

# HIGHER BRAIN FUNCTION

WHAT IS LIMBIC SYSTEM. ENUMERATE ITS PARTS AND ALSO FUNCTION?

Limbic System: A system of structures surrounding the basal ganglia and itself surrounded by a ring of cerebral cortex is called the limbic system.

## Components:

- (i) Hypothalamus
- (ii) Epithalamus
- (iii) Stria medullaris
- (iv) Habenular nucleus
- (v) Amygdaloid complex
- (vi) Pineal body
- (vii) Septal nucleus
- (viii) Mid brain reticular formation
- (ix) Ant. thalamic nuclei part of Basal ganglia.

## Functions of Limbic System :

(i) It control emotional behaviour Expressed in Form OF joy & sorrow & fear, Fight.

(ii) Liking, Disliking Control by amygdaloid.

(iii) Control sex behaviour

(iv) Control endocrine Gland

(v) Control Food Habits necessary For Survival OF individual.

(vi) Motivation ie reward & punishment.

(vii) Autonomic Function → Heart Rate + BP

(viii) Control OF Change OF body Temperature

(ix) Role in memory

(x) Control OF circadian rhythm

## Define Sleep and Compare Slow wave Sleep with Rapid Eye movement Sleep?

Sleep: unconsciousness from which person can be aroused by sensory or other stimuli.

### Slow wave Sleep

(i) Brain waves are strong and of low frequency

(ii) Restful & Deep Sleep

(iii) Person is not difficult to arouse

(iv) Muscle tone not depressed

(v) Dreamless

(vi) Heart rate, respiratory rate & BMR ↓

### Rapid Eye movement Sleep

(i) Eyes undergoes rapid movement

(ii) Restful sleep occur in episode

(iii) Person is difficult to arouse

(iv) Muscle tone is depressed

(v) Dreamful

(vi) Heart rate & respiratory rate become irregular.

## Sleep Disorders;

Insomnia: inability to sleep / Abnormal wakefulness

It is most common & occur due to the systemic illness

Such as = Psychiatric problem

Alcoholic  
Drug addiction

Somnambulism: is getting up from bed and walking in state of sleep.

In children associated psychological disturbance occur during Non-REM sleep

Nocturnal Enuresis:

involuntary voiding of urine at bed

Also called bedwetting

Common in children.

## Write down Functions of Amygdala & Hippocampus

### Amygdala:

#### Functions:

- (i) Has a center for Punishment
- (ii) involved in olfaction (important in animals)
- (iii) Control of Behavior & Emotions
- (iv) Control of Sexual Functions.

### Kluver Bucy Syndrome:

In monkeys Bilateral Destruction of Amygdala

- (i) Changes in behavior of animal
- (ii) Changes in Dietary Habits

### Hippocampus:

#### Functions:

- (i) Has a center for Punishment
- (ii) Role in control of Behavior & emotions
- (iii) Fit is accompanied by Hallucination
- (iv) on weak electrical stimulation → Epilepsy
- (v) In some patient of Epilepsy removal of Hippocampus give benefits.

### Antegrade Amnesia: Bilateral Destruction of

Hippocampus (loss of recent memory)

unable to learn new events  
unable to remember names  
old memory remain intact

## Enlist indications for lumbar puncture ?

- (i) Anesthesia
- (ii) Diagnostic purpose
- (iii) To relieve intracranial Tens. e.g.  
meningitis  
uremia
- (iv) To introduce drug which cannot pass through Blood Brain Barrier.

level : Introduce needle b/w L3 & L4 spines

## What information you get after analysis of CSF ?

Formation : Formed from choroid plexuses of mainly two lateral ventricles.

Rate of formation = 500ml/day

volume : 150 ml

Pressure : 110-130 mm of water

### Composition:

- (i) Protein
- (ii) Amino acid
- (iii) Glucose
- (iv) Cholesterol
- (v) Na, K, Ca, Mg, PO<sub>4</sub>, SO<sub>4</sub>

Functions : (F176)

## Circulation:

Mainly formed into lateral ventricle

↓  
Pass through foramen of monro into 3<sup>rd</sup> ventricle

↓  
Through aqueduct of sylvius into 4<sup>th</sup> ventricle

↓  
Pass into cisterna magna through foramen of magendi & Two foramen of luschka

↓  
• Pass into spinal cord thru central canal

## Define EEG & Detail of each wave ?

Electro-Encephalo-Gram: Graphical recording of changes in electrical potentials taking place in Gray matter of cerebral cortex is called EEG.

### waves:

#### (i) Alpha

- Rhythmical wave
- Frequency b/w 8 & 13 cycles

### ocur:

- (i) inattentive Brain
- (ii) Light sleep
- (iii) Drowsiness
- (iv) Eye-lids are close

## Beta:

→ Frequency b/w Greater than 14 cycles/sec  
as high 80 cycles/sec.

### occur:

(i) Tension

(ii) Intense activation of nervous system

## Theta:

→ 4 - 7 cycles/sec

### occur:

(i) Emotion Stress

(ii) Frustration

(iii) Disappointment

## Delta:

→ 3.5 cycles/sec

### occur:

(i) Deep sleep in Adults

(ii) waking hours in early childhood.



## Write down Hypothalamic nuclei & Functions?

### Hypothalamic nucleus

### Functions

- (i) Supra-optic nucleus → Synthesize of ADH
- (ii) Para-ventricular nucleus → Synthesize of oxytocin
- (iii) Pre-optic & Anterior nuclei → Control Parasympathetic
- (iv) Posterior & Lateral nuclei → Sympathetic system control
- (v) Anterior Hypothalamic nuclei → Regulate Temperature (Response to ~~heat~~ Heat)
- (vi) Posterior Hypothalamic nuclei → Regulate Temperature (Response to cold)
- (vii) Lateral Hypothalamic nuclei → initiate eating & ↑ Food intake
- (viii) Medial Hypothalamic nuclei → inhibit eating & ↓ Food intake
- (ix) Supra-chiasmatic nucleus → Control circadian Rhythms
- (x) Medial Hypothalamic nuclei → Thirst Center.

## Blood - Brain - Barrier ?

In Brain the junction b/w Capillary endothelial cells allows only very small molecules to pass into Brain tissue & prevent macromolecules is called Blood - Brain - Barrier.

## Define Speech? Discuss important speech areas in Brain & their Functions.

Speech: The ability to Express thoughts Feelings in articulate words is called Speech.

### Speech areas:

(i) Wernicks area: (22)

#### location:

→ Post. end of Temporal lobe

#### Function:

- (i) Responsible for processing of info.
- (ii) Understand meaning of sound & spoken word.

(ii) Brocas area: (44)

#### location:

Frontal lobe in front of inferior end of motor area.

#### Function:

- (i) receives information from Wernicks area via arcuate fibers send to the speech muscle.

Formation of words.

## Speech Disorder:

(i) Sensory Aphasia: Aphasia mean inability to speak.

(i) Visual Aphasia: Patient can see but cannot understand written words.

Cause: Damage to visual speech centres (Area 18, 19)

(ii) Auditory Aphasia: Patient can hear but cannot understand spoken words.

Cause: Damage to Auditory speech area (Area 22)

## (ii) Motor Speech Aphasia:

(i) Broca's Aphasia: Patient completely speechless

Cause: Damage of Broca's Area (44, 45)

(ii) Agraphasia: inability to write or draw

Cause: Damage motor center for written (Near 46)

(iii) Dysphasia: Difficulty in speech

(iv) Dysarthria: imperfect articulation of speech due to disturbance of muscular control.

Cause: (Area 4)

(v) Aproxia: Lesion of P<sup>o</sup> motor area.

## Define & Classify Memory ?

Memory: Previous thoughts or Experiences which can be retrieved is called memory.

### Types:

- i) Short-Term memory: WHICH lasts for Sec. / mins.  
Neurotransmitter chemical secreted at such Terminal cause inhibition & Fascilitation. Circuit of this type lead to Short Term memory loss.
- ii) intermediate memory: WHICH lasts for Days / weeks
- iii) Long-Term memory:  
which once stored can be recalled up to years / even Lifetime later.

## Alzheimer's Disease

Alzheimer disease is defined as

Premature aging of Brain. usually beginning in mid adult life and progressing rapidly to Extreme loss of mental Power, similar to seen in very old age.

- impaired memory
- impaired thoughts & speech
- completely Helplessness.

# Define Epilepsy Classify it and Explain the Grand mal Epilepsy?

Epilepsy: Characterized by uncontrolled excessive Activity of either part or all part of CNS

## Types:

- (i) Grand mal Epilepsy
- (ii) Petit mal Epilepsy
- (iii) Focal Epilepsy

Grand-mal Epilepsy: Characterized by the Extreme neuronal discharges in all areas of Brain in cerebral cortex, in deeper part of Cerebrum & even in brain stem.

Also discharge transmitted all the way into spinal cord & cause Generalized tonic seizures of entire body.

## Duration:

Few sec. to 3-4 mins.

Petit-mal Epilepsy: characterized by 3-30 sec of unconsciousness.

- (i) Twitch like muscle contraction
- (ii) Blinking of eyes.

# SCENARIO

Salma 20 years old has speech problem  
she can read out & utter the read words but  
unable to understand meaning of words.

WHICH TYPE OF SPEECH ABNORMALITY?

Sensory ~~motor~~ Aphasia

WHICH SPEECH AREA DAMAGED?

~~Broca's~~ Aphasia (44 & 45)

Wernicke area (22)

A 20 year old boy is brought to emergency  
by his friend in state of coma. He is student  
undergoing Examination. Sudden jerky movement in  
limbs & hand, fell down & breathless. His  
mouth full of foam. Condition remain 3-5 min  
& he confused & not answering.

Examination revealed tongue bite. could not recall  
previous events. sensory & motor Examination normal.

(i) Diagnose: Grand-mal Epilepsy

(ii) Factors initiate Attack:

(i) Administering of neuronal stimulant (drug: Pentylentetrazol)

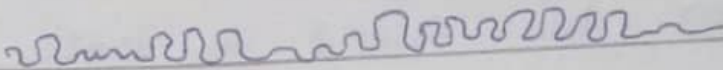
(ii) By insuline Hypoglycemia

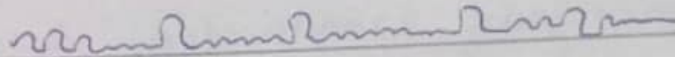
(iii) Passage of Alternating electrical current <sup>directly</sup> thru brain

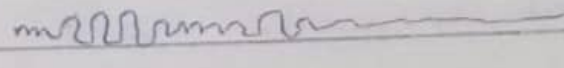
(iii) Stops the Attack:

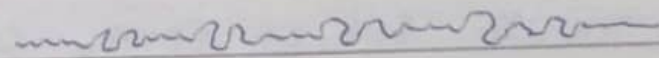
. Neuronal Fatigue

	Alpha wave	Beta wave	Theta wave	Delta wave
Frequency	8-12	12-30	4-8	1-5
Amplitude	50 $\mu$ V	5-10 $\mu$ V	10 $\mu$ V	20-200 $\mu$ V
Occurs	Light sleep	Tension	stress frustration	Deep sleep

Alpha wave = 

Beta wave = 

Stage 1 sleep = 

Stage 2 & 3 sleep =   
Theta wave

Stage 4  
Delta wave = 