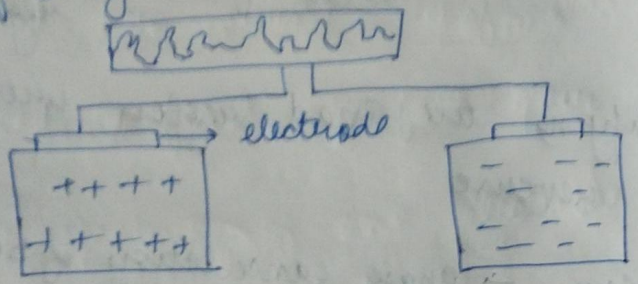
→ Problem → Phase cancellation of biological activity → Might just cancel each other
• Leads to false localisation

Detects a large group of neurons that are active at the same time.

→ Measures Post Synaptic Potentials (Not action potential)

# DIPOLE PRINCIPAL

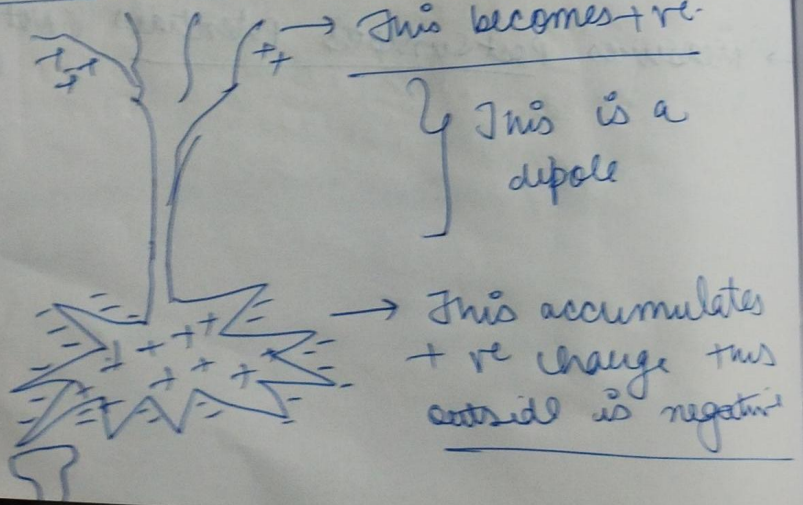
Diff charged electrodes at a distance




↓

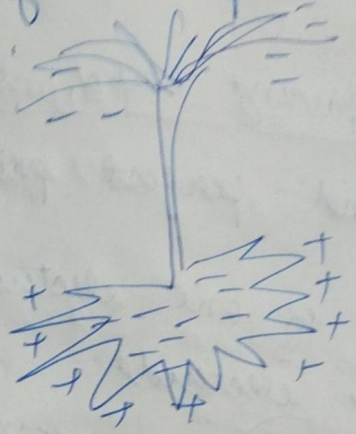
This graph is due to diff in charge b/w these two areas

## Excitatory Post Synaptic Potential




## Inhibitory Post Synaptic Potential

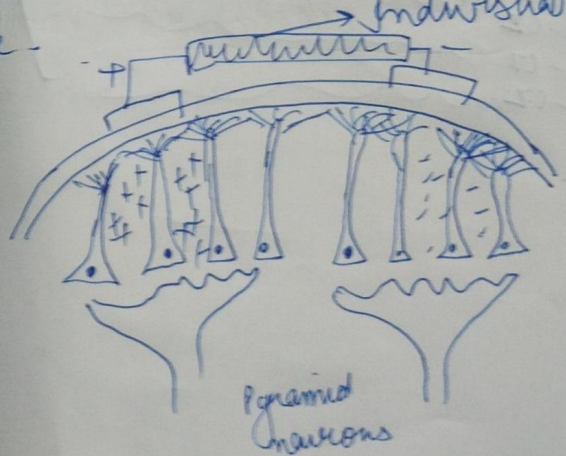
↳ what if two dipole are created is inverted



These 2 create differences in charge

→ We can measure this difference but it is too small of a number to work on

→ Clusters of pyramidal neurons are stimulated and create an overall charge.

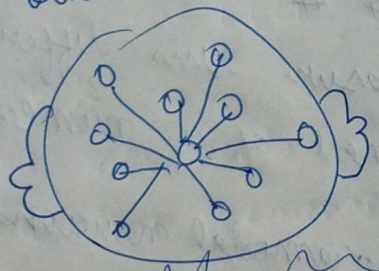


EEG Has 32 electrodes like this in multiple regions.

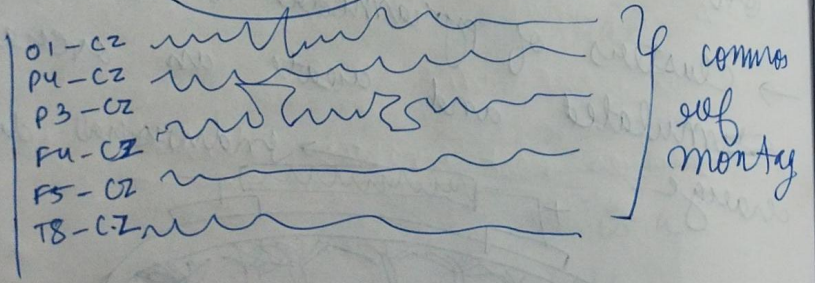
→ Need for pairing up of electrodes

→ Need to find perfect pair combo.

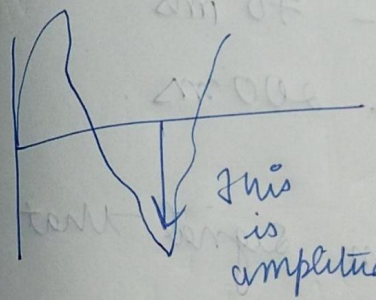
① perspective of one electrode to all other electrodes

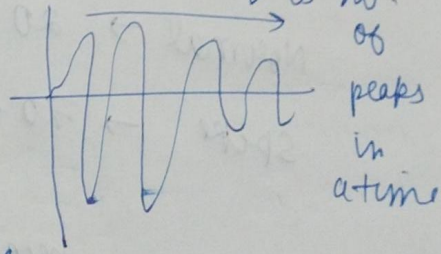


compare every electrode to same electrode




② Other way is to compare every electrode relative to its adjacent




## 5 Key Bands of freq signals

Sleep → Delta → < 4

Relaxing - Theta → 4 - 8

Attention - Alpha — 8 - 13

Active Mind → Beta - 13 - 35

High Concent → Gamma > 35

Interictal Epileptiform Discharges
↳ consists of sharp spike waves

Normal → 20 - 70 ms

Spike → 70 - 200 ms.

Artifacts → Non brain signal that contributes to the EEG.

→ Eye Blink
→ muscle movements
→ Power line influence