Biological Determinants of Behavior (Brain & Behavior) Slides 3+4

By: Jasmine Al-Zahiri

1. I know the summary is long but keep in mind this was 98 slides and the most condense material
2. You can find the past paper questions at the end of this summary

-Human Behavior-

- The collection of behaviors exhibited by human beings
- Refers to the actions or reactions of an organism, usually in relation to the environment
- Behavior can be:
  - Conscious or Unconscious
  - Overt or Covert
  - Voluntary or involuntary
- The behavior of people falls within a "range":
  - Ranging from common to unusual
  - Ranging from Acceptable to outside acceptable limits
- Social behavior = behavior specifically directed at other people.
- The **acceptability of behavior** is evaluated relative to **social norms** and regulated by various means of **social control**
- Four categories of human behavior:
- *Category 1:* **Detectable Behavior** i.e. we can detect with our senses (see or hear) vs. behavior that cannot be detected (e.g. thinking)
- *Category 2:* **Purposive** behavior or goal driven (action)
- *Category 3:* **Performance** (or skilled behavior); demonstrates skills of various kinds from work to sports
- *Category 4:* **Instinctual** behavior, having to do with the anatomical or physiological nature of the organism. It is determined by the need or the desire to **avoid pain** and **embrace pleasure**
- Human behavior is influenced by:
  - Culture, attitudes, emotions, values, ethics, authority, rapport, hypnosis, persuasion, coercion, genetics

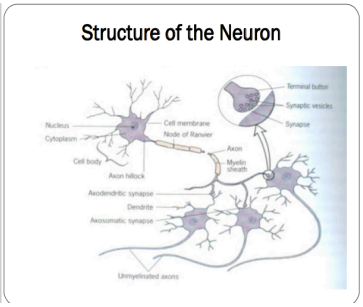
-Determinants of Behavior-

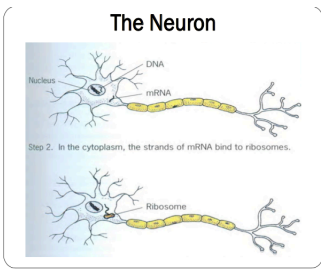
- **Biological Determinants**: Genes, structure of brain and nervous system, brain chemistry
- **Psychosocial factors**: include social support, loneliness, marriage status, social disruptions, bereavement, work environment, social status, and social integration
- **Learning**: conditioning
- **Sociocultural factors**: include the customs, morals, values, and demographic characteristics of the society in which the organization functions

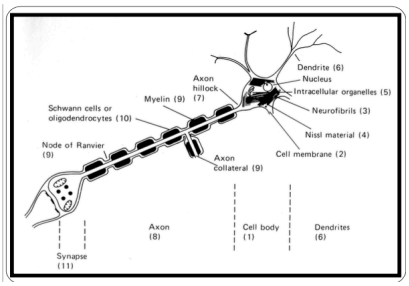
-Brain and Behavior-

- The **complexity of the behavior** of an organism is related to the **complexity of its nervous system.**
- Organisms with complex nervous systems have a greater capacity to learn new responses and thus adjust their behavior.
- Scientific understanding of human behavior and experience in health and disease requires knowledge about:
  - Functional Anatomy of the Neuron
  - Functional Organization of the Brain
  - Neurotransmitters
  - Receptors
  - Molecular Neurobiology
  - Molecular Psychopharmacology
- Advances in the understanding of the structure, organization, and function of the brain offer powerful new methods for:
  - Evaluating behavior
  - Diagnosing, understanding pathophysiology, and developing specific and effective therapies for **mental disorders**

-Functional anatomy of the Neuron-







- The "Neuron":
  - Is a highly specialized cell type, both anatomically and biochemically, to carry out the functions of information, signaling, and processing.
  - Hundreds of specialized types, each serving specialized functions.
  - Neurons do not divide once they are mature
  - 4 components:

1. ***Cell body (perikaryon)*** which consists of:

- The **nucleus** (contains a nucleolus plus a Barr body in females)
  - *Two main functions*

    a) Controls chemical reactions in the cell cytoplasm via the formation of proteins and enzymes

    b) Stores information needed when the cell division and transcription of genes and mRNA splicing occurs
  - *Surrounded by a double membrane:*

    a) The outer membrane has ribosomes

    b) Ribosomes are involved in protein biosynthesis, the process of translating RNA into protein

    c) The inner and outer membrane fuse at regular spaces, forming **nuclear pores**
  - *Nucleus contains the chromosomes and nucleoli:*

    a) Chromosomes contain information encoded in (DNA) attached to proteins called **histones** and are usually arranged in to a dense network called **chromatin**

    b) Nucleoli are granular structures that **make rDNA** (ribonucleic) and assemble it with proteins.
- The **cytoplasm** contains inclusions:
  - Nissl substance (involved in protein synthesis)
  - Golgi apparatus (involved in synthetic activities)
  - Mitochondria (involved in energy productions)
  - Microfilaments (unknown function)
  - Microtubules (involved in transport of substances)
  - Lysosomes (bodies containing powerful enzymes)
  - Melanin pigment (found in neurons of the substantia nigra and locus coeruleus)

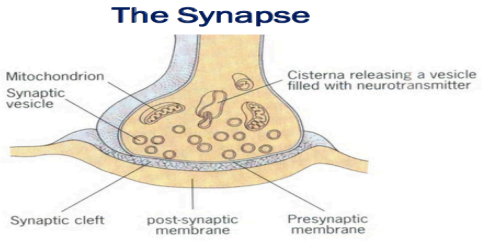
2. ***Axon***

- Usually single
- Myelinated and Unmyelinated
- The proximal portion is called the **"Axon Hillock"**
- Branches distally: each branch forms an outpouch at its end called the **"Button"**
- Conducts impulses **away from the perikaryon**

3. ***Dendrites***

- Usually more than one per neuron
- Contain Nissl substance
- Branched and studded with dendritic spines (sites for synaptic contact)

- Conduct information **to the perikaryon**



4. *Presynaptic Terminal*

➢ **The synapse:**

- Is a specialized structure involved in the transmission of information from one neuron to another
- Consists of:

a) **Button**: outpouch of the terminal portion of a branch of the axon of the presynaptic neuron

b) **Dendritic membrane** of the adjacent Postsynaptic neuron (specialized contacts)

- Transmission is accomplished by:

a) **Chemical Transmission** by messengers called "N*eurotransmitters (NTs)*"

b) **Electrical Transmission** by ion exchange

- Receptors
    a) The dendritic membrane at the synapse is markedly enriched with "Receptors" that respond to the neurotransmitter released by the terminal button of the Presynaptic neuron.
    b) Neurotransmitter receptors are proteins that span the neuronal membrane.
    c) Receptors have: **ligand binding regions** that are accessible to extracellular messengers and **ligand-gated channels** consist of channel pores that allow passage of ions

-Brain Organization-

**Important slide → most likely a test question **

Brain Organization

Brain structures as derivatives of the neural tube:

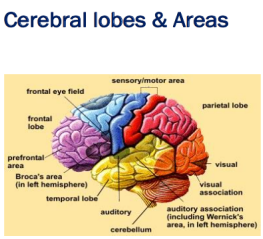
Primary vesicles	Secondary vesicles	Brain components
- Prosencephalon (forebrain)	Telencephalon	Cerebral Cortex Hippocampus Amygdala Striatum
	Diencephalon	Thalamus & subthalamus Hypothalamus Epithalamus
- Mesencephalon (midbrain)	Mesencephalon	Midbrain
- Rhombencephalon (hindbrain)	Metencephalon	Pons Cerebellum
	Myelencephalon	Medulla

- Hemispheric lateralization: is a feature of higher cortical processing
  - The primary sensory cortices for touch, vision, hearing, smell, and taste are represented bilaterally
  - Recognition of familiar and unfamiliar faces localized to the left inferior temporal cortex
  - Processing of olfaction occurs in right frontal lobe
- Brodmann 47 areas each have an assigned function.
- 3 processing blocks distinguished:
  - **Brain Stem and thalamic reticular activating system** (provides arousal and set up attention)
  - **Posterior Cortex**: integrates perception and generates language
  - **Frontal Cortex**: generates, programs, and executes plans

- Localization of language occurs in the left hemisphere (Dominant Hemisphere)
- Prosody (emotional and affective components of language "Body Language") localized in the right hemisphere
- The limbic system is responsible for:
  - Generating and modifying memories
  - Assigning emotional weight to sensory and recalled experience **(Amygdala)**

-Functional Brain Systems -

Three functional brain systems show the relation between the organizational principles and the structural components of the human brain: **Thalamocortical system, basal ganglia, and association areas.**



1.Thalamocortical system

- Connects the thalamus to the cortex and certain related structures.
- The Thalamocortical system comprises 3 subsystems, each with different pattern of functional circuit):

1. Sensory System:
   - Different pathways: Somatosensory, Visual , Auditory , Olfactory, and Gustatory
     a) Somatosensory
     - 6 modalities: light touch, pressure, pain, temperature, vibration, proprioception
     - The peripheral receptor organs generate coded neural impulses that travel proximally along the sensory nerve axons to the spinal cord

     b) Visual System
     - Visual images are transduced into neural activity within the retina and processed in highly specialized nerve cells in the visual cortex (occipital cortex).
     - Cortical visual abnormalities include:

     1. ***Prosopagnosia***: inability to recognize faces, in the presence of preserved recognition of other environmental objects. (Results from disconnection of the **Left inferior temporal cortex** from the **visual association area in the parietal lobe**)
     2. ***Visual Agnosia***: Inability to identify items despite preserved vision due to a lesion in the visual association area.
     3. ***Color Agnosia***: Inability to recognize a color due to damage to the visual cortex
     4. ***Color Anomia***: Inability to name a color
     5. ***Anton's syndrome***: Failure to acknowledge blindness in **bilateral occipital lobe lesions**
     6. ***Gertsman Syndrome***: Agraphia + Acalculia + Right- Left disorientation + finger agnosia due to a lesion in **the dominant parietal lobe**

     c) Auditory System
     - Sounds produce air pressure changes and leads to neural impulse generation travelling to the brain stem → to the thalamus → to the primary auditory cortex
     - **Word deafness**: Inability to recognize speech despite intact hearing due to left parietal lesion causing disconnection of the auditory cortex from Wernicke's area
     - **Auditory Sound Agnosia**: Inability to recognize non- verbal sounds such as horns or

animal sounds in the presence of intact hearing and speech recognition due to right hemisphere lesion

d) Olfactory System

- Smell is associated with sexual and reproductive responses
- Human can recognize 10,000 different odors
- Olfactory signals skip the thalamus and project directly to the frontal lobe and limbic system (especially pyriform cortex)
- Olfactory cues stimulate strong emotional responses and evoke powerful memories

d) Gustatory System

- Taste receptors stimulate gustatory nerves that transmit impulses to nucleus solitarius in brain stem and end in medial temporal lobe
- Human discriminates 4 broad classes of taste stimuli: sweet, sour, bitter and salty
- Detection and discrimination of foods involve a combination of: taste + olfaction + touch + vision + hearing

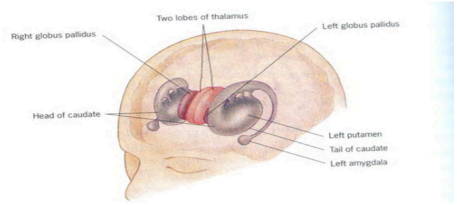
II. Motor System:

➢ Movement of body muscles are controlled by the: Motor System, Basal Ganglia, Cerebellum

a) Motor System (Cortex):

- Lies immediately anterior to the central fissure in each vertebral hemisphere.
- Individual cells within the motor strip causes contraction of single muscles in the opposite half of the body
- The cerebral cortex immediately anterior to the motor strip is called the **"supplementary motor area (Brodmann area 6)**. It triggers complex movements.
- Movement of body muscles is controlled by the **LMN.**
- Firing of LMN is regulated by **UMN** summated activity.
- The **corticospinal tracts** control fine movements.
- The **motor cortex** directs smooth execution of movements planned in the **association areas** of the brain in consultation with the **basal ganglia** and **cerebellum.**

Basal Ganglia



2. and b) **Basal ganglia system:**

- A collection of nuclei grouped together on the basis of their interconnections
- Play an important role in: regulating movement and cognitive functions (e.g. memory)
- Major components: Caudate, Lentiform nucleus (putamen+globus pallidus

(pallidum or paleo striatum), Subthalamic nucleus, substantia nigra **[striatum** = all of the mentioned nuclei]

- Mediates postural tone
- **Parkinson's disease** results from over activity of the striatum due to lack of dopamine inhibition.
- **Huntington's disease** results from shrinkage of the caudate nucleus.
- Decreased activity in caudate nucleus found in obsessive compulsive behavior (OCD) and tics
- The Caudate also influences associative or cognitive processes.
- The Globus Pallidum damaged in Wilson's disease and Co poisoning.
- Lesions of Substantia Nigra lead to rigidity and tremor as in Parkinson's disease with depression in over 30%.
- Subthalamic Nucleus lesions yield ballistic movements

c) Cerebellum:

- Modulates tone of agonistic and antagonistic muscles by predicting relative contraction needed for smooth motion.
- Activity in the cerebellum detected several msec before a planned movement is initiated.
- Coarse intentional tremor results from cerebellar ablation.

III. Cortical Association System

- In most behaviors, sensory systems project to association areas, where sensory information interpreted in terms of internally determined memories, motivation and drives.
- The exhibited behavior results from a plan of action determined by the association components and carried out by the motor systems

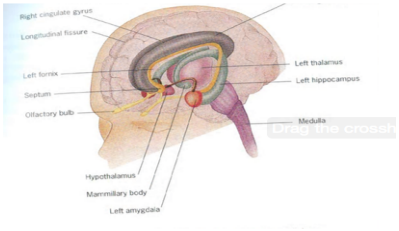
-Autonomic Nervous System-

- Monitors the basic functions necessary for life.
- Consists of **sensory and motor divisions.**
- Sensory fibers that transmit the activity of visceral organs, blood pressure, cardiac output, blood glucose level, and body temperature.
- Most of the sensory information remains unconscious.
- The Motor Component: (sympathetic and parasympathetic divisions)
  - Have antagonistic roles
  - Innervate the same organs
  - The parasympathetic fibers slow the heart rate and begin the process of digestion.
  - The sympathetic fibers mediate the " fight or flight response resulting in: increased heart rate, shunting of blood away from viscera, increased respiration.
  - The sympathetic fibers are highly activated by sympathomimetic drugs (amphetamine,

cocaine) and withdrawal of sedative drugs (benzodiazepines, alcohol, and opioids)

- Increased risk of heart attacks in presence of:
  - High levels of hostility
  - Chronic activation of sympathetic (fight or flight response)
  - Elevated adrenaline secretion
- The ANS is controlled by the hypothalamus that controls:
  - rage
  - temperature
  - blood pressure
  - perspiration
  - sexual drive
  - appetite and obesity

The Limbic System



3.Limbic System

- **Limbic** = Latin for "Limbus" (for border) applied by "Pierre Broca" more than 100 years ago
- Limbic system applied by "MacLean" to describe the pathway that relates certain **telencephalic** structures (including the hippocampus and Amygdala) and their connections with the **hypothalamus** and its output pathway (that control autonomic, somatic, and endocrine functions)
- Involved in the **experience and expression of emotions, behavior and long-term memory**.
- Limbic structures are closely associated with the **olfactory structures**
- Structures:
  - **Fornix**: carries signals from the hippocampus to the parahippocampus and septal nuclei
  - **Hypothalamus**: regulates the autonomic nervous system via hormone production and release such as:
    - ➢blood pressure
    - ➢heart rate
    - ➢ Hunger
    - ➢ Thirst
    - ➢Sexual arousal
    - ➢Sleep/wake cycle
  - **Thalamus**: The "relay station" to the cerebral cortex

- **Amygdala**: Involved in signaling the cortex of motivationally significant stimuli such as those related to **reward and fear** in addition to **social functions** such as **mating**.

- **Hippocampus**: required for the formation of long-term memories

- **Parahippocampus gyrus**: plays a role in the formation of spatial memory and is part of the hippocampus
- **Cingulate gyrus**: autonomic functions regulating heart rate, blood pressure and cognitive and attentional processing

- **Mammillary body**: Important for the formation of memory

- **Pituitary gland:** secretes hormones regulating homeostasis

- **Dentate gyrus:** contributes to new memories and to regulate happiness (Pleasure Centre).

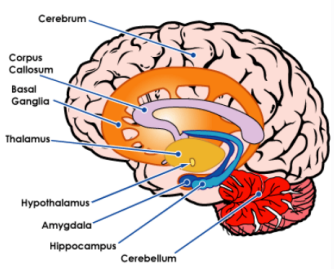
- **Entorhinal cortex and pyriform cortex**: Receive smell input in the olfactory system.

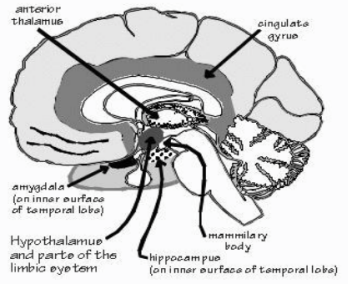
- **Olfactory bulb**: Olfactory sensory input

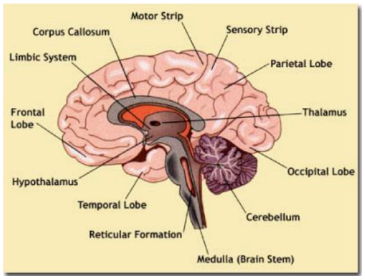
- **Nucleus accumbens**: Involved in reward, pleasure, and addiction

- **Orbitofrontal cortex**: Required for decision making

- Behavioral Aspects of the Limbic System
  - Houses the emotional association areas, which direct the hypothalamus to express the motor and endocrine components of the emotional state
  - Electrical stimulation → "rage" reaction
  - Electrical stimulation of the *lateral hypothalamus* → fully satiated animals to eat vividly
- Functions of the Limbic System
  - The limbic system operates by influencing the: endocrine system and ANS
  - Highly interconnected with **the nucleus accumbens**, the brains' 'pleasure system', which plays a role in **sexual arousal** and the "**high"** derived from certain recreational drugs.
  - Also tightly connected to the **prefrontal cortex** (related to the **pleasure obtained from solving problem)**.
  - This connection sometimes surgically severed, a procedure of psychosurgery to cure severe emotional disorders (Patients who underwent this procedure often became passive and lacked all motivation)







-Reticular Formation-

- A poorly differentiated area of the brain stem that forms the **core of the brainstem** running through the mid-brain, pons and medulla; **centered roughly in the pons**.
- Neurons forming meshwork extending from the spinal cord to thalamus (Diencephalon) in the **ventral core of the brain stem**
- The area from the brain stem to the thalamus is called the **"reticular formation proper"**
- Neurons are **neither sensory nor motor**
- Reticular Activating Systems:
  - The **ascending reticular activating system** connects to areas in the thalamus, hypothalamus, and cortex
  - The **descending reticular activating system** connects to the cerebellum and sensory nerves.
  - The reticular formation is involved in actions such as **awaking/sleeping cycle**, and **filtering incoming stimuli** to discriminate irrelevant background stimuli
- Functions of the Reticular Formation:
  - It controls approximately 25 specific behaviors (including sleeping, walking, eating, urination, defecation, and sexual activity).
  - **Important regulator in the autonomic nervous system** for such processes as respiration rate, heart rate, and gastrointestinal activity.
  - Plays an important role in sleep and consciousness as well as **modulation of pain**.
  - It has been shown to play a major role **in alertness, fatigue, and motivation** to perform various activities.

-Cerebral Hemispheres-

RIGHT HEMISPHERE	LEFT HEMISPHERE	CORPUS COLLUSUM
Controls the **left side** of the body	Controls the **right side** of the body	Communication between the right and left hemisphere
Temporal and spatial relationships	Produces and understands **language**	
Analyzing **nonverbal** information		
Communicating emotion		

-Cortical Sites (Cerebral Lobes)-

- **Frontal Lobe**
  - It contains most of the **dopamine- sensitive neurons** in the cerebral cortex
  - The dopamine system is associated with **reward, attention, long-term memory, planning, and drive.**
  - Dopamine tends to limit and select sensory information arriving from the thalamus to the forebrain.
  - Reduced dopamine activity in the prefrontal cortex is claimed to be found in conditions of poor performance and functioning of that brain region during **working memory** tasks, and slightly increases risk for **schizophrenia**.
  - Frontal lobe functions:
    - Behavior in general, Inhibition, Initiative
    - Abstract thought processes, Problem solving
    - Creative thinking
    - **Working memory**
    - Attention
    - Judgment
    - Coordination of movements
    - Generalized and mass movements, some eye movements
    - Skilled movements and some motor skills

- Sense of smell
- Libido (sexual urges)

➢ Frontal lobe lesions result in:
- Impaired **mental flexibility** and spontaneity, but IQ is not reduced.
- **Talking** may increase or decrease dramatically.
- **Perceptions** regarding risk taking and rule abiding are impaired.
- **Socialization** can diminish or increase.
- Orbital frontal lobe damage can result in peculiar **sexual habits**.
- Dorsolateral frontal lobe damage reduces **sexual interest**.
- **Creativity** is diminished as well as problem solving skills.
- **Distraction** occurs more frequently.
- The **dorsolateral frontal cortex** is concerned with planning, strategy formation, and executive function.
- Patients with dorsolateral frontal lesions tend to have:
  −Apathy, personality changes, abulia, and lack of ability to plan or sequence.
  −Poor **working memory for verbal information** (if the left hemisphere is affected)
  −Poor **working memory for spatial information (**if the right hemisphere is affected)

- **The frontal operculum contains** the center for expression of language.
- Patients with **left** frontal operculum lesion may demonstrate **Broca aphasia** and defective verb retrieval,
- Patients with exclusively **right** opercular lesions tend to develop **expressive aprosodia.**
- Patients with orbitofrontal lesions tend to have:
  −Disinhibition, emotional labiality, and memory disorders.
  −Personality changes include: impulsiveness, sexual disinhibition, and complete lack of concern for others.
- Patients with **superior mesial lesions** typically develop akinetic mutism.
- Patients with **inferior mesial (basal forebrain) lesions** tend to manifest anterograde and retrograde amnesia and confabulation.

❖ Parietal Lobe

➢ **Integrates & comprehend sensory information** from different modalities, particularly determining spatial sense and navigation.
➢ Sense of touch **(tactile sensation**) &Appreciation of form through touch (**stereognosis**)
➢ Response to internal stimuli (**proprioception**)
➢ **Manipulation** of objects
➢ Some **language** and reading functions
➢ Knowledge **of numbers** and their relations
➢ Portions of the parietal lobe are involved with **visuospatial processing**
➢ Parietal lesions result in:
- Impairment of **tactile sensation**

- Impairment of **proprioception** (i.e. postural sensation and sensation of passive movement)
- Loss of ability to identify objects based on touch **(astereognosis**)
- **Sensory and visual neglect syndromes**, i.e. inability to pay attention to things in certain parts of the person's sensory or spatial environment. This can be as extreme as denial of a limb.
- Loss of ability to read **(dyslexia),** write **(dysgraphia**) or calculate **(dyscalculia)**
- Loss of ability to find a defined place **(geographical agnosia)**

❖ **Temporal Lobe**

- Involved in **speech, memory, and hearing**.
- The superior temporal gyrus includes the (**primary auditory cortex**) involved in hearing.
- Adjacent areas in the superior, posterior and lateral parts of the temporal lobes are involved speech (left temporal lobe in particular)
- **Wernick's area**, which spans the region between temporal and parietal lobes, also plays a key role in speech
- The functions of the left temporal lobe extend to **comprehension, naming, verbal memory and other language functions**
- **Sound processing**.
- Ventral part of the temporal cortices involved in **visual processing** of complex stimuli such as **faces and scenes**, and in **object perception** and **recognition**.
- The medial temporal lobes are thought to be involved in **episodic memory** (memory of autobiographical events (times, places, and associated emotions) and **declarative memory** (memory that stores facts).
- The hippocampi seem to be particularly important for transference **from short to long-term memory and control of spatial memory and behavior**.
- Temporal lobe lesions result in:
  - Disturbance of auditory sensation and perception
  - Disturbance of selective attention of auditory and visual input
  - Disorders of visual perception
  - Impaired organization and categorization of verbal material
  - Disturbance of language comprehension
  - Impaired long-term memory
  - Altered personality and affective behavior
  - Altered sexual behavior

❖ **Occipital Lobe**

- Harbors **the primary visual center**
- If one occipital lobe is damaged, the result can be **homonymous** vision loss from similarly positioned "field cuts" in each eye.
- Occipital lesions can cause **visual hallucinations**.

- Lesions in the parietal-temporal-occipital association area are associated with **color agnosia, movement agnosia, and agraphia**.

-Other Structures-

- **Hypothalamus**
  - Contains a number of small nuclei with a variety of functions located below the thalamus just above the brain stem.
  - Links the nervous system to the endocrine system **via the pituitary.**
  - Responsible for certain **metabolic processes** and other activities of the **ANS**
  - It **synthesizes and secretes neurohormones**, often called **hypothalamic-releasing hormones**, and these in turn stimulate or inhibit the secretion of pituitary.
  - The hypothalamus controls: **body temperature, hunger, thirst, fatigue, anger, and circadian cycles, mood and motivation, sexual maturation, and hormonal body processes**
- **Pineal Body**
  - Also called the **"third eye".**
  - Is a small endocrine gland in the brain
  - Shaped like a tiny pine cone (hence its name), and is located near to the center of the brain, between the two hemispheres
  - It produces melatonin (a derivative of **Tryptophan**), a hormone that affects the modulation of **wake/sleep patterns** and photoperiodic (seasonal) functions
  - Melatonin is involved in **circadian rhythms** of biological functions.
  - Melatonin secretion during sleep at night is important for **regeneration of cerebral neurons**
- **Pituitary Gland**
  - Hormonal body processes
  - Physical maturation
  - Growth (height and form)
  - Sexual maturation &Sexual functioning
- **Posterior Fossa Structures**
  - THE CEREBELLUM
    - Balance
    - Posture
  - THE BRAIN STEM
    - Motor and sensory pathway to body and face
    - Vital centers: cardiac, respiratory, vasomotor

-Localization of specific brain functions-

- **Arousal**
  - Is a physiological and psychological state of being awake or alert, or reactive to stimuli and readiness for action
  - It involves activation of the:
  - Reticular activating system in the brain
    - Autonomic nervous system
    - Endocrine system
  - The arousal system is formed of five neural systems, based on the neurotransmitters, that originate in the brain stem and project to the cerebral cortex:
    - Acetylcholine
    - Norepinephrine
    - Dopamine
    - Histamine
    - Serotonin
  - Arousal is important in regulating:
    - Consciousness
    - Attention
    - Information processing
- **Memory**
  - The process in which information is:
    - **Encoded or registered**: receiving, processing and combining have received information.
    - **Stored**: creation of a permanent record of the encoded information
    - **Retrieved** (recall or recollection): calling back the stored information
  - The loss of memory is called **forgetfulness or amnesia**
  - Three period of memory:
    - **Sensory** (Immediate) – functions over a period of seconds
    - **Short term** (recent or working memory) functions over a period of minutes to days
    - **Long term** (Remote) – functions over a period of months to years
  - Long term memory:
    - Explicit (Conscious) Memory
    - Declarative (facts & events):
      - Episodic (events, experiences)
      - Semantic (facts, concepts)
    - Implicit (Unconscious) Memory
    - Procedural (skills, tasks)
  - Brain structure critical to the formation of memories:
    - Temporal lobe involved in autobiographical and recognition memory

- Parietal lobes involved in verbal short term memory and focusing attention
- Basal ganglia are associated with learning, unconscious memory processes (implicit memory)

Note: Alzheimer and Pick disease are examples of memory disorders

- Hippocampus contains cognitive maps, encoding, memory consolidation (process of converting short to long-term memory
- Cerebellum plays a role in procedural memory
- Amygdala involved in emotional learning and memory consolidation
- Frontal lobes are important in working memory and prospective memory

❖ **Language**

- 90% of people are Right handed (99% of them have left hemisphere dominance for language)
- 10% left handed **(7% have left hemispheric dominance** and 3% either mixed or right hemispheric dominance)
- **Music** is represented in the right hemisphere
- **Aphasias** are language disorders (inability to understand or produce language in the presence of normal articulation).
- **Broca's aphasia** (non fluent aphasia): Inability to form speech due to a lesion of inferior frontal lobe.
- **Wernicke's aphasia** (fluent aphasia): inability to comprehend speech due to a lesion of the left superior temporal lobe.
- **Developmental Dyslexia**:
  - Inability to learn in the context of adequate intelligence, motivation and education in children, due to right hemisphere dysfunction

❖ **Emotions**

- Emotion is often defined as a complex state of feeling that results in physical and psychological changes that influence thought and behavior and actions.
- There are only two basic emotions that we all experience: love and fear
- All other emotions are variations of these two emotions
- Emotions derive from the basic drives that all animals share (feeding, sex, reproduction, pleasure, pain, fear, aggression)
- Human emotions are largely learned and include: affection, pride, guilt, pity, envy, and resentment.
- Emotions are represented in the prefrontal cortex and the limbic system namely the amygdala.
  - Lesion of the left prefrontal area produces depression
  - Lesion of right prefrontal produces laughter and euphoria

The end

-Past Paper Questions-

1. All of the following are neurotransmitters except
a- dopamine
b- epinephrine
c- norepinephrine
d- Vasopressin
e- Serotonin

2.The consolidation of memory begins at the age of 3 when the hippocampus gets mature (sht like) ... this represents which of the following perspectives: >>> **the biological perspective**

3. True about Neurotransmission receptors – **receive signals that elicit an electrical response**

4.Not in the synapse – **axon hillock**

5.Thalamus relays sensations to the – **cerebral cortex**

6. Cerebral cortex is derived from **– telencephalon**

7. Lesion in which part of the frontal lobe causes disinhibition **– orbitofrontal cortex**

8. Not a function of the limbic system **– judgment and decision making**

9. Not caused by a lesion in the frontal lobes **– receptive dysphasia (removed)**

10. Active in goal-driven positive emotions **– nucleus accumbens**

11. Not a neurotransmitter criterion **– once the transmitter is released into the cleft in stays there**

12. Judgment = **prefrontal cortex**

13. Dopamine over activity = **Schizophrenia**

14. Reticular formation **=(wrong) balance body it is the cerebellum the balance center**

15. Neuroreceptor =**specific for neurotransmitter**

16. Not neurotransmitter **- thyroxine**

17. Nucleolus **makes rDNA**

18**. Instinctual behavior**- pain avoidance and pleasure

19. which of the following is true- stimulation of the **lateral hypothalamus in a satiated animal leads to eating**

20. Which of the following is a function of the basal ganglia
a-cognitive function and movement << answer
b- perception

21. which of the following is part of the limbic system- **hippocampus**

22. which is derived from telencephalon
a- >>>cerebral cortex
b- pons
c- cerebellum
23. Which of the following is involved in short term or working memory: **frontal cortex**

24. which of the following is important for long term memory: **hippocampus**

25. Part of limbic system **--- amygdala ***

26. Wrong about RF------**have both sensory and motor ***

27. Not associated with basal G injury ---- **ataxia ***

28. Wrong about smell---- **smell pass to hypothalamus**

29. The system most involved with internal body functions: **ANS**

30. 7% of left-handed people are right hemisphere dominant (true)

31. the movements you control and do in conscience are --> **voluntary**

32. Ligand gated channels are exposed to the extracellular transmitters (true)

33. Not function of limbic system: filtering

34. not part of the limbic system: **caudate**
35. Prosencephalon, except cerebellar hemisphere
36. **Autosomal dominant**- Huntington disease