

NERVOUS SYSTEM

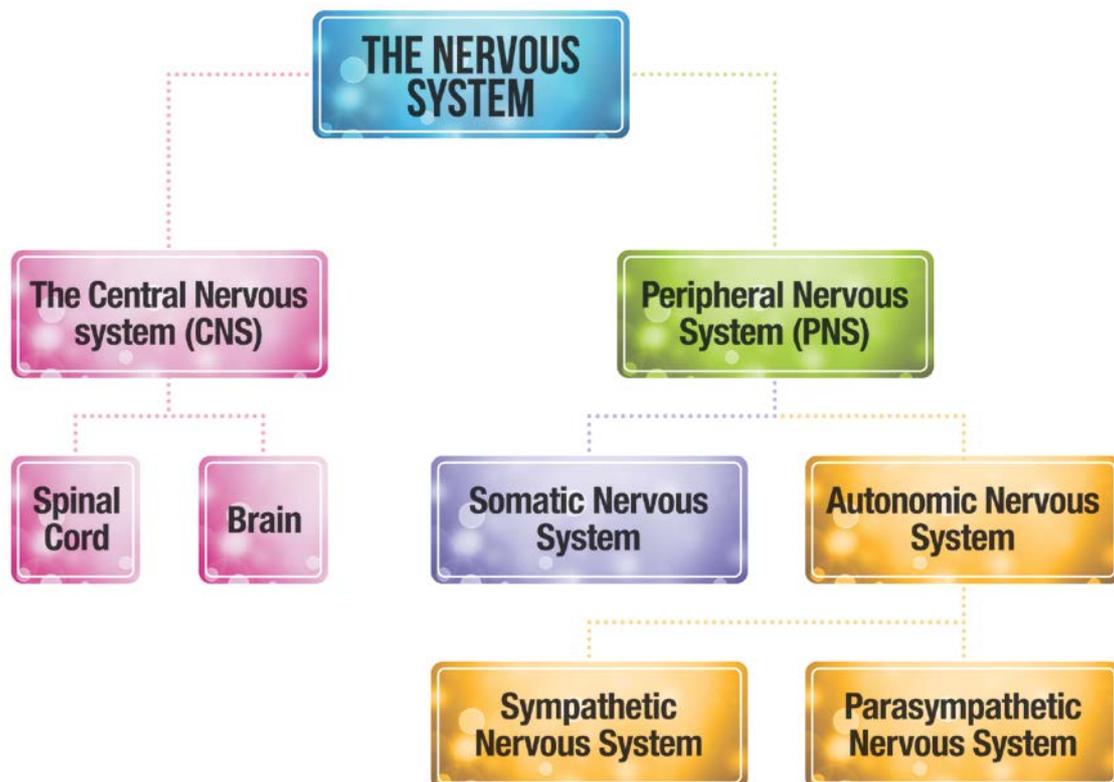
Topic: The divisions of the nervous system: central and peripheral (somatic and autonomic).

WHAT YOU NEED TO KNOW

1. Outline the structure (components) of the nervous system.
2. Outline the role of the nervous system, including:
 - a. Central nervous system (CNS)
 - i. Brain
 - ii. Spinal cord
 - b. Peripheral nervous system
 - i. Somatic nervous system
 - ii. Autonomic nervous system
 1. Sympathetic nervous system
 2. Parasympathetic nervous system
3. Identify similarities and differences between the components of the peripheral nervous system and/or central nervous system

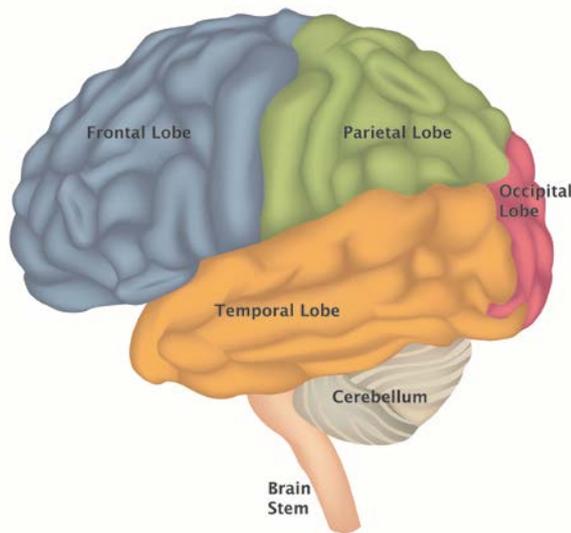
1. The nervous system

The nervous system is divided into the two main components: 1) the central nervous system (CNS) and 2) the peripheral nervous system (PNS). The nervous system has the following structure:



2a. The CNS – Brain and spinal cord

The CNS consists of the **brain** and the **spinal cord**. The brain provides **conscious awareness** and is involved in all psychological processes. The brain consists of many regions, which are responsible for different functions.



For example, the brain consists of four main lobes: frontal lobe, parietal lobe, temporal lobe and occipital lobe.

The **occipital lobe** processes visual information; the **temporal lobe** processes auditory information; the **parietal lobe** integrates information from the different senses and therefore plays an important role in spatial navigation; the **frontal lobe** is associated with higher-order functions, including planning, abstract reasoning and logic.

The **brain stem** connects the brain and spinal cord and controls involuntary processes, including our heartbeat, breathing and consciousness.

The role of the **spinal cord** is to transfer messages to and from the brain, and the rest of the body. The spinal cord is also responsible for simple reflex actions that do not involve the brain, for example jumping out of your chair if you sit on a drawing pin.

2a. The PNS – somatic and autonomic nervous systems

The role of the peripheral nervous system (PNS) is to relay messages (nerve impulses) from the CNS (brain and spinal cord) to the rest of the body. The PNS consists of two main components: 1) the somatic nervous system and 2) the autonomic nervous system.

The **somatic nervous system** facilitates communication between the CNS and the outside world. The somatic nervous system is made up of **sensory receptors** that carry information to the spinal cord and brain, and **motor pathways** that allow the brain to control movement. Therefore, the role of the somatic nervous system is to carry sensory information from the outside world to the brain and provide muscle responses via the motor pathways.

The **autonomic nervous system** plays an important role in **homeostasis**, which maintains internal processes like body temperature, heart rate and blood pressure. The autonomic nervous system only consists of **motor pathways** and has two components: 1) the sympathetic nervous system and 2) the parasympathetic nervous system.

The **sympathetic nervous system** is typically involved in responses that prepare the body for **fight or flight**. Impulses travel from the sympathetic nervous system to organs in the body to help us prepare for action when we are faced with a dangerous situation. For example, our heart rate, blood pressure and breathing rate increase, while less important functions like digestion, salivation and the desire to urinate are suppressed.

The role of the **parasympathetic nervous system** is to relax the body, and return us to our 'normal' resting state. Consequently, the parasympathetic nervous system slows down our heart rate and breathing rate, and reduces our blood pressure. Furthermore, any functions that were previously slowed down during a fight or flight reaction are started again (e.g. digestion).

CENTRAL NERVOUS SYSTEM		
	SIMILARITIES	DIFFERENCES
BRAIN	The brain stem and spinal cord both control involuntary processes (e.g. the brain stem controls breathing and the spinal cord controls involuntary reflexes).	The brain provides conscious awareness and allows for higher-order thinking, while the spinal cord allows for simple reflex responses. The brain consists of multiple regions responsible for different functions, whereas the spinal cord has one main function.
SPINAL CORD		
PERIPHERAL NERVOUS SYSTEM		
	SIMILARITIES	DIFFERENCES
SOMATIC AUTONOMIC	The sympathetic nervous system (part of the autonomic nervous system) and the somatic nervous system respond to external stimuli. The sympathetic nervous system responds to external stimuli by preparing the body for fight or flight and the somatic nervous system responds to external stimuli (by carrying information from sensory receptors to the spinal cord and brain).	The autonomic nervous system consists of two sub-components, whereas the somatic nervous system only has one. The somatic nervous system has sensory and motor pathways, whereas the autonomic nervous system only has motor pathways. The autonomic nervous system controls internal organs and glands, while the somatic nervous system controls muscles and movement.
SYMPATHETIC / PARASYMPATHETIC		

Possible Exam Questions

1. Which of the following statements is false?
 The autonomic nervous system: a) comprises of two subsystems; b) controls communication between the CNS and the environment; c) plays an important role in homeostasis; d) maintains internal processes like blood pressure. (1 mark)

2. Joline has just been to the cinema with her friend to watch a new horror movie. While she is walking home alone she believes that she can hear footsteps following her and starts to panic. Without thinking she starts sprinting and gets home as fast as she can. She bursts through the front door, heart pounding, dripping with sweat and shaking.

Outline the role of the autonomic nervous system and central nervous system, referring to Joline's experience in your answer. (4 marks)

3. Outline the role of the central nervous system/somatic nervous system/autonomic nervous system. (4 marks each)

4. Outline two differences in the organisation/function of the somatic nervous system and autonomic nervous system. (4 marks)