Objective Sheet 2

NERVOUS AND ENDOCRINE SYSTEMS **HUMAN PERSPECTIVES CHAPTER 2**

1. DESCRIBE THE PROPERTIES OF NERVOUS TISSUE

- Nervous tissue is made up of specialised nerve cells called neurons
- Nervous tissue are excitable; are capable of transporting messages (nerve impulses) around the body

2. DESCRIBE THE STRUCTURE AND FUNCTION OF THE MOTOR (EFFERENT) NEURONS, SENSORY (AFFERENT) NEURONS AND INTERNEURONS

SENSORY NEURONS

Carries messages from receptors in the sensory organs, or in the skin to the CNS (brain and spinal cord.)

- Take nerve impulses from receptors to the CNS
- Mostly unipolar with the cell body lying off to one side of the axon
- Pass through dorsal root of spinal nerves
- Cell body in dorsal root ganglion
- Sensory receptors occur at end of the dendrites
- Axons synapse with interneurons in spinal cord.

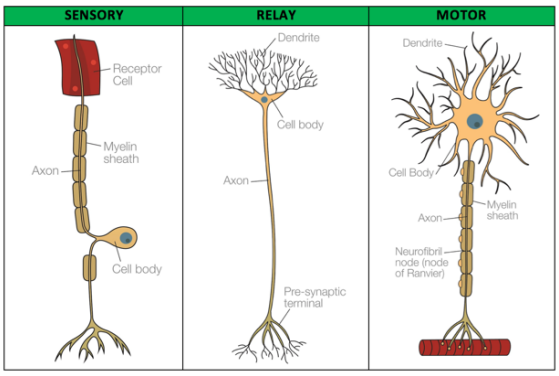
MOTOR NEURONS

Carries messages away from the CNS (brain and spinal cord) to effectors (muscles and glands)

- Take nerve impulses from CNS to effectors
- Mostly multipolar with a single long axon
- Pass through ventral root of spinal nerves
- Cell body in grey matter of spinal cord
- Effector structures (muscles or glands) occur at end of axons
- Dendrites synapse with interneurons in spinal cord
- Motor neurons be somatic (voluntary) or autonomic (involuntary)

INTERNEURONS

They are located in the brain and spinal cord. They link between the sensory and motor neurons. Also can be called either Interneuron, Association, Connector Neuron



3. EXPLAIN WHAT TYPE OF SUBSTANCE MYELIN IS, AND WHAT TYPE OF CELLS PRODUCE MYELIN

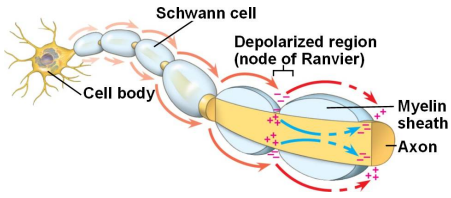
Myelin is the white, fatty material that surrounds the axon of most neurons

- The myelin sheath of peripheral nerve fibres is produced by Schwann cells (glial cells).

4. DESCRIBE THE FUNCTIONS OF THE MYELIN SHEATH. EXPLAIN THE IMPORTANCE OF THE NODES OF RANVIER IN NERVE TRANSMISSION

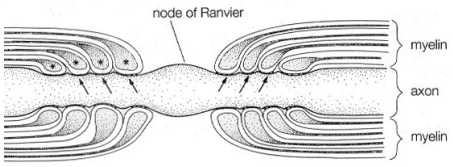
MYELIN SHEATH

- Nerve fibres with a myelin sheath are called myelinated.
- The myelin sheath speeds up nerve transmission, acts as an insulator and protects the axon from damage.



NODE OF RANVIER

- Due to the myelin sheath ions cannot flow between the inside and the outside of the membrane and an action potential cannot form.
- An action potential will then jump from one node of ranvier to the next because the myelin sheath is absent from the nodes
- Thus the nerve impulse travels much faster along myelinated fibre than unmyelinated ones

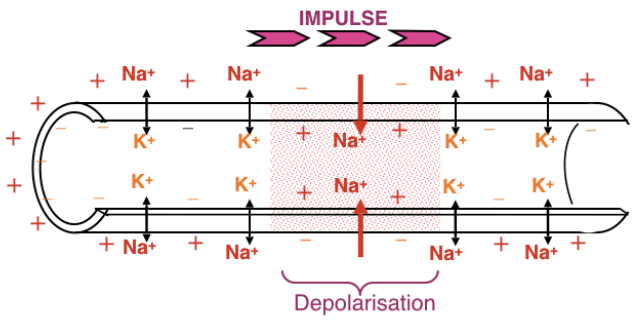


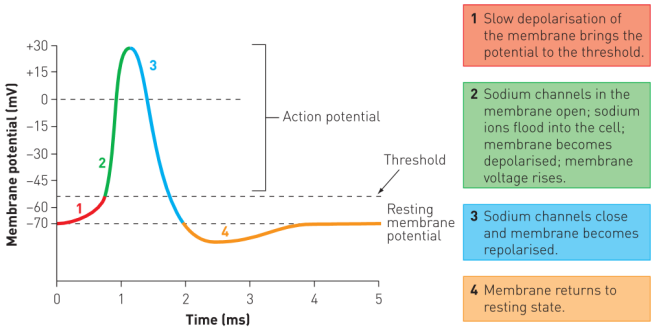
5. EXPLAIN WHY NERVES IMPULSES ARE DESCRIBED AS ELECTROCHEMICAL

- A nerve impulse is an electrochemical change that travels along a nerves fibre as it involves a change in electrical voltage that is brought about by changes in the concentration of the ion outside the cell membrane of the neuron

6. EXPLAIN HOW A NERVE FIBRES BECOMES DEPOLARISED (SODIUM AND POTASSIUM MOVEMENT) AND HOW THE NERVE IMPULSE IN TRANSMITTED

- Due to different permeability to sodium and potassium, there is a weak electrical charge across the membrane of the neuron (**resting potential**). The membrane is said to be **polarised**. (Negative charge on the inside of the membrane and positively charged in the outside)
- When the neuron is stimulated the action of the sodium and potassium membrane pumps is briefly interrupted.
- Changes in the permeability of the membrane allows sodium to flood into the cell and potassium to leak out
- This reverses the electrical charge across the membrane (**action potential**). The cell membrane is said to be **depolarised**.





- Depolarisation sweeps down the nerve fibre in a sequence of small steps – this is the **nerve impulse**.
- As soon as the nerve impulse passes, the membrane pumps are reactivated and the resting potential restored.
- In myelinated fibres the impulse leap-frogs from node to node, this is called **saltatory conduction**
- (https://youtu.be/OZG8M_IdA1M) - nervous system, part 2 crash course - for better analysis

7. DEFINE SYNAPSE, EXPLAIN ITS FUNCTION AND NAME AND TWO MAIN TYPES OF TRANSMITTERS

SYNAPSES

- A synapse is the junction between two neurones, or between a neuron and a muscle or gland.
- Nerve impulse transmission occurs because special neurotransmitter chemicals are released into the tiny gap (the synaptic cleft), which separates the two nerve cells.
- At the synapses the neurons do not actually join, there is a very small gap between them
- **Acetylcholine** (parasympathetic) and **noradrenaline** (sympathetic) are the neurotransmitters of the peripheral nervous system.

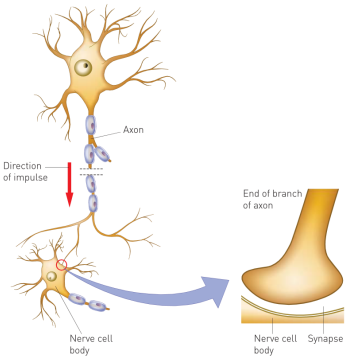
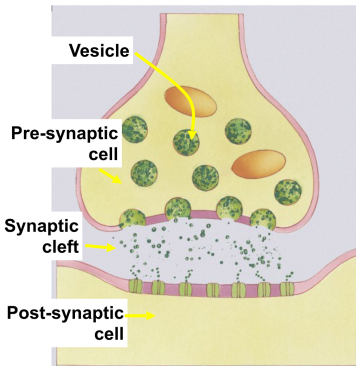


Figure 3.7 A synapse is a small gap between one neuron and the next.



- Vesicles containing the neurotransmitter move towards the pre-synaptic membrane where they fuse with the cell membrane, releasing their contents into the synaptic cleft.
- The neurotransmmitter molecules act on the post-synaptic cell by binding to specific receptors on the cell surface.

8. DESCRIBE THE TYPE OF FIBRES CARRIED BY (A) THE DORSAL ROOT (B) THE VENTRAL ROOT

DORSAL ROOT

- Sensory neurons pass through the dorsal root and have there cell bodies in the **dorsal root ganglion**

VENTRAL ROOT

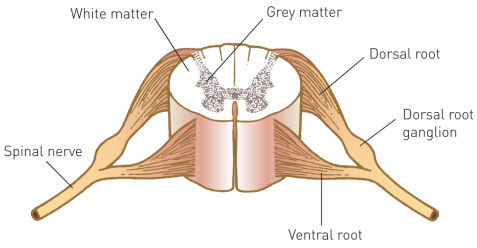
- Motor neurons pass through the ventral root and have their cell bodies in the grey matter of the spinal cord

9. EXPLAIN WHERE YOU WOULD FIND GREY AND WHITE MATTER IN THE SPINAL CORD

Grey matter - inside
White matter - outside

Grey matter and White matter

- The central core of the spinal cord consists of grey matter.
- This contains cell bodies and unmyelinated fibers.
- Motor and sensory neurones synapse with connector neurones in the grey matter.
- The outer part of the spinal cord consists of white matter.
- This contains ascending and descending tracts of myelinated nerve fibers



The brain contains the white matter inside and the grey matter on the outside (opposite to spinal cord)

10. DESCRIBE THE STRUCTURE AND THE FUNCTIONS OF THE SPINAL CORD

STRUCTURE

- Extends from foremen magnum to 2nd lumbar vertebrae (which is about waist level)
- Heavily protected by;
- Vertebral canal
- Inside the vertical canal are the meninges, but the dura mater is not joined to the vertebrae. Instead there is a space containing connective tissue, fat and blood vessels
- There's is still cerebrospinal fluid circulating between the meningeal layers
- Grey matter is in the centre of cord. Surround by white matter (opposite to brain)
- Grey matter "H" shape contains a central canal filled with cerebrospinal fluid (CSF)
- Myelinated fibre-

1) **Ascending** - sensory Neurons
2) **Descending**- motor axon from Brian

FUNCTION

Two main functions

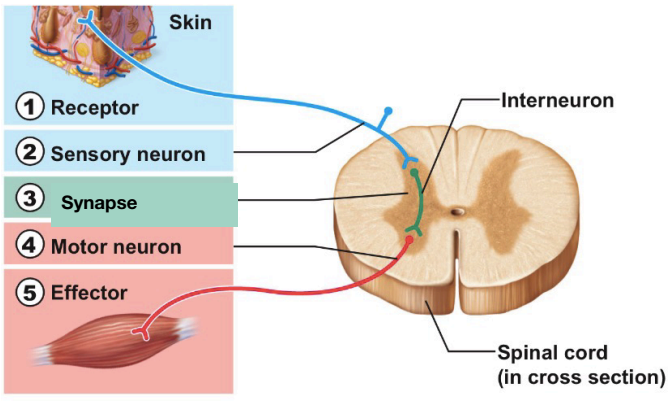
- Carry sensory impulse to the brain
- To interpret involuntary reflex

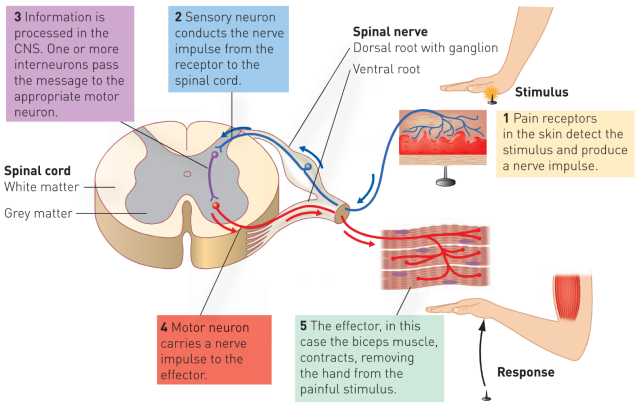
11. EXPLAIN WHAT A SPINAL REFLEX IS AND IT'S IMPORTANCE. LIST AND DESCRIBE MAIN COMPONENTS OF A REFLEX ARC

- A reflex is a rapid automatic response to a change in the internal or external environment to maintain homeostasis
- It is involuntary and does not directly involve the brain
- Impulses are later sent to the brain but awareness does not occur until after the response has been initiated

- The pathway of the nerve impulse follows from a receptor to an effector and is known as a reflect arc it has the following components:

1) **A Receptor -** reacts to a change in the internal or external environment by initiating a nerve impulse
2) **A Sensory neuron -** carries impulses from the receptor to the CNS
3) **Synapse -** nerve impulses may be passed directly to motor a neuron or there may be one or more interneuron directing the impulse to the correct motor neuron
4) **A Motor neuron -** carries the impulse to the effector
5) **An Effector -** receives nerve impulses and carries out the appropriate response. Effectors are muscle cells or secretory cells





12. LIST AND DESCRIBE THE PROTECTIVE STRUCTURE OF THE CENTRAL NERVOUS SYSTEM

Bone

- The Brain is heavily protected by the cranium, hard bone. The spinal cord is protect by the vertebrae, as they surround the spinal cord

The meninges

- They consist of three layers and cover the hole central nervous system
- Outer layer: dura mater, sticks/ connects the brain to the skull
- Middle layer: arachnoid mater, blood vessels
- Inner layer: pia mater, hold the brain matter together
- between the middle layer and the inner layer we find the subarachnoid space which contains the cerebrospinal fluid

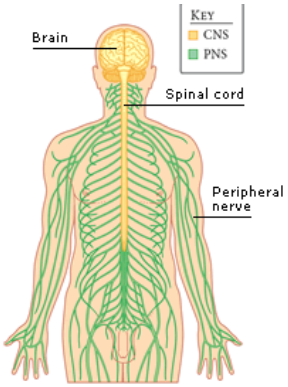
Cerebrospinal fluid

- Is a clear watery fluid containing glucose, urea and salt
- It is formed in the blood
- It circulate through the brain and spinal cord and does the following things. Act as a shock absorber, supports the brain (as the brain is suspended inside the cranium and loads in the fluid), transports nutrients to the brain and spinal cord, plus carrying away their wastes.
- Three functions protection, support and transport

13. DISTINGUISH BETWEEN THE CENTRAL NERVOUS SYSTEM (CNS) AND THE PERIPHERAL NERVOUS SYSTEM (PNS)

CENTRAL NERVOUS SYSTEM (CNS)

The control centre, consisting of the brain and spinal cord



PERIPHERAL NERVOUS SYSTEM (PNS)

All of the motor neurons and sensory neurons that enter and leave the CNS make up the PNS

All the signals are carried from the receptor cells to the CNS and then to the effectors (muscles/glands). Signals carried to and from the CNS by the peripheral nerves that make up the peripheral nervous system

14. NAME THE DIVISIONS OF THE PERIPHERAL NERVOUS SYSTEM INCLUDING AFFERENT, EFFERENT, SOMATIC, VISCERAL AND AUTONOMIC

AFFERENT DIVISION (SENSORY)

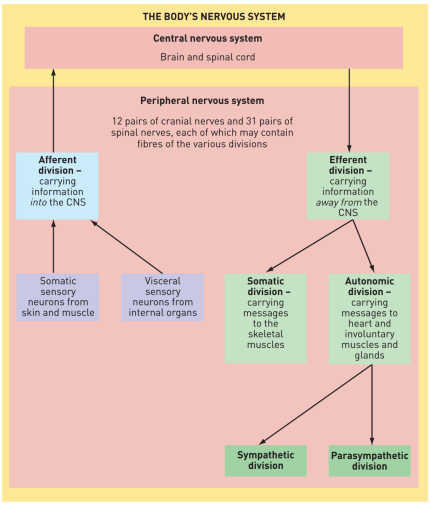
- Carries nerve impulses from receptors to the central nervous system

Somatic sensory neurons

- A nerve cell that carries messages from receptors in the skin, muscles, bones and joint into the CNS

Visceral sensory neurons

- A neuron that carries messages from the internal organ to the CNS



EFFERENT DIVISION (MOTOR)
- Carries nerve impulses from the central nervous system to effectors.
- Efferent nerves can be somatic (volutary) or autonomic (involutary

Somatic division
- Takes impulses from the CNS to skeletal muscles
- To motor neurons that are under voluntary control

Eg- skeletal muscles
- Enables the body's fight or flight response
- Throws the body out of homeostatic balance.
- The neurotransmitter is noradrenaline.

Automatic division
- Carries impulses from the CNS to involuntary muscles and glands
- To motor neurons that are under involuntary control

Eg- motor neurons regulating the heart, digestive system ect.
- Helps maintain homeostatic balance
- Carries nerve impulses to involuntary glands and internal organs
- May be sympathetic (fight or flight) or parasympathetic (normal functioning)
- Consists of two neurones form efferent chain (pre- and post-ganglionic neurones)

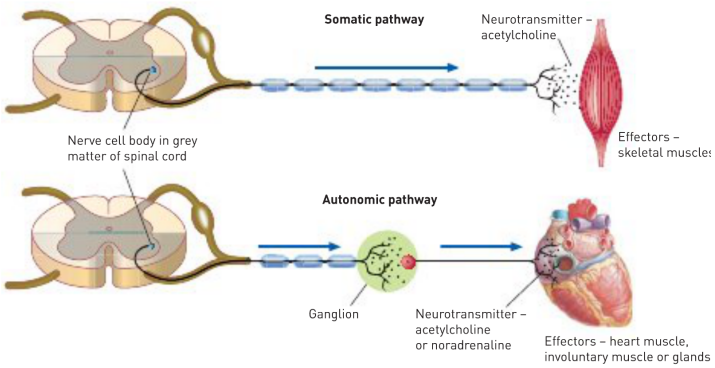


Figure 4.3 The difference in motor pathways between the autonomic and somatic divisions of the peripheral nervous system

Characteristics	Autonomic (involuntary)	Somatic (voluntary)
Effecters	Heart muscles, involuntary muscles and glands	Skeletal muscles
General function	Adjusts to the internal environment Maintains homeostasis	Response to the external environment Voluntary muscle movement
Efferent pathways	Two nerve fibres (both the sensory and motor neurons) from the CNS to the effect with a synapse in a ganglion	One nerve fibre form CNS to effector, no synapse (one path via motor neuron)
Neurotransmitter at effector	Acetylcholine or Noradrenaline	Acetylcholine
Control	Involuntary	Voluntary
Nerves to target organ	Two set- Sympathetic and parasympathetic (sensory and motor)	One set (motor)
Effect to target organ	Prepares sympathetic or parasympathetic response Excitation or inhibition	Cause a motor response Always excitation

15. DESCRIBE THE GENERAL ROLES OF THE SYMPATHETIC DIVISIONS OF THE AUTONOMIC NERVOUS SYSTEM

SYMPATHETIC DIVISION

- Fight or flight response (action)
- Involuntary

PARASYMPATHETIC DIVISION

- Rest and relax response, and control most of the time (the steady state)
- Involuntary

Both parasympathetic and sympathetic division are apart of the automatic division

Sympathetic	Parasympathetic
Release of adrenaline	None
Increased cardiac output	Decreased cardiac output
Dilation of the airways	Constricts airways
Sweating	None
Dilation of pupils	Constriction of pupils
Hairs stand on end (goose bumps/piloerection)	None
Vasoconstriction of peripheral arterioles	Little effect
Fat & glycogen converted to glucose	None
Digestion stops	Stimulates digestion
Secretion of saliva stops	Stimulates secretion
Anal & urethral sphincters contract	Anal & urethral sphincters relax
Release of adrenaline	None

16. EXPLAIN WHAT IS MEANT BY "FIGHT OF FLIGHT" RESPONSE AND DESCRIBE SOME OF THE WAYS OF THE BODY RESPONDS TO SYMPATHIES AND PARASYMPATHETIC STIMULATION DURING THIS TIME

Fight or flight response: in threatening situations the balance between sympathetic and parasympathetic stimulation is upset and the sympathetic becomes dominant

- The rate and force of contraction of the heat increase, causing blood pressure to increase
- Blood vessel in organ involved in strenuous activity dilate

Eg- skeletal muscles, heart rate and lived

- Blood vessel of organ not invoked in activity constrict

Eg- kidney stomach, intestines and skin

- Airways in the lungs dilate and the rate and depth of breathing increases
- Blood glucose level rises, because the liver converts more glycogen into glucose
- Secretion from sweat glands increase
- Pupil dilates (increase what you see) to allow more light into the eye
- Adrenal medulla release the hormones adrenaline and noradrenaline, which intensify and prolong the above response

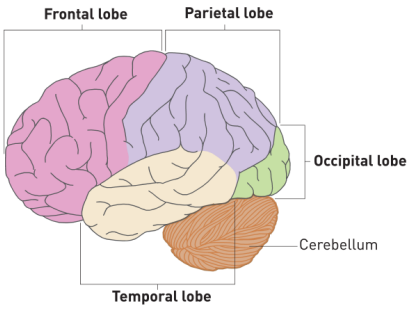
Structure	Effect of sympathetic stimulation	Effect of parasympathetic stimulation
Heart	Increases rate and strength of contraction	Decreases rate and strength of contraction
Lungs	Dilates bronchioles	Constricts bronchioles
Stomach/intestines	Decreases movement	Increases movement
Liver	Increases the breakdown of glycogen and release of glucose	Increases the uptake of glucose and the synthesis of glycogen
Iris of the eye	Dilates pupil	Contract pupil
Sweat glands	Increases sweat secretion	No effect
Salivary glands	Decreases the secretion of salvia	Increase the secretion of salvia
Blood vessel of: **Skin** **Skeletal muscle** **Internal organs**	 Contracts vessels Dilates vessels Constricts vessels (except of the heart lungs and brain)	 Little effect No effect Little effect
Urinary bladder	Relaxes muscles of the wall	Constricts muscles of the wall
Adrenal medulla	Stimules hormone secretion	No effect

17. LABEL A DIAGRAM OF THE BRAIN AND DESCRIBE THE FUNCTIONS OF THE MAJOR REGIONS- CEREBRUM, CEREBELLUM, HYPOTHALAMUS, MEDULLA, CORPUS CALLOSUM, PONS, MENINGES AND CEREBROSPINAL FLUID

CEREBRUM

Structure:

- Divided into two cerebral hemispheres by the longitudinal fissure. It is folded in patterns that increase the surface area, the folds/ rounded ridges are called convolutions or (gyri)
- The convolutions are seperate by shallow downfolds are called sulci and the deep downfolds called fissure
- The dealer fissure, the longitudinal fissure, separated the cerebrum into two halvss (left and right hemisphere)
- Five lobes; occipital, frontal, temporal, parietal, insular



Function:

- controls higher order function such as thinking, reasoning, memory, learning, conscious awareness of surroundings contains the following:

Sensory areas: receives and interprets nerve impulse from the senses

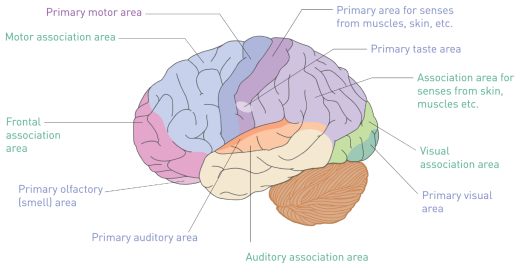
- perception of sight, hearing, taste and smell

Motor areas: sends impulses to muscles, especially for involuntary move to

- movement and speech

Association areas: interpret information for the sense and make it useful

- awareness, memory etc.



CEREBELLUM

Structure:

- Lies under the rear part of the cerebrum, folded outside, white matter inside, grey outside

Function:

- Controls poster, balance and fine motor movements resulting in smooth movement eg, writing playing instruments ect. maintains posture and balance.
- Receives sensory information from the inner ear (for posture and balance) and from receptors in the skeletal muscles.
- We could still live without the cerebellum as impulses do not originate in the cerebellum, we can still move just not fine muscle movements

Movement/ balance control

Movement

- Intention to move starts in the motor association area of the cerebrum
- Neurons in the motor association area decide the intensity and sequence activity
- Program sent to the primary motor area in the cerebrum
- Nerve impulses sent to the lower centres in the brain and spinal cord, leading to muscle contraction
- Cerebellum receives impulses from the cerebrum through upper motor neurons
- Cerebellum also receives information from the eyes, eyes and stretch receptors in muscle and joints
- All input is then combined to give smooth and co-ordinated movement

Balance control

- The cerebellum gets information from:
- The cerebrum
- The inner ear (movements in the head and position of the head)
- eyes
- pressure receptors (especially feet)
- Stretch receptors in muscles and joints
- It is then able to direct muscle contraction and help us keep our balance

CORPUS CALLOSUM

Structure:

- Wide band of nerve fibres that lie underneath the cerebrum, the nerve fibres cross from one cerebral hemisphere to the other

Function:

- Communicate between the two cerebral hemispheres (left and right)

HYPOTHALAMUS

Structure:

- Lies in the middle of the brain in a v-shape above the pituitary gland

Function:

- Homeostasis which include the regulation of the heart, digestive system, appetite, thirst, metabolism, body temperature, emotional responses, secretion of hormones
- Hormones secretion acts through the pituitary gland by secreting hormones directly to it and secreting hormones into the blood stream, which tell the pituitary to realise other hormones.

THALAMUS

Structure:

- Makes up 80% of the diencephalon the other 20% is the hypothalamus

Function:

- All sensory information, except smell

MEDULLA OBLONGATA

Structure:

- It is a continuation of the spinal cord it is about 3cm long and is below the pons.
- It contains the cardiac centre, respiratory centres and vasomotor centres

Function:

Under the influence of the hypothalamus the medulla plays an important role in automatically adjusting body functions

- Cardiac centre - regulates the rate and force of heartbeat
- Respiratory centre - controls rate and depth of breathing
- Vasomotor centre - regulates the diameter of blood vessels

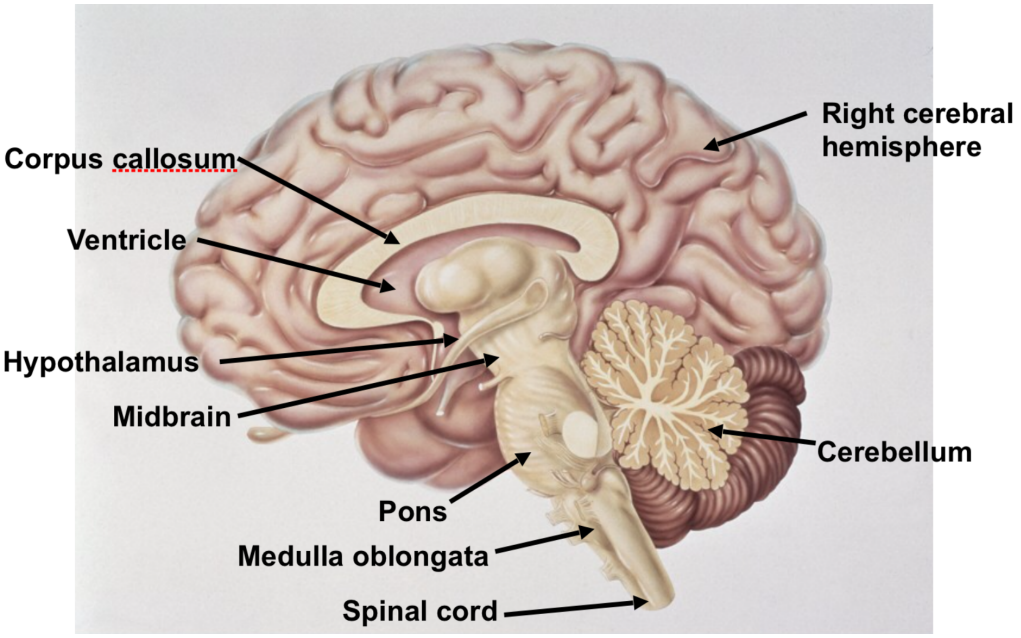
OTHER

Mid Brian

- Connect the cerebrum to the lower parts of the brain

Pons

- Acts as a cross bridge of nerve impulses that connects the spinal cord to the brain.



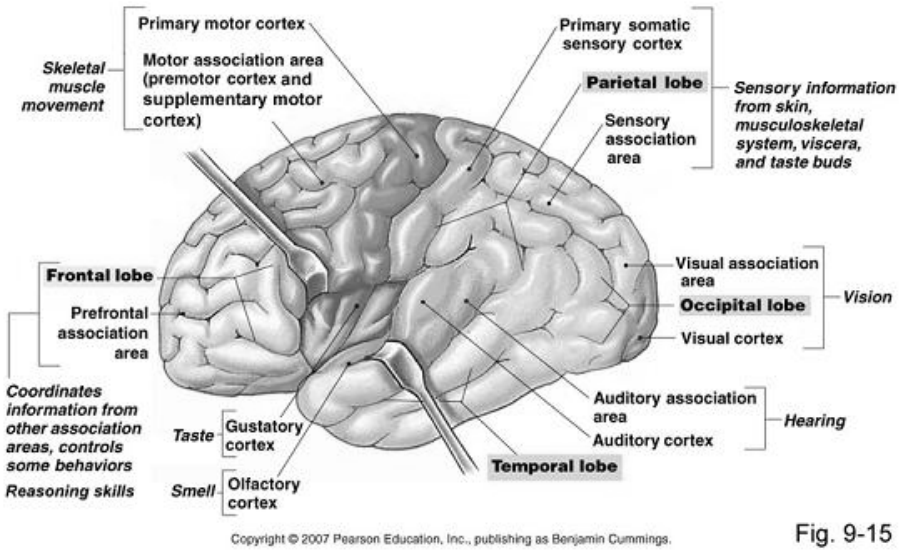


Fig. 9-15

18. NAME AND IDENTIFY THE LOCATION OF THE DIFFERENT RECEPTORS THAT DETECT CHANGES IN THE INTERNAL AND EXTERNAL ENVIRONMENT INCLUDING THERMORECEPTORS, OSMORECEPTORS, PAIN, AND TOUCH RECEPTORS

A receptor is a structure that is able to detect a change in the body's internal or external environment.

THERMORECEPTORS

Function:

- Inform the brain of changes in temperature either inside or outside of the body. This information is received by the hypothalamus

Location:

- Thermoreceotors in the skin
- Inside the body, the core temperature, is monitored by thermoreceptors in the hypothalamus. which detect the temperature of the blood that is flowing through the brain
- The skin thermoreceptors and the hypothalamus thermoreceptors work together allowing the hypothalamus to regulate temperature

OSMORERECEPTORS

Function:

- Respond to very small changes in osmotic pressure and are able to stimulate the hypothalamus so that the body's water content is maintained within very narrow limits

Location:

- In the hypothalamus are sensitive to osmotic pressure (determined by the concentration of substances dissolved in the water of the blood plasma)

CHEMORECEPTORS

Function:

- Stimulated by particular chemicals
- Sensitive to odours
- Involved in the regulation of the heartbeat and the of breathing

Location:

- Nose, making us sensitive to odours
- Mouth, giving us sensitivity to taste
- Internal chemoreceptors sensitive to composition of body fluids, regulation of the heartbeat and the breathing

TOUCH RECEPTORS

Function:

- Inform the brain of touch, allowing us to feel what we are touching

Location:

- Mainly in the skin, some close to the surface of the skin and are sensitive to light touches.
- Eyelids and external genital organs
- Nerve ending at the base of the hair follicles
- Deep in the skin, sensitive to pressure and vibrations

PAIN RECEPTORS

Function:

- Warn the body of danger/ damage
- Keeps the person aware that a tissue damaging situation exists

Location:

- Skin
- Mucus membranes
- Most organs, not the brain

19. DISTINGUISH BETWEEN ENDOCRINE AND EXOCRINE GLANDS

EXOCRINE GLANDS

Secrete into a duct that carries the secretion of the body surface or to one of the body cavities. Sweat glands, mucous glands, salivary glands and the glands of the alimentary canal are examples of exocrine glands

ENDOCRINE GLANDS

Secrete hormones into the extra cellular fluid that surrounds the cell that make up the glands. The secretion then usually passes into the capillaries to be transported by the blood. Endocrine glands are sometimes called ductless glands.

20. DEFINE "HORMONE"

A chemical that is secreted by an endocrine gland and that affects the functioning of a cell or organ; often carried in the blood

Hormones are

- Chemical messengers
- Mostly proteins, amines (small molecules derived from amino acids) or steroids
- Secreted by endocrine glands (glands without ducts)
- Carried in bloodstream to target organs
- Change the way in which cells function
- Target specific

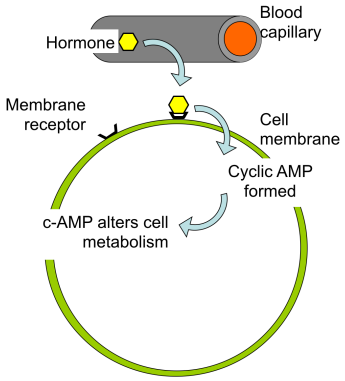
21. EXPLAIN HOW STEROID (LIPID SOLUBLE) AND PROTEIN/AMINE (WATER SOLUBLE) HORMONES DIFFER IN THE WAY THEY ACTIVATE THEIR TARGET CELL (THEIR MODE OF ACTION)

ACTION OF PROTEIN/AMINE HORMONES

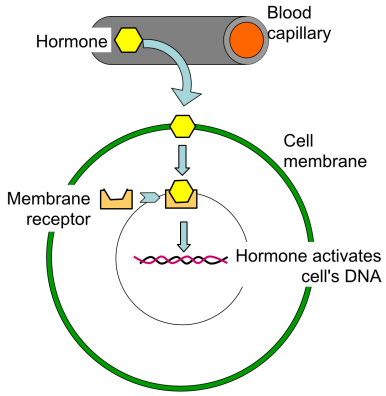
- These attach to receptor cells on the cell membrane of the target organ.
- When hormone and target cell combine, they trigger the response in the target cell causing a secondary messenger to diffuse through the cell.
- This activates particular enzymes.
- Water soluble

Eg- Insulin

Action of protein and amine hormones



Action of steroid hormones



ACTION OF STEROID HORMONES

- These enter the target cells and combine with receptors inside the cell.
- The complex produced activates the genes controlling the formation of particular proteins.
- Lipid soluble

Eg- Cortisone

****Hormones are NOT enzymes****

22. DESCRIBE THE LOCATION OF THE ENDOCRINE GLANDS IN THE BODY

Pituitary gland

- A pea-sized structure located at the base of the brain

Anterior

- The hypothalamus secretes releasing factor and inhibiting factor to the anterior pituitary
- No nerve connection but lots of blood vessels
- Makes and releases/secretes hormones

Posterior

- Does not make the hormones it releases them
- Joined to the hypothalamus by nerves fibres that pass
- through the infundibulum
- Hormones that are releases by the posterior are made but
- the hypothalamus

Hypothalamus

- Is located at the base of the brain

Pineal gland

- Is found deep inside the brain and in children is about the size of a pea. After puberty it gradually decreases in size

Thymus

- Is located in the chest just above the heart and just behind the sternum. Like the pineal gland, the thymus is largest in infants and children, and begins to string after puberty

Thyroid

- Is located in the neck, just below the larynx. It's consist of two lobes that lie either side of the trachea and are joined by a narrow piece of tissue that lies across the front of the trachea

Parathyroid

- There are usually 4 parathyroid glands, although some people have more
- Each is the size of a pea and they are embedded in the rear surface of the lobe of the thyroid gland

Adrenal gland

- There are two adrenal grands, one immediately above each kidney. Each adrenal gland has an inner adrenal medulla and an over adrenal cortex. These two parts are quite different in their structure and function. This, each adrenal gland is really two separate adrenal glands

Pancreas

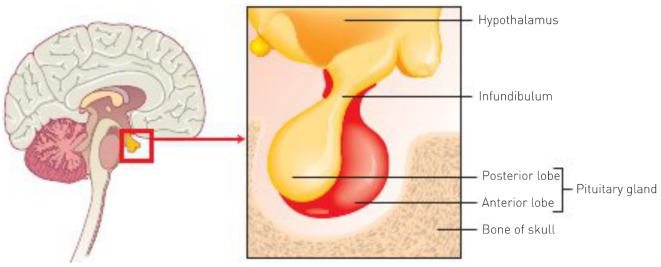
- Lies just below the stomach and alongside the duodenum, the first part of the small intestine.
- It is both an exocrine gland and endocrine gland

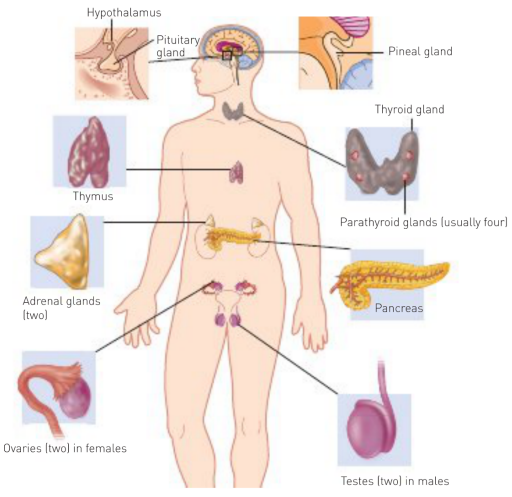
Ovaries

- Females have a pair of ovaries, held by a membrane beside the uterus on each side of the lower abdomen

Testes (two)

- Males have two testes help in the scrotum





23. LIST THE HORMONES PRODUCED BY THE VARIOUS ENDOCRINE GLANDS AND DESCRIBE THEIR EFFECT AND SPECIFIC TARGETS

Gland	Hormone	Target organ	Main effect
Anterior lobe of the pituitary	Follicle stimulating hormone (FHS)	Ovaries (females) Testes (males)	Growth of follicles Production of sperm
	Luteinising hormone (LH)	Ovaries (females) Testes (makes)	Ovulation and maintenance of corpus luteum Secretion of testosterone
	Growth hormone (GH)	All cells	Growth and protein synthesis
	Thyroid stimulating hormone (TSH)	Thyroid gland	Secretion of hormones from the thyroid
	Adrenocorticotrophic hormone (ACTH)	Adrenal cortex	Secretion of hormones from the adrenal, context
	Prolactin (PRL)	Mammary glands	Milk production
Posterior lobe of the pituitary	Antidiuretic hormone (ADH)	Kidneys	Reabsorption of water
	Oxytocin (OT)	Uterus Mammary glands	Contraction of uterus during childbirth Release of milk

Glands	Hormones	Target cells	Main effect
Thyroid	Thyroxine	Most cells	Increase metabolic rate and therefore oxygen consumption and heat production
	Calcitonin	Bone and Kidneys	Lowers levels of calcium in the blood
Parathyroid	Parathyroid hormone	Bones and Kidney	Increase level of calcium in the blood
Thymus	Thymosins	T lymphocytes	Stimulates development and maturation of T lymphocytes
Adrenal cortex	Corticosteroids including: Aldosterone	Kidney	Increases reabsorption of sodium ions and excretion of potassium ions
	Cortisol	Most cells liver and joints	Promotes normal metabolism; helps the body deal with stress: promotes the repair of damaged tissue
Adrenal medulla	Adrenaline and noradrenaline	Most tissues	Prepare the body for fight or flight response; Reinforces the effect of the sympathetic nervous system
Pancreas Islets of langerhans Beta-cells	Insulin	Liver and Most cells	Stimulates uptake of glucose; lowers blood glucose levels
Alpha-cells	Glucagon	Liver and fat storage tissues	Stimulates breakdown of glucose and fats; increase blood glucose levels
Testes	Androgens	Many tissues	Stimulates sperm production; growth of skeleton and muscles; make sexual characteristics
	Testosterone		Male secondary sexual characteristics
Ovaries	Oestrogen	Many tissues	Stimulates developer of female characteristics; regulates menstrual cycle
	Progesterone	Uterus and mammary glands (breast tissue)	Regulates menstrual cycle and pregnancy; prepares mammary glands for milk secretion

24. EXPLAIN THE ROLE OF THE HYPOTHALAMUS IN THE FUNCTIONING AND CONTROL OF THE PITUITARY GLAND

- The hypothalamus regulates many of the basic functions of the body, such as body temperature, water balance and heart rate. Many of the functions of the hypothalamus are carried out though the pituitary glands
- The anterior lobe has not nerve connections with the hypothalamus but it is connected but a complex network of blood vessels.
- The posterior lobe is not a true gland because it does not secrete substances meaning that are not make but released, it is joined to the hypothalamus by nerve fibres that come from nerve cell bodies. The hypothalamus impulses pass through the infundibulum to the posterior lobe
- The hypothalamus produces many different hormones. Some of them are carried by the blood to the anterior lobe of the pituitary, where they stimulate or inhabit the release of hormones made in the anterior lobe. Other hormones pass along the nerve fibre from the hypothalamus to the posterior lobe of the pituitary where they are secreted.

25. COMPARE THE ACTION OF THE NERVOUS AND ENDOCRINE SYSTEM - SPEED, SPECIFICITY OF MESSAGE, NATURE AND TRANSMISSION OF THE MESSAGE AND DURATION OF ACTION

Hormones	Nerve impulses
Chemical	Electrochemical
Transports in blood stream	Transported along nerves
Long duration response (minutes/hours)	Short duration response (Milliseconds)
Involved in long term adjustments	Short term adjustment
Long response time (seconds/ days)	Short response time (milliseconds)
Affects only target organ/cells (muscles glands or other neurons)	Can effect any cell in the body
Can affect many parts of body simultaneously	Affects only specific effectors at any one time
Produces physiological response	Physiological or Behavioural response
Involuntary response	Involuntary or voluntary responses
Effectors usually endocrine glands or involuntary muscles	Effectors may be exocrine glands or voluntary skeletal muscles

26. KNOW THE SYNTHETIC HORMONES MAY BE DEVELOPED USING RECOMBINANT DNA TO TREAT ENDOCRINE DYSFUNCTION AND CELL REPLACEMENT THERAPY HAS THE POTENTIAL TO TREAT NERVOUS SYSTEM DISORDERS INCLUDING PARKINSON'S AND ALZHEIMER'S (THIS WILL BE COVERED IN DETAIL IN SEMESTER 2)