Write in brief, the functions of the cerebrum and what happens if there is an injury in that particular region.

CHAT GPT:

1. Cerebrum:

The cerebrum is the largest region of the brain and is in charge of several vital activities, including consciousness, movement, sensation, perception, and cognition. It is divided into two hemispheres, left and right, which are linked by the corpus callosum, a bundle of nerve fibres. The cerebrum is also in charge of controlling voluntary muscular movements and interpreting sensory information such as touch, taste, sight, and hearing.

The specific effects of a cerebrum damage will depend on the location and extent of the injury. A traumatic brain injury (TBI) to the front of the cerebrum, for example, may result in memory, attention, and decision-making issues. An damage to the rear of the cerebrum may cause vision or coordination issues. Specific cerebrum injuries can also impact movement, sensation, and speech. A serious injury to the brain might result in coma or death. Individuals suffering from cerebrum injury can benefit from rehabilitation therapy and medicines, but recovery can be lengthy and uncertain.

1. Cerebellum:

The cerebellum is a small but vital region of the brain located directly under the cerebrum. It is in charge of synchronising voluntary muscle movements as well as maintaining balance and posture. It aids in the fine-tuning of motions such as playing a musical instrument or typing on a keyboard, as well as the management of muscle tone.

The specific repercussions of a cerebellar injury will depend on the location and extent of the injury. An lesion to the cerebellum, for example, can create problems with coordination, balance, and fine motor control, resulting in tremors, trouble walking and executing fine motor tasks, and a proclivity to fall. An lesion to the cerebellar vermis, a specific section of the cerebellum, can cause problems with balance and coordination, as well as eye movement regulation.

Cerebellar injury can occur as a result of several factors, including head trauma, stroke, infection, and certain medical diseases. Physical therapy, medication, and, in some situations, surgery are also treatment possibilities. However, rehabilitation can be gradual, and some individuals may not achieve their previous level of function completely.

1. Medulla:

The medulla oblongata, located near the base of the brain, is an important element of the brain stem. It is responsible for many of the body's automatic activities, such as heart rate, respiration, and blood pressure. Coughing, sneezing, swallowing, and vomiting are all controlled by the medulla.

If the medulla is injured, the specific repercussions will depend on the location and amount of the injury. An lesion to the medulla, for example, might induce breathing and heart rate difficulties, leading to difficulty breathing or even respiratory arrest. An injury can potentially impair blood pressure regulation, resulting in high or low blood pressure. It can also have an impact on medulla-controlled reflexes such as coughing and swallowing.

Head trauma, stroke, or certain medical disorders can all cause medulla injuries. Supportive care and medication to alleviate symptoms may be available as treatment options, but in extreme situations, the injury may be fatal. If a person survives, they may have long-term difficulties such as difficulty breathing, swallowing, and speaking, as well as long-term rehabilitation.

1. Pons:

The pons is a brainstem structure positioned above the medulla oblongata and below the midbrain. It acts as a relay station for communications between the cerebrum and the spinal cord. The pons regulates various key functions, including sleep, alertness, and breathing. The pons also contains many nuclei that help to regulate face movements, sensation, and movement.

The specific repercussions of a pons injury will depend on the location and amount of the injury. An damage to the pons, for example, can impair breathing and disturb the regulation of sleep and arousal. It can also cause facial paralysis, difficulties speaking and swallowing, and balance and coordination issues. Pons injuries can also result in alterations in sensation and reflexes in the face, arms, and legs.

Head trauma, stroke, infection, or certain medical disorders can all cause pons injuries. Supportive care, physical therapy, and medication may be used as treatment options. However, recovery can be lengthy and unpredictable, and some patients may not be able to fully achieve their previous level of function.

1. Hypothalamus

The hypothalamus is a small but vital brain region located directly above the brainstem. It regulates many of the body's autonomic activities, including hunger, thirst, body temperature, and hormonal balance. The hypothalamus also regulates the autonomic nerve system and the endocrine system, which are in charge of many of the body's internal activities. Furthermore, the hypothalamus is linked to emotions and behaviours such as aggression, fear, and pleasure.

If the hypothalamus is injured, the specific repercussions will depend on the location and amount of the injury. An lesion to the hypothalamus, for example, might cause difficulties with appetite and thirst, making it difficult to maintain a healthy weight. It can also interfere with body temperature control, resulting in fever or hypothermia. It may also impair hormonal balance regulation, leading to disorders such as diabetes insipidus, which is characterised by excessive thirst and urination.

1. Hippocampus

The hippocampus is a tiny, curving structure in the brain's temporal lobe. It is essential for memory and spatial navigation. The hippocampus is in charge of creating new memories, particularly long-term memories, as well as consolidating short-term memories into long-term ones. It also aids in spatial navigation by allowing the brain to find itself within a mental map of the environment.

If the hippocampus is injured, the specific repercussions will depend on the location and amount of the injury. An lesion to the hippocampus, for example, might create memory issues, specifically with establishing new memories, resulting in trouble remembering recent events. It can also impair one's capacity to navigate and find one's way, causing disorientation and trouble navigating in familiar surroundings.

Head trauma, stroke, infection, or certain medical diseases such as Alzheimer's disease can all cause hippocampal injuries. Supportive care, medicine, and cognitive therapy are all possible treatment choices. However, rehabilitation can be gradual, and some individuals may not achieve their previous level of function completely.

3)

What is resting membrane potential:

The electrical potential differential across a cell's plasma membrane while it is not actively sending or receiving signals is referred to as the resting membrane potential. It is the differential in voltage between the inside and outside of a cell when it is at rest. The balance of ions on either side of the membrane, as well as the selective permeability of the membrane to these ions, maintain the resting membrane potential. In most cells, the resting membrane potential is around -70 millivolts (mV), indicating that the inside of the cell is more negatively charged than the exterior.

The action of certain transmembrane proteins known as ion channels, which allow certain ions to pass through the membrane while excluding others, establishes and maintains the resting membrane potential. The membrane, for example, is selectively permeable to potassium ions (K+) and negatively charged ions like chloride ions (Cl-), but not to sodium ions (Na+). This means that potassium ions tend to flow out of the cell via open potassium channels, whereas chloride ions tend to flow in via closed potassium channels. This generates a negative charge within the cell, establishing the resting membrane potential.

Describe the sequence how resting potential gives rise to an action potential:

A neuron's resting potential is the electrical charge across the cell membrane when it is not actively firing an action potential.

The balance of ions on either side of the membrane maintains this charge, with a higher concentration of negatively charged ions inside the cell and a higher concentration of positively charged ions outside the cell.

The balance is upset and the inside of the cell becomes more positively charged when a stimulus, such as a chemical signal from another neuron, causes the membrane to become more permeable to positively charged ions. This is referred to as depolarization.

When depolarization reaches a certain threshold, the membrane potential becomes positive enough for voltage-gated ion channels to open, allowing a rapid inflow of positively charged ions, typically sodium (Na+), into the cell. This is known as the action potential rising phase.

As positive ions enter the cell, the membrane potential rapidly increases, reaching its maximum, known as the action potential. This is followed by a repolarization phase, during which positively charged ions are pushed out of the cell and negatively charged ions, typically potassium (K+), enter the cell.

The neuron is ready to fire another action potential in response to a fresh stimulus once the membrane potential returns to resting.