Nervous System and Special Senses

HEALTH SCIENCE
What’s your reaction time?
Go to this website and check it out:
https://www.justpark.com/creative/reaction-time-test/
8) Outline basic concepts of normal structure and function of all body systems, and explain how homeostasis is maintained.
Objectives

- Students will describe the functions of the central nervous system.
- Students will list the 3 divisions of the nervous system.
- Students will describe the structure of the brain and spinal cord.
- Students will demonstrate knowledge of brain structure through creation of a brain model.
During this lecture we are going to discuss...

- The Central Nervous System
- Brain and spinal cord
INTRODUCTION TO THE CENTRAL NERVOUS SYSTEM and its relationship to homeostasis

Functions of the central nervous system:

- Communication and coordination system in the body
  - It Receives messages from stimuli
  - Brain interprets message
  - Brain responds and carries out activity
- The brain is in charge of reasoning and intelligence
The Brain

- Intricate mass of soft nervous tissue
- Weighs about 3 pounds
- Protected by the skull and has three main parts: cerebrum, cerebellum, and medulla

Discussion:
- What cavity is the brain located in?
- Describe its location using directional terms.
THE BRAIN

- Memory (storage of “old” info.)
  - Short term
  - Long term
    - Depends on how much attention we give something or how much we practice it.

Discussion
Give an example of something that is in your short term memory and something in your long term memory.
The spinal cord functions as both a reflex center and a conduction pathway to and from the brain.

Nerve impulses can travel up to 330 meters/second from the brain to the body via the spinal cord and its nerves.
Coverings of the brain

- **Dura mater**
  - Outer brain covering, lines the inside of the skull
- **Arachnoid mater**
  - Middle layer
- **Pia mater**
  - Covers the brain surface

Draw a representation of the coverings of the brain similar to the example. Label the different layers.
Notice each layer under the skull.

Why do you think it's important to have so many layers that cover the brain?
CEREBRUM

- Largest part of the brain (2 pounds)
- The cerebrum is divided into 2 hemispheres (right and left)
Why is the brain wrinkly?

The cerebral surface is covered with furrows and ridges

- **Sulci** - Shallow grooves
- **Fissures** - deeper grooves 5 types
  - Longitudinal fissure
  - Transverse fissure
  - Central fissure
  - Lateral fissure
  - Parieto-occipital fissure
Longitudinal Fissure

A large cleft which separates the brain's left hemisphere from the brain's right.
Transverse Fissure

Left cerebral hemisphere

Transverse cerebral fissure

Brain stem

Cerebellum

(b) Left lateral view
Central Fissure
Lateral Fissure
Parieto-occipital Fissure
These fissures divide the brain into lobes

- **Frontal lobe**
  - Motor function, voluntary muscles
  - Right side of the brain controls the voluntary movements of the left side of the body
  - Left side of the brain controls the right side of the body

Discuss why is this important to know when considering stroke patient?
Which side of your brain do you use the most?!

- Go to the following websites and take the short tests:
Lobes Cont...

- **parietal lobe**
  - Sensory, receives nerve impulses (pain touch heat cold)
- **occipital lobe**
  - Visual area, controls eyesight
- **temporal lobe**
  - Auditory area, olfactory
- **Cerebral cortex** controls conscious thought, judgement, memory, reasoning, and willpower
The Cerebellum

- Coordinates muscle activity and balance so that the muscles run smoothly
The Medulla Oblongata (part of the brain stem)

- The medulla is a part of the brain stem and controls breathing, heartbeat, circulatory action, and digestive movements.

- Discussion:

  - Do we have to “tell” our bodies to carry out these functions? (involuntary)

  - What are the other two parts of the brain stem? (pons and midbrain)
Brain stem is made of 3 parts:

- Midbrain
- Pons
- Medulla
Activity Option One  
(This is a project grade)

- Make a visual representation of the brain.
- **Look in old books page 171-172**
- You will use colorful construction paper and differentiate between each layer and each lobe of the brain, including the cerebral cortex.
- Label each layer and each lobe.
- Draw a symbol and then use a key with the symbol that describes the function of each lobe.
- Label as many internal organs, structures, or glands underneath, making a flap for the temporal lobe.
Activity Option Two

- You will now be provided the materials to create a brain “hat”
- This will serve as a model of the brain. You need to color the different lobes and draw a symbol in each to represent its function. Once your have colored your brain, follow the instructions for cutting it out. I will be walking around helping you assemble your model.
Activity Option Three

- With a partner you will be mimicking the brain and how it sends signals to the body.
- One person will be acting as the “brain”
- One person will be acting as the “body”
- The person who is the “body” will be blindfolded
  - Sit back to back, the “brain” is going to give instructions to the “body” to complete these tasks
    - Draw a flower
    - Draw a house
    - Draw a stick figure
    - Drop a paper clip into a cup
    - Color in a square
    - * once you have completed switch roles
  - Individually reflect on your experience as it relates to the spend of impulses from the brain to the body. Think about the results of having to wait to receive these impulses and how long it took to interpret information sent from your “fake” brain.
The brain contains four lined cavities called ventricles.

These are filled with cerebrospinal fluid.

Cerebral Spinal Fluid

The primary function of CSF is to cushion the brain within the skull and serve as a shock absorber for the central nervous system. CSF also circulates nutrients and chemicals filtered from the blood and removes waste products from the brain.
Discussion

- With a partner discuss....
- Applying what you know about directional terms, describe where the spine is located.

- Applying what you know about anatomical terms, which Cavity is the spinal cord located in?
Why do we need a shock absorber?

▶ Any blow to the head has the potential to damage our delicate brain.

▶ To help prevent damage our body is equipped with measures such as membranes filled with fluid (CSF) and ventricles (hollow spaces that absorb impact)

▶ Discuss:

▶ Can anyone think of a common way the brain can be injured despite these shock absorbers?
What is a concussion?

- Type of traumatic brain injury
  - caused by a bump, blow, or jolt to the head
  - a hit to the body that causes the head and brain to move rapidly back and forth.

- These sudden movements cause the brain to bounce around or twist in the skull, stretching and damaging the brain cells and structures.
Discussion

- What are some activities that could cause the brain to suffer from a concussion?
- Applying what you know about the brains function and roles, what can potentially happen due to these injuries?
Sport Concussion Assessment Tool (SCAT)

- Assessment tool to determine the presence of a concussion and the severity.
- A health care provider gives a series of questions and commands to the injured patient and records their response.
Activity

With a partner go to the SCAT assessment tool located on the class website.

Read the information about concussions and the assessment tool, then perform the assessments on your partner then switch.

Create and write a scenario detailing how your partner was injured and the results of the SCAT assessment tool. What is the outcome for your partner?
What is a stroke? (Activity)

Go to the class website and choose the “What is a stroke?” selection.
Follow the directions.
You will go to the link provided and answer the questions from the information you read from Khan Academy.
This website is extremely beneficial and has additional videos and explanations related to strokes.
This will be for a grade and is also testable information.
Take time to understand what you are reading. Strokes are extremely serious and YOU the FUTURE HEALTHCARE PROFESSIONAL will take care of and treat stroke patients.

REMEMBER!!! TIME IS BRAIN!!!
Additional research.

- Work with a partner and use your technology to describe the appearance of each of the brain coverings, and what is located in each ...
  - Dura mater-
  - Arachnoid mater-
  - Pia mater-
  - * add these to your notes
The Nervous System has two parts:

- The Central Nervous System and the Peripheral Nervous System (these are constantly “talking” to each other, sending and receiving messages)
- The Peripheral is divided into Somatic and Autonomic
- The Autonomic is divided into the Sympathetic and Parasympathetic
Nervous System

Peripheral nervous system

Somatic nervous system (voluntary skeletal muscles)

Autonomic nervous system (involuntary muscle, i.e. organs)

Parasympathetic "rest & digest"

Sympathetic "flight or flight"

Central nervous system

Brain

Spinal cord

DRAW & LABEL THIS DIAGRAM!!!
The Somatic Nervous System

Notice that each nerve has its own function!!

12 cranial pairs
31 spinal pairs

Each responds and carries out sensory messages and motor reflexes.
Our automatic nervous system is divided into TWO parts. These are INVOLUNTARY functions.

Parasympathetic—essentially brings your body to a resting state
Example: slowing your heart rate down after a two-mile run

Sympathetic—essentially does the opposite
Example: increasing your heart rate when you are scared, preparing the body for fight or flight.

Together these work to maintain our body’s homeostasis depending on our immediate needs.

ACTIVITY: Color worksheets of these systems!!!
Activity:
Read the following cranial nerve checks.

With a partner or group practice “checking” the list.

<table>
<thead>
<tr>
<th>Cranial Nerve Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I- Olfactory</strong></td>
</tr>
<tr>
<td>- Sense of smell (strong coffee)</td>
</tr>
<tr>
<td><strong>II- Optic</strong></td>
</tr>
<tr>
<td>- Visual acuity, ophthalmoscope</td>
</tr>
<tr>
<td><strong>III- Oculomotor</strong></td>
</tr>
<tr>
<td>- Check for pupillary symmetry</td>
</tr>
<tr>
<td><strong>IV- Trochlear</strong></td>
</tr>
<tr>
<td>- Check pupillary light reflexes</td>
</tr>
<tr>
<td><strong>V- Trigeminal</strong></td>
</tr>
<tr>
<td>- Check light touch (sensory)</td>
</tr>
<tr>
<td>- Strength of masticatory muscles (motor)</td>
</tr>
<tr>
<td><strong>VI- Abducens</strong></td>
</tr>
<tr>
<td>- Eye movement</td>
</tr>
<tr>
<td><strong>VII- Facial</strong></td>
</tr>
<tr>
<td>- Test facial expressions</td>
</tr>
<tr>
<td><strong>VIII- Acoustic Vestibular</strong></td>
</tr>
<tr>
<td>- Hearing</td>
</tr>
<tr>
<td><strong>IX- Glosopharyngeal</strong></td>
</tr>
<tr>
<td>- Voice, palate rise (“AAH”)</td>
</tr>
<tr>
<td><strong>X- Vagus</strong></td>
</tr>
<tr>
<td>- Gag reflex</td>
</tr>
<tr>
<td><strong>XI- Accessory</strong></td>
</tr>
<tr>
<td>- Bulk and strength of SCM, Trapezius</td>
</tr>
<tr>
<td><strong>Hypoglossal-</strong></td>
</tr>
<tr>
<td>- Tongue strength, movement and bulk</td>
</tr>
<tr>
<td>- Stick out, wiggle, press against resistance</td>
</tr>
</tbody>
</table>
Special Senses