Bellringer

- What type of neuron carries messages from the brain and spinal cord to the muscles and glands?
  a. Sensory
  b. Motor
  c. Associative
  d. Afferent

- Which part of the brain stem controls respiration?
  a. Pons
  b. Midbrain
  c. Medulla oblongata
  d. Amygdala
3.02 Understand the functions and disorders of the nervous system
3.02 Essential Questions

- What are the functions of the nervous system?
- What are some disorders of the nervous system?
- How are nervous system disorders treated?
- How does the nervous system relate to the body’s communication systems?
Functions of the nervous system:

**Neurons**

- Nerve cells including its processes.
  - In order for a nerve impulse to begin, it must be initiated by a stimulus
  - Transmit a message from one cell to the next

**Types of neurons:**

- **Sensory** – emerge from the skin or sense organs and carry messages or impulses toward the spinal cord and brain
- **Motor** – carry messages from the brain and spinal cord to the muscles and glands
- **Associative** – carry impulses from the sensory neuron to the motor neuron
Structures of the peripheral nervous system

**Reflex**

- Unconscious and involuntary
- In a simple reflex, only a sensory nerve and motor nerve are involved (ex: “knee-jerk” reflex)
Functions of the central nervous system: **Brain**

**THINK ABOUT IT...**

**HOW DO YOU USE YOUR BRAIN?**

3.02 Understand the functions and disorders of the nervous system
Functions of the central nervous system:

**Brain**

**How do you use your **Cerebrum**?**

It helps with planning, recalling information and decision making.

- Frontal lobe – controls voluntary movement, controls speech
- Parietal lobe – controls sensory receptors for (pain, touch, heat, cold, balance) Also helps to determine distance, sizes, and shapes.
- Occipital lobe – controls eyesight
- Temporal lobe – responsible for smell (olfactory) and hearing (auditory)
Functions of the central nervous system: **Brain**

**HOW DO YOU USE YOUR LIMBIC SYSTEM?**

- Located at the center of the brain beneath the other 4 lobes.
  - Structures of the limbic system: olfactory bulb, amygdala, hippocampus, parahippocampus, fornix, mammillanry body, cingulated gyrus, septum pellucidum
  - Functions of the limbic system: It influences unconscious and instinctive behaviors that relate to survival (ex: emotional reactions)
- How does this effect you?
- Can you control it?
3.02 Understand the functions and disorders of the nervous system
Functions of the central nervous system:

**Brain**

**How do you use your Cerebellum?**

Functions of the cerebellum:

- Messages are carried to the cerebellum regarding movement within joints, muscle tone, position of the body, and tightness of ligaments and tendons. All information related to skeletal muscle activity is carried to the cerebellum.

3.02 Understand the functions and disorders of the nervous system
Functions of the central nervous system: **BRAIN**

- **Diencephalon**
  - Located between the cerebrum and the midbrain

- **Structures**
  - Thalamus – spherical mass of gray matter. relays sensory stimuli to the cerebral cortex
  - Hypothalamus – part of the limbic system. Stimulates the pituitary to release its hormones/aids in temperature control, appetite control and weight
  - Pineal body – produces melatonin
  - Pituitary gland – ’master gland’, Secretes multiple hormones
Functions of the central nervous system:

**Brain**

**How do you use your Brain Stem?**

- **Midbrain** – contains reflex centers involved with vision and hearing
- **Pons** – controls respiration
- **Medulla oblongata** – controls the heart rate, the rate and depth of respiration, vasoconstrictor center which affects BP, and the center for swallowing and vomiting

3.02 Understand the functions and disorders of the nervous system
Functions of the central nervous system:

**Brain**

**DISCUSS THE RELEVANCE OF THE BRAIN STEM FOR THESE FUNCTIONS?**
Functions of the central nervous system: **Spinal Cord**

Functions of the spinal cord:
- Carries messages from the sensory neurons to the brain for interpretation
- Serves as the reflex center for the body

What is the relevance to health?
3. Understand the functions and disorders of the nervous system

**Peripheral nervous system** – connects the brain and spinal cord with sensory receptors, muscles, and glands

- **Cranial** – 12 pairs of nerves that begin in the brain
- **Spinal** – 31 pairs of nerves that originate at the spinal cord

Also called sensory-somatic nervous system
3.02 Understand the functions and disorders of the nervous system

Functions of the peripheral nervous system:

**Autonomic nervous system**

Functions of the autonomic nervous system:

- **Sympathetic** – fight or flight system (pupil dilation, increased sweating, increased heart rate, and increased blood pressure).
- **Parasympathetic** - rest and digest system (slows the heart rate, increases intestinal and gland activity, and relaxes sphincter muscles in the gastrointestinal tract.)
Functions of the nervous system

- Discuss the relevance of the nervous system to the body’s communication systems.

![Diagram of the nervous system with CNS and PNS divisions and their functions]
Bellringer

- What disease causes problems with remembering recently learned information?
  a. Cerebral palsy
  b. Alzheimer’s
  c. Epilepsy
  d. Neuritis

- What disorder is characterized by inflammation of the linings of the brain and spinal cord?
  a. Cerebral palsy
  b. Meningitis
  c. Encephalitis
  d. Hydrocephalus
Disorders of the nervous system and their treatments

- **Alzheimer’s disease**

The elderly are at greatest risk of developing Alzheimer’s disease.

Symptoms: confusion, senility, short-term memory loss, anxiety, loss of social skills, weight loss, mood swings, aphasia (loss of speech), loss of recognition of persons or familiar surroundings

Treatment: certain drugs may be used to minimize or stabilize symptoms

Prevention: exercise, eating low-fat diets, eating foods high in omega-3 fatty acids and antioxidants

Cause: unknown
Disorders of the nervous system and their treatments

- **Cerebral palsy**
  
  Cause: disturbance in voluntary muscular action due to brain damage
  
  Treatment: surgery (contractures), medications (for muscle spasticity), PT, OT, mechanical aids
  
  Healthcare team members who will take care of the patient with cerebral palsy: Pediatrician, neurologist, orthopedic surgeon, occupational therapist, physical therapist, speech therapist
Disorders of the nervous system and their treatments

- **Epilepsy**

  Is a seizure disorder of the brain
  Involves abnormal electrical impulses of the brain
  Cause: uncertain

  **Symptoms:** seizure (convulsion), hallucinations, loss of consciousness

  **Treatment:** anticonvulsants (phenobarbital, dilantin, and tegretol)
Disorders of the nervous system and their treatments

- **Hydrocephalus**
  
  **Hydro- cephal -us –**
  
  - Condition that involves an increased volume of CSF within the ventricles of the brain. Usual cause is blockage.
  - Can be congenital or acquired from illness or injury

  Treatment: shunt to divert CSF around blockage
Disorders of the nervous system and their treatments

- **Meningitis** - inflammation of the linings of the brain and spinal cord

  **Causes:** bacterial or viral
  **Symptoms:** headache, fever and stiff neck
  If severe, can cause paralysis, coma and death
  **Treatment:** antibiotics if bacterial
Disorders of the nervous system and their treatments

- **Multiple sclerosis** – chronic inflammatory disease of the CNS in which immune cells attack the myelin sheath of nerve cell axons (autoimmune disease)

  - Symptoms: weakness of extremities, numbness, double vision, nystagmus (tremorous movements of the eye), speech problems, loss of coordination, possible paralysis

  - Who is most likely to develop it: young adults between 20-40/ about two-thirds are women

  - Treatment: medications (Interferon, Avenox), rest, exercise and minimal stress

  - Prognosis: there is no cure; is not fatal; have the life expectancy of the general population
Disorders of the nervous system and their treatments

- Neuritis - Inflammation of one or more nerves

- **neur-** -itis

- Symptoms: pain and tenderness; impaired sensation, strength, and reflexes
- Results from an injury that causes pressure on a nerve just underneath the skin.
- Treatment: is directed toward the cause of the neuritis; analgesics may be prescribed
- Prevention: adopt healthy eating habits, exercise regularly and resting.
Disorders of the nervous system and their treatments

- **Paralysis** - is loss of muscle function for one or more muscles.
  - Types: Monoplegia - one limb is paralyzed
  - Hemiplegia - the arm and leg on one side of the body are paralyzed
  - Paraplegia - both legs are paralyzed, or sometimes the pelvis and some of the lower body
  - Quadriplegia - both the arms and legs are paralyzed

Prognosis: depends upon the severity of the injury or disease, as well as what part of the spinal cord or brain is affected.
Disorders of the nervous system and their treatments

- **Parkinson’s disease** - progressive disorder of the nervous system that affects your movement.

  - Symptoms: tremors, shuffling gait, pill-rolling (movement of the thumb and index finger), and muscle rigidity
  - Older adults (especially men) are most likely to have this disorder.
  - Treatment: medications to control symptoms and surgery (DBS - deep brain stimulation)
Disorders of the nervous system and their treatments

- **Poliomyelitis** – is a disease of the nerve pathways of the spinal cord
- Prevention: vaccination
- Treatment: no cure; bed rest, antibiotics for secondary infections (none for poliovirus), analgesics for pain, portable ventilators to assist breathing, moderate exercise (physical therapy) to prevent deformity and loss of muscle function, nutritious diet
- Prognosis: depends on the form of the disease and the body area affected. Most of the time, complete recovery is likely if the spinal cord and brain are not involved.

3.02 Understand the functions and disorders of the nervous system
Disorders of the nervous system and their treatments

- **Spinal cord injury**

- Symptoms: varies depending on the location of the injury but can include: increased muscle tone (spasticity), loss of normal bowel and bladder control, numbness, pain, weakness, paralysis

- Treatment: medicines to reduce swelling, surgery, bed rest, PT

- Risk factors for teens: Engaging in risky behavior - diving into too-shallow water or playing sports without wearing the proper safety gear or taking proper precautions, motor vehicle crashes
Disorders of the nervous system and their treatments

- **West Nile Virus – is a mosquito borne virus**
  - The greatest incidence of West Nile virus per the WHO is in Africa, Europe, the Middle East, North America and West Asia. West Nile virus has been reported in most of the United States, but Midwestern and Southern states have recently had the highest incidence rates.
  - Risk factors: time of year, geographic region, time spent outside
  - Prevention: wear long sleeved shirts and long pants, mosquito repellant, get rid of standing water
  - Treatment: Most people recover from West Nile virus without treatment. Over-the-counter pain relievers can help ease mild headaches and muscle aches.
Disorders of the nervous system and their treatments

**Cerebral Vascular Accident (CVA)**
- Stroke
- Interruption of blood and O2 to brain
- Tissue death
- 90% caused by blood clots
- Clots lodge in carotid arteries, blocking the flow of blood to the brain
- 10% caused by ruptured blood vessels in the brain
- Common symptom: Hemiplegia (paralysis on one side of the body)