1) Describe the properties of nervous tissue

- integrated communication network and control centre of the body
- Coordinates all voluntary and involuntary actions
- Aids the body in homeostasis

2) Describe the structure and the function of motor, sensory and interneurons

Sensory neurons

Function: To carry messages form the sense receptors to the central nervous system (afferent)

Structure:

- receptor
- dendron
- Myelin: fatty material covering the axon/ dendron
- Nodes of ranvier: gaps between the myelin
- Cell body on the side: contain the nucleus and most organelles all other cells have
- Shawnn cell
- Axon: a single lord extension and it carries nerve impulses from the receptor to the (CNS)
- Axon terminals: carries impulse to the CNS
- Neurilemma: covers the axon and dendron

Interneurons

Function : links the sensory neurons to the motor neurons

Structure

- Dendrites
- Cell body in the middle of dendrites and the axon terminals
- Axon
- Axon terminals

Motor neutrons

Function: to carry message from the central nervous system to the muscles and the glands (efferent)

Structure:

- Dendrites
- Cell body
- Axon
- Myelin
- Nodes of ranvier
- Axon terminals: carries impulses into the receptors in the muscles and glands

3) Explain what type of substance myelin is and what type of cell produces myelin

Myelin

- it is a fatty material surrounding the axon of myelinated neurons
- it is produced by specialised cells called shawnn cells that wrap around the axon

4) Describe the function of the myelin sheath. Explain the importance of the node of ranvier

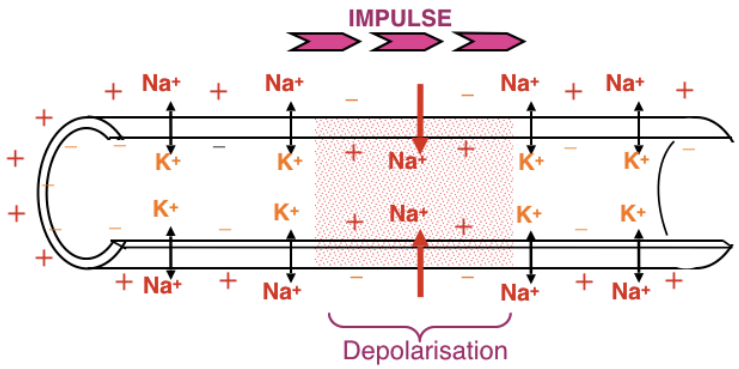
- myelin sheath: acts as an insulator, protects the axon from damage and speeds up the movement of nerve impulses
- Node of ranvier, allows the action potential to jump from one node to the next as the myelin in absent at the nodes, thus the nerve impulse travels much quicker

5) Explain why nerve impulses are described as electrochemical

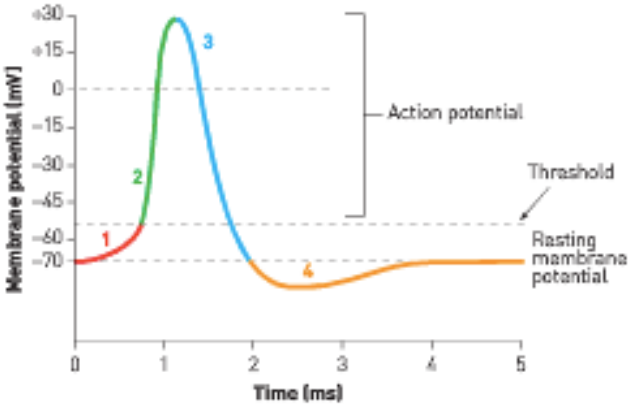
- a nerve impulse is an electrochemical charge that travels along a nerve fibre as it involves a change in electrical voltage that is brought about by changes in the concentration of the ions outside the cell membrane of the neuron
- At the synapse special chemicals are released from the ends of the neuron. These diffuse across the gap and attach to receptors on the membrane of the next neuron. Substances that diffuse in this way are called neurotransmitters (a molecule that carries a nerve impulse across the small gap between adjacent nerves)

6) Explain how a nerve impulse becomes depolarised and how the nerve impulse in transmitted

- due to different permeability to sodium and potassium across the cell membrane, there is a weak electrical charge across the membrane of the neuron (resting potential) and is said to be polarised
- When the neuron is stimulated (eg. by heat, touch ect.) the action of the sodium and potassium pumps in the membrane is briefly interrupted
- This changes the permeability of the membrane allowing sodium to flood the cell and potassium to leak out
- This reverses the electrical charge cross the membrane (action potential) the cell membrane is now said to be depolarised



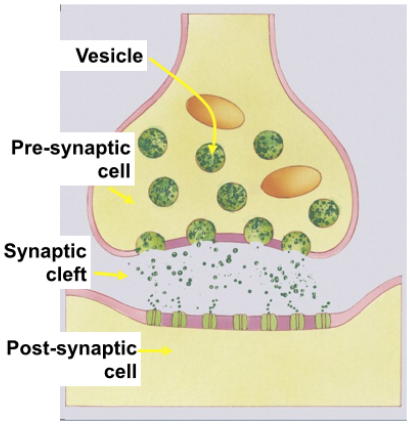
- Depolarisation sweeps down the nerve fibre in a sequence of small steps, this is called a nerve impulse
- As soon as the nerve impulses passes, the membrane pumps are reactivated and the resting potential is restored
- In myelinated fibres the impulse leaps from node to node and is faster than unmyelinated nerves



1)Slow depolarisation of the membranes bring the potential to the threshold
2)Sodium channels in the membrane open, sodium ions flow into the cell membrane becomes depolarised, membrane voltage rises
3)Sodium channels close and the membrane becomes repolarised
4)Membrane returns to resting state

7) Define synapse, explain its function and name the two type of transmitters

- a synapse is the junction between two neurons or between neuron and a muscle or a gland
- Special neurotransmitters chemicals are released in the tiny gap (synaptic cleft), which separates the two nerve cells.
- Two neurotransmitters are acetylcholine (parasympathetic) and Noradrenaline (sympathetic)
- Vesicles containing the neurotransmitter move and fuse with the pre synaptic membrane releasing their contents into the synaptic clef
- The neurotransmitter molecules act on the post-synaptic cell by binding to specific receptors on the cells surface, passing on the synapse



8) describe the types of fibres carried by the dorsal root and the ventral root

- The dorsal root carries the sensory neurons
- The ventral root carries the motor neurons

9) Explain where you can find grey matter and white matter in the spinal cord

- The brain and spinal cord contain both grey matter and white matter.
- The brain contains the white matter inside and grey on the outside,
- The spinal cord contains the grey matter on the inside and the white matter on the outside
- **White matter**: contains tracts of myelinated nerve fibres
    - That connect various part of the cerebrum with the same hemisphere
    - That carry impulses between the the left and right hemisphere
    - That connect the cerebrum to other parts of the brain
- **Grey matter**: contains unmyelinated nerve fibres, consists of synapsing cell bodies

10) Describe the structure and the function of the spinal cord

Structure: Cylindrical structure that extends from the foramen magnum to the base of the skull

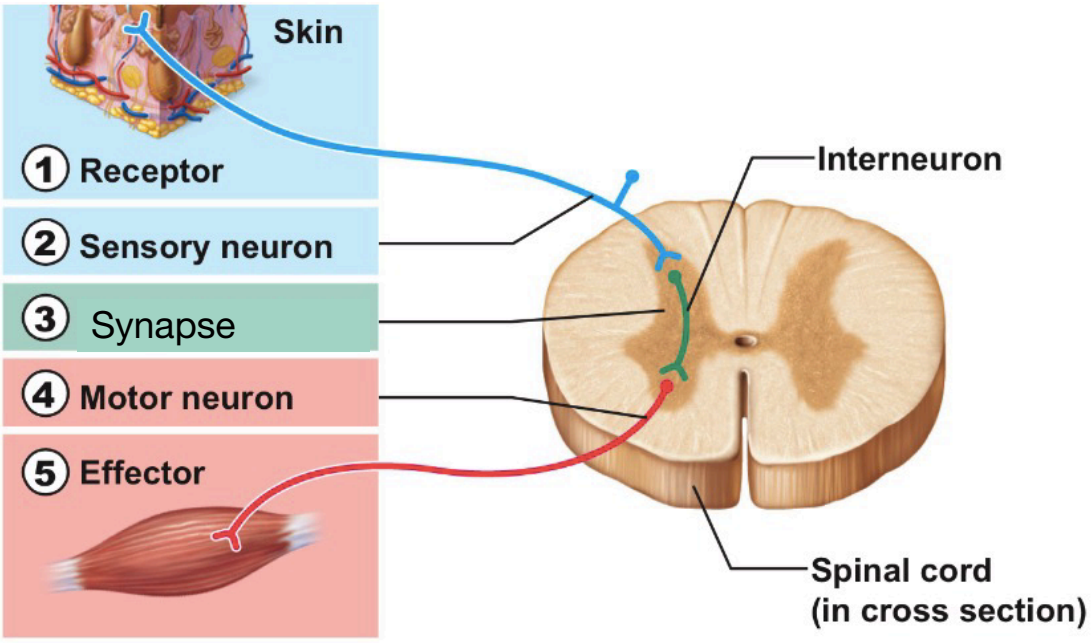
Function:

- Provides a pathway for communication between the muscle and the gland and the brain.
- Integration of automatic and protective reflects

11) Explain what a spinal reflex is and its importance. List and describe the 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
- A spinal reflex arc is when the reflex is carried by the spinal cord alone and not the brain
- 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:
    -

- Receptor: reacts to a change in the internal or external environment by initiating a nerve impulse
- Sensory neuron: carries impulses from the receptor to the CNS
- Synapse: nerve impulses may be passed to motor neuron or interneuron directing the impulse
- Motor neuron: carries the impulse to the effector
- Effector: receives nerve impulses and carries out the appropriate response



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/ adheres the brain to the skull
    - Middle layer: arachnoid mater
    - 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)-15) Distinguish between the central nervous system and the peripheral nervous system

Central nervous system (CNS) contains:

- Brain
- Spinal cord
-

Peripheral nervous system (PNS) contains:

- Cranial nerves
- Spinal nerves
- All the motor and sensory neurons that leave and enter the CNS

Somatic division

- Motor neurons that are under voluntary control
- eg.motor neurons that are attached to skeletal muscles

Autonomic division

- Motor neurons that are under involuntary control
- e.g. motor neurons regulating the cardiac, digestive system etc.

Parasympathetic division (involuntary)

rest and relax response, in control most of the time (the steady state)
Neurotransmitter from nerve endings acetylcholine

Sympathetic division (involuntary)

Fight or flight response
Noradrenaline

Both the parasympathetic and sympathetic divisions are apart of the autonomic division

Characteristics	Somatic (voluntary)	Autonomic (involuntary)
Effecters	Skeletal muscles	Organs
General function	Voluntary muscle movement	Maintaining homeostasis
Efferent pathways	One nerve fibre form CNS to effector, no synapse (one path via motor neuron)	Two nerve fibres (both the sensory and motor neurons) from the CNS to the effect with a synapse in a ganglion
Neurotransmitter at effector	Acetylcholine	Noradrenaline
Control	Voluntary	Involuntary
Nerves to target organ	One set (motor)	Two set (sensory and motor)
Effect to target organ	Cause a motor response	Prepares sympathetic or parasympathetic response

Causes the stimulus to be transferred to the next neuron/ effector

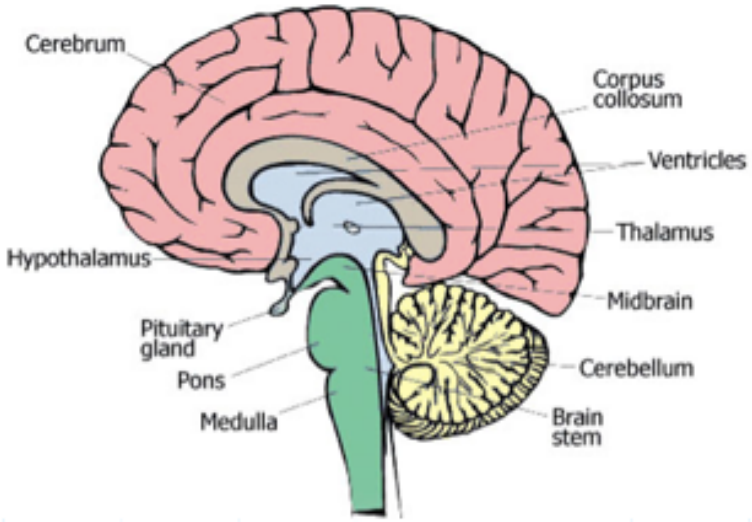
16) Explain what is meant by " fight or flight response" and explain how this effects the parasympathetic and sympathetic stimulation

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

- rate and force of the heart contraption, increase in blood pressure
- Dilation of blood vessels that are needed for strenuous activity
- Constriction of blood vessels not needed for activity
- Dilation off airways in lungs
- Depth of breathing increases
- Blood glucose levels rise
- Increase in sweat gland secretion
- Adrenal medulla release hormones adrenaline and noradrenaline
- Dilate pupils

Structure	Effect of sympathetic stimulation (noradrenaline)	Effect of parasympathetic stimulation (acetylcholine)
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	Contracts vessels	Little effect
Skeletal muscle	Dilates vessels	No effect
Internal organs	Constricts vessels (except of the heart lungs and brain)	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 function of the major regions



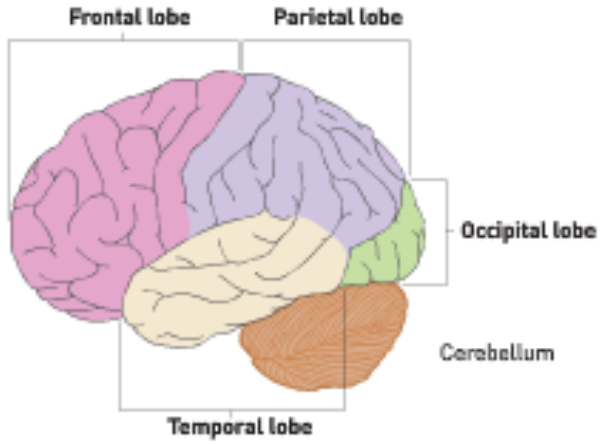
Cerebrospinal fluid (CSF)

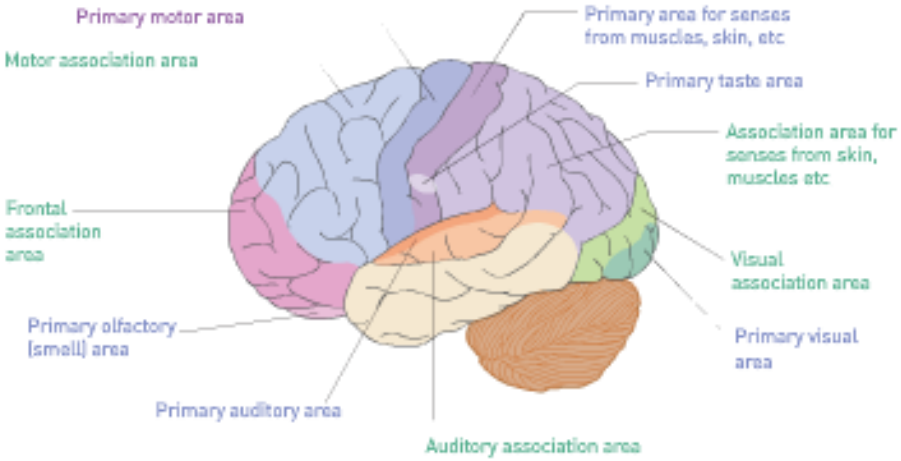
- it is a clear watery fluid containing glucose, urea and salt
- It is formed in the blood
- It circulates through the brain and spinal cord and does the following things. Act as a shock absorber, supports the brain (as the brain is suspended inside the cranium and loads in the fluid), transports nutrients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

Parts of the brain

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 shallow down folds are called sulci and the deep down folds are called fissure the longitudinal being the biggest.
- Divided into 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 : perception of sight, hearing, taste and smell
- Motor areas : movement and speech
- Association areas: awareness, memory etc.
- Central sulcus separates the primary sensory area and the primary motor area

Cerebellum

- Structure: lies under the rear part of the cerebrum, folded outside, white matter inside, grey outside
- Function: coordinates fine contractions of muscles 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

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 is under the influence of the hypothalamus
- It contains the cardiac centre, respiratory centres and vasomotor centres
- Function: regulates the heart, breathing, diameter of blood vessels.

Spinal cord
- Structure : ascending/afferent tracts are sensory axons that carry impulses towards the brain. Descending/ efferent tracts are motor axons that carry impulses away from the brain.
- Function provide a pathway for communication between muscle and glands and the brain. Integration of automatic reflects e.g. pulling away after being burned

Mid Brian
- Function: connect the cerebrum to the lower parts of the brain

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

18) name and identify the location of the different receptors that detect change in the internal and external environments including thermoreceptors, osmoreceptors etc.

Thermoreceptors

Function:
- inform the brain of changes in the temperature outside the body and inside the body

Location:
- outside the information is received by the hypothalamus and the cerebrum by the thermoreceptors in the skin
- Inside the body, the core temperature is monitored by thermoreceptors in the hypothalamus, detecting 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

Osmoreceptors

Function:
- respond to very small changes in osmotic pressure and arable to stimulate the hypothalamus so that the body's water content is maintained within very narrow limits

Location:
- osmoreceptors are located 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, e.g. finger tips, lips, 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
- secretes via a duct and carries it to the bodies surface or into one of the bodies cavities

Endocrine:
- secretes into the blood stream

20) Define hormone

Hormone : a chemical that is created by an endocrine gland and that affects the function of a cell or organ
- 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

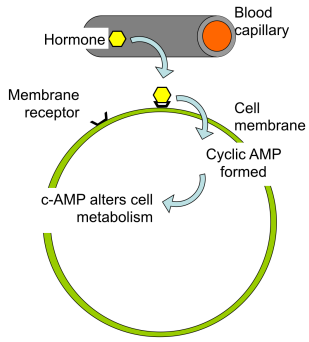
21) explain how steroid and protein/amine hormones differ in the way they activate their target cell

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

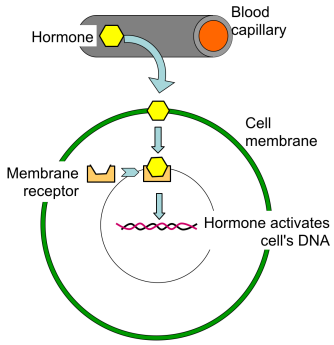


ACTION OF STEROID HORMONES

- 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

Action of steroid hormones



22) Describe the location of the endocrine glands in the body

Pituitary gland

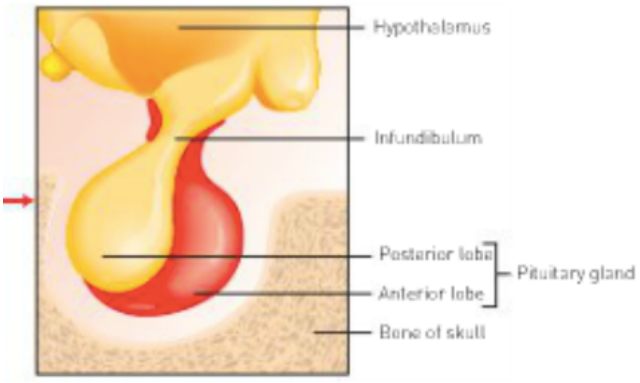
- A pea-sized structure located at the base of the brain

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

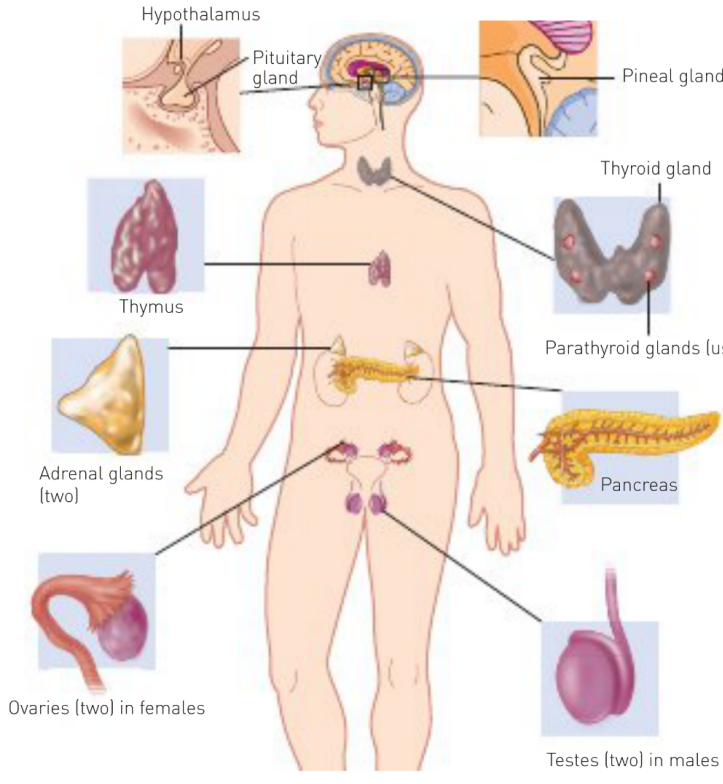
Parathyroid
- There are usually 4 parathyroid glands, although some people have more
- Each is the size of a pea and they are embedded in the rear surface of the lobe of the thyroid gland

Adrenal gland
- There are two adrenal grands, one immediately above each kidney. Each adrenal gland has an inner adrenal medulla and an outer adrenal cortex. These two parts are quite different in their structure and function.
- 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	Follicle- stimulating hormone (FHS)	Ovaries (females) Testes (males)	Growth of follicles Production of sperm
	Luteinising hormone (LH)	Ovaries (females) Testes (males)	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 cortex
	Prolactin (PRL)	Mammary glands	Milk production
Posterior lobe	Antidiuretic hormone (ADH)	Kidneys	Reabsorption of water

Gland	Hormone	Target organ	Main effect
	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
Parathyroid	Parathyroid hormone	Bones Kidney	Increase level of calcium in blood
Thymus	Thymosins	T lymphocytes	Stimulates development and maturation of T lymphocytes
Adrenal cortex	Corticosteroids including: Aldosterone Cortisol	 Kidney Most cells liver and joints	 Increases reabsorption of sodium ions and excretion of potassium ions 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** **Alpha-cells**	 Insulin Glucagon	 Liver and Most cells Liver and fat storage tissues	 Stimulates uptake of glucose; lowers blood glucose levels Stimulates breakdown of glucose and fats; increase blood glucose levels
Testes	Androgens Testosterone	Many tissues	Stimulates sperm production; growth of skeleton and muscles; make sexual characteristics Male secondary sexual characteristics

Glands	Hormones	Target cells	Main effect
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 if 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	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

Alzheimers: Alzheimer's disease is a progressive, neurodegenerative disease that occurs when nerve cells in the brain die.

The causes of the diseases (relate to the nervous system)

- age and family history
- certain genes
- abnormal protein deposits in the brain
- other risk and environmental factors
- immune system problems

- Alzheimer's disease is the reduced production of certain brain chemicals necessary for communication between nerve cells
- acetylcholine, as well as norepinephrine, serotonin, and somatostatin.
- Acetylcholine is the neurotransmitter used in parasympathetic stimulation which maintain the body under quiet conditions.
- Amyloid plaques, composed of specific proteins and pieces of dead brain cells, progressively accumulate in the brain tissue.
- In a healthy brain, these protein fragments would break down and be eliminated.
- In Alzheimer's disease, the fragments accumulate to form hard, insoluble plaques.
- A naturally occurring brain protein known as tau, which forms part of a structure called a microtubule.
- The microtubule helps transport nutrients and other important substances from one part of the nerve cell to another. In Alzheimer's disease the tau protein is abnormal and the microtubule structures collapse.
- As Alzheimer's disease progresses, brain tissue shrinks due to the microtubule collapsing and the chambers within the brain get larger.

Symptoms

Cognitive: mental decline, difficulty thinking and understanding, confusion in the evening hours, delusion, disorientation, forgetfulness, making things up, mental confusion, difficulty concentrating, inability to create new memories, inability to do simple maths, or inability to recognise common things
Behavioural: aggression, agitation, difficulty with self care, irritability, meaningless repetition of own words, personality changes, restlessness, lack of restraint, or wandering and getting lost
Mood: anger, apathy, general discontent, loneliness, or mood swings
Psychological: depression, hallucination, or paranoia

Diagnosis

There is no single test that shows a person has Alzheimer's. Diagnosing Alzheimer's requires careful medical evaluation, including:

- A thorough medical history
- Mental status and mood testing
- A physical and neurological exam
- Cognitive tests
- Tests (such as blood tests and brain imaging) to rule out other causes of dementia-like symptoms

Physical exam Measuring blood pressure and other vital signs may help physicians detect conditions that might cause or occur with dementia. Such conditions may be treatable.

Neurological tests. Assessing balance, sensory function, reflexes, vision, eye movements, and other cognitive functions helps identify conditions that may affect the diagnosis or are treatable with drugs.

Treatment
Current Alzheimer's medications can help for a time with memory symptoms and other cognitive changes.

Any new research or development (cell replacement therapy)
AD brains make smaller amounts of neurotrophins, proteins that help neurons grow and survive. Studies are examining ways to produce more neurotrophins in AD patient brains. No stem cell treatments are currently approved for AD. Positive effects have been seen with neural stem cell transplants given to mice with a disease similar to AD, but researchers are still studying what these stem cells are doing and how they might help repair the brain. Researchers are using induced pluripotent stem cells to grow neurons that have the same genetic background as people affected by AD so they can study the disease.

Parkinsons

Cause: Parkinson's disease is a progressive disorder of the nervous system that affects movement. Many of the symptoms are due to a loss of neurons that produce a chemical messenger in your brain called dopamine (neurotransmitter). When dopamine levels decrease, it causes abnormal brain activity, leading to signs of Parkinson's disease.

Symptoms
Tremor: can occur at rest, in the hands, limbs, or can be postural
Muscular: stiff muscles, difficulty standing, difficulty walking, difficulty with bodily movements, involuntary movements, muscle rigidity, problems with coordination, rhythmic muscle contractions, slow bodily movement, or slow shuffling gait
Sleep: daytime sleepiness, early awakening, nightmares, restless sleep, or sleep disturbances
Whole body: fatigue, dizziness, poor balance, or restlessness
Cognitive: amnesia, confusion in the evening hours, dementia, or difficulty thinking and understanding
Speech: impaired voice, soft speech, or voice box spasms
Mood: anxiety or apathy
Nasal: distorted sense of smell or loss of smell
Urinary: dribbling of urine or leaking of urine
Facial: jaw stiffness or reduced facial expression

Diagnosis
blood tests: to rule out other conditions that may be causing your symptoms.
Imaging tests : such as MRI, ultrasound of the brain, SPECT and PET scans — may also be used to help rule out other disorders.

Treatment

- Physical exercise :Aerobic activity for 20–30 minutes 5 days a week improves cardiovascular health. If injured, pursuing an activity that avoids the injured muscle group or joint can help maintain physical function while recovering.
- Cognition-enhancing medication
- Dopamine promoter
- Antidepressant
- Cognition-enhancing medication
- Anti-Tremor

1) Describe how thermoregulation is achieved by regulating heat gain or loss from the body and state the normal body temperature

Thermoregulation: maintaining the balance between heat production and heat loss
- The human body temperature remains constant at about 36.7 *C
- To achieve this the heat gained by the body must equal the heat loss by the body
- The hypothalamus monitors the temperature of the blood and receives impulses form the peripheral thermoreceptors
- Through negative feedback loops (controlled by the automatic nervous system) it controls the mechanisms for maintaining temperature, such as diameter on blood vessels, sweating, shivering, metabolic rate etc.

2) Describe the location of the thermoreceptors in the body

Peripheral : in the skin and mucus membranes
- cold(stimulated by drop in temperature)
- Heat (stimulated by a rise in temperature)

Central: in the hypothalamus, spinal cord, abdominal cavity (receive info from body core)

3) Describe how heat can be transferred by conduction, convection and radiation

Conduction: the heat transferred through two objects via contact
- heat moves from hot to cold
- eg. When holding an ice block heat from the body is transferred in to the ice causing it to melt

Convention currents: heat that is transferred by water or air
- heat moves in currents
- heat rises and the cold falls causing a current to flow
- heat from the body rises in the air thus is transferred by convention currents

Radiation: heat transfer via electromagnetic waves
- heat moves form hot to cold
- No contact
- heat transferred from the sun to the earth
- Heat transferred from the body to other surroundings without contact

4) Explain how the evaporation of sweat can lead to cooling of the body
- exercise or exposure to heat causes an increases in heat in the body
- The thermoreceptors in the skin and mucus membrane pick up the increase in temperature and informs the hypothalamus
- The hypothalamus causes vasodilation and increases the rate of sweating in order to decrease the temperature
- Latent heat absorbed by sweat for evaporation.
- Meaning the sweat on the skin is turned into a gas due to evaporation and the heat rises (the gas) moving away from the body and causing a cooling effect

5) Describe how the body responds to the fall/rise in the body temperature (both physiology and behavioural)

Response to the cold

Physiology

- **vasoconstriction**, impulses from the hypothalamus stimulate the sympathetic nerves causing the blood vessel in the skin to constrict. This decreases the flow of blood to the skin, thus the skin becomes cooler and there is less heat loss from the body's surface.
- **Shivering**, the hypothalamus sends stimuli to parts of the brain that increase muscle tone . Increase in muscle tone causes an increase in muscle tremors know as shivering. The shivering increases the body heat production, as no external work is done the heat goes toward the internal temperature
- **Secretion of hormones**, through the SNS the hypothalamus stimulates the adrenal medulla, causing adrenaline and noradrenaline to be secreted into the blood. This hormones increase metabolic rate leading to an increase in heat production
- The hypothalamus also causes the secretion of thyroxine which increase metabolic rate thus heat production

Behavioural

-this occur if we become aware of cold conditions. If we feel cold we can put on a jumper, seeking for shelter, decrease our surface area (crawling into a ball) etc.

Response to the heat

Physiology

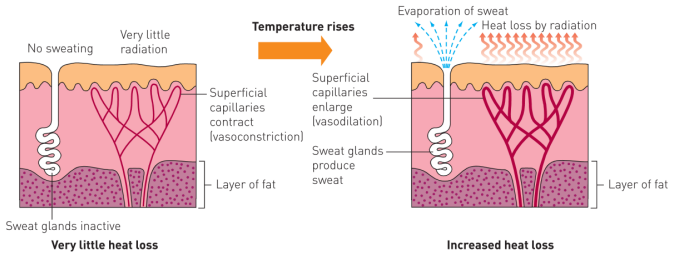
- **vasodilation**, impulses from the hypothalamus stimulate the sympathetic nerves causing the blood vessel in the skin to dilate. This increases the flow of blood to the skin, thus the skin becomes warmer and there is a greater heat loss.
- **Sweating**, hypothalamus causes an increase in the rate of sweating, evaporation occurs causing a cooling effect
- **Long term** there can be a decrease in metabolic rate as the secretion of thyroxine is decreased

Behavioural

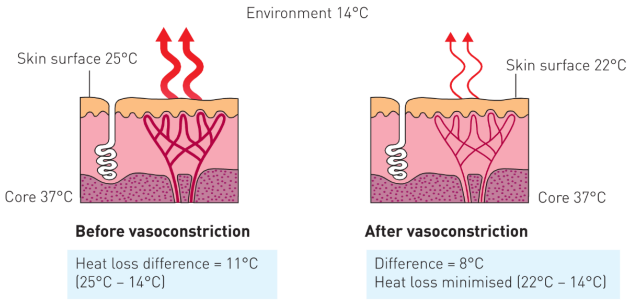
- actions such as taking of clothing reducing physical activity

6) Explain the terms vasodilation and vasoconstriction

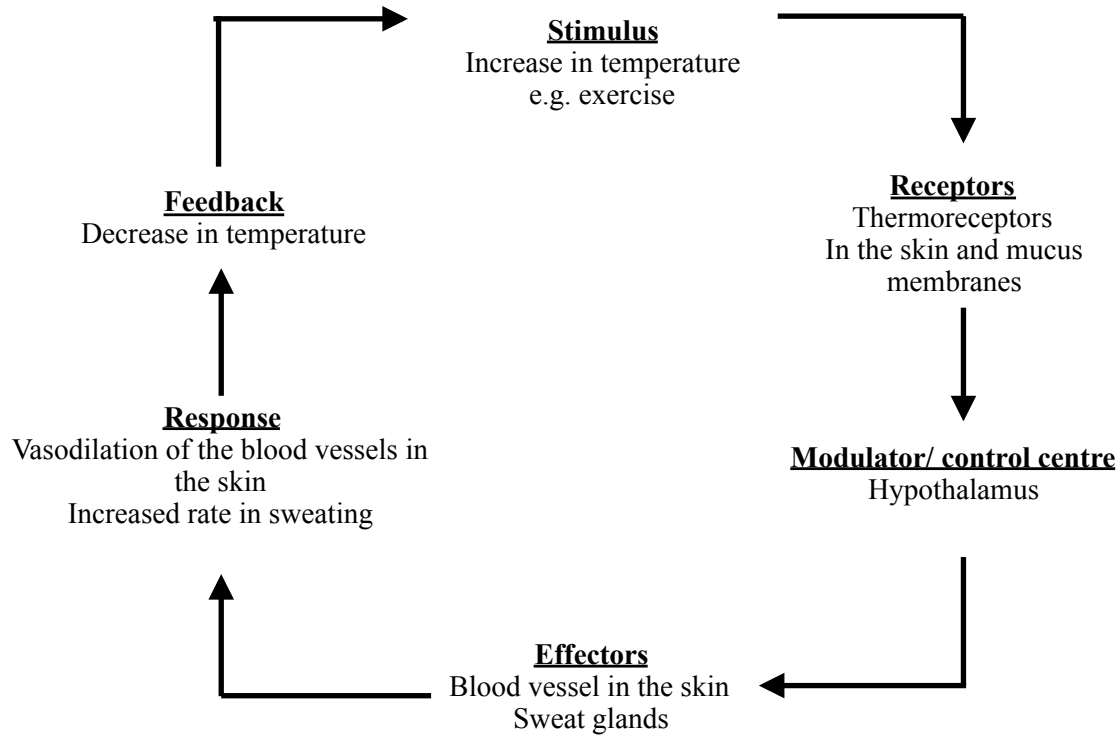
Vasodilation: an increase in the diameter of the blood vessels, increasing the blood flow through them

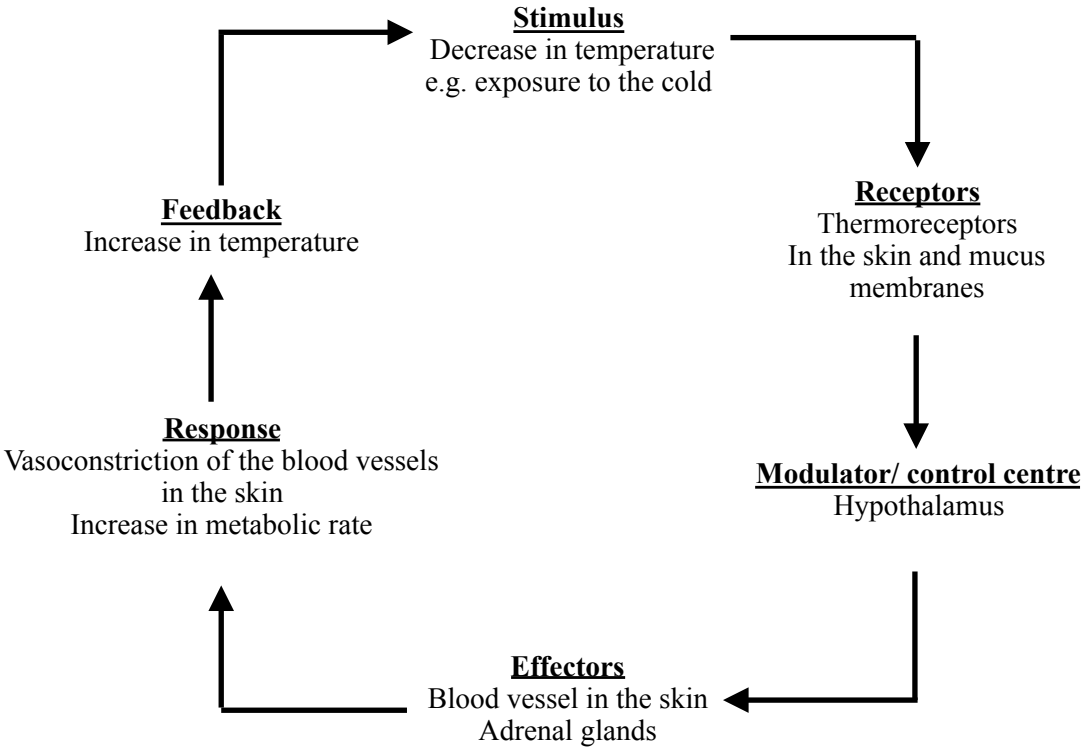


Vasoconstriction: a decrease in the diameter of the blood vessels, decreasing the blood flow through them



7) Draw the feedback model of temperature control





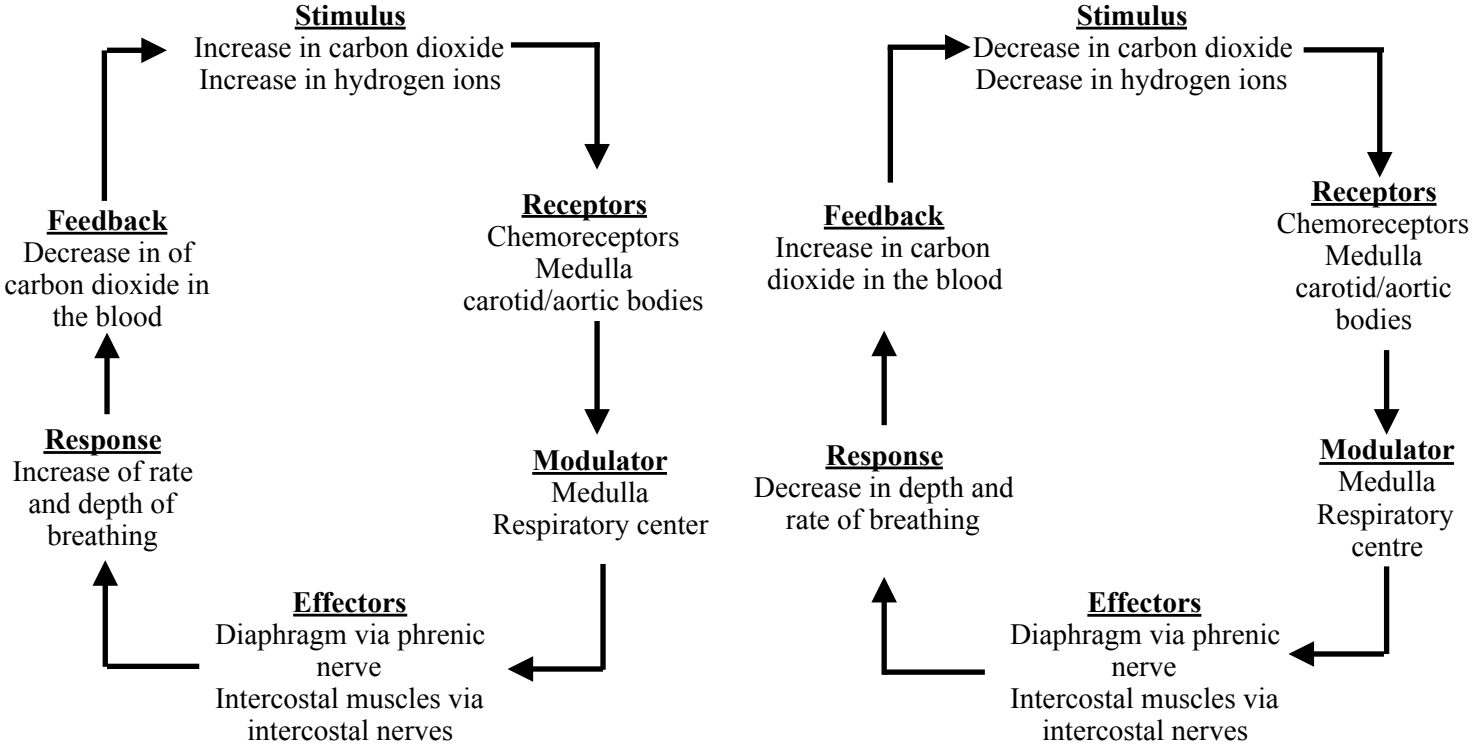
8) Write the word equation for cellular respiration

Glucose + oxygen ⟶ water + carbon dioxide + ATP

9) Describe the regulation of carbon dioxide in the blood in terms of stimulus response model

Control of breathing

- respiratory centre in the medulla
- Two regions, inspiratory and expiratory
- They work together and send impulses through phrenic nerve to the diaphragm and the intercostal nerve to the intercostal muscles



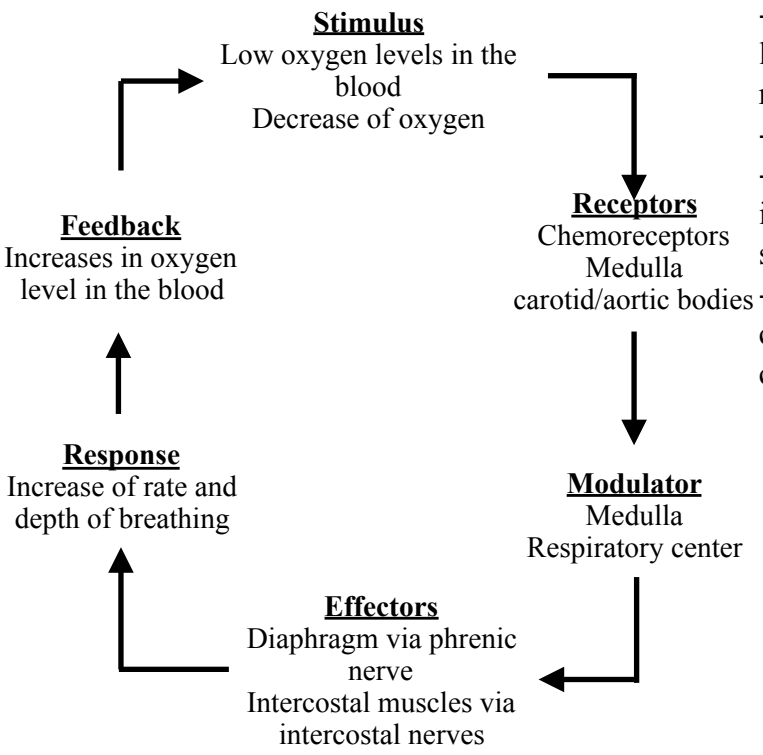
10) Describe the relationship that exists between the concentration of CO2 in the plasma and the concentration of hydrogen ions

- carbon dioxide dissolves in water to produce carbonic acid $CO_2 + H_2O \longrightarrow H_2CO_3$
- Carbonic acid ionises to from hydrogen ion and bicarbonate ions $H_2CO_3 \longrightarrow H^+ + HCO_3^-$
- Thus as carbon dioxide increases so carbonic acid, increasing the concentration of hydrogen ions
- Decreasing the pH

11) Describe the effect on breathing rate of an increase in Hydrogen ion concentration in the blood

- when there is an increase of hydrogen ions there is an increase of breathing rate and depth
- When there is a decrease of hydrogen ions there is a decrease of the breathing rate and depth

12) Describe how a very low concentration of oxygen in the blood can affect the breathing rate



- oxygen concentration need to fall to very low levels before there is any major effect of breathing rate
- Decrease in oxygen, increase in breathing rate
- When giving oxygen to a patient it must be given in small amounts as high oxygen level removes the stimulus to breath
- Regulation of breathing is affected by mainly carbon dioxide, ph levels and low oxygen concentration

13) Describe how the stretch receptors in the lungs control inspiration and expiration

- inspiration takes place and the lungs are inflated
- This inflation is picked up by the stretch receptors is the lungs
- The message in sent from the stretch receptor to the inspiratory neurons in the respiratory centre (medulla)
- Activity of the inspiratory neurons in inhibited and expiration occurs

15) Understand the risks involved with hyperventilation

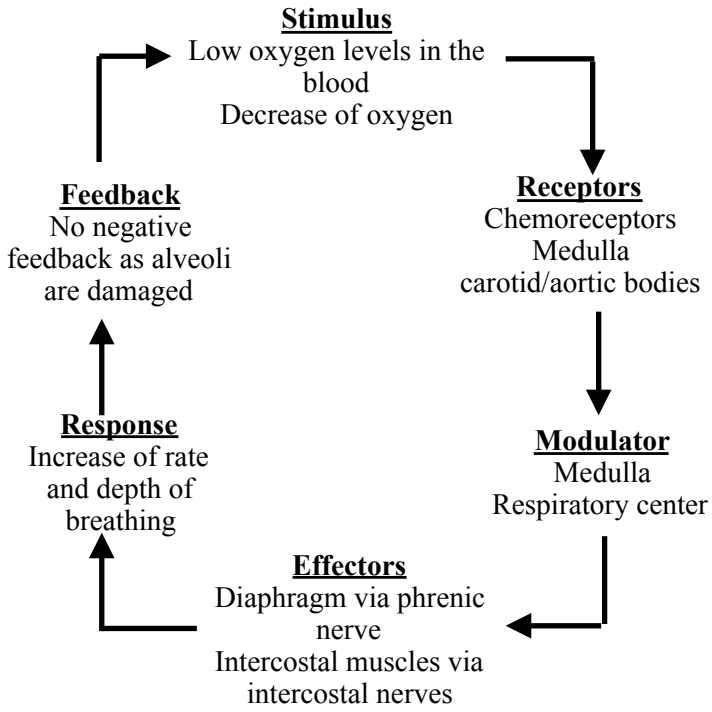
Hyperventilation

- deep breaths cause a decrease in carbon dioxide levels in the blood (carbon dioxide is pushed out)
- No sensation to breath as CO_2 levels are low
- If underwater CO_2 levels do not reach critical
- Oxygen is used up and leads to blackout
- Person loses consciousness, CO_2 levels rise
- Automatically start to breathe
- Water taken into lungs
- Person drowns

Anxiety/ panic attacks

- person starts to breathe rapidly oxygen levels decreases with the corresponding rise in carbon dioxide
- Low blood CO_2 levels can cause blood vessel in the brain to constrict, causing dizziness and fainting

Emphysema



The alveoli in the lungs are damaged making the passage of oxygen from the air to the blood more difficult
Thus oxygen levels remain low and no negative feedback occurs
Causing the person to gasp for breath in as the response , depth of breathing increases with out the corresponding increase of oxygen

16) Describe the regulation of blood sugar levels by the hormones insulin, glucagon, Adrenalin and cortisol in terms of stimulus response model

- glucose is used in respiration to produce energy needed during exercise
- The hepatic portal vein carries glucose from the digestive system to the liver
- In the liver some of the glucose is converted to glycogen (a complex form of sugar)
- The glycogen can be converted to glucose when needed
- These processes are controlled by two hormones which are produced in the islets of langerhans in the pancreas

Insulin:

- produced by the beta cells
- Causes of decrease in blood sugar levels by
- Increase cellular uptake of glucose
- Promoting glycogenesis (glucose ⟶ glycogen)
- Promoting fat storage

Glucagon:
- produced by the alpha cells
- Causes an increase in blood sugar levels by
- Promoting glycogenolysis (glycogen ⟶ glucose)
- Promoting gluconeogenesis (proteins and fats ⟶ glucose)

Stimulus response
- Decrease in blood sugar levels
- Stimulates alpha cells
- Glucagon secreted
- Glycogenolysis
- Increases in blood sugar levels
- Stimulates Beta cells
- Insulin secreted
- Increased cellular uptake of glucose and glycogenesis

Other hormones
Adrenaline
- produced by the adrenaline medulla
- Increases blood glucose levels

Cortisol
- produced in the Arenal cortex

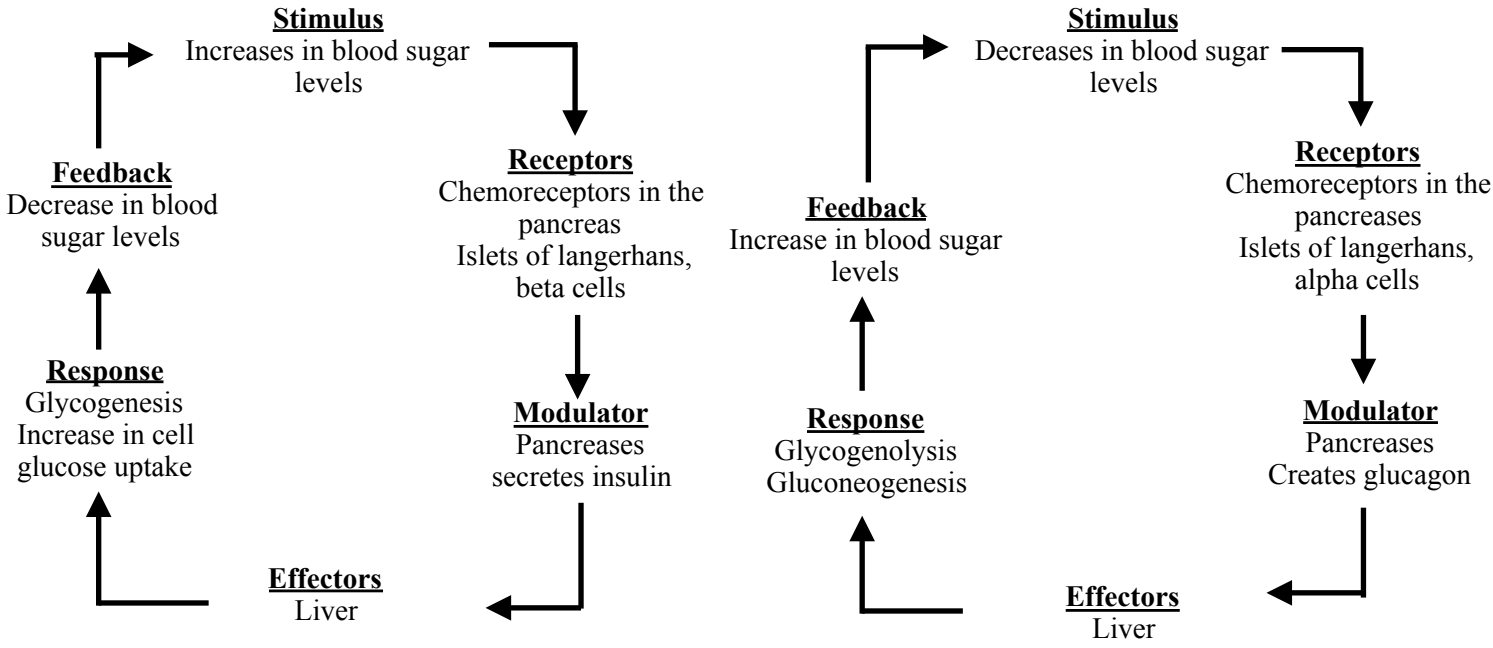
<u>17) Define the following terms glycogenesis, glycogenolysis and gluconeogenesis</u>

Glycogenesis (genesis the making of)
- The formation of glycogen, complex form of glucose, from glucose (glucose ⟶ glycogen)
- It is performed in the liver
- Decreases blood glucose levels
- It is activated by insulin (beta cells)

Glycogenolysis (genolysis the breaking down of)
- It is carried out by the liver
- This is the breakdown of glycogen to form glucose (glycogen ⟶ Glucose)
- increases blood glucose levels.
- Activated by glucagon (alpha cells)

Gluconeogenesis
- The formation of glucose from either proteins or lipids
- Performed in the liver

18) Describe blood glucose control using stimulus response feedback model



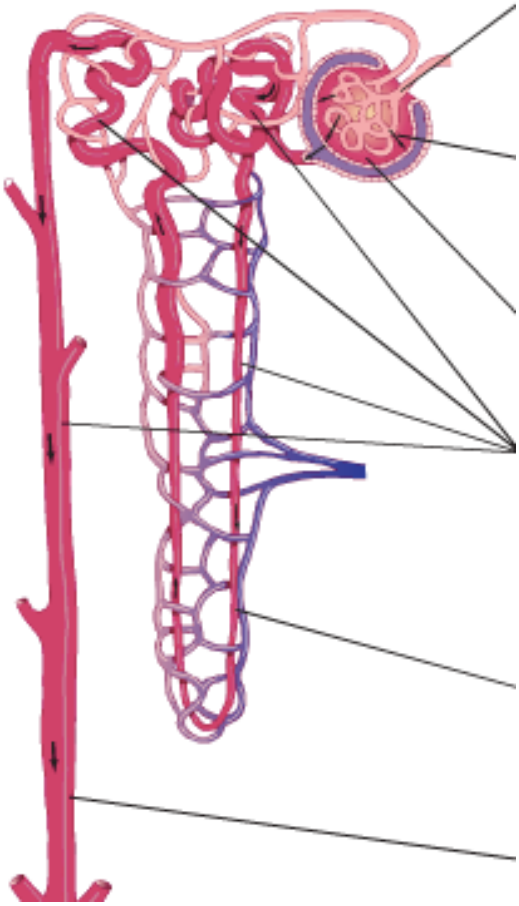
19) Explain the importance of water in body functions

20) Describe the term osmoregulation and how it can be affected by inputs and outputs

Osmoregulation (regulating water)

- water is continuously loss from the body in the form a sweat, urine, faeces and exhaled breathe
- At times of strenuous activity water loss can be quite high, thus more water is lost from the blood meaning a lower water concentration and hence a higher osmotic pressure
- Low water concentration ⟶ high osmotic pressure
- High water concentration ⟶ low water concentration
- Osmorereceptors in the hypothalamus in the thrift centre detect the change in the osmotic pressure making the person feel thirsty, thus stimulating the person to drink
- The water is reabsorbed and the osmotic pressure returns to normal

21) Draw and label the nephron of the kidney, identying the location of filtration, reabsorption and active secretion



Blood enters the glomerulus under high pressure

Filtration: high blood pressure forces the water and the small molecules through the glomerular and into the capsule, meaning the larger molecules and blood cells are kept in the blood
filtrate is collected in the capsule

Reabsorption : of water occurs via osmosis in the loop of Henle and the proximal convoluted tubule, it also occur in the distal convoluted tubule via active reabsorption and is controlled by a hormone know as the antidiuretic hormone which is produced by the hypothalamus and released by the posterior pituitary

Secretion : some material that need to be removed by the body are secreted into the neuron in order to be excreted out of the body

The water and dissolved substance that are left make up the urine and are carried to the ureter to the bladder in order to be excreted

22) Describe the effect of adh (anti-diuretic hormone) and aldosterone In maintaining the water balance

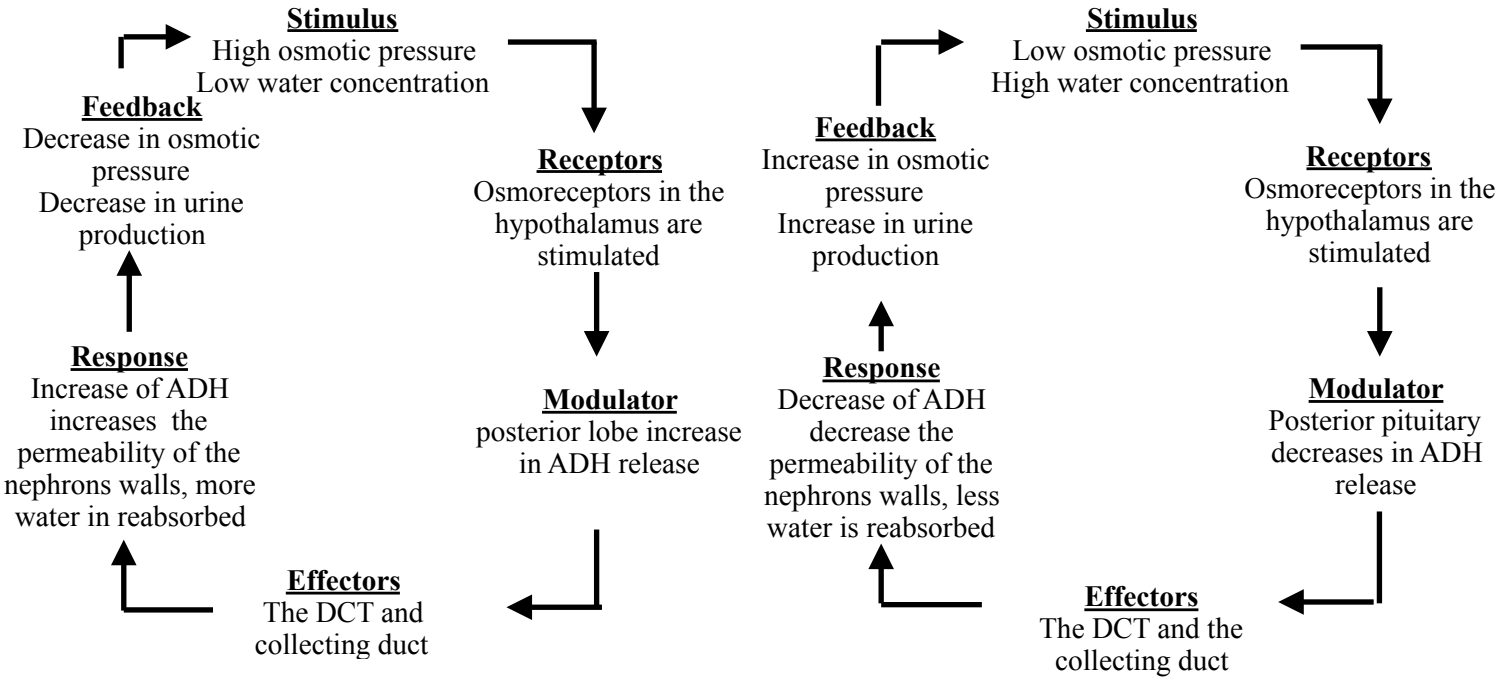
ADH

- The antidiuretic hormone is produced by the hypothalamus and is release by the posterior pituitary
- ADH controls the permeability of the walls of the distal convoluted tubule and the collecting duct of the nephron
- When the concentration of ADH in the blood is high it increases the permeability of the walls, thus water in the nephron is able to be reabsorbed more easily
- This reabsorption of water means that there is a higher concentration of the materials remaining in the nephron, thus the urine is more concentrated

Aldosterone

- made in the adrenal cortex
- Increases reabsorption of sodium ions and excretion of potassium ions

- Makes urine less concentrated



23) Describe the components of a stimulus-response feedback model

Stimulus
Receptors
Modulator
Effectors
Response
Feedback

24) Understand and describe the term homeostasis

Homestasis

Is the process where by the body's internal environment is maintained in a steady state (with in normal limits)

25) Describe some of the common causes to the distribution of hormones

- Either having too little or to much, of any hormone will have an impact in homeostasis.
- If any of the endocrine glands are malfunctioning in any way or firm this will also have an I lacy on homeostasis
- To much hyper
- To much little hypo

26) Describe some of the treatments for the distribution of hormones

- Drugs that either block or encourage production of the particular hormone that isn't being produced properly
- Surgery to fix the issue with the endocrine gland responsible for not producing the hormone properly

27) Describe some of the disease associated with homeostasis including: diabetes, hyperthyroidism and hypothyroidism

Diabetes

- A person with diabetes has an abnormally high levels of glucose in their blood a condition know as hyperglycaemia
- In a normal person there is balance between the hormones insulin and glucagon which usually keeps the blood glucose at the correct levels
- A diabetic does not produce enough insulin, or their cells have an abnormal resistance to the effect of insulin
- Insulin stimulates the cells to take up glucose from the blood or convert glucose to glycogen by the liver in order to lower blood glucose
- Thus a person with diabetes has high amounts of glucose in the blood and they excrete high amounts in the urine

Type 1 diabetes

- sometimes called insulin dependant diabetes
- Usually begins in childhood (juvenile diabetes)
- It occurs because of in a immune system causes destruction of the beta cells
- As these cells produce insulin type 1 diabetes do not produce sufficient insulin
- The only treatment is regularly injections that provides a continuous supple of insulin user the skin
- These injection do not cure diabetes as the patient must have regularly injection to stay alive
- Long term effects of type 1 diabetes include kidney failure, heart attack, stroke, amputation, blindness or even nerve damage

Type 2 diabetes

- is known as non-insulin dependant or adult onset diabetes
- Usually develops in people over the age of 45
- Unlike type 1 type 2 diabetes patient are able to produce insulin but their cell do not respond to it
- It is a lifestyle disease and is more common in those who are overweight
- Certain lifestyle factor that can increase the chance of developing type 2 diabetes are
    - Lack of physical activity
    - Being overweight or obese
    - A diet that in high in fats, sugar, salt and low in fibre
    - High blood pressure
    - High blood cholesterol
    - Smoking
- It develops gradually
- Because the cell do not response to insulin they do not take up glucose from the blood
- The treatment of diabetes includes the management of blood glucose levels in order to keep within a normal range
- This includes management of a carful diet, regular physical activity, maintaining a healthy weight , monitoring blood glucose and sometimes medication if blood glucose cannot be controlled by other measures

Hyperthyroidism
- to much thyroxine is produced by the thyroid gland
- Rapid heat beat
- Weight loss
- Increased appetite
- Fatigue
- Sweating
- drugs can block the thyroid gland's use of iodine
- Surgery remove some of the gland
- Drinking radioactive iodine

Hypothyroidism
- Too little thyroxine is produced
- slow heart rate
- Unexpected weight gain
- Fatigue / lack of energy
- Intolerance to cold
- Swelling of face
- thyroxine molecules
- Change in diet

28) Explain how drugs, exercise and diet can effect homeostasis

Drugs
Many drugs help to maintain homeostasis
Eg- Drugs that treat high blood pressure, irregular hart rhythm, blood glucose level ect.

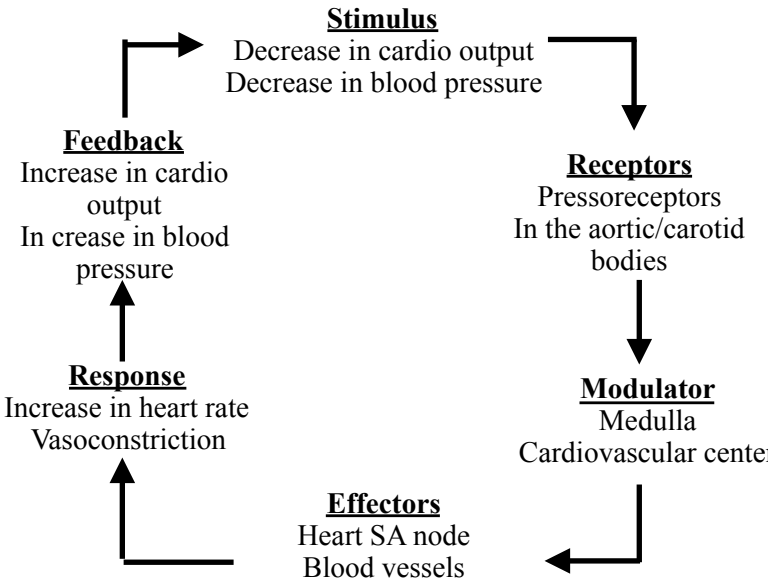
Non medical drug, such as alcohol or ecstasy, can also disrupt homeostasis. Many of them do this by binging go receptor proteins or neurons and others cells. This can either speed up or slow down nerve transmission to the brain

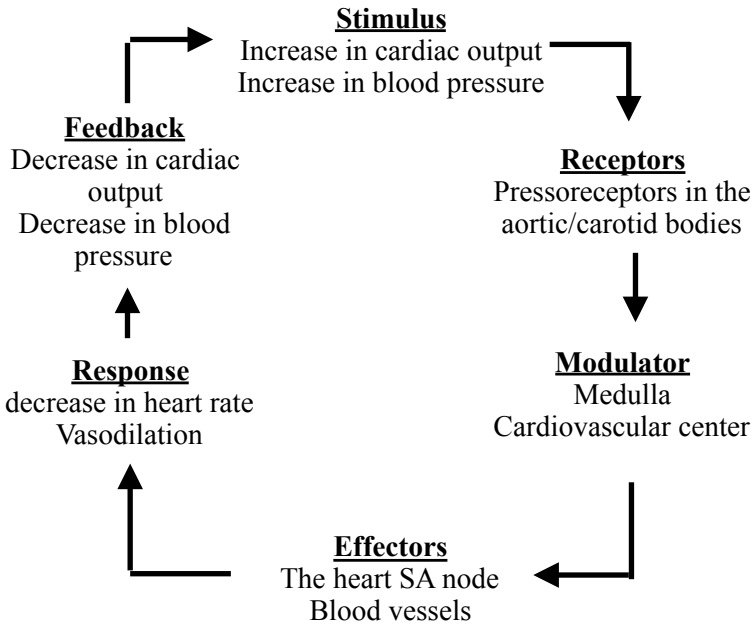
Exercise / Diet
Over exercise can cause disrupt homeostasis. If nutrition is inadequate, excessive exercise can cause the protein in muscle to be broken down for energy. Instead if building muscle, muscle mass may be reduced. This is a string link between eating disorders, such as anorexia.

Nervous control of the heart
- the constant beat of the heart is brought about by the sinoatrial node (SV)
- The SV node by be influence by the sympathetic and parasympathetic division of the automatic nervous system
- Neuron to the heart and the walls of the blood vessels originate in the cardiac centre in the medulla
- Sympathetic nerve fibres make contract with the SV node, the AV node (atrioventricular node) and the part of the cardiac muscle
- Message from the hypothalamus stimulate the cardiovascular centre causing the sympathetic nerves to release noradrenaline and adrenaline which increase the heart rate and the strength of contraction
- Inhibiting impulses are sent along the parasympathetic fibres, which travel to the heart via the vagus nerve
- Stimulation of the parasympathetic nerve cause the release of acetylcholine which decreases the rate of the heart beat and the strength of contraction

- Parasympathetic dominate at rest, sympathetic increases during exercise

- pressoreceptors respond to changes in the blood pressure
- Increase in the blood pressure the cardiovascular centre
- Parasympathetic neurons are stimulated causing a decrease in the heart rate
- Cardio output is therefore decreased and the blood pressure falls





1) Explain what is meant by the term infectious disease

Infectious disease
- are disease that are caused by foreign organisms invading the body and multiplying
- These foreign organisms are called pathogens

2-3) Define the term pathogens and brief describe the characteristics of the four types of pathogens/list the main differences between bacteria and viruses

Pathogen: a disease causing organism

Bacteria
- the great majority of bacteria are harmless to humans these are called non-pathogenic
- All bacteria consists of a single cell and can be seen with only a micro-scope
- Under a light micro-scope only the cell shape of the bacteria can be seen
- Cell shape is used to classify bacteria
- They can be shaped like spheres, rods or spirals
- They usually have a rigid cell wall but lack a nucleus and other cell organelles
- They reproduce asexually by cell division
- Many are beneficial but some are diseases
- They are be treated with antibiotics
- e.g.. Syphilis, Gonorrhoea, Pneumonia,Whooping cough, tetanus

Viruses
- an infection agent, too small to be seen with a light microscope, consisting of a protein sheath surrounding a core of nucleic acid (DNA or RNA)
- They are non-cellar
- They are dependent on living cells for reproduction
- Diseases that have no bacterial cause
- They are no small to be seen under a light microscope, thus they can only be seen using a electron microscope
- They contain DNA or RNA never both
- The DNA or RNA tells the cells to make more virus particles when infecting a living cell
- The new virus particles are then able to ;eave the host cell to infect others
- Can not be treated with antibiotics
- e.g..HIV/AIDs, Herpes, Influenza, Common cold, Chicken pox

Fungi
- Microscopic fungi are responsible for diseases such as thrush, ringworm and tinea.

Animal parasites (Protozoa)
- diverse group of microscopic one celled animals
- Larger and more complex than bacteria
- They have a nucleus and other cell organelles
- e.g.,malaria

Main differences between bacteria and viruses
Bacteria
- A bacteria is a living organism that has DNA and RNA. It has a cell wall and cell membrane
- Bacteria are larger than viruses
- 1000nm
- Bacteria contain organelles such as cytoplasm, cell wall and nucleus
- Bacteria are able to grow, feed and excrete
- One cell
- Bacteria are self producing, with out a host
- Antibiotics or antibacterial

Viruses
- A virus is a small, infectious agent which has DNA and RNA but never both.No cellular structure and only lives inside the living cells of the organism
- Viruses are smaller than bacteria
- 20-400nm
- Viruses consist only of genetic material and protective coating, the have no cell wall
- Not living, no cells
- Viruses lack any metabolic function so they do not grow feed or secret
- Viruses are not self-reproducing as they need a host cells to multiple
- Viruses mutate/multiple much faster than bacteria
- Antiviral and vaccines

4) list the current treatments for bacteria and viruses

Antibiotics
- Antibiotics are drugs that are used to fight infections of micro-organisms, particularly bacteria
- They interfere with the protein synthesis in the common if the target bacteria
- Each antibiotic is effective for only certain types of bacterial infection and cannot be used to treat viral infections

Bactericidal antibiotics
- Kill bacteria by changing the structure of the cel, wall or membrane, or by disrupting the action of the essential enzymes.

Bacteriostatic antibiotics
- Stop bacteria from reproducing, usually by distrusting protein synthesised

Broad-spectrum antibiotics
- An antibiotic that affects many types of bacteria

Narrow-spectrum antibiotics
- An antibiotic that affects only a particular type of bacteria

Antiviral
- Are used specifically for treating viral infections
- Viruses enter the host cell and the virus DNA and RHA induces the cel, to produce new virus particles. These particles can then leave the cell and infect news host cells
- The way in which viruses replicate make it difficult to fins drugs that interfere with virus replication
- Because the host cell produces the new virus particles, any drug that interferes with virus replication is likely to be toxic to the host

5) understand antibiotic resistance and its implications for future effectiveness

Natural selection
- Some bacteria that antibiotics are used to kill have gradually evolved and become resistant to them
- Multiple drug resistance has been cause by the overuse of antibiotics in medicine and agriculture
- Preventing the misuse and abuse of antibiotics will slow the development of resistance but there is no way of stopping it all together

Multiple drug resistance
- Resistance of some strain if bacteria to most of the available antibiotics

Total drug resistance
- Rests inane of some strains if bacteria to all antibiotics

6) describe the different methods by which pathogens may be transferred
Transmission by contact

- Involves the spread if pathogens by physical contact. The contact may be direct, actually touching an infected person, or indirect, touching an object that has been touched by an infected person

Transmission by body fluid
- When blood or other body fluids from an infected person comes into contacts with either the bloodstream or mucous membrane (Eg- nose, mouth, throat and gentlest) of an uninflected person, such as through a needle stick or a break in skin, then pathogens can enter the body of the person.

Infection by droplets
- When tiny droplets of moister, harbouring pathogenic organisms, are emitted when breathing talking, sneezing, or couching. The droplets May be breathed i it may settle on food to be later ingested.

Ingestion
- When food or drinks contaminated with pathogen are ingest it may result in disease

Airborne transmission
- When moisture in exhaled droplets evaporates, many bacteria are killed, but viruses and some bacteria remain viable and can cause infection when inhaled.

Transmission by vectors
- The transfer of pathogens by other animals, such as insects, ticks and mice. Some vectors transfer pathogens directly, however many spread the pathogens to food or water, which is then ingested.

7) describe the physical barriers the body has to defend externally against pathogens

1) First line of defence – physical barriers to infection. (skin, mucous membranes etc)
2) Second line - non-specific immune response eg. phagocytes, inflammation, fever etc.
3) Third line is Specific Resistance. This is called the Immune Response and targets specific pathogens (lymphocytes, antibodies are made against specific antigens.

Physical barriers
Skin
- Skin is very good at stoping the entry of micro organisms, providing it is not broken by cuts or abrasions.
- Sebum is produced by the oil gland in the skin. It contains substance that kill some pathogenic bacteria
- Sweat secreted onto the skin contains salts and fatty acid that prevents growth of many micro organism

Mucous membrane
- Line cavities that open to the exterior. They secret mucus, which inhibits the entry of micro-organism to the organ of the body.
- The whole digestive, urinary and reproductive tracts are protected with many

Hairs
- Found in the nose cavity and the ears
- In the nose, jar and a layer of mucus enable to the nose to trap up to 90% of particle inhaled when breathing

Cilia
- The mucus membrane lining the nose cavity, the trachea and other air passages have cilia.
- The beating of cilia moves mucus containing trapped particles and micro organism, towards the throat where it may be coughed up or swallowed

Acids
- The acids kill many if the bacteria taken in with food or those contained in mucus swallowed from nose or windpipe
- The vagina has acid secretion that reduces the growth of micro organisms
- Sweat is slightly acidic

Lysozyme
- Is and enzyme that kills bacteria

- The eye are protected by the flushing action of tears, which contains lysozyme
- It is found in saliva, sweat, secretions of the nose and tissue fluid

Cerumen (Ear Wax)
- Protects the outer ear against
- It is slightly acidic and contains lysozyme

Flushing action
- Helps keep some areas relatively free of pathogens
- Urine flowing through the urethra has a cleansing action.
- This prevents bacterial growth and helps stop bacteria reaching the bladder and kidneys

8) explain the inflammatory response as non-specific immune response such s mast cells, histamine, heparin and macrophages

Inflammatory response: is the response to damage to a tissue which involves swelling, heat, pain and redness

- Mast cells (special cells found in most tissues which co-ordinate inflammation) release histamines, heparin or other substances into the tissue fluid
- Histamine – increases blood flow to damaged area (vasodilation) and causes walls of blood capillaries to become more permeable, so that fluid if filtered from the blood.
- Heparin prevents blood clotting
- The chemicals released by the mast cells attract macrophages, phagocytes and leucocytes
- Increased blood flow to site causes redness and heat.
- Escape of fluid fluid from the blood causes swelling.
- Expansion of tissues increases pressure on pain receptors and causes pain.
- Phagocytes filled with bacteria begin to die releasing pus

Macrophages
- large phagocytic cells that develop from leucocytes
- Some wander looking for pathogens other are fixed and wait for the pathogen o come to them
- Engulf and digest pathogens or release substances to destroy them

9) explain the causes and benefits of a fever

- during the course of an infection individuals often experience a fever
- The hypothalamus resets the body internal temperature higher than normal thus the person begin to feel cold and being to shivering and vasoconstriction occurs in the skin
- These increases the temperature once the temperature has reached the new temperature the fever will break and the body's thermostat will reset back to normal thus the person begin to feel hot and starts to sweat and vasodilation of the skin occurs
- The body will then reach normal temperature again
- fever is beneficial as high temperature are believed to Inuit the growth of some bacteria and viruses, the heat also speeds up the rate of chemical reaction which help the body to repair its self more quickly when fighting a disease
- However fever can be harmful is the temperature reach to high

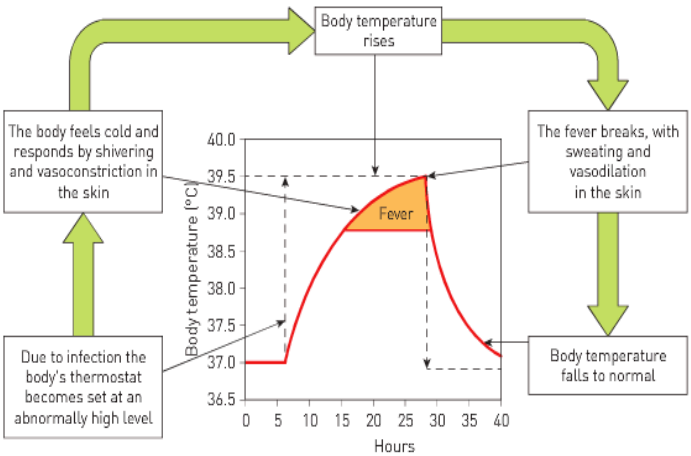


Figure 10.8 Body temperature during fever

How is the fever stimulated

- The resetting of the body's thermostat is due to substance call pyrogens
- pyrogens are released by leucocytes and macrophages during inflammatory response to a foreign intruder

10-12) explain the role played by the lymphatic system, macrophages and phagocytes in defending the body against invasion by pathogenic micro-organisms

- The lymphatic system is a one-way drainage system that carries lymph from body tissues back to the general circulation
- Lymph is a clear yellow liquid that carries white blood cells, especially lymphocytes.
- The lymphatic system comprises lymph, lymph nodes, lymph vessels, the spleen, tonsils and thymus.
- The lymphatic system plays a vital role in protecting the body from pathogens and cancer cells, and removing debris (e.g. old blood cells) from the circulation.Lymph vessels pass through a series of lymph nodes.
- Lymph vessels are thin-walled, vein-like tubes that carry lymph.
- lymph nodes are small bean-shaped structures that contain high concentrations of macrophages and lymphocytes.

Function
- To return excess tissue fluid to the circulation.
- To filter out cellular material, including pathogens and cancer cells.
- To activate the immune system.

Structures in the body that contain lymphatic tissue, but are not part of the lymphatic system, include:
- The spleen
- Thymus gland
- Tonsils
- Peyer's patches in the gut
- The appendix

The lymphatic system fights infection as:
- Lymph is a clear yellow liquid that carries white blood cells, especially lymphocyte
- Lymph entering the lymph node contains cell debris, foreign particles and micro organisms that have penetrated the bodies external defences,
- Some of theses micro organisms may be able to cause diseases and must therefore be destroyed
- Large particles, such as bacteria, are trapped in the mesh work of fibres as the lymph flows though the space in the lymph node
- Phagocytes, including leucocytes and macrophages ingest and engulf these particles through phagocytosis
- When infection occurs, the formation of lymphocytes increases and the lymph nodes become swollen and sore

13-14) explain what is meant by the statement "the immune response is specific" and identify the two parts f the immune response antibody mediated and cell mediated

Specific immunity
- Specific immunity protects the body against specific substances (antigens).
- There are two types of specific immunity, cellular immunity and antibody mediated (humoral) immunity.
- Specific immunity is acquired through natural infection or immunisation.

Non-specific immunity
- work against all pathogens eg. Inflammation response, phagocytes
- First line of defence

15) antigen and antibody

Antigen
- any substance that is capable of causing the formation of antibodies
- Protein or peptide

Antibody
- a substance produced in response to a specific antigen
- Combine with antigen to neutralise or destroy it

16) describe where T and B cells are made in the body

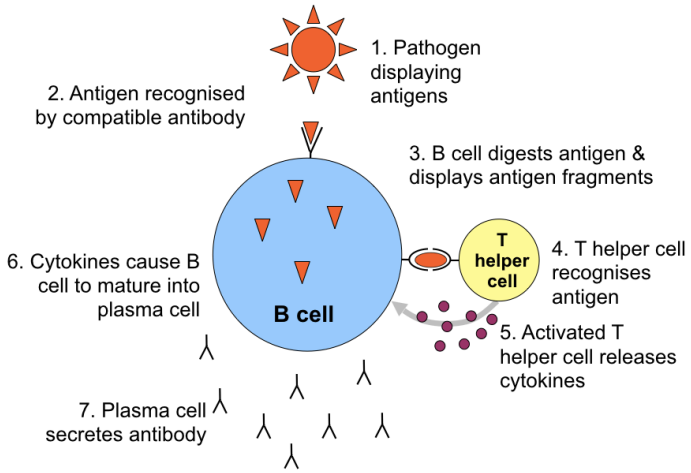
B cells (B lymphocytes)
- Produced and matured in the bone marrow

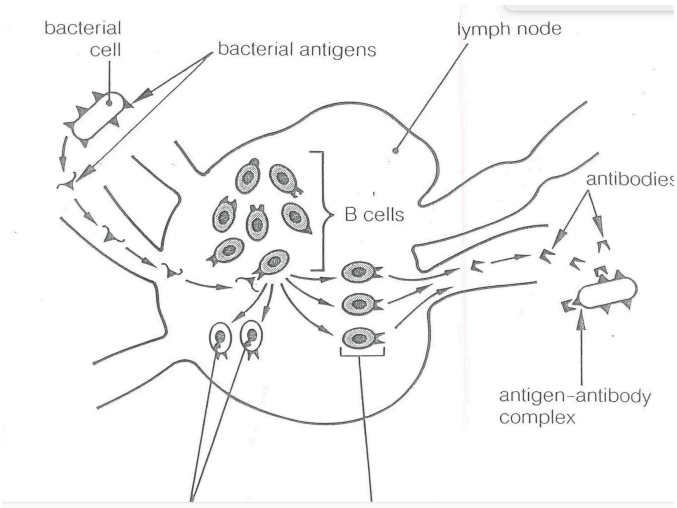
T cells (T lymphocytes)
- produced in the bone marrow and matured in the thymus

B cells	T cells
•Humoral immunity •Antibody mediated immunity	•Cellular immunity •Cell mediated immunity
Chemical-based system	Cell-based system
Produce antibody (Ig)	Produce killer cells
Lymphocytes educated in bone marrow	Lymphocytes educated in thymus
Effective against extracellular bacteria (some viruses)	Effective against intracellular viruses & cancer cells (some bacteria)

17) explain the main events that occur in antibody-mediated (humoral response)

- Antigens on foreign cells, such as bacteria, are recognised by receptors on specific B cells.
- The antigen is digested by the B cell and antigen fragments are displayed on the cell surface.
- T helper cells with matching receptors become activated when they lock onto the antigen fragment.
- The activated T cells secrete cytokines, (messenger proteins that regulate the immune system).
- Cytokines stimulate the B cell to divide, producing numerous plasma cells some become memory cells
- The plasma cells secrete antibodies into the circulation.
- The antibodies attach to the antigen forming the antigen-antibody complex



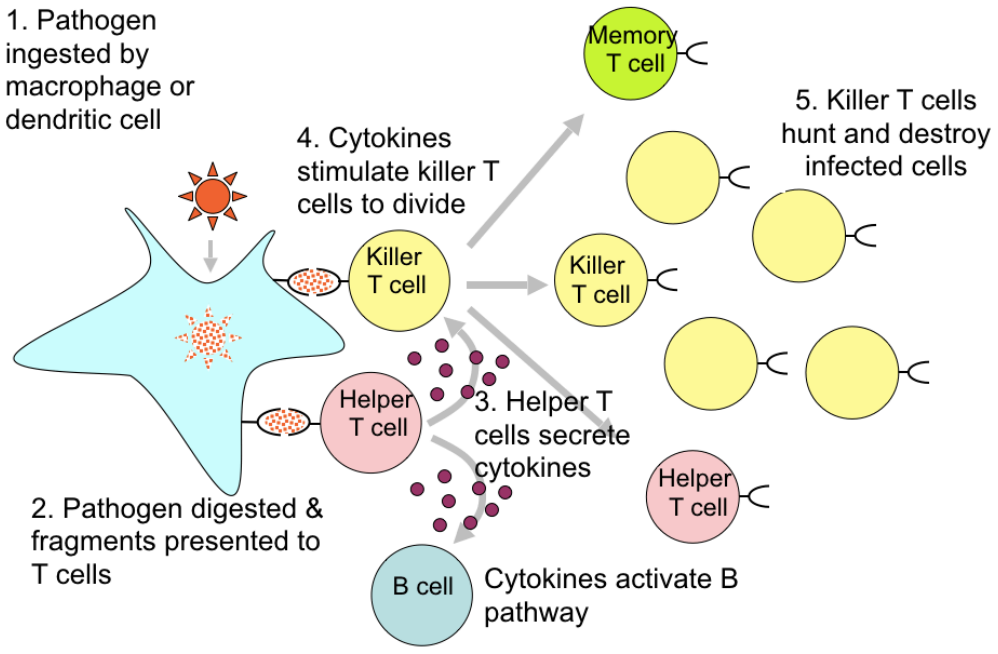


18) describe how antibodies may render an antigen inactive

1) combine with other enzyme or bacterial toxins
2) bind to the surface of viruses and prevent them from entering other cells
3) coat the bacteria so that the bacteria is more easily consumed by phagocytes
4) cause particles such as bacteria, viruses or foreign blood cells to clump together this is know as agglutination
5) dissolve organisms
6) make them insoluble thus they are more easily consumed by phagocytes

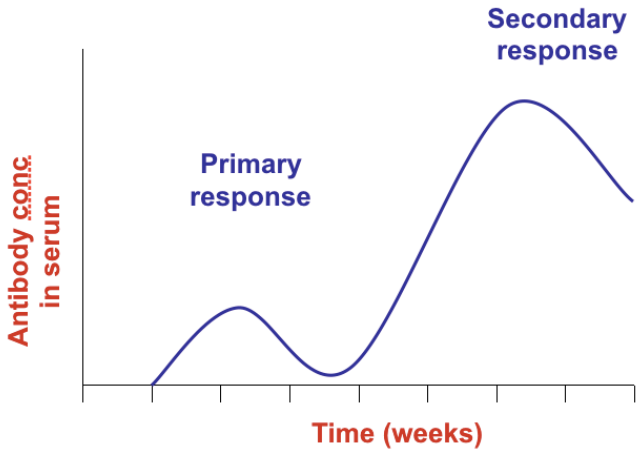
19-20) explain the main event that occur in cell medicated immunity and describe how killer T cells may deal with an invading antigen

- A 'sick' cell is ingested by an antigen presenting cell (macrophage or dendritic cell).
- Antigen fragments of the pathogen molecules are displayed on surface of the macrophage
- Cytokines stimulate T cells to divide and differentiate into killer cells, helper cells and memory cells.
- Killer cells (cytotoxic T cells) destroy body cells infected by viruses or transformed by cancer.
- Helper T cells perform many immune functions. They are essential for activating cytotoxic T cells, and B cells.
- Memory cells remain in the body and enable the immune system to react rapidly should it encounter those same antigens again.



21) explain the role played by the memory cells

Memory cells
- Remain in the body and enable the immune system to react rapidly should it encounter those same antigens again.



Primary response
- Cells need to differentiate so does not appear immediately
- Peak in antibody production about 1-2 weeks
- Decreases in expose decrease in antibody production
- Plasma cells have short life span
- Production of cells suppressed

Secondary response
- response is immediate because of memory cells
- Antibodies increase rapidly. Antibody numbers are much larger than primary response
- Can occur many year after primary response
- Memory cells can survive more than 20 years

22) define immunity

Immunity
- Resistance to infection from an invading micro-organisms

23) distinguish between the four different type of immunity

Active (antibodies are made)
Natural
- antigen enter the body naturally
- Immune response produces antibodies

Artificial
- antigen are introduce via vaccines
- Immune response produces antibodies

Passive (antibodies are given not made)
Natural
- antibodies are given naturally
- Baby receive antibodies from mother

Artificial
- immune serum
- Antibodies are given in booster shot

24) Distinguish between the three different types of vaccines that are available

Live-attenuated micro-organisms
- Live attenuated vaccines use micro-orgainism with a reduced ability to produce disease symptoms, so that the immunised person does not contract the disease but manufactures antibodies against the antigen.
- These vaccines are so similar
- to the natural infection that they help prevent, they create a strong and long-lasting immune response. Just 1 or 2 doses of most live vaccines can give you a lifetime of protection

Eg- measles, mumps, rubella, rabies, TB, chicken pox, smallpox and yellow fever

Dead micro-organisms
- Dead micro organisms vaccines use a dead version of the organism that causes a disease.
- Inactivated vaccines usually don't provide immunity that's as strong as live-attenuated micro organisms vaccines, but they are still recognised as antigen.
- They require several booster shots to get ongoing protection against diseases

Eg- cholera, typhoid, plague, whooping couch

Toxoid
- Toxoid vaccines use an inactive toxin made from bacteria.
- They create immunity to the parts of the organism that cause a disease instead of the organism itself. This means the immune response is targeted to the toxin instead of the whole cell.

Eg- diphtheria, tetanus

Subunit
- Sub unit vaccines use a fragment of the organism to provoke the immune response
- They require several booster shots to get ongoing protection against diseases

Eg- human papillomavirus (HPV), hepatitis B, pneumococcal disease, meningococcal disease

25) List some of the risks ethical concern associated with using vaccines
- How the vaccines are manufactured
- How it was tested
- The risks associated with the use of the vaccine
- The treatment of animals in the production of vaccines
- The way in which cells are obtained for vaccines
- Young children not understanding the benefits and risks of vaccinations, how can they then give consent to be vaccinated
- The equitable distribution of vaccines.

1) describe the structure of DNA

- a twisted ladder like structure
- Made up of a nucleotide bases that consist of a phosphate group, simple sugar and a nitrogen base
- The nucleotides tides are joined by hydrogen bonding

2) define mutation and explain the possible sources of mutation

Mutation: a change in a gene on a chromosome leading to new characteristics in a organism
Sources of a mutation

- mutations occur without any known cause but a number of agents are know to increase the rate at which they occur
- These are called mutagens
- Some known mutants are mustard gas, formaldehyde, sulfur dioxide, and some antibiotics
- Radiation is also a known mutagens
- Mutagens are anything that causes a mutation some spontaneous

3) Explain the difference between a gene mutation and a chromosomal mutation

Gene mutations

- are changes in a single gene so that the traits normally produced by that gene are changed or destroyed
- Gene mutation occur during the replication of the DNA molecule before the cell division.
- Point mutation is the simplest type of mutation is involves the change of a single base pair
- Lethal recessive the gene is deadly in its homozygous form

Chromosomal mutations

- is when all of part of the chromosome is affected
- deletion
- Duplication
- Inversion
- Translocation
- Non disjunction

4) explain the difference between somatic and germ line mutation

Somatic

- a mutation in the DNA that occurs in the body cells other than the germ cells
- These type of mutation can not be passed on to the offspring

Germ line

- Is a DNA change that occur in the egg or the sperm
- This type of mutation can be passed onto the offspring

5) understand what a point mutation is and its possible consequences

Point mutation

- a change in just one base pair

- It could have no effect at all, alter a protein or even prevent a protein form being produced

6) list ways that a gene mutation can occur

- deletion: part of the chromosome is lost
- Duplication: a section of the chromosome is occurs twice. This may happen if part of one chromatic breaks off and joins another
- Inversion: breaks occur in a chromosome and the broken pieces join back together but in the wrong way around
- Translocation : part of the chromosome breaks off and is rejoined to the wrong chromosome
- Non disjunction: during meiosis a chromosome pair does not separate probably so that one daughter cell has an extra chromosome and the other cell has one less chromosome

7) describe the biotechnology techniques

DNA sequencing

- DNA sequencing is the precise order of nucleotides in a sample of DNA
- The DNA is denatured by heating to a high temperature forming a single strand of DNA
- Primers are attached to the DNA and the strand and is equally divided into four tubes. DNA polymerase and four dideoxynucleotides are also added
- Into each tube a different nucleotide is placed but with hydrogen synthetically replacing the hydroxyl group, OH, that is normally used in the bonding of the nucleotides
- When one of these dideoxynucleotides is inserted into the replicating chain the DNA sequencing stops at this point
- As these process in repeated several times the DNTP's are inserted at different points in the chain, forming different lengths of DNA strands
- Using gel electrophoresis fragment of different lengths for each of the four DNTP's

Uses of DNA sequencing

- determining if a person will inherit a disease
- Paternity tests
- Forensics
- Evolutionary biology

DNA profiling

- a single strand of DNA is amplified using the polymerase chain reaction
- The segment of DNA is cut at specific points
- The DNA fragments differing is sizes are then separated by using gel electrophoresis

Uses of DNA profiling

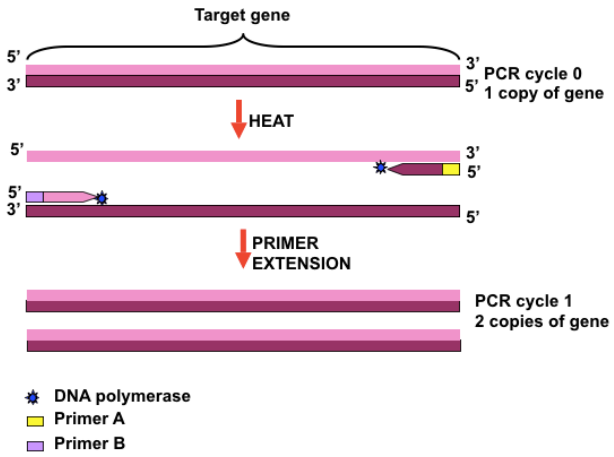
- identifying an individual identity
- Determining their parentage
- Detecting genetic variation or mutations

Gel electrophoresis

- it is the process of separating fragments of DNA using an electrical current
- The samples that are being tested are injected into the wells in a sheet of porous jelly-like material
- An electric current is passed through the gel and the fragments are drawn toward the positive end
- DNA itself is negatively charge, thus it is attracted to the positive end the shortest fragment of DNA move the furthest

Polymerase chain reaction

- the polymerase chain reaction is like a digital photo copier
- It is used for creating copies of specific action of the DNA from a sample, this is known as DNA amplification



Denaturing:

- the DNA is heated to 96 ℃ to separate the to strands
- A heat stable DNA polymerase (taq polymerase) is used

Hybridisation

- primers(short synthetic DNA fragments) are added to the DNA
- The primers bind to complimentary base sequences on the separated DNA strands
- the primers act as starting points for the replication of new DNA molecules
- Temperature 55-65℃

DNA synthesis/elongation/extension

- DNA polyermase (taq) is added
- Acting at the primer the DNA polymerase reads the DNA code and builds a complementary strand of DNA, by adding complementary nucleotides
- Temperature 73℃

PCR uses

- gene analysis
- Forensic science
- Detection and diagnosis of diseases

Recombinant DNA

- Isolate the gene of interest and cut it out using restriction enzymes to make a fragment of DNA that induces that gene
- Isolate a plasmid from a bacterial cell and cut it with the same type of restriction enzymes
- Gene of interest is spliced into the plasmid and is now called recombinant DNA
- Often antibody resistance gene is also added into the plasmid so that when the plasmid is integrated back into the bacterial cell the the bacteria then have the plasmid with the gene a interest to survive and clone
- Thus reproduce the foreign protein

Insulin production

- The insulin gene is two large to be inserted into one plasmid
- The gene is chemically synthesised as two nucleotide sequences one insulin A and other insulin B
- The two insulin chain are added into two separate plasmids
- The enzyme B-galactosidase is located on the plasmid to make the plasmid produce insulin
- The insulin gene must be must be linked to B-galactosidase, which carrie the promoter for transcription
- Restriction enzymes are used to cut the plasmids at the appropriate sites

- The A and B chains are inserted into the plasmids the sequences are joined together using DNA ligase
- The recombinant plasmids are inserted back into the bacteria
- The bacteria are then grown

Gene therapy

Preparing the gene for cloning

- double stranded DNA containing introns
- As a normal part of the cell process of gene expression transcription creates a primary RNA molecule
- The introns of the RNA molecule are removed using restriction enzymes to from mRNA
- Reverse transcriptase is added which synthesises a single DNA molecule complementary to mRNA
- The second DNA strand is made by using the first as a template and adding the enzyme DNA polymerase

Cell replacement therapy

Definition : to replace damaged faulty cells in order to reduce the symptoms of the disease

Steps

- fertilised egg matures until it reaches blastocyst stage (8 cells)
- Blastocyst cells are harvested
- Cells taken from inner cell mass
- Cells stimulated with growth factors
- Cells mature into adult nerve cells
- Cells to be cloned
- Nerve cell are then injected back into the patient
- New cell replace damaged nervous tissue
- Symptoms of disease reduced

ESCs

- cells removed from embryo whilst still pluripotent
- Extraction
- Expansion
- Differentiation
- Transplantation

iPSCs

- somatic cells removed from patient
- These cells are reprogrammed
- Extraction
- Reprogramming
- Expansion
- Differentiation
- Transplantation

In vitro cloning: Made in the laboratory
- PCR

In vivo: made in a living cell/thing
- recombinant DNA

10) define gene therapy. List some genetic disorders that are currents being researched and/or used in gene therapy

Gene therapy

Preparing the gene for cloning
- double stranded DNA containing introns
- As a normal part of the cell process of gene expression transcription creates a primary RNA molecule
- The introns of the RNA molecule are removed using restriction enzymes to from mRNA
- Reverse transcriptase is added which synthesises a single DNA molecule complementary to mRNA
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11) outline some ethical concerns

Risks
- allergic reaction
- Effects of embryo
- Vaccines using autism

Ethical concerns
- Were its tested
- Playing god
- How its made
- Killing babies

Benefits
- herd immunity
- Prevention of diseases when travelling

1) Understand that humans can show multiple variations and how the changing environment can influence the survival of organism with genetic variation

- In every species there is genetic variation due to sexual reproduction, mutations, meiosis (random assortment of chromosomes, crossing over and non disjunction) and epigenetics
- Thus there are some genes that are advantageous in the gene pools due to the environment in which the species lives in. The organism with the advantageous genes are more likely to survive an the one with out the advantageous gene are more likely die
- There are some mutations that have no advantage or disadvantage but if the environment changes then must of the this mutations can become useful, thus increasing the survival chances of the organism with the gene.
- Random assortment
- Crossing over
- Non-disjunction
- Random fertilisation
- Mutations

2) explain how gene pool allele frequencies can be altered

Mutations
- new mutation could be harmful and could be lost
- New mutation could also be advantageous increasing the chance of survival and changing the gene frequency

Selection pressures
- include environmental, disease, predation and mate selection
- different environment pressures such as wet/dry ect will favour individuals that suit that environment more than the ones that do not thus the gene pool frequency changes

Random genetic drift
- this is a random purely by chance change in the gene frequencies in a gene pool
- Mostly in small populations
- The population needs to be isolated

Founder effect
- an group of individuals may become isolated from a population but the gene frequencies in the founder population may not be the same as the original population if there is no gene flow between the original population and the founder population the gene frequencies will be different

Barrier to gene flow
- social
- Cultural
- Geographical

Population size
- larger population act as a buffer for random changes un allele frequency

- Smaller population can allow for change in allele frequencies more easily

Mate selection
- random mating allows for animals and plants gametes are released in the wind/water
- Assortive mating only certain combination come together at higher frequencies

Gene flow
- allows for emigration and immigration which has the effect of adding and deleting alleles to a population and can change gene frequencies

3) Explain how survival can be enhanced if particular phenotypes are selectivity advantageous

- there may be a selection against one of the genotypes, if one of the genotypes for example aa has a lower fitness than AA or Aa then the frequency of that allele will slowly decrease

Heterozygous advantage
- in recessive homozygous form the allele can be lethal and organism with that genotype will die off
- Although in heterozygous form the gene can be advantageous to the survival of the organism thus it stays in the population
- An example of this is the sickle cell allele, in recessive homozygous form the gene is lethal although in heterozygous form the gene is said to provide protection against malaria
- Thus is the tropics where malaria in very common the allele stays in the population

4) Give examples of genetic diseases found in specific populations

Tay sachs

Sickle cell

5) explain the theory of evolution using natural selection as the key process- variation, struggle of existence, isolation, and differential selection, speciation

Darwin's deductions
- there is a struggle for existence between organisms
- Survival of the fittest occurs for (those who are best suited for the environment will survive in large numbers)
- In the nature the environment limits the size of the population

Darwin's theory
- reproduction produces variation
- Organism that are nest suited to the environment will survive and reproduce
- Over time the structure pf the population will change
- This is called evolution

Speciation

Variation

- In a population there are always sources of variation, these variations are mainly due to sexual reproduction and mutations
- A range of variation exist within the population which share a common gene pool

Isolation

- A barrier is formed dividing the population into two
- No interbreeding occurs between the two populations
- Each population has a separate gene pool
- Type of berries include, geographical, behavioural eg night or day animals, reproductive eg lion and tiger, sociocultural eg ethic group or religion

Selection

- different selection pressures occur for the two different populations over a number of generations
- This bring about change in the gene frequencies in the gene pool
- Such changes lead to the evolution of new subspecies
- Different selection pressure include , environmental, diseases, mate selection, predators

Speciation

- over a long period of time the change in the gene frequencies might be enough to prevent the reproduce of fertile offspring between the two subspecies
- When this happens the two subspecies have become two new species has they no longer can reproduce fertile offspring

6) describe how the following support the theory of evolution: fossils and comparative studies

Fossils

- shows a common ancestor as fossil evidence can show similarity between species

Comparative anatomy

- homologous structures, structure or organs that are similar but do not necessarily have the same function, suggesting a common ancestor
- Pentadactyl limb in vertebrae are an example of this
- Vestigial organs, structures of reduced size that appear to have no function

Embryology

- comparing the early stages of development
- Vertebrae all have great similarity between the species eg they all have gill pouches, tails suggest that all vertebrae developed from fish
- Over time the divergence has occurred to give as five classes, fish, reptiles, bird, mammals and humans

Protein studies

- protein consist of very long chain of amino acids
- Linking together particular amino acids in a precise sequence determined by the DNA creates these proteins
- Modern biochemical techniques enable the sequence of amino acids in a protein to be determined
- By comparing the type and sequence of the amino acids similar proteins from different species, the degree of similarity can be determined

- Animals of the same species have identical amino sequences in their proteins
- The degree of difference in proteins enables an estimate of the amount of evolution that has taken place since two species developed from a common ancestor
- The longer the period of time involved, the greater the number of amino acids that are different
- Ubiquitous protein perform very basic but essential tasks that all organisms require for life, they are found in all organisms from bacteria to humans and are completely independent of an organism specific function
- Cytochrome C is a well known example of a Ubiquitous protein that shows how protein sequence can provide evidence of evolution
- This protein perform an essential step in cellular respiration, it has appeared to have changed very little over millions of years
- Human Cytochrome C contains 104 amino acids, regardless of the species tested 37 of these have been found to be in the same position in every sequenced Cytochrome C molecule
- This suggests that these protein have descended from an ancestral Cytochrome C molecule

DNA
- the sequence of bases in the DNA of different organism varies
- New genes are gained through mutation, others are lost through natural selection, genetic drift or other processes
- Despite the common ancestor the code in the DNA is for different for different species.
- Examination of the genome can show the DA difference
- The less differences in the DNA the more closely related the species are for example humans and chimpanzees have a DNA difference of 1.2%
- Chromosomes also contain non-coding sequences in the DNA these are sometime often referred to as junk DNA as they have no apparent function and appear to be of no use to the organism. More closely related species have more junk DNA in common. This only make sense if the related species evolved from a common ancestor
- ERV's
- A polymerase chain reaction can be used to produce copies of small amount of DNA so that it can be used in the sequencing of the genome
- DNA sequencing is also facilitated buy gel electrophoresis and bacterial enzymes (restriction enzymes)

7) Explain how comparative genomics, comparative biochemistry and bioinformatics are used to provide further evidence of evolution

Comparative genomics
- the comparing of genome sequences of different species help to identify regions of similarity and differences
- Can be used to study evolutionary changes in organisms by measuring the changes in DNA
- Allows researchers to identify genes that are preserved among species as well as genes that give species its unique characteristics

Bioinformatics
- Uses of types of science including computer, statistics and applied mathematics to help understand biological processes
- Uses computers to describe molecular components of living things measuring changes in the DNA

- Provide the IT platform for the data collected by genomic
- This platform is capable of storing and managing the large amount of information collected

Biochemistry
- shows a common ancestor though compared the DNA and proteins of organism the more difference in the sequence the more distantly related

8) Understand that a phylogenetic tree can be constructed by genomic information
- a phylogenetic tree is a branching diagram or tree showing the inferred evolutionary relationships among various biological species
- It is based upon similarities and difference in their physical or genetic characteristics
- The root of the tree represents the ancestral linage and the tips of the beaches represent the descents of that ancestor

9) explain the term fossil and the problems with the fossil record

Fossil: Fossils are preserved remains or traces of once living organisms
- few organism become fossil, there is a poor probability of becoming fossilised as fossil condition must be suitable, soil layers must have minimal disturbance, more likely hard parts (very little soft tissue is fossilised)
- Incomplete fossil record, fossils need to be found, earth movement/ rock cycles may have destroyed fossils, inaccessible sites
- Classification of a species, difficult to classify a species unless you can observe interbreeding
- Different interpretation of the same evidence, scientists may make different assumption from the same evidence eg the debate of the position of Neanderthal in the human evolutionary tree

10) describe the term absolute dating and use examples
- absolute dating tells you the chronological age of an object
- Two examples of this are potassium-argon dating and radioactive carbon dating
- They are both forms of radiometric dating, this form of dating works by measuring the proportion of an original radioactive substance and its decay product
- radioisotopes are unstable and break down or decay to from more stable isotopes of another elements
- Radioisotopes emit radiation as they undergo decay which by can be measured
- Each isotope has a unique rate of decay known as its half life (the time taken for half of any given isotope to decay)

Carbon-14
- half life 5370 years
- All thing contain carbon in a known ration
- C-14 id formed in the atmosphere by the action of cosmic radiation
- Some of this is taken in by plants
- When an organism dies the C14 decays to C12 and the ratio of C14 to C12 changes
- Can only be used in organic material with that contain carbon
- Need at these 3g of a sample
- The amount of carbon in the air can vary
- Only useful up to 50000 years

Potassium argon
- half life 1.3 billion years
- K-40 decay to form Ar-40 and Ca-40
- Used in dating volcanic rocks and minerals older than 300000 years
- Only used for volcanic rocks/ash
- Must be older than 200000 to get a reading

11) Describe the term relative dating and use examples

Relative dating: compares the age of one thing with that of something else
Superstition
- unless disturbed the lower bed in a sedimentary sequence are older than the rocks above

Comparative stratigraphy
- if the sequence of sedimentary rocks in different areas is similar it is likely that they are the same age

Index fossils
- an index fossil is a fossil of a species that can be used for relative dating
- Index fossil are of distinctive appearance, have a short life span and have a broad geographical distribution
- If rocks in different location contain the same index fossils, it is likely that both area are of the same age

12) understand that human and great apes are in the same taxonomic family (hominidae)

	Pongids	Hominids	Evolutionary benefits
Head	- Face is prognathic - Foramen magnum is towards the back of the skull - 400-500cc brain capacity - Forehead is large and backward sloping - Chin is not dominant - Sagittal crest is present	- Flat face no prognathism - Foramen magnum is at the centre of the skull - 1350cc brain capacity - Forehead is vertical and small - Chin is pro dominant - Sagittal crest is not present	Skull balance of the vertebral column Smaller neck muscle as no longer need not hold up the head Enables a larger brain Less prognathism means skull has better balance
Jaw	- horse shot shaped jaw - Large canines teeth and incisors - Diastema present	- parabola shaped jaw - Even sized teeth - no diastema present	- smaller teeth allow for flatter face - Better grinding action - No diastema thus no interlocking of the jaw
Feet	- only one foot arch longitudinal - short heel - Some opposability	- two arches both longitudinal and transverse - Longer heel - Big toe not opposable	- allow for striding gait - Formation of spring - Big toe makes walking easier

	Pongids	Hominids	Evolutionary benefits
Vertebrae	- L shaped - Long square vertebrae at the neck - Higher centre of gravity	- s shaped - Large wedge shaped vertebrae - Lower centre of gravity	- allows head to balance on neck with out muscle support - Head aligns directly above the pelvis
Pelvis	- long and narrow - Angled forward - Femur is vertical	- short and broad - Tilted back bowl shaped - Femur has a carrying angle, bring knees toward central line of body, outer angle of hinge joint is stronger	- supports organs - Muscle attachment for legs
Hands	- short thumb which isn't as strong as humans - No full opposability - Power grip only - Bones of fingers curved	- longer thumb - Full opposability - Both precision and power grip - Less curved fingers	- Greater precision grip - Allows for tool making and other craftsmanship
Other	- Simple speech - Some reliance of smell - Large amount of body hair - Prenatal care 2-5 years	- complex speech - Most reliance on sight - Limited body hair - prenatal care upto 20 years	
Locomotion	- quadrupedal - Arms longer than legs - Carrying angel not present - Large scapula	- bipedal - Legs longer than arms - Carrying angle present - small scapula	

13) determine the relatedness possible evolutionary pathways for hominids using compassion

Hominid	Physical features	Lifestyle and culture	Major achievement
Australopithecines - **Afarensis** - **Paranthropus robustious**	- 450-500cc brain - Strong curved fingers and toes - Stronger thumb - Well developed brow ridges - Jaw prognathic - Arms longer than legs - Vertebrae less wedge shaped	- home bases - Hunter and forgers broad range of habitats - Mainly vegetarians - Social group	- some basic tool use (pebble tools) - Bipedal - Some precision grip

Hominid	Physical features	Lifestyle and culture	Major achievement
Homo habilis	- 600-700cc brain - Robust hands power grips - Could climb trees - Bulge in the speech area of the brain	- food gathering - At night went to trees - Shift in meeting area - Hunting/ sharing/ co-operation - Communication - Extended parental care	- first tool maker - Olden tool culture
Homo erectus	- 1000cc brain - Modern teeth - Brow ridges	- building of shelters - Better tool - Fire - Variety of hunting technique - Improved communication better language - Cooking destroyed parasites - Acheulian	- use of fire provided protection hunting - Hunting, warmth - Cooking of food - Tool of stone and bone
Homo neanderthalensis	- 1400-1500cc brain - Large occipital bun - Cheeks swept back - Heavy brow ridges - Very large flat nose - Robust but shorter than modern man	- well developed social system buried dead - Cared for disabled - Buried the dead - Co-operative hunting - Cloth marker - art/cave drawing - Perhaps belief in after life religion	- crafting adding handle to tools - More complex tools - Use of bone of stone - Mousterian tools
Homo sapiens	- 1350 cc brain - Flat face - Rounded cranium - Even sized teeth - Legs loner than arms - Carrying angle - Longer thumb - Straight finger	- live anywhere- modify the environment - Complex society - Increase in food production - Full speech/ many languages - Culture of tools include - Magdalenian - augrignacian - Solutrean	- blade/bone/antler tools - Written language - Portable art - Figurines -

14) understand that the study of the manufacturing of and the tend in the tool culture

Tool tends

- increase variety of material used pebbles, stone, bone, antler, ivory, blade
- Tool where made for specific tasks
- Tool took longer to make
- Increase in complexity
- And refinement of delicate tools
- Made by an increase in number of flakes/ blow to core

Tool culture	
Early tools Afarensis	- very basic pebble tools - Chipping stones for a cutting edge
Oldowan homo habilis	- river worn pebble that fashioned - Made with minimum flakes - Produced a core with a cutting edge - Sharp flake also used for cutting
Acheulian homo erectus	- typically tear dropped in shaped - Carefully crafted with slight budge in each broad surface - Range great in size often referred to as hand axes - Uses many more blow to make
Mousterian homo neanderthals	- flint become a sought after material it was very predictable in the way in would chip - Much finer workmanship was possible - Levullois method
Upper palaeolithic homo sapiens	- produce flint tool of make finer man workman ship using much punch blade technique - Long thin flakes were removed and shaped into tool - Other material such as ivory, none and antler was used