Fleek AESTHETICS

ANATOMY & PHYSIOLOGY

level 3

Contents: Learning Requirements

Learning Requirements

To be one of the best therapists around you need to know how the body works from the inside out and this manual has been designed to help you be the best!

You will need to read this manual thoroughly to ensure you are knowledgeable on every aspect as there will be assessments on the day of the course including written exams.
By the end of this manual you will be able as a manual therapist to accurately verbally discuss with your client what you are going to do and the likely outcomes, be able to manually deliver a therapy to your client that pin points, relieves and relaxes your clients.

Learning outcomes

The anatomy and physiology of the human body is awesome and whilst it is the same for us all it is also unique to every individual and as this course progresses you will understand what we mean!

- To understand how the anatomy and physiology of the human body works.

Learning Methods

- By the end of this manual and course you will be able to identify the various names of the anatomy, its physiology and what they all do as well as deliver all the practical techniques on clients.
- You will be continually assessed throughout the course using various methods these will be some of the following
- Written exams
- Quiz
- Oral questions
- Practical work assessments

The assessment process is continuous throughout the course by our tutors to ensure that you are fully understanding the material and techniques and able to apply them in practice.
Our tutors will ensure that you knowledge and understanding of the human body is through, safe and effective.
Certification will be based upon successful assessment of the course

Introduction – Structural Organisation Summary

There are 6 levels of structural organization:

Chemical: This includes all atoms and molecules.

- Cellular: This includes cells, made from molecules, form the basic structural and functional units of the body.
- Tissue: This includes cells of the same type make up tissue.
- Organ: This includes tissues of varying type make up an organ.
- System: This includes several organs with a common function make up a system.
- Organism: This includes all parts of the body function together to make up the organism.

To perform any effective Treatment, it is important to have a basic knowledge and understanding of the anatomy and of the following systems, and positioning of individual muscles.

• Cellular • the Muscular System • the Circulatory System • the Lymphatic System • the Nervous System • the Skeletal System • the Digestive System • the Skin The Cellular System

Anatomy and physiology are as you will hear us say many times crucial to any competent massage therapist. But before you become competent, you do need to understand how our bodies are made up and how they work so that you can then identify things such as what each muscle is called and what action/s it performs. If you are working on a client and they have a lot of tension in a particular muscle, say the neck, you will need to be able to advise where the tension is and what the likely cause of it is, for example, not doing the correct stretching exercises before and after a gym workout or only doing it for 2-3 minutes when it should be a minimum of ten minutes, or you are getting in and out of the car incorrectly, or you are at a desk every day and do not get up every hour or so to walk around stretch, worse no one has assessed your desk, chair and computer are all at the right height.

The human body is made up of billions of microscopic cells, which are the most basic living unit in the body. The human body has few cells that work independently, this is because they are all designed to function collectively. All our cells have varying shapes and structures, which are determined by their roles. However, they are all made up of the same component parts, including the cell membrane, nucleus, cytoplasm, cilia and microvilli.

The cell membrane helps to contain the contents of the cell whilst allowing products such as oxygen, nutrients and waste to pass through in both directions. The membrane itself consists of two layers of phospholipids, the tails of which are attracted to each other, forming a lipid bilayer. This has liquid qualities and the inner and outer surfaces contain floating protein molecules which act as transport channels for larger molecules.

Introduction – Structural Organisation Summary

Then you have the nucleus which controls the actions of the cells. It contains chromosomes carrying DNA which directs the cells actions. The cytoplasm refers to all of the contents of the cell except the nucleus. It contains a cytosol gel which is largely made up of water and some nutrients. This is where many of the chemical reactions take place. The cytoplasm also contains ribosomes, which produce protein, and the Golgi body is a large organelle which produces proteins and lipids. Cytoplasm also contains mitochondria, which are double membraned organelles which produce energy and are responsible for cellular respiration.

There are also single membraned organelles called lysosomes which collect and break down the waste products of the cell. The cilia are small hairs found on the surface of some cells, which beat to trap and eject dust and bacteria. The microvilli are found across the surface of the cell and are designed to increase the surface area available for absorption. Cells have a number of functions, including respiration, cellular respiration, growth, reproduction,

excretion, filtration, movement, irritability, diffusion, osmosis, and active transport. The role of the cell will depend upon where in the body it is found. During respiration, oxygen is absorbed through the cell membrane and oxidises nutrient material. Carbon dioxide is then passed out of the cell in the same way. Cellular respiration is the process of maintaining a balance of nutrients and waste within the cell so that it can function. Cell growth will take place until it reaches a state of maturity where it will then reproduce.

Once it has reached maturity that is when the cells divide through the process of mitosis. The cells in the skin reproduce when one parent cell divides to form two identical daughter cells. This ensures that each new cell is the same as the previous one, otherwise the skin would be constantly changing. The cell excretes waste products through the cell membrane whilst the process of filtration allows the movement of fluid across the membrane due to the differences in pressure inside and outside the cell.

Most cells are capable of movement either as a whole or a single part of the cell. The cell is also subject to irritability, which allows it to respond to stimuli. Diffusion takes place when chemicals become concentrated outside the cell and small molecules pass through the cell membrane until a balance is reached.

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Introduction – Structural Organisation Summary

Osmosis allows the movement of water through the cell membrane to areas of high chemical concentration in order to dilute the chemicals that cannot pass through using diffusion. Active transport allows larger molecules to cross the cell membrane against the concentration gradient. Carrier molecules bind themselves to the incoming molecules and release them into the cell. Each cell has a different life span according to its type and function.

In order to maintain the correct cellular level, each cell must reproduce in order to continue life. This reproduction takes place through the division of the cell, where identical daughter cells are created.

There are two types of cellular division: mitosis and meiosis. During mitosis, two identical daughter cells are produced to allow for growth and repair. This division is achieved through the four phases of prophase, metaphase, anaphase and telophase. When a cell reaches maturity, it is able to divide and reproduce again, thus continuing the Cycle.

In meiosis, four daughter cells are produced, each with half the number of chromosomes of the original cell. This is the process by which a new organism is formed by the fusion of a sperm and egg, as in human reproduction, producing a unique individual person. When similar cells act together to perform a specific function they become a tissue. In this tissue, the cells then divide to repair any damage that occurs to the tissue.

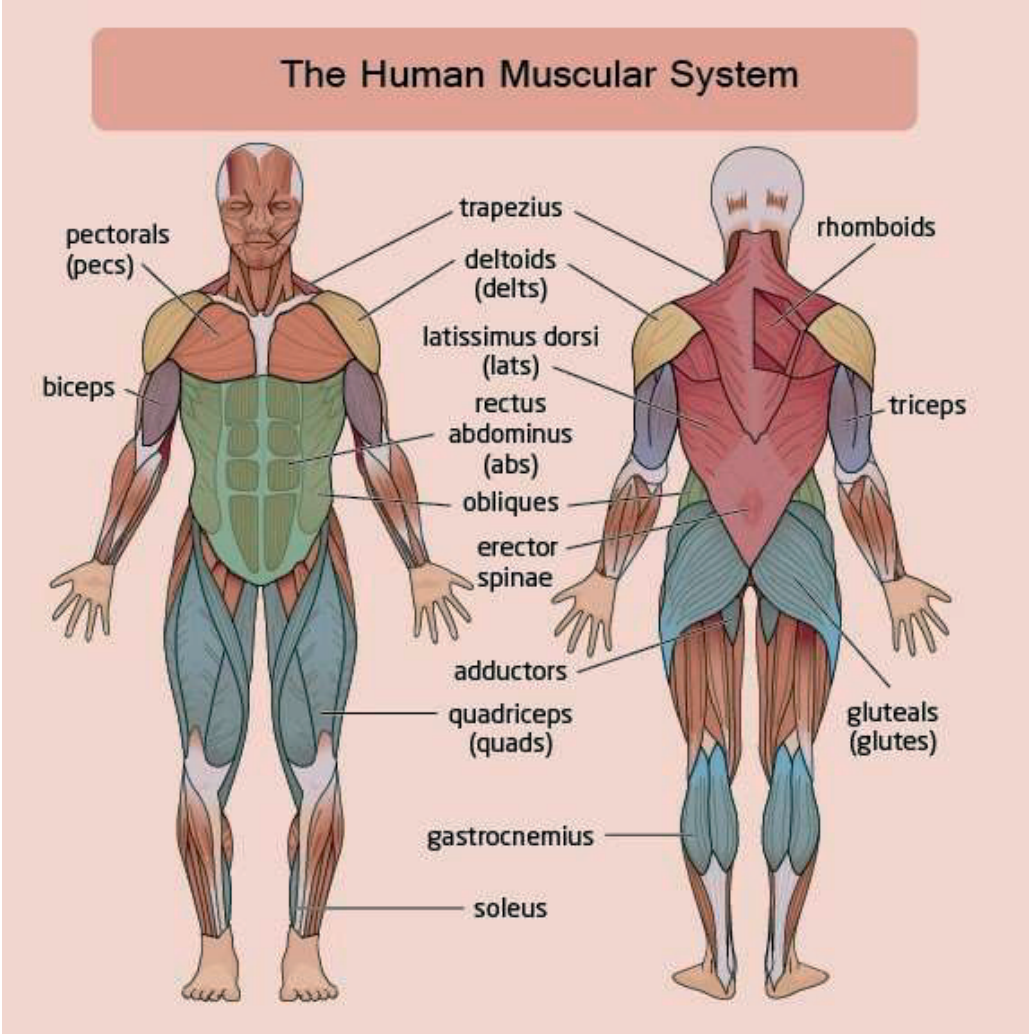
The body is made up of basic types of tissue: epithelial, connective, muscular and nervous. The epithelial tissue is used for protection, absorption and filtration by providing surfaces and linings to areas of the body, particularly hollow organs, ducts and glands. The epithelial tissue includes many different types of cell, all of which are packed tightly together and arranged in continuous sheets. These tissues receive all their nutrients and remove their waste through diffusion as they have no blood supply of their own.
The connective tissue supports and connects different parts of the body. It has different functions including storing energy reserves and helping to provide immunity. Apart from cartilage and tendons, connective tissue generally has a rich blood supply and nerve supply. Its cells are separated by protein fibres and fluid. Muscular tissue is paramount in the production of movement as it is capable of contracting, and shortening. The fibres of the muscle tissue are made up of elongated cells that provide the facility for contraction.

There are 3 types of muscular tissue.
The skeletal muscle tissue helps to maintain posture whilst the smooth muscle tissue moves substances around the body.
Cardiac muscular tissue forms the walls of the heart and is not under conscious control.
Nervous tissue is the communication system of the body, and is responsible for controlling and directing most of the processes of the body. It is primarily made up of neurons, which are nerve cells, and neuroglia which are supporting nerve cells.
Adipose tissue is made up of adipocytes, which are specialised fat storage cells. These are present within connective tissue and provide protection for nearby organs. It also helps to reduce heat loss and supply energy if a shortage occurs. It is found under the skin, supporting the organs, within yellow bone marrow and between bundles of muscle fibres..

The Muscular System

An Interesting Factoid Before We Start – In AD 130-200 there was a gentleman called Galen who it is believed is one of the first to great anatomists to number muscles. Then we have people such as versalius who did attempt to introduce nomenclature, but still used Galens method of numbering. Around the 18th century British Anatomist William Calper and Scottish Anatomist James Douglas developed the specific terminology we use today for the anatomy Ok now before we get further into this course manual it is important to note that nearly every anatomy book you read will differ in the way it describes the human body. For example most that you read will agree that a muscles primary actions are the same but some do disagree on the muscles secondary actions. It is also important to remember that we still do NOT know the human body in-depth and that new discoveries about the human body are still being made today and will continue to be in years to come as technology and understanding improve.

The muscular system helps move the body which has 639 named muscles, which make up 4050% of body weight. It's important to note that a muscles name can give you clues to the way it works and its features. The name either reflects a muscles shape or its attachment. For example, a well-known muscle is the Rhomboid, its location is temporalis. At the end of
each muscle will be a tendon which helps attach our muscle to the bone and each muscle has an insertion and origin. The Origin is the attachment to the more stationary bone while the insertion is the connection to our more mobile bone.
A human body is made up of something like six trillion muscle fibres and every one of those fibres are thinner than a human hair but what is so awesome is they can hold anything up to wait for it .....1000 times its body weight!



The Muscular System

Muscles have three main functions:

Movement, maintaining posture and the production of heat. Each movement requires the coordinated action of several muscles. The muscular system is also involved in the movement of fluids such as blood, lymph and urine. In order for you to stand upright, the fibres of some muscles create tension and rigidity. This will create heat due to the movement generated by the muscles.

Each muscle is approximately 75% water, 20% protein and 5% mineral salts, glycogen and fat.

Skeletal muscles are composed of bundles of muscles fibres called fasciculi. These bundles and muscles are surrounded by connective tissue sheaths. The epimysium is the outer layer which encircles the entire muscle. The perimysium surrounds collective bundles of muscles, whilst the endomysium surrounds the individual muscle fibre. This layer contains blood capillaries that supply blood containing oxygen and nutrients, and remove waste products. These layers extend beyond the muscle fibres and become tendons or aponeuroses and attach the muscle to bone.

The three main types of muscle are voluntary, which is mainly attached to the bone, involuntary, which is found inside the digestive and urinary tracts as well as the walls of blood vessels, and finally cardiac, which is only found in the walls of the heart. Voluntary (skeletal) muscles consist mainly of muscle fibres, each of which is enclosed in connective tissue called the endomysium. Most voluntary muscles are made up of fast-twitch fibres which react quickly but also tire easily, and slow-twitch fibres which have greater endurance. Voluntary muscles contract if a stimulus is received from a motor nerve and they are all attached to the skeleton.

Involuntary (smooth) these muscles are not under the control of a conscious part of the brain and are found in the walls of hollow organs such as the stomach. For example, is your heart voluntary or Involuntary?

These muscles are controlled by the autonomic nervous system and therefore work below the level of consciousness. The muscle cells are spindle shaped and tapered at one end, with each cell containing a central nucleus. These muscles are controlled and contract in response to nerve impulses and neurotransmitters, and some by autorhythmic cells (self excitable). The cardiac muscle contracts to create the pumping action required for blood flow. These contractions are automatic and never tire, and are regulated by nerves and hormones such as adrenaline. It is branched in structure and has discs between each muscle cell. It is an involuntary muscle, regulated by the autonomic nervous system and its own pacemaker, the sinoatrial node. It cannot work without oxygen, and a shortage will create pain, muscle spasm and cardiac arrest.

The Muscular System

Muscle attachments are known as origins and insertions. The end of the muscle closest to the centre of the body is the origin and is fixed, whilst the insertion is further away and moveable. Origins are shorter and broader, whilst insertions are longer and denser. On contraction, the insertion generally moves toward the origin. Muscle contraction is the ability to shorten and thicken. The speed at which they do this can vary depending on the type of muscle it is. Voluntary muscles move by a stimulus from the brain. Each muscle fibre is connected to a fibre of a nerve cell which ends in a motor point where the stimulus is given, like a tiny electrical current. When an impulse is received, the motor nerve fibre secretes a substance called acetylcholine which stimulates the muscle to contract.
The energy required to perform a muscle contraction comes from carbohydrates. Glucose, the smallest form of carbohydrate, is converted into glycogen which is broken down in the presence of oxygen during a contraction and energy is released enabling the muscle to move. A really good blood supply is essential if the muscles are to carry out their movements properly. A lack of oxygen and nutrients will result in muscle cramp, tiredness for example which may result in things such as say a painful spasm.

Prime Movers - these are muscles that product an actual movement when they contract. Others, synergists, work to hold a limb or area of the trunk in a fixed position which makes a more stable base for other muscles that produce movements. Usually when prime movers are contracting other muscles, called antagonists, are extending to permit the movement. Muscles can sometimes reverse their roles to act as prime movers or antagonists, i.e. the extensors and flexors of the forearm.
Muscles move bones by pulling on them, using them as levers with the joints acting as the fulcrums of these levers. By the muscles shortening, contracting and becoming thicker, movement is produced and the attachments are brought closer together. The attachment that is most fixed is known as the 'origin', and the more movable attachment as the 'insertion'. Skeletal muscles almost always act in groups rather than independently. Within a group may be prime movers, their antagonists permitting the movement, and synergists steadying the movement, all under the control of the nervous system directed by control of the brain.

Muscle Tone

At any time some fibres in a muscle are contracted whilst others are relaxed. When not enough fibres are contracted to produce movement, it allows us to maintain our posture without any effort, whether we have good or bad posture. This partial muscle contraction is called muscle tone, and the term is generally used to describe the firmness or slackness of muscle. Good muscle tone is achieved by exercise, and some massage movements, such as hacking which stretches the muscle fibres, may help to maintain the tone of superficial muscles. Clearly, massage must be prescriptive and you must always adapt to the client and their needs on that particular session, over time you as a the therapist will develop hands that are sensitive to each client's needs

Muscle Fatigue

During moderate exercise muscles are able to obtain sufficient energy aerobically or by oxidising glucose in the body. As the exercise level increase, there is not enough oxygen available and energy is then produce via glucose an aerobically, which then causes the waste product known as lactic acid to be produced. Lactic acid can build up in the muscles which will slow them down and can lead to cramping. One of the benefits of massage following exercise is it may aid the removal of lactic acid from the muscles..

Muscle Types and it's Action

Extensors Extend the limb
Flexors Allow you to flex a limb
Adductors Allow you to bend a limb towards the body
Abductors Allow you to take a limb away from the body
Sphincter Surround an orifice such as the eye socket
Supinator Turn a limb so it faces upwards
Pronator Turn a limb so it faces downwards
Rotators Rotate a limb
Deltoid Abducts the shoulder to a right angle
Bicep Allows flexion of the elbow and shoulder and supinates hand
Tricep Allows extension of the elbow and shoulder
Brachialis Allows flexion of the elbow
Trapezius Draws scapula back, braces the shoulders, pulls the occiput – extending the neck
Latissimus Dorsi Allows adduction of the shoulder, drawing the arm back and downwards
Erector Spine Keeps body in upright position and produces extension of the vertebralcolumn
Pectoralis Major Allows adduction of the shoulder, drawing the arm across the thorax
Rectus Abdominis Flexes the spine and aids respiration
External Oblique Flexes the trunk together with internal oblique
Internal Oblique Flexes trunk together with external oblique and produces rotation when used with the external oblique of the opposite side

Gluteus Maximus Extends hip joint and rotates it laterally
Gluteus Medius Abduction of the hip joint
Hamstrings Extension of the hip and flexion of the knee
Quadriceps The muscle mass forms the bulk of the anterior region of the thigh and is divided into four separate muscles:
- Rectus Femoris: flexes hip joint
- Vastus Lateralis: extends knee joint
- Vastus Medialis: extends knee joint
- Vastus Intermedius: extends the knee joint

Adductors of hip Adducts the femur
Abductors of hip Abducts the hip
Gastrocnemius Flexes foot
Soleus Flexes foot
Tibialis Anterior Allows flexion and inversion of the foot
Sternocleidomastoid Used separately it turns the head to the opposite side. Used together it flexes the neck

The Muscular System

Remember what we stated earlier, there are three types of muscular tissue; Voluntary or Striped Muscle, Involuntary or Unstriped Muscle and Cardiac Muscle?

- Voluntary or Striped Muscle

This muscle is under voluntary conscious control of the brain. It is found attached to the bones of the skeleton and this type of muscle is used in movement. These muscles are capable of doing a great deal of work, but will tire easily.

- Involuntary or Unstriped Muscle

This muscle is not under the conscious control of the brain. It is found in the wall of the alimentary canal, of blood vessels and in the uterus and bladder. These muscles cannot product strong contractions and are therefore not used for movement. They do not tire easily and are used for continuous work.

- Cardiac Muscle

These muscles are only found in the wall of the heart. They never tire and can produce the strong contractions which are required to pump the blood around the body. This is a very specialized muscle that requires large supplies of oxygen.

The Muscular System

Fleek AESTHETICS

Upper Limb Muscles:

Muscles That Act On Anterior Arm
- Deltoid (Anterior & Middle)
- Pectoralis major
- Biceps brachii
- Coracobrachalis
- Subscapularis
- Teres major
- Latissimus dorsi

Muscles That Act On Posterior Arm
- Deltoid (Posterior & Middle)
- Supraspinatus
- Infraspinatus
- Teres minor
- Triceps brachii (Long Head)

Muscles That Act On Anterior Shoulder
- Serratus anterior
- Pectoralis minor

Muscles That Act On Posterior Shoulder
- Levator scapulae
- Trapezius
- Rhomboids major
- Rhomboids minor

Muscles That Act On Anterior Forearm
- Biceps brachii
- Brachialis
- Brachioradialis
- Pronator teres

Muscles That Act On Posterior Forearm
- Triceps brachii (Long Head)
- Triceps brachii (Medial Head)
- Triceps brachii (Lateral Head)
- Anconeus

Muscles That Act On Anterior Wrist/Hand
- Flexor carpi radialis
- Palmaris longus
- Flexor carpi ulnaris
- Flexor digitorum superficialis

Muscles That Act On Posterior Wrist/Hand
- Extensor carpi radialis longus
- Extensor carpi radialis brevis
- Extensor digitorum
- Extensor carpi ulnaris

Lower Limb Muscles:

Muscles That Act On Anterior Thigh
- Iliacus
- Psoas major
- Tensor Fasciae Latae
- Sartorius
- Rectus femoris
- Pectineus
- Adductor longus
- Adductor brevis
- Adductor magnus
- Gracilis

Muscles That Act On Posterior Thigh
- Gluteus maximus
- Gluteus medius
- Gluteus minimus
- Piriformis
- Quadratus Femoris
- Biceps Femoris (Long Head)
- Semimembranosus
- Semitendinosus

Muscles That Act On Anterior Leg
- Rectus Femoris
- Sartorius
- Gracilis
- Vastus Lateralis
- Vastus Medialis
- Vastus Intermedius

Muscles That Act On Posterior Leg
- Semimembranosus
- Semitendinosus
- Biceps Femoris (Long Head)
- Biceps Femoris (Short Head)
- Gastrocnemius
- Plantaris
- Popliteus

Muscles That Act On Ankle/Foot
(from anterior leg compartment)
- Tibialis Anterior
- Extensor Digitorum Longus
- Extensor Hallucis Longus
- Fibularis (Peroneus) Tertius

Muscles That Act On Ankle/Foot
(from posterior leg compartment)
- Gastrocnemius
- Soleus
- Plantaris
- Flexor Hallucis Longus
- Flexor Digitorum Longus
- Tibialis Posterior

Muscles That Act On Ankle/Foot:
(from lateral leg compartment)
- Fibularis (Peroneus) longus
- Fibularis (Peroneus) brevis

Actions of Major Muscles of Head & Neck

Type of Muscle	Muscle Action
Frontalis & Occipitalis	Muscles of Facial Expression: Raise the eyebrows
Obicularis Oculi	Muscle of Facial Expression: Blink and closes the eye
Temporalis	Muscle of Mastication: Closes jaw
Levator Labil Superioris	Muscle of Facial Expression: Dilates nostril and elevates upper lip
Sternocleidomastoid	Muscle that Moves the Head: Flexes neck, rotates head
Zygomaticus Minor & Major	Muscles of Facial Expression: Raises the corners of the mouth
Splenius Capitis	Muscle that Moves the Head: Rotate head, move to one side, holds
Obicularis Oris	Muscle of Facial Expression: Closes and protrudes lip
Trapezius	Muscles that Move the Shoulder: Raises arm, lower, rotate and pulls scapula medially
Masseter	Muscle of Mastication: Closes jaw
Platysma	Muscle of Facial Expression: Draws mouth downward

The Tongue

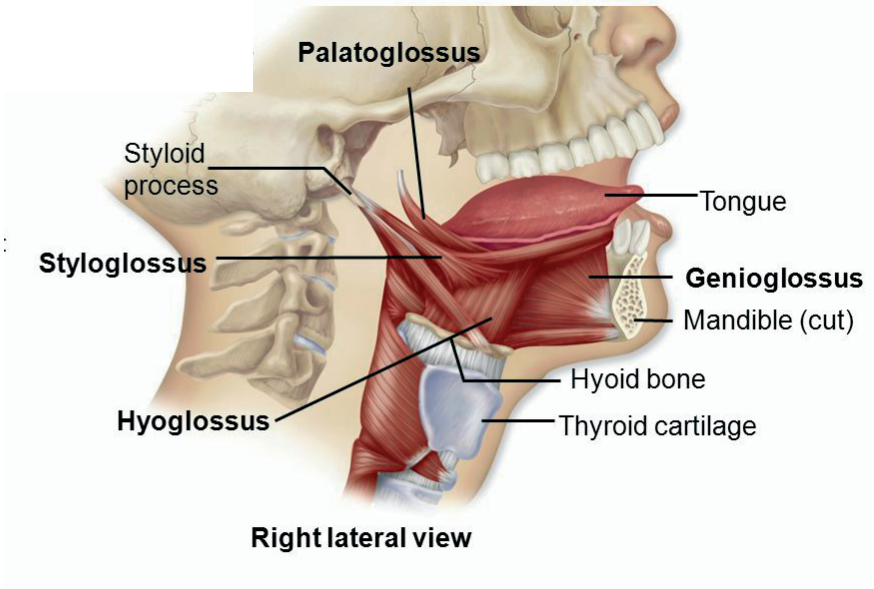
Have you heard the saying the tongue is the strongest muscle in the body?

Well yes, it is an incredibly strong set of muscles and is the only muscle in the body that is not attached to a bone.
We say set of strong of muscles because there are in fact 8 muscles in the tongue :0
They are classed as either intrinsic or extrinsic
The four muscles in the intrinsic group are where the tongue originates and insert within the tongue, running along its length. They are the superior longitudinal muscle, the inferior longitudinal muscle, the vertical muscle, and the transverse muscle. These muscles alter the shape of the tongue by lengthening and shortening it, curling and uncurling its apex and edges as in tongue rolling, and flattening and rounding its surface. This provides shape and helps facilitate speech, swallowing, and eating.

The superior longitudinal muscle runs along the upper surface of the tongue under the mucous membrane, and elevates, assists in retraction of, or deviates the tip of the tongue. It originates near the epiglottis, at the hyoid bone, from the median fibrous septum.
The inferior longitudinal muscle lines the sides of the tongue, and is joined to the styloglossus muscle.
The vertical muscle is located in the middle of the tongue, and joins the superior and inferior longitudinal muscles.
The transverse muscle divides the tongue at the middle, and is attached to the mucous membranes that run along the sides. Extrinsic Muscles

The four extrinsic muscles originate from bone and extend to the tongue. They are the genioglossus, the hyoglossus (often including the chondroglossus) the styloglossus, and the palatoglossus. Their main functions are altering the tongue's position allowing for protrusion, retraction, and side-to-side movement.(5)
The genioglossus arises from the mandible and protrudes the tongue. It is also known as the tongue's "safety muscle" since it is the only muscle that propels the tongue forward.
The hyoglossus, arises from the hyoid bone and retracts and depresses the tongue. The chondroglossus is often included with this muscle.
The styloglossus arises from the styloid process of the temporal bone and draws the sides of the tongue up to create a trough for swallowing.
The palatoglossus arises from the palatine aponeurosis, and depresses the soft palate, moves the palatoglossal fold towards the midline, and elevates the back of the tongue during swallowing

Lateral view of the tongue, with extrinsic muscles



Right lateral view

The Structure of the Tongue

The tongue is a muscular hydrostat that forms part of the floor of the oral cavity. The left and right sides of the tongue are separated by a vertical section of fibrous tissue known as the lingual septum. This division is along the length of the tongue save for the very back of the pharyngeal part and is visible as a groove called the median sulcus.
The human tongue is divided into anterior and posterior parts by the terminal sulcus which is a V-shaped groove. The apex of the terminal sulcus is marked by a blind foramen, the foramen cecum, which is the remnant of median thyroid diverticulum in early embryonic development.
The anterior oral part is the visible part situated at the front and makes up roughly two-thirds the length of the tongue. The posterior pharyngeal part is the part closest to the throat, roughly one-third of its length. These parts differ in terms of their embryological development and nerve supply.
The anterior tongue is, at its apex (or tip), thin and narrow, it is directed forward against the lingual surfaces of the lower incisor teeth. The posterior part is, at its root, directed backward, and connected with the hyoid bone by the hyoglossi and genioglossi muscles and the hyoglossal membrane, with the epiglottis by three glossoepiglottic folds of mucous membrane, with the soft palate by the glossopalatine arches, and with the pharynx by the superior pharyngeal constrictor muscle and the mucous membrane. It also forms the anterior wall of the oropharynx.
The average length of the human tongue from the oropharynx to the tip is 10 cm. The average weight of the human tongue from adult males is 70g and for adult females 60g.

In phonetics and phonology, a distinction is made between the tip of the tongue and the blade (the portion just behind the tip). Sounds made with the tongue tip are said to be apical, while those made with the tongue blade are said to be laminal.

The Surface of the Tongue

The upper surface of the tongue is called the dorsum, and is divided by a groove into symmetrical halves by the median sulcus. The foramen cecum marks the end of this division (at about 2.5 cm from the root of the tongue) and the beginning of the terminal sulcus. The foramen cecum is also the point of attachment of the thyroglossal duct and is formed during the descent of the thyroid diverticulum in embryonic development.

The terminal sulcus is a shallow groove that runs forward as a shallow groove in a V shape from the foramen cecum, forwards and outwards to the margins (borders) of the tongue. The terminal sulcus divides the tongue into a posterior pharyngeal part and an anterior oral part.
The pharyngeal part is supplied by the glossopharyngeal nerve and the oral part is suppled by the lingual nerve (a branch of the mandibular branch (V3) of the trigeminal nerve) for somatosensory perception and by the chorda tympani (a branch of the facial nerve) for taste perception.
Both parts of the tongue develop from different pharyngeal arches.

The Structure of the Tongue

Nerve supply

Innervation of the tongue consists of motor fibers, special sensory fibers for taste, and general sensory fibres for sensation.
Motor supply for all intrinsic and extrinsic muscles of the tongue is supplied by efferent motor nerve fibers from the hypoglossal nerve (CN XII), with the exception of the palatoglossus, which is innervated by the vagus nerve (CN X).
Innervation of taste and sensation is different for the anterior and posterior part of the tongue because they are derived from different embryological structures (pharyngeal arch 1 and pharyngeal arches 3 and 4, respectively).
Anterior two thirds of tongue (anterior to the vallate papillae):
Taste: chorda tympani branch of the facial nerve (CN VII) via special visceral afferent fibres
Sensation: lingual branch of the mandibular (V3) division of the trigeminal nerve (CN V) via general somatic afferent fibres Posterior one third of tongue:
Taste and sensation: glossopharyngeal nerve (CN IX) via a mixture of special and general visceral afferent fibres Base of tongue Taste and sensation: internal branch of the superior laryngeal nerve (itself a branch of the vagus nerve, CN X)

The Micro-Anatomy of the Tongue

The upper surface of the tongue is covered in masticatory mucosa a type of oral mucosa which is of keratinized stratified squamous epithelium. Embedded in this are numerous papillae that house the taste buds and their taste receptors. The lingual papillae consist of filiform, fungiform, vallate and foliate papillae. and only the filiform papillae are not associated with any taste buds.
The tongue can also divide itself in dorsal and ventral surface. The dorsal surface is a stratified squamous keratinized epithelium which is characterized by numerous mucosal projections called papillae. The lingual papillae covers the dorsal side of the tongue towards the front of the terminal groove . The ventral surface is stratified squamous non-keratinized epithelium which is smooth.

How the TongueDevelops

The tongue begins to develop in the fourth week of embryogenesis from a median swelling,the median tongue bud known as the tuberculum impar, of the first pharyngeal arch. In the fifth week a pair of lateral swellings, the lateral lingual swellings (distal tongue buds) one on the right side and one on the left, form on the first pharyngeal arch. These lingual swellings quickly expand and cover the tuberculum impar and continue to develop through prenatal development. They form the anterior part of the tongue that makes up two thirds of the length of the tongue. The line of their fusion is marked by the median sulcus.
In the fourth week a swelling appears from the second pharyngeal arch, in the midline, called the copula. During the fifth and sixth weeks the copula is overgrown by a swelling from the third and fourth arches (mainly from the third arch) called the hypopharyngeal eminence, and this develops into the posterior part of the tongue (the other third). The hypopharyngeal eminence develops mainly by the growth of endoderm from the third pharyngeal arch. The boundary between the two parts of the tongue, the anterior from the first arch and the posterior from the third arch is marked by the terminal sulcus. The terminal sulcus is shaped like a V with the tip of the V situated posteriorly. At the tip of the terminal sulcus is the foramen caecum, which is the point where the embryological thyroid begins to descend.

The Structure of the Tongue

Function

Taste - Chemicals that stimulate taste receptor cells are known as tastants. Once a tastant is dissolved in saliva, it can make contact with the plasma membrane of the gustatory hairs, which are the sites of taste transduction.
The tongue is equipped with many taste buds on its dorsal surface, and each taste bud is equipped with taste receptor cells that can sense particular classes of tastes. Distinct types of taste receptor cells respectively detect substances that are sweet, bitter, salty, sour, spicy, or taste of umami. Umami receptor cells are the least understood and accordingly are the type most intensively under research.

Mastication

The tongue is an important accessory organ in the digestive system. The tongue is used for crushing food against the hard palate, during mastication and manipulation of food for softening prior to swallowing. The epithelium on the tongue's upper, or dorsal surface is keratinised. Consequently, the tongue can grind against the hard palate without being itself damaged or irritated.

Speech

The intrinsic muscles of the tongue enable the shaping of the tongue which facilitates speech.

Intimacy

The tongue has a role in physical intimacy and sexuality. The tongue is part of the erogenous zone of the mouth and can be employed in intimate contact as in the French kiss.

Some interesting facts (don't worry this bit is not in an exam)

Clinical significance~Disease

Tongue disease

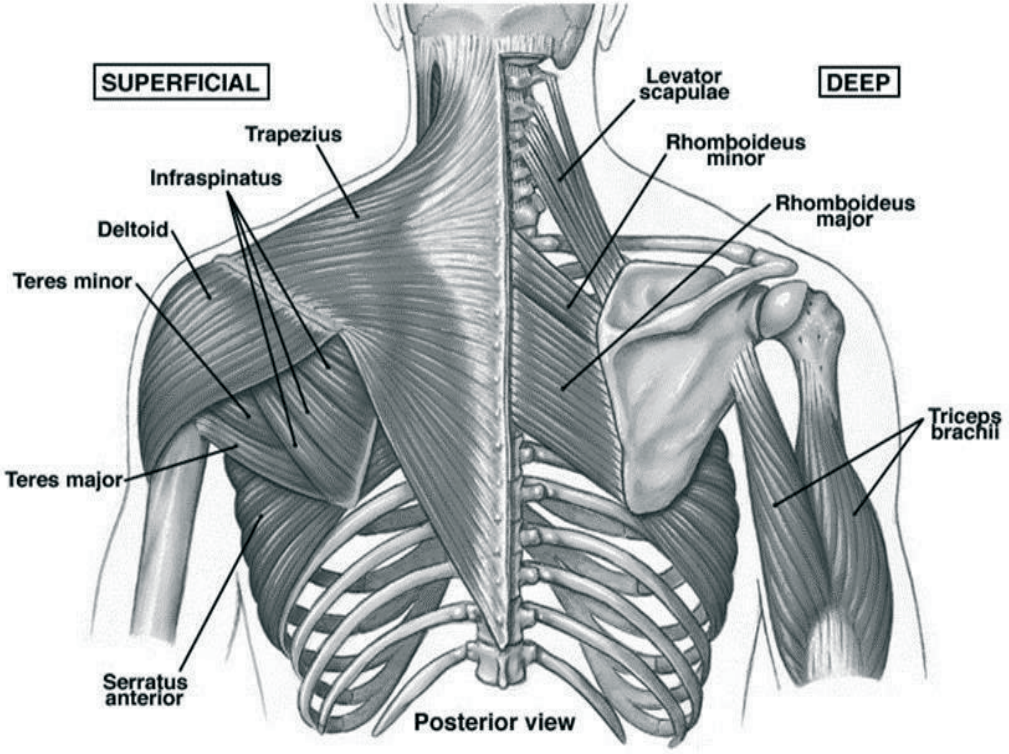
A congenital disorder of the tongue is that of ankyloglossia also known as tongue-tie. The tongue is tied to the floor of the mouth by a very short and thickened frenulum and this affects speech, eating, and swallowing.
The tongue is prone to several pathologies including glossitis and other inflammations such as geographic tongue, and median rhomboid glossitis; burning mouth syndrome, oral hairy leukoplakia, oral candidiasis (thrush) and black hairy tongue.
There are several types of oral cancer that mainly affect the tongue. Mostly these are squamous cell carcinomas.
Food debris, desquamated epithelial cells and bacteria often form a visible tongue coating.
This coating has been identified as a major contributing factor in bad breath (halitosis), which can be managed by using a tongue cleaner.

Medication delivery

The sublingual region underneath the front of the tongue is an ideal location for the administration of certain medications into the body. The oral mucosa is very thin underneath the tongue, and is underlain by a plexus of veins. The sublingual route takes advantage of the highly vascular quality of the oral cavity, and allows for the speedy application of medication into the cardiovascular system, bypassing the gastrointestinal tract. This is the only convenient and efficacious route of administration (apart from Intravenous therapy) of nitroglycerin to a patient suffering chest pain from angina pectoris.

Actions of Major Muscles of the Back & Shoulders

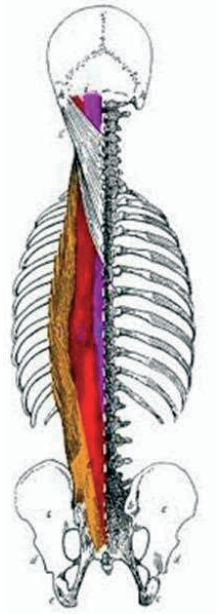
Muscle	Type of Muscle	Action
Levator Scapulae	Muscle that moves the Shoulder	Elevates scap
Rhomboid Minor & Major	Muscles that moves the Shoulder	Raises and adducts scap
Triceps Brachil	Muscle that moves the Arm	Extends the elbow
Serratus Anterior	Muscle that moves the Shoulder	Helps to stabilise the scapula and assists in rotating scapula upward
Teres Major	Muscle that moves the Arm and Shoulder	Extends humerus, adducts and
Teres Minor	Muscle that moves the Arm and Shoulder	Rotates arm laterally
Deltoid	Muscle that moves the Arm	Abducts humerus, rotates humerus laterally and medially
Infraspinatus	Muscles that moves the Arm	Rotates arm laterally
Trapezius	Muscle that moves the Shoulder	Raises arm, lowers, rotates and pulls scapula medially



Actions of Major Muscles of the Back & Shoulders

Erector Spinae:

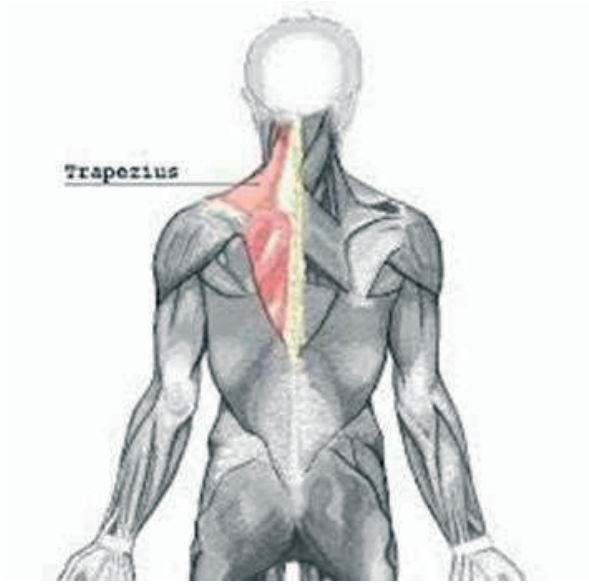
Three bands of muscle that lie in the groove between the vertebral column and the ribs



- Attaches to the sacrum, iliac crest of pelvis at one end to the ribs, transverse and spinous processes of the vertebrae and the occipital bone at the other end.
- Extends, side flexion and rotation of the vertebral spine

Trapezius: Large triangular shaped muscle in the upper back. Fibres are arranged in three groups – upper, middle and lower

Trapezius

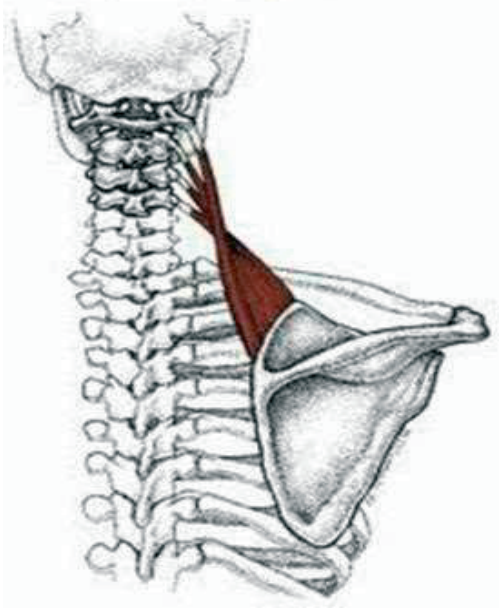


- Extends horizontally from the base of the skull, the cervical and thoracic vertebrae to the scapulae
- Upper fibres raise the shoulders
- Middle fibres pull the scapula towards the spine
- Lower fibres draw the shoulders downwards

Actions of Major Muscles of the Back & Shoulders

Levator Scapula:

Long strap-like muscle that runs almost vertically through the neck



- From the scapula to the cervical vertebrae of the neck
- Elevates and adducts the scapula (draws scapula toward spine)

Rhomboids:

Between the scapula

- Attaches to the upper thoracic vertebrae at one end and the medial border of the scapula at the other
- Adducts the scapula (draws it towards the spine)

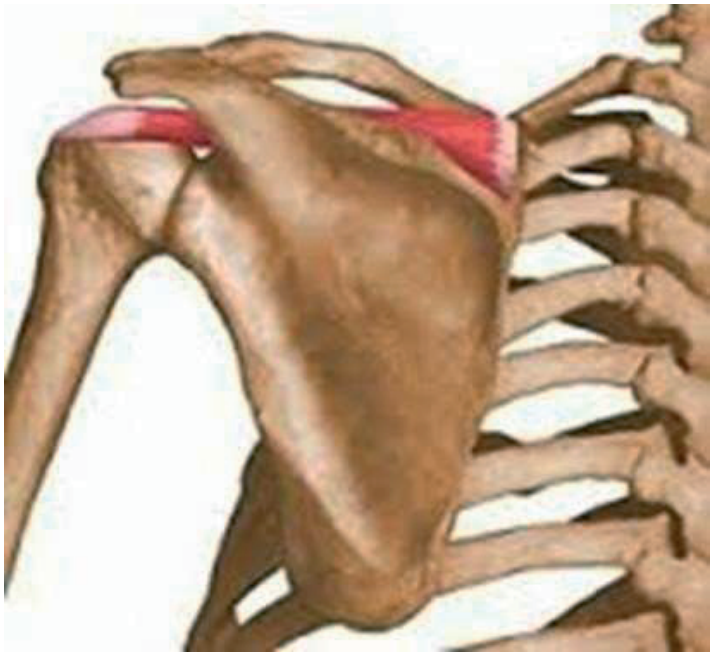
Supraspinatus:

Actions of Major Muscles of the Back & Shoulders

Fleek AESTHETICS

Supraspinatus:

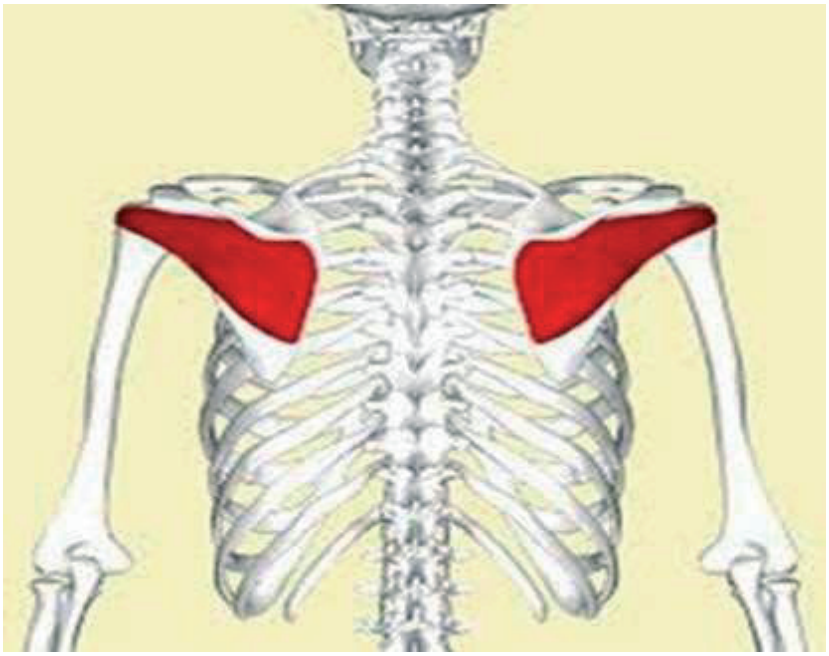
In the depression above the spine (top ridge) of the scapula



- Attaches to the spine of the scapula at one end and the humerus at the other end
- Abducts the humerus (draws the arm away from body)

Infraspinatus:

Below the spine (top ridge) of the scapula



- Attaches to the middle two-thirds of the scapula at one end and the top of the humerus at the other
- Rotates the humerus laterally (outwards)

Actions of Major Muscles of the Back & Shoulders

Fleek AESTHETICS

Teres Major:

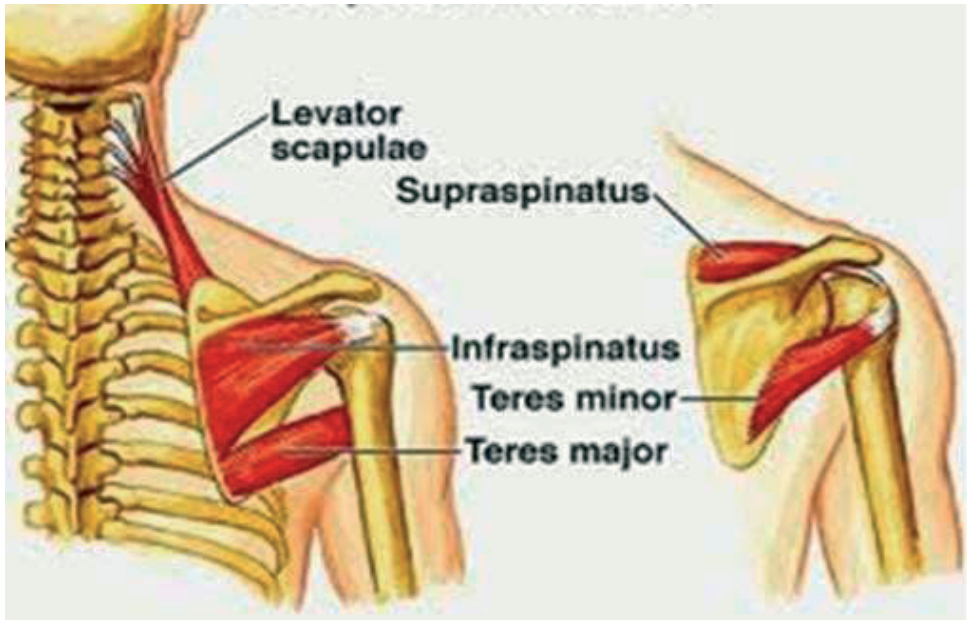
Across the bottom lateral (outer) edge of the scapula

- Attaches to the bottom lateral (outer) edge of the scapula at one end and the back of the humerus at the other
- Adducts and medially (inwards) rotates humerus

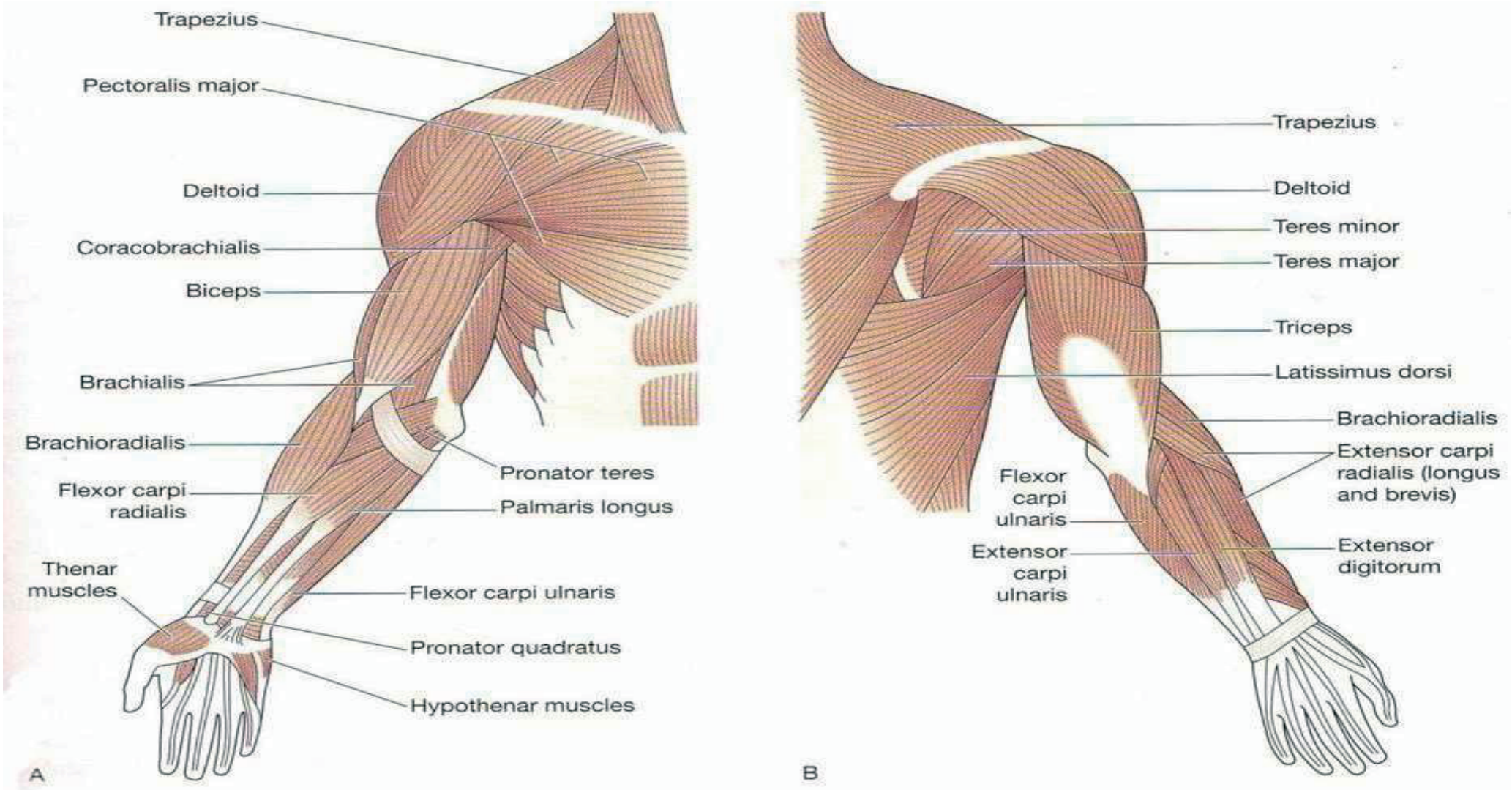
Teres Minor:

Across the lateral edge of the scapula above teres major

- Attaches to the lateral (outer) edge of the scapula, above teres major at one end, and into the top of the posterior of the humerus at the other end
- Rotates humerus laterally (outwards)



Muscles of Upper Limb



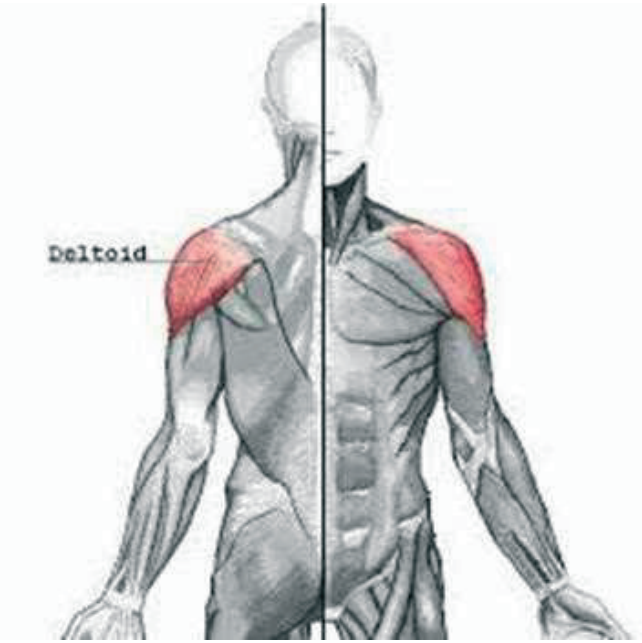
The main muscles of the shoulder and upper limb. A: anterior view. B: posterior view.

Muscles of Upper Limb

Fleek AESTHETICS

Deltoid:

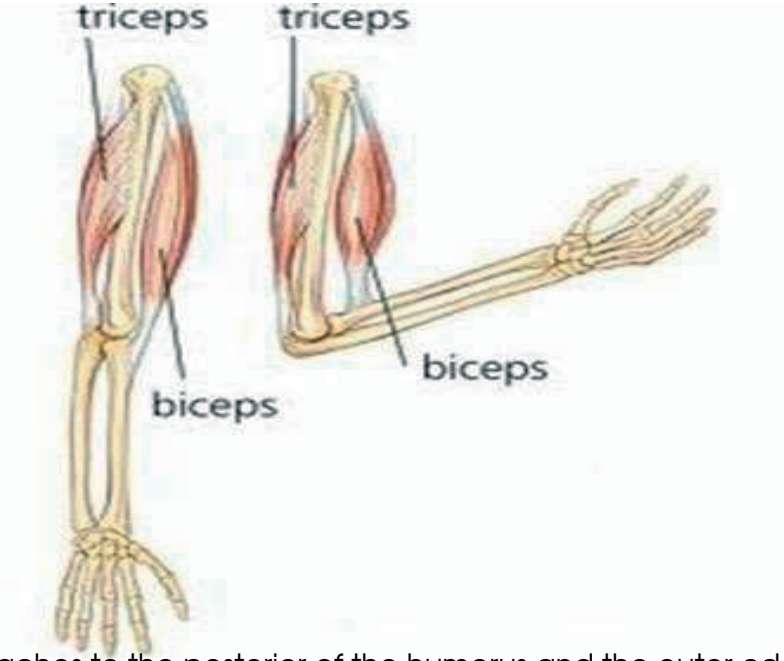
Caps the top of the humerus and the shoulder



- Attaches to the clavicle and the spine of the scapula at one end and to the side of the humerus at the other
- Abducts the arm (draws it away from the body)
- Draws the arm backwards and forwards Biceps: Front of the upper arm
- Attaches to the scapula at one end and the radius and flexor muscles of the forearm at the other
- Flexes the forearm

Triceps:

Back of the humerus

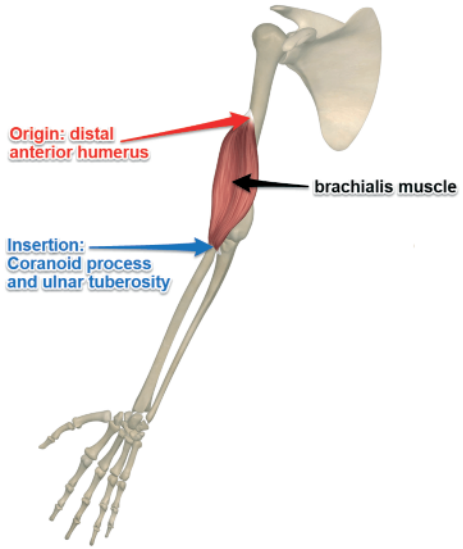


- Attaches to the posterior of the humerus and the outer edge of the scapula at one end, to the ulna below the elbow at the other
- Straightens the forearm

Muscles of Upper Limb

Brachialis:

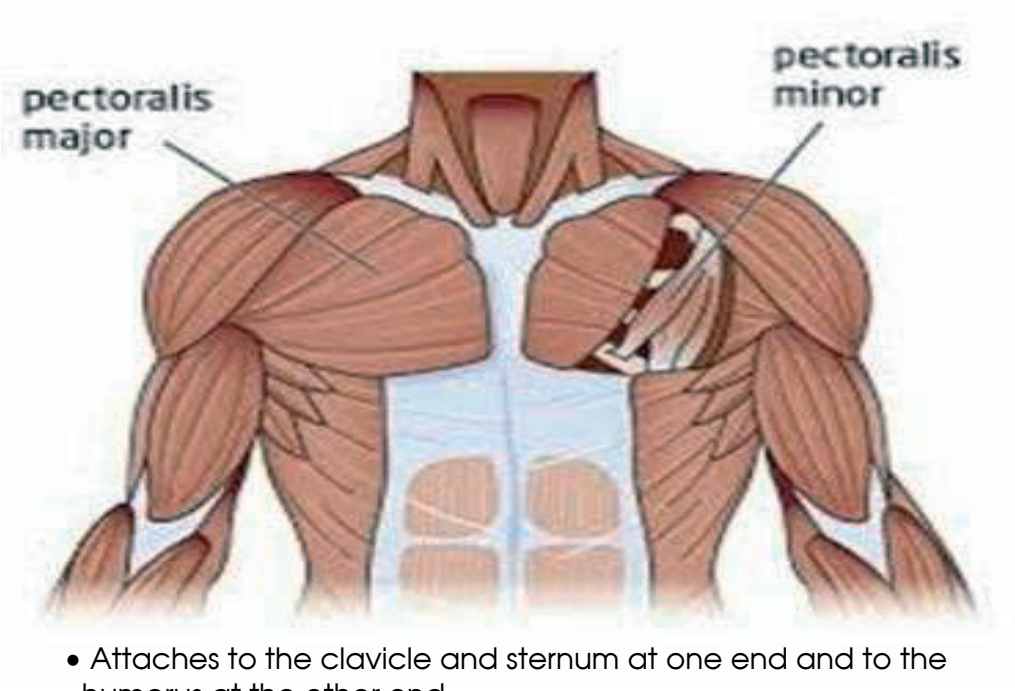
Lies beneath the biceps muscle



- Attaches to the distal half of the anterior surface of the humerus at one end and the ulna to the other
- Flexes the arm

Pectoralis Major:

Covers the front of the upper chest



- Attaches to the clavicle and sternum at one end and to the humerus at the other end
- Adducts the arm medially (inward) and rotates the arm

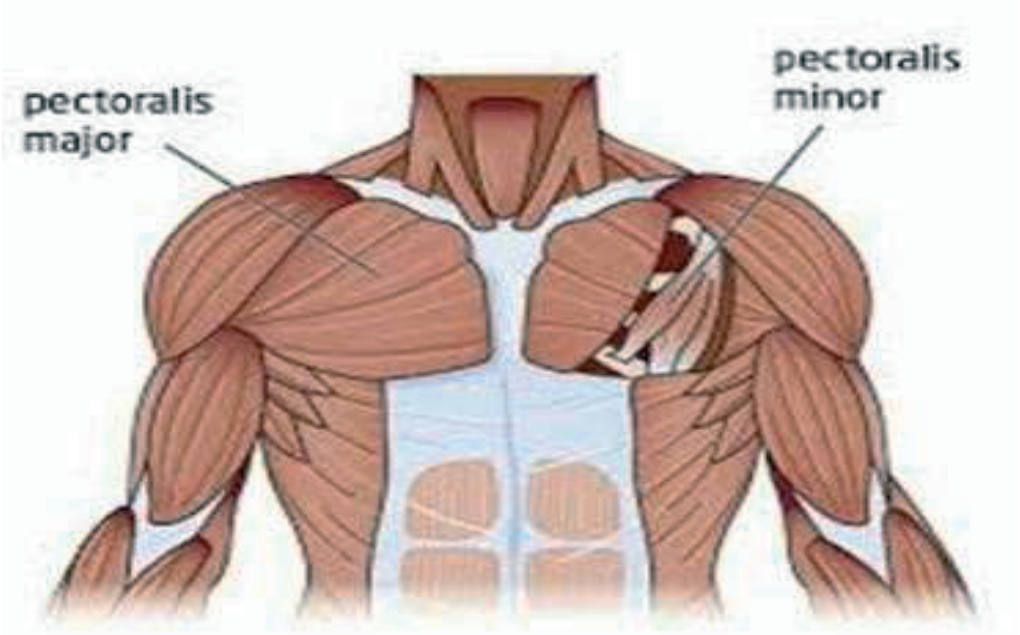
Pectoralis Minor: Thin strap-like muscle that lies beneath the pectoralis major.

- Attaches from the upper ribs at one end to the scapula at the other
- Draws shoulders downwards and forwards

Muscles of Upper Limb

Pectoralis Minor:

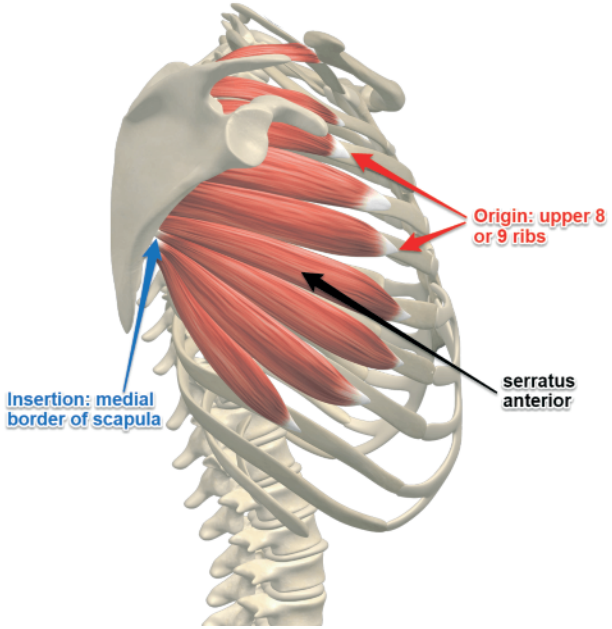
Thin strap-like muscle that lies beneath the pectoralis major.



- Attaches from the upper ribs at one end to the scapula at the other
- Draws shoulders downwards and forwards

Serratus Anterior:

Situated on the side of the chest/rib cage



- Attaches to the outer surface of the upper 8th of 9th rib at one end to the inner surface of the scapula, along the medial edge nearest the spine
- Pulls the scapula downwards and forwards

Assignment One

Please explain about the various muscles groups and what they do please ensure that the assignment is a minimum of 400 words

The Circulatory System

The main function of the circulatory system is to transport food and oxygen to all of the cells in the body. It also plays a large part in maintaining the body's hydric balance and metabolism, and it also provides a vital defence against infection. All of these functions occur via the network of arteries, veins and small capillary vessels.

All arteries, except the pulmonary artery and its branches, carry oxygenated blood from the heart, or serve as distributors carrying the blood to the capillaries.

The vein's function is simply to collect; it returns the de-oxygenated blood from the capillaries to the heart.

The capillaries allow the exchange of tissue fluids to occur and essential nutrients to reach the cells of the body. Their walls are made up of a single layer of endothelial cells which allow water, minerals, oxygen, glucose, vitamins, glycerol, amino acids and other substances to pass through to the cells of the body. Similarly, it allows waste to be carried away through the capillary network.

The heart acts as a pump, keeping the blood moving to meet our physical demands. The heart rate is the number of beats per minute. The average resting male rate is 70 beats per minute (bpm), whilst the average resting female rate is 75bpm.

In pulmonary circulation, the right side of the heart receives deoxygenated blood and pumps it to the lungs for oxygenation. The left side of the heart receives oxygenated blood from the lungs and pumps it to the rest of the body; this is known as systemic circulation. The heart requires its own blood supply in which oxygenated blood flows from the left ventricle to the ascending aorta. This splits between the right and left coronary aorta, which in turn feed into the heart tissue. Deoxygenated blood is directed from the heart to the coronary sinus before entering the right atrium. This is known as coronary circulation. The contracting rhythm of the cardiac cells needs to be controlled so that the heart functions in a co-ordinated manner. This control comes from the autorhythmic cells and the sinoatrial node, the heart's pacemaker. The rate of the heartbeat is also controlled by the autonomic nervous system and some hormones.

The circulatory system works to keep the capillaries supplied with the required amount of blood for its needs.

Blood pressure is the force exerted by the blood on the walls of a vessel. It is this which keeps the blood moving, and comes about from the contractions of the left ventricle.

So as the blood moves further away from the left ventricle, the pressure falls. The beating of the heart and the circulation can be measured by the pulse, which is a pressure wave felt in the arteries. This wave corresponds to the beating of the heart, and can be felt at any point where an artery lies near the surface.

There are a variety of vessels that pump blood from the heart around the body, and they form a closed system of tubes. These either carry blood away from the heart and take the form of arteries and arterioles and branch through tissues as capillaries, or carry blood towards the heart as veins and venules.

Arteries are large triple-walled vessels with a hollow centre through which blood flows. The artery walls consist of an outer layer of fibrous tissue called the tunica adventitia, a middle layer of smooth muscle and elastic tissue called tunica media and an inner layer of squamous epithelium known as the tunica intima. They carry blood away from the heart to provide tissues and organs with oxygen and nutrients.

The Circulatory System

Elastic arteries such as the aorta have thin walls, and their tunica media has more elastic fibres than muscle fibres, so that they can stretch and recoil as the blood flows from the heart to smaller arteries. Another type of artery is the muscular artery; the brachial artery is an example of a muscular artery.
Muscular arteries are medium sized and their tunica media has more smooth muscle fibres making the walls thick and capable of greater vasodilation and vasoconstriction, or expansion and contraction.
Once the blood has flowed from the arteries into the arterioles it moves into the capillaries. These are the smallest of the blood vessels and the only ones to have semi-permeable walls, meaning they have gaps in them. It is here where oxygen and nutrients can pass into the tissues surrounding them in exchange for carbon dioxide and waste.
Interstitial fluid is the intermediary that allows this exchange to take place. The capillaries are microscopic vessels that passes through the tissues and connects the arterioles and venules.
This is known as microcirculation. Vasoconstriction and vasodilation enable the capillaries to help adjust body temperature as these processes alter blood flow.
The walls of the capillaries are made up of a single layer of endothelium and a basement membrane which allows nutrients, oxygen and waste to pass between the interstitial fluid.
Veins have a similar structure to the arteries, however, they have thinner walls due to lower levels of muscle and elastic tissue. Some veins also have valves similar to those in the heart which prevent backflow.

Blood Circulation And The Arteries Of The Thorax

The thoracic aorta has branches of arteries that supply the thorax and are divided into two groups. The visceral branches are arteries that feed the viscera, the internal organs of the body.
These include the pericardial arteries which supply the pericardium, the bronchial arteries which supply the lungs, the oesophageal arteries which supply the oesophagus and the mediastinal arteries which supply the mediastinum.
The mediastinum is a group of structures in the thorax surrounded by loose connective tissue.
It is the central compartment of the thoracic cavity. It contains the heart, the great vessels of the heart, oesophagus, trachea, phrenic nerve, cardiac nerve, thoracic duct, thymus, and lymph nodes of the central chest.
The parietal branches feed the wall structures and consist of the posterior intercostal and subcostal arteries; they supply muscles and the skin of the thorax, vertebral canal and mammary glands.
The superior phrenic arteries supply the diaphragm. The thorax is drained by a network of veins including the azygos, hemizygous and accessory hemizygous collectively called the azygos system. This system receives blood from the parietal and visceral branches of the thoracic aorta. The azygos feeds the superior vena cava or brachiocephalic veins. The abdominal aorta has paired and unpaired branches that supply the abdominopelvic region and are divided into two groups.

The Circulatory System

The visceral branches that serve the internal organs of the body are the coelic artery which divides into three branches:
1. Common hepatic artery which supplies the liver, gall bladder, sections of the stomach, pancreas and duodenum
2. Left gastric artery which supplies the stomach
3. Splenic artery which supplies the spleen, pancreas and stomach.

The superior and inferior mesenteric arteries supply the small and large intestines. Suprarenal arteries supply the adrenal glands, renal arteries supply the kidneys and gonadal arteries supply the gonads.
The parietal branches that supply the structures of the body walls include the inferior phrenic arteries which supply the diaphragm, lumbar arteries which supply the spinal cord and muscles of the lumbar region and median sacral arteries which supply the coccyx, sacrum and rectum.
The blood from the abdomen returns to the heart through the inferior vena cava, which receives blood from smaller veins carrying blood from the branches of the abdominal aorta.
Blood from the digestive organs passes through the liver before draining into the hepatic veins and into the inferior vena cava. The right and left common iliac veins drain blood from the lower limbs and unite to form the inferior vena cava.
It is important to always remember that massage movements are performed with pressure being directed toward the heart following venous flow at all times. This helps improve your client's blood circulation and the components of blood reach their destinations more quickly with waste being removed more efficiently.

The whole bodies' circulatory system transports blood via blood vessels to all the bodily systems. The blood is made up of three different types of blood cells these are:
- Erythrocytes – red blood cells
- Leucocytes – white blood cells
- Thrombocytes – platelets

The Circulatory System

Functions of the Blood

The circulatory system works to keep the capillaries supplied with the required amount of blood for its needs.
- The blood carries oxygen to the cells
- Blood transports hormones
- Blood carries nutrients
- Blood removes waste products
- Aids regulation of body temperature
- Carries white cells and antibodies to fight infection
- Has a clotting mechanism to protect the body Venous Drainage from the Head and Neck.

There are three main veins responsible for draining blood from the head and neck these are:

- External Jugular Vein

These veins are smaller than the internal jugular veins. They get the blood from the superficial regions of the face, scalp and neck, the external jugular veins go down on either side of the neck. They empty into the right and left subclavian veins in the base of the neck.

- Internal Jugular Vein

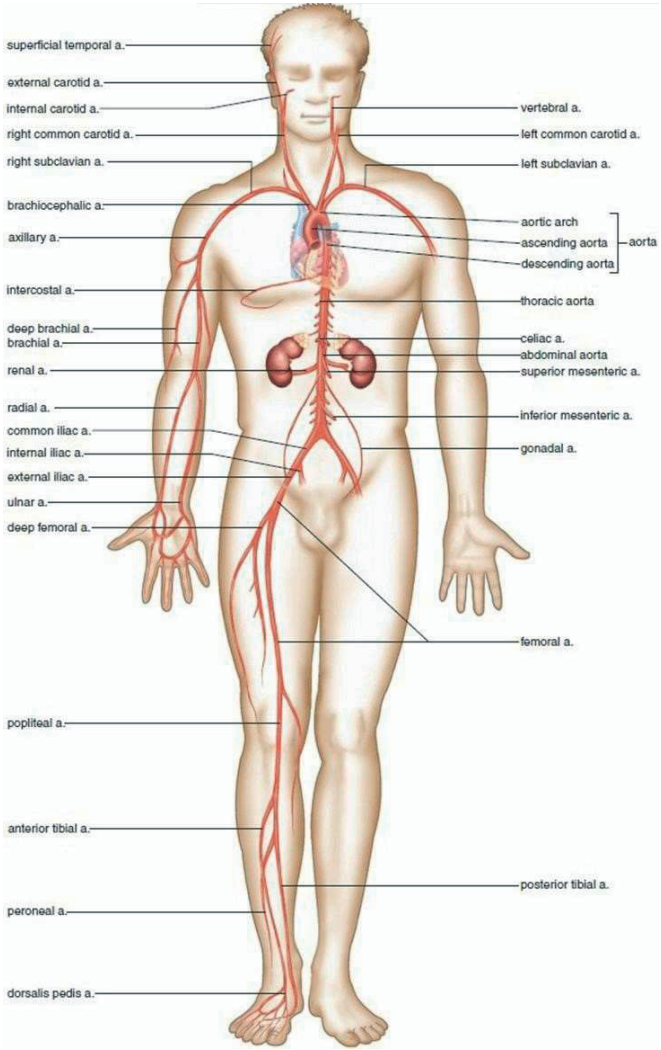
These are the major drainage veins of the head and neck and are deep veins that lie alongside the carotid artery.

- The Vertebral Veins

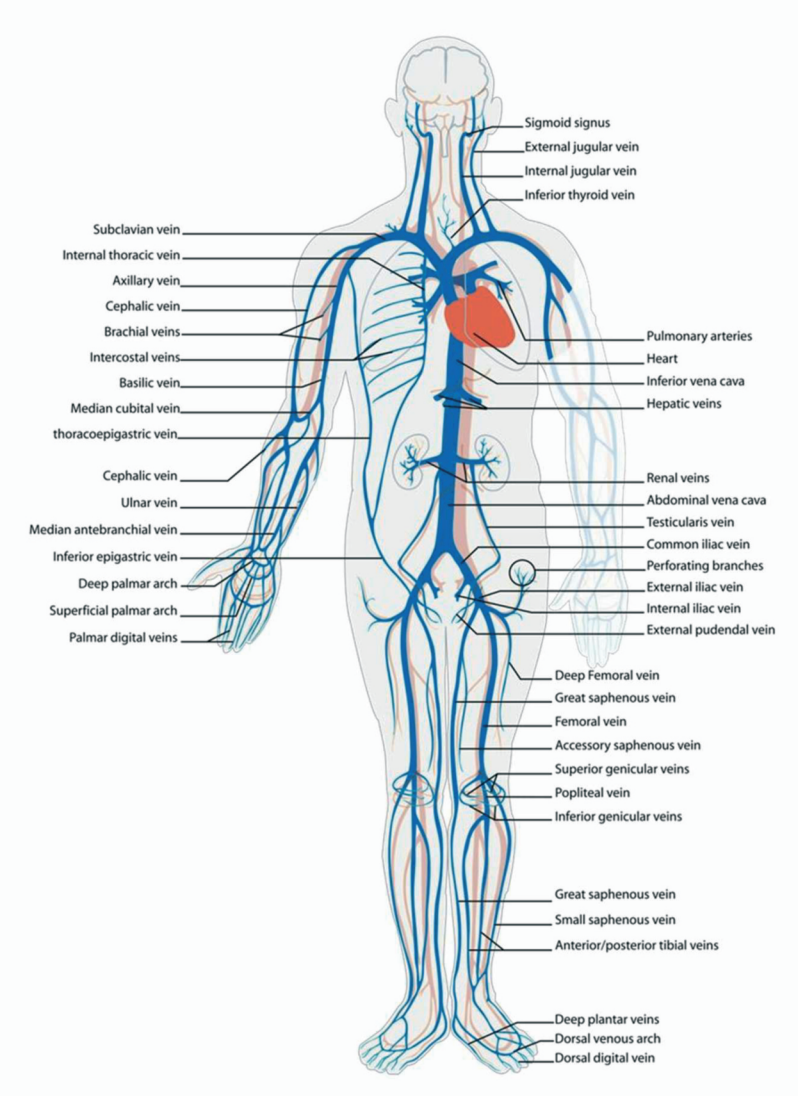
These go down from the transverse openings of the cervical vertebrae and enter the subclavian veins. The vertebral veins drain deep structures of the neck such as the vertebrae and the muscles.

The Circulatory System

Principal Arteries of the Body

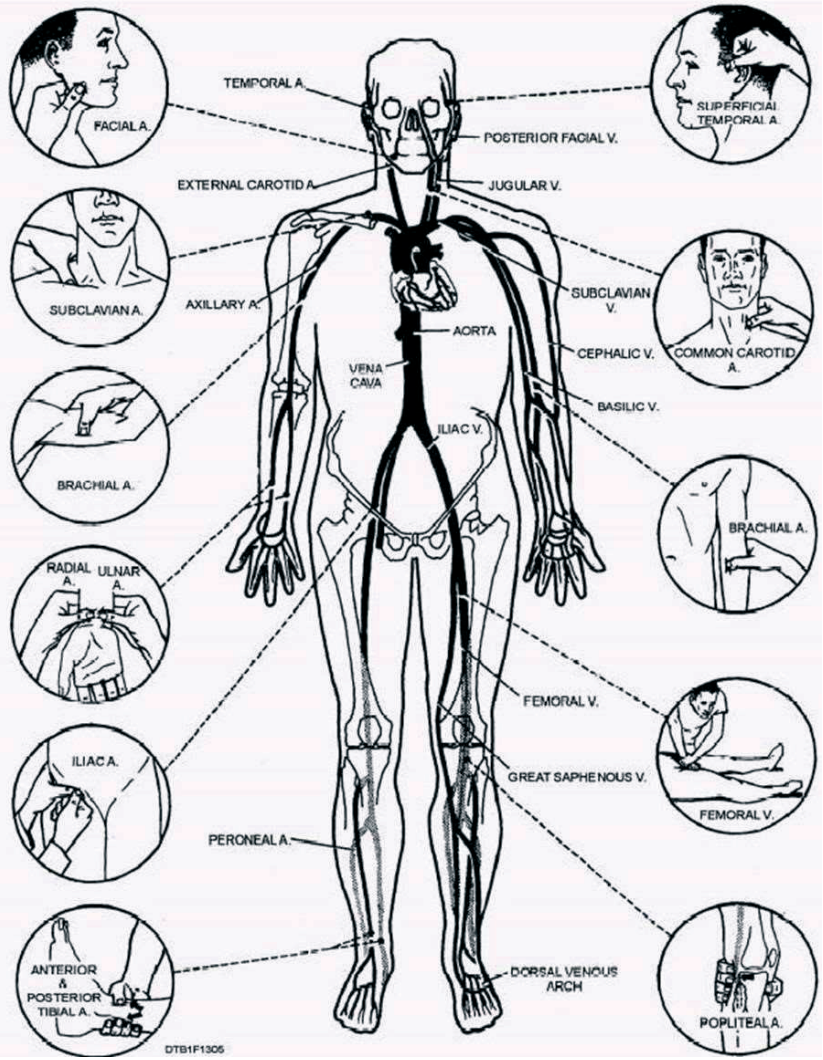


Principal Veins of the Body

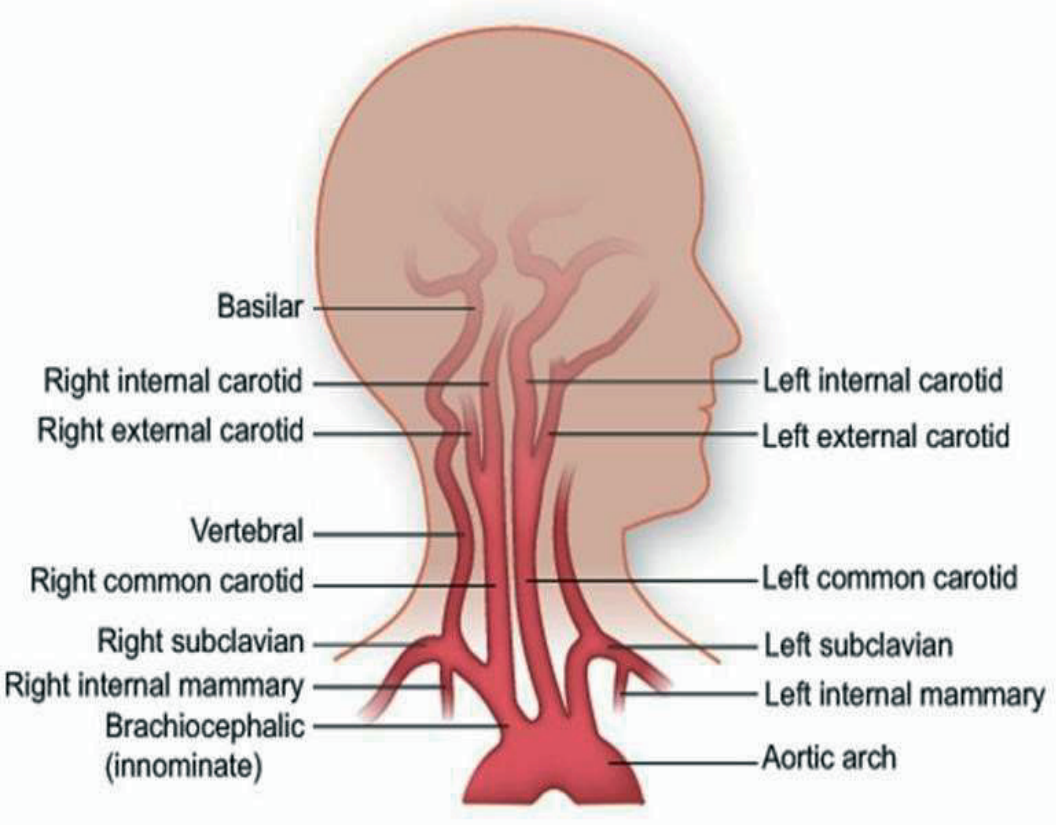


The Circulatory System

Principal Arteries and Veins of the Body

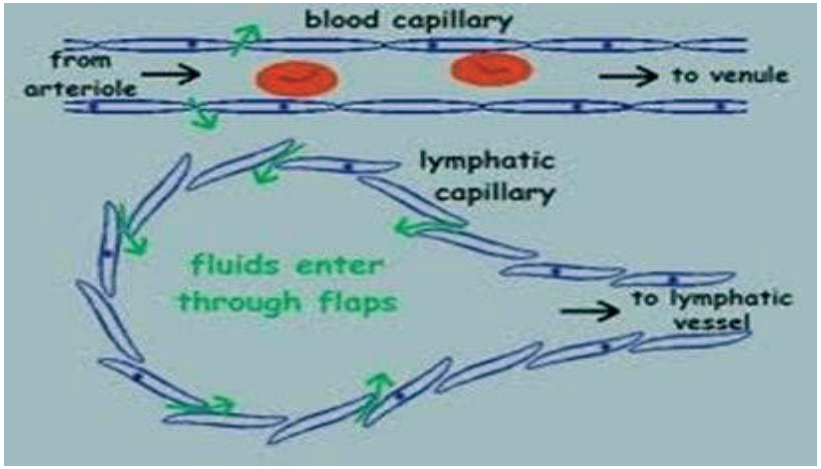


Arteries and veins relating to Head



The Lymphatic System

The lymphatic system is a one-way drainage system that removes excess fluid from the body's tissues and returns it to the circulatory system. It is part of the body's immune system, which provides defence against disease causing organisms.
Lymphatic vessels form a network of tubes that extend all over the body. The smallest of the vessels – the lymphatic capillaries – end blindly in the body's tissues. Here they collect a liquid called lymph which leaks out of the body capillaries and accumulates in the tissues.
Once collected, lymph flows in one direction along progressively large lymphatic vessels.



Along the network of lymphatic vessels are nodes which filter bacteria and micro-organisms from the lymph as it passes through them. The cleansed lymph is then collected by two main lymphatic ducts (the thoracic and the right lymphatic ducts) which empty the lymph into the bloodstream.

The lymphatic system therefore returns the excess fluid which accumulates in the body's tissues back into the bloodstream, while at the same time filtering micro-organisms and releasing antibodies to help the body to fight infection.
It consists of lymphatic capillaries, vessels, nodes and ducts. The capillaries and vessels form a network around the body which act as tunnels for the transportation of lymph fluid, in the same way that blood vessels provide a network for the transport of blood.
When the blood circulates through the capillaries, fluid passes through the thin walls which in turn passes into the tissues thus covering the various individual cells with the required nutrients.
The cells' waste products are absorbed by acid, most of which is collected by the vessels forming the lymphatic system. These vessels contain lymph which is a straw coloured fluid similar to blood plasma.
Lymph straw coloured fluid that carries more waste than nutrients. It contains absorbed fats, urea, glucose, sugar, salts, lymphocytes and some plasma protein.

Lymphatic capillaries

Lymphatic capillaries appear in tissue spaces which, in close relation with the blood, come together to form lymph vessels, these vessels run in both subcutaneous tissue and the deeper tissues of the body. Are one cell thick, hair-like structures which combine to form lymphatic vessels they transport lymph from the tissues. They are bind-ended tubes, situated between cells and are found throughout the body. The walls of lymphatic capillaries are structured in such a way that tissue fluid can pass into them but not out of them.

The Lymphatic System

Lymphatic Vessels

Are larger and thicker than capillaries, and contain valves which prevent backflow of lymph. They transport lymph through one or more lymphatic nodes. Lymph travels around the body in one direction only, towards the heart. It is carried in vessels that begin as lymphatic capillaries. These capillaries join up and become wider tubes, known as lymphatic vessels.
The lymph vessels generally run parallel to the veins. These vessels are similar to veins as they contain valves, although they generally have thinner walls. The lymph flows around the body through these lymph vessels and passes through a number of lymph nodes to be filtered.

The lymphatic system does not have pump like the heart, but like veins relies on the movement of the body and the contraction of the skeletal muscles. The squeezing action of the muscles forces the lymph along its vessels. Involuntary actions such as breathing and the heartbeat also help the movement of lymph through the vessels

Lymph nodes

Lymph nodes occur at intervals in the lymphatic system. These are small oval items which are the place where lymphocytes are formed, and they further act as filters.
Lymph nodes have a fibrous outer capsule containing lymphoid tissue, they vary in size from a pin head to an almond and filter lymph to remove bacteria so can become swollen and tender if infection is present. They also produce some antibodies. Lymph enters the node through the afferent lymphatic vessels and leaves the node via the efferent lymphatic vessels. As many as five afferent lymph vessels may enter a node while only one or two efferent vessels carry lymph away from it. Trabeculae divide the node into sections, provide support and enable blood vessels to enter into the node.
There are approximately 600 bean-shaped lymph nodes scattered throughout the body. They lie mainly in groups around the groin, breast, arm pits and round the major blood vessels of the abdomen and chest.

Lymph is transported by pressure on skeletal muscles and small valves in said vessels. It enters the venous system slowly as the Lymph is not pumped by any muscle like the heart.
The flow of Lymph can be stimulated by pressures from massage.

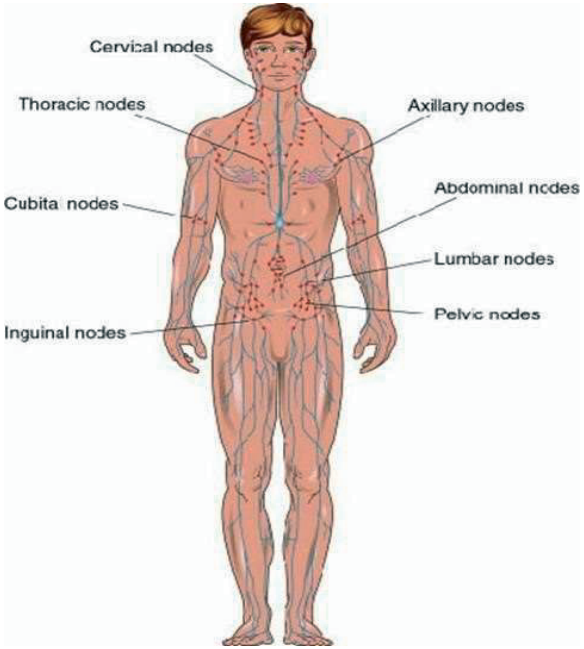
Important groups of lymph nodes in the head are:

- Occipital
- Submandibular
- Deep cervical
- Superficial cervical glands
- Anterior auricular
- Posterior auricular

The Lymphatic System

Important groups of lymph nodes in the rest of the body include the:

- Axillary
- Abdominal
- Inguinal
- Popliteal
- Supratrochlear



Lymphatic ducts

The lymphatic ducts are known as the thoracic duct and the right lymphatic duct. The larger thoracic duct is about 45 cm long, has valves and is located at the back of the abdomen. The smaller right lymphatic duct is about 1 cm long and is formed by the joining of the vessels from the head, thorax and right limb. These collect lymph and return it to the bloodstream.

The Thoracic duct is the main collecting duct of the lymphatic system and receives lymph from vessels in the abdomen and lower limbs and empties into the left subclavian vein. The right lymphatic duct empties into the right subclavian vein.

Functions of the Lymphatic system:

The lymphatic ducts are known as the thoracic duct and the right lymphatic duct. The larger thoracic duct is about 45 cm long, has valves and is located at the back of the abdomen. The smaller right lymphatic duct is about 1 cm long and is formed by the joining of the vessels from the head, thorax and right limb. These collect lymph and return it to the bloodstream.

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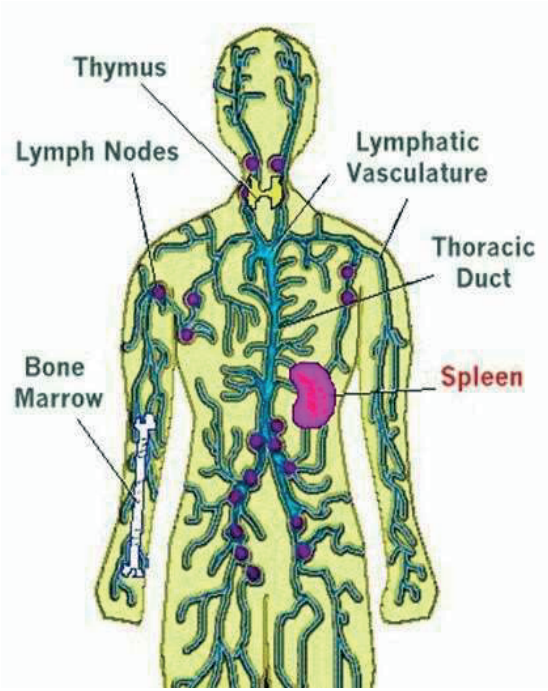
The Lymphatic System

The Spleen

The spleen consists of lymphatic tissue and is part of the lymphatic system. It is oval in shape and weighs approximately 200 g. The spleen is situated in the left side of the abdomen, beneath the diaphragm and behind the stomach. The normal adult spleen is about the size of a large apple.

Functions of the spleen:

The spleen acts as a reservoir for blood. If blood is needed elsewhere in the body, perhaps because of a haemorrhage, it can be diverted.
Lymphocytes are produced here, so the spleen is an important part of the immune system.
If the spleen has to be removed, resistance to disease may be slightly lowered.
The spleen has good blood supply. Old worn-out red blood cells are filtered from the blood and destroyed after their 12- day life.
The spleen can be easily damaged by trauma. If this happens a haemorrhage can occur so the damaged spleen has to be removed quickly. The body can still survive without it.



The lymphatic system helps compliment the circulatory system by draining excess fluid from the tissues and returning it to the circulatory system. This then helps fulfil a number of tasks including maintaining blood volume and blood pressure, and preventing oedema.
Lymphatic drainage is the movement of lymph around the body.

This movement is assisted by a number of factors including the pressure from the skeletal muscles against the lymphatic vessels, the respiratory changes in pressure and the compression of the lymph vessels from the pull of the skin and fascia during movement. It is important to remember that massage will help speed up the lymphatic circulation, as pressure is always directed toward the nearest lymph node. This will help prevent the `pooling' of lymph in the tissues. So you can see that a proper understanding and working knowledge of the position of the lymph nodes is important because if too much pressure is applied they may swell and start to produce lymphocytes unnecessarily, which would therefore be detrimental to your client's health.

The Nervous System

The nervous system provides a network of communication between different areas of the body and also acts as a receptor for information from the external environment. It consists of the brain, spinal cord, nerves and sense organs and controls all the bodily systems and provides the most rapid means of communication in the body.
Millions of nerve impulses (messages) are continually reaching the brain from receptors, for instance, the skin, and just as many leave the brain and stimulate muscles to move and organs to carry out their work. In the body the message are in the form of electrical impulses which pass from neurone (nerve cell) to neurone. There are billions of neurones within the body and their function is to transmit nerve impulses.

There are three main parts within the Nervous System – they are:

- The Central Nervous System – which controls the 5 senses, sight, smell, touch, taste and hearing and voluntary muscle actions such as talking, walking etc.
- Peripheral nervous system – connects the Central nervous system to the limb and organ
- The Autonomic Nervous System – which controls involuntary bodily functions, internal organs and blood vessels and includes the parasympathetic and sympathetic systems It is essential to maintain a good level of nerve energy which can be obtained from proper nutrition, good exercise, relaxation and oxygen. Nerve fatigue will display symptoms of weariness, irritability, dull eyes and poor complexion, this can be overcome by stimulating the nervous systems by use of chemicals, massage, light rays and heat.

Central nervous system

The central nervous system consists of the brain and spinal cord.

The Nervous System

Central nervous system

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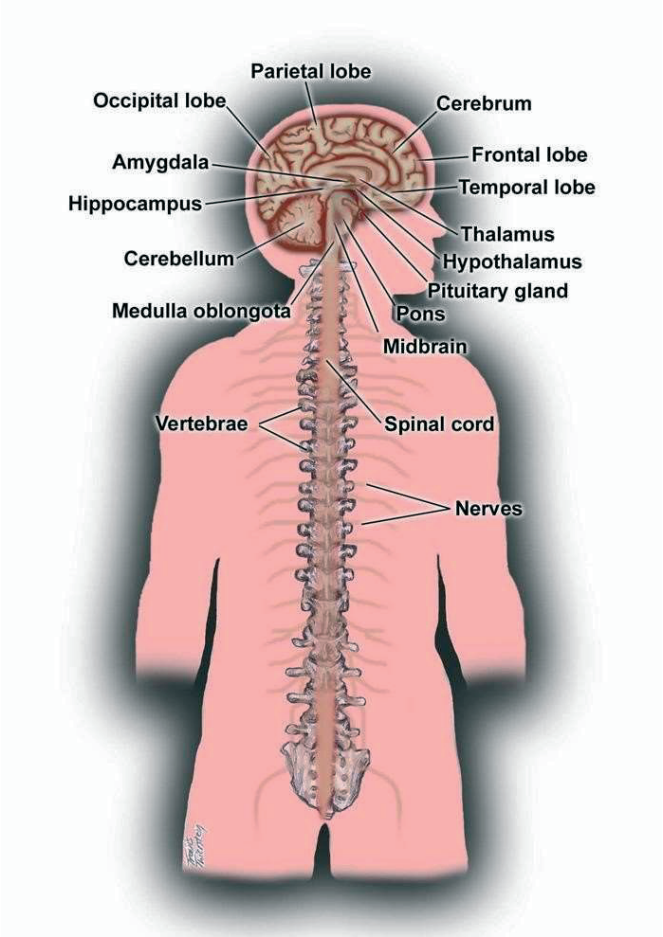
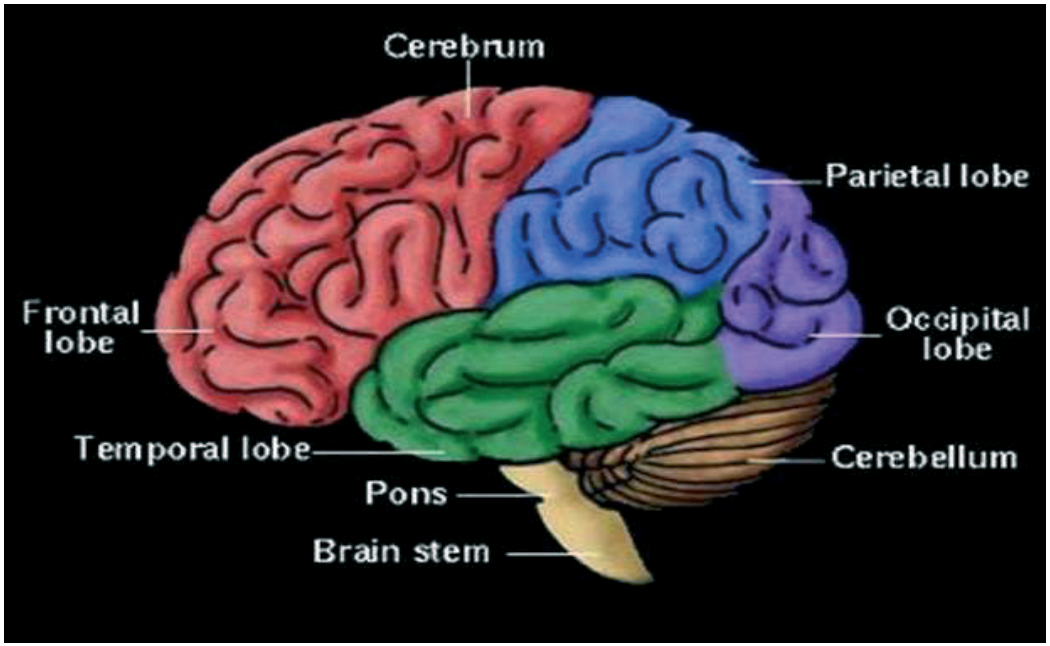


The Brain

The brain is the most important part of the system, as it is the main communication centre and contains 100 billion neurons. The brain receives and stores messages as well as transmitting them to all parts of the body to stimulate organs to do their work.

As the brain is such a vital organ, it has various safety features designed to protect it. It is protected firstly by the cranial bones of the skull then by the cranial meninges, then finally the subarachnoid space.



The Nervous System

The brain is responsible for:

- Storing messages that it receives from all different parts of the body via the sensory nerve endings
- Transmitting messages via motor nerves to all different parts of the body to stimulate the required response
- Co-ordinating the body's movements
- Controlling feeding
- Controlling sleeping patterns
- Controlling temperature regulation
- Controlling salt/water balance in the body
- Storing information in our memory
- Emotional and intellectual processes

The brain is protected by the bones of the skull, whilst the spinal cord is protected by the vertebrae.

A connective tissue called the meninges surrounds the central nervous system, and is made up of three layers.
The dura mater layer is an outer sheath, whilst the pia mater layer is attached to the surface of the organs. This layer nourishes underlying tissue through its supply of blood vessels.
The arachnoid mater layer provides space for the blood vessels and the circulation of cerebrospinal fluid. Not only does the central nervous system contain neurones, it also has another type of nervous tissue known as neuroglia.
Neuroglia cells are a type of connective tissue that supports and nourishes the neurones. They are smaller cells than the neurones and are found in large numbers.

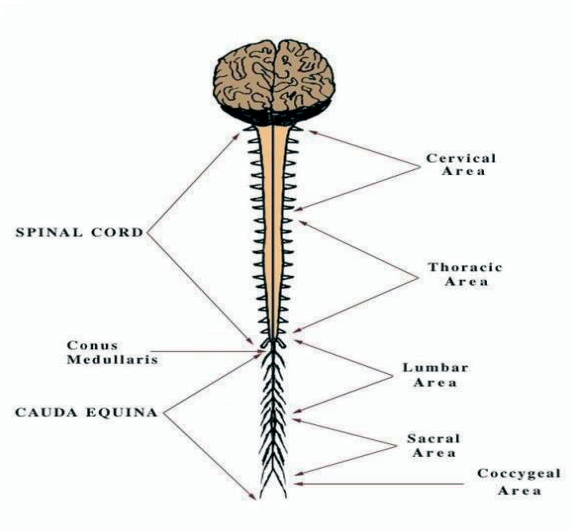
The Nervous System

The spinal cord

The spinal cord is a continuation of the medulla oblongata and extends downwards through the vertebral column, finishing on a level with the lumbar vertebrae. It is protected by the vertebral column, 3 meninges and the cerebro-spinal fluid.

The functions of the spinal cord are:

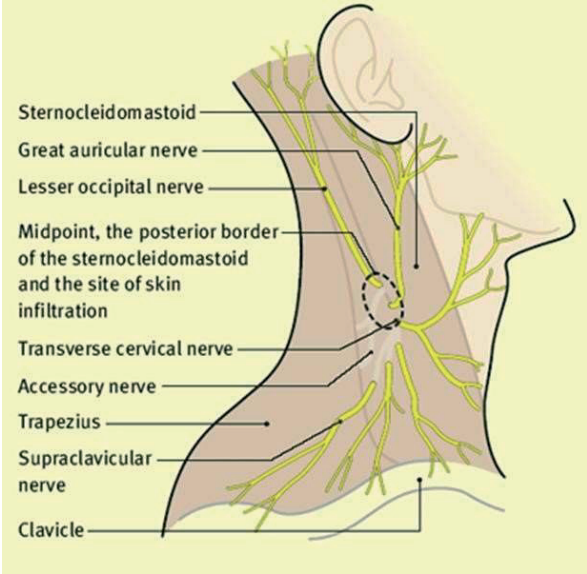
- It conveys sensory impulses from one area of the spine to another and from the skin and muscles of the trunk and limbs to the brain
- It allows and co-ordinates spinal reflex actions, which are a rapid response to a stimulus without any conscious thought of the brain. This action protects the body from danger before any harm is caused.



The peripheral nervous system

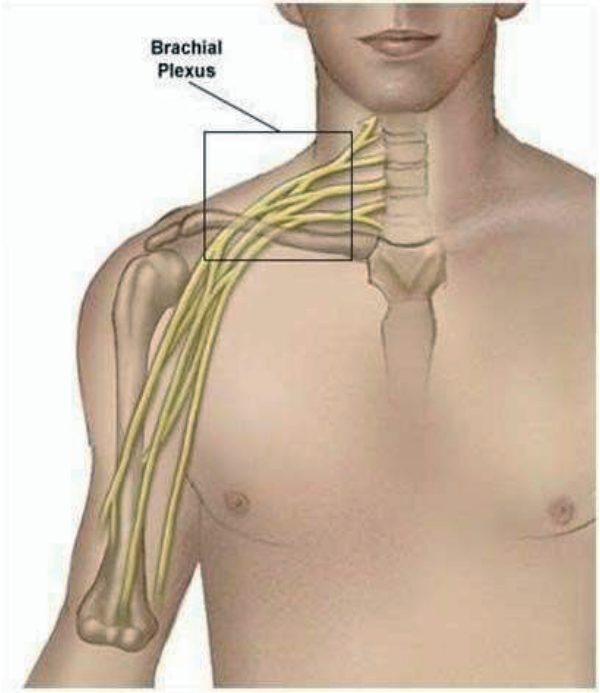
The peripheral nervous system is concerned with all nerves situated outside the central nervous system, and consists of:

- 31 pairs of spinal nerves – which emerge from in-between the vertebrae of the spinal column. These are mixed nerves and they have two points of attachment to the spinal cord and these are referred to as roots. The names of the 31 pairs of spinal nerves depend on the region of the spine they emerge from:-
- 8 pairs of cervical nerves
- 12 pairs of thoracic nerves
- 5 pairs of lumbar nerves
- 5 pairs of sacral nerves
- one pair of coccygeal nerves
- Each spinal nerve is divided into several branches, forming a network of nerves or plexuses which supply different parts of the body:
- the cervical plexuses of the neck supply the skin and muscles of the head, neck and upper region of shoulders

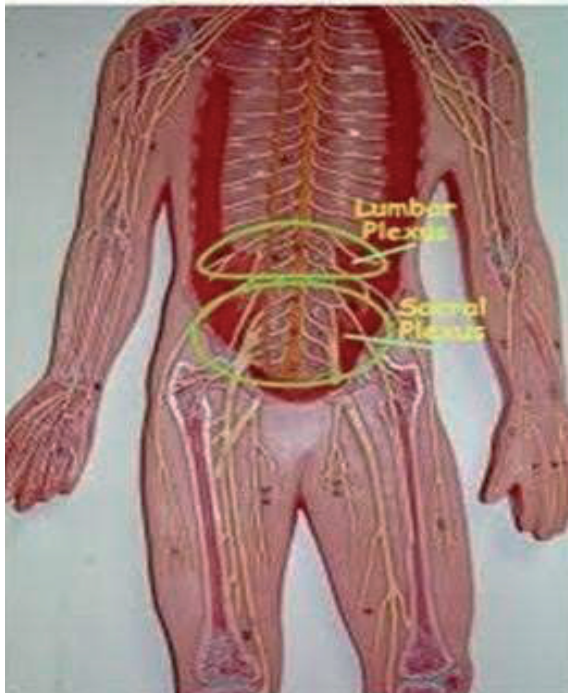


The Nervous System

The brachial plexuses supply the skin and muscle of the arm, shoulder and upper chest



the lumbar plexuses supply the front and sides of the abdominal wall and part of the thigh



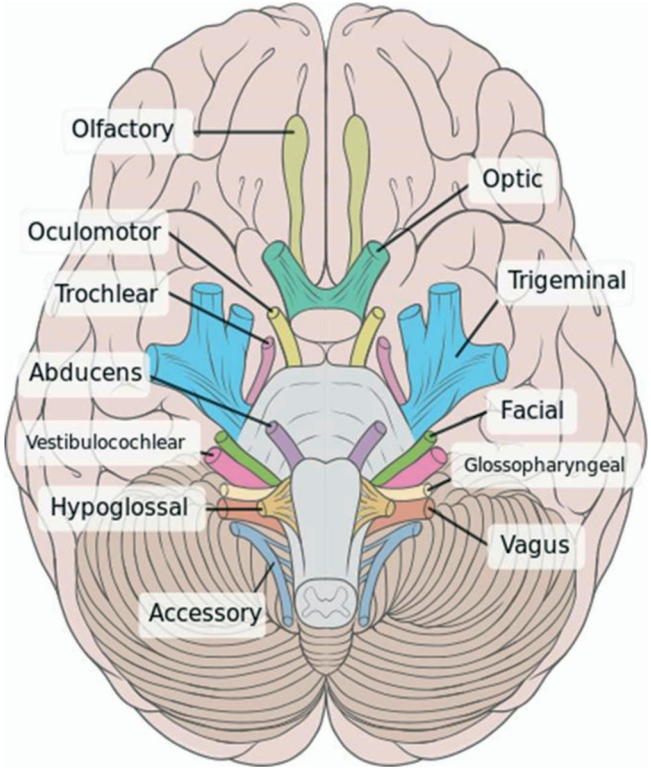
- the sacral plexuses at the base of abdomen supply the skin, muscles and organs of the pelvis
- the coccygeal plexus supplies the skin in the area of the coccyx and muscles of the pelvic floor

The Nervous System

12 pairs of cranial nerves – that originate from the brain, most are confined to the head and neck, but the tenth nerve has branches in the trunk

Olfactory Nerve: sensory nerve for smell
Optic Nerve: sensory nerve for vision
Oculomotor Nerve: missed nerve that innervates both internal and external muscles of the eye and a muscle of the upper eyelid
Trochlear Nerve: Smallest of the cranial nerves and is a motor nerve that innervates the superior oblique muscle of the eyeball that helps you look upwards
Trigeminal Nerve: Mixed nerve (containing motor and sensory nerves) that conducts impulses to and from several areas in the face and neck. It also controls the muscles of mastication (the masseter, the temporalis and the pterygoids).

It has three main branches
Ophthalmic branch, Maxillary branch and the Mandibular branch
The ophthalmic branch - carries sensations from the eye, nasal cavity, skin or forehead, upper eyelid, eyebrow and part of the nose
The maxillary branch - carries sensations from the lower eyelid, upper lip, gums, teeth, cheek, nose, palate and part of the pharynx
The mandibular branch - carries sensations from the lower gums, teeth, lips, palate and part of the tongue



- Abducens: Mixed nerve that innervates only the lateral rectus muscle of the eye which helps you look to the side
- Facial: Mixed nerve that conducts impulses to and from several areas in the face and neck. The sensor branches are associated with the taste receptors on the tongue and the motor fibres transmit impulses to the muscles of facial expression.
- Glossopharyngeal: Mixed nerve that innervates structures in the mouth and throat. It supplies motor fibres to part of the pharynx and to the parotid salivary glands and sensory fibres to the posterior third of the tongue and the soft palate.
- Vagus: Unlike the other cranial nerves in that it has branches to numerous organs in the thorax and abdomen, as well as the neck. It supplies motor nerve fibres to the muscles of swallowing and motor nerve fibres to the heart and organs of the chest cavity. Sensory fibres carry impulses from the organs of the abdominal cavity and the sensation of taste from the mouth.
- Accessory: This functions primarily as a motor nerve, innervating muscles in the neck and upper back (such as the trapezius and the sternomastoid), as well as muscles

Assignment Two

You are required to explain the following systems:
The Circulatory System
The Lymphatic System
The central system - the Nervous System, the Brain

Autonomic Nervous System

The autonomic nervous system supplies the internal organs and is so called because these organs function without conscious effort – that is, their functions are automatic, i.e. you can blink or move your finger at will, but you cannot voluntarily control your heart rate or how fast your stomach digests food. The autonomic nervous system controls the involuntary movements of smooth and cardiac muscle, and of the glands, and is part of the peripheral nervous system.

The autonomic nervous system is connected to the blood vessels and the organs in the body by nerves. It is controlled by the medulla oblongata and hypothalamus, which receive impulses from the central nervous system.

There are two parts to the autonomic nervous system, the sympathetic and parasympathetic nervous systems, which have opposite effects as these systems work antagonistically. Each organ has a sympathetic and parasympathetic nerve supply.

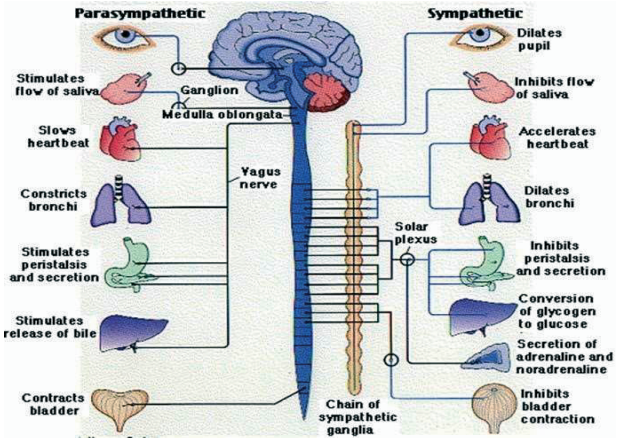
The sympathetic nervous system has nerves that are responsible for actions in time of stress and are made of a network of interlaced nerves or plexuses. The nerves supply internal organs and run back to the spinal nerves. It also has nerves which supply the blood vessels, sweat and sebaceous glands and the arrector pili muscle in the dermis.

The parasympathetic nervous system has branches which run to all the internal organs and control everyday bodily activities such as digestion and urination. They are directed towards relaxation and restorative processes. The heart rate slows, blood pressure drops and the digestive system becomes active.

In an emergency, such as when we feel threatened, the sympathetic nervous system has immediate effects on the body. Sympathetic nerves stimulate the adrenal glands to produce the hormone adrenalin. The hormone is distributed quickly by the blood and stimulates organs into greater activity. When the emergency is over the parasympathetic system returns the body to its normal state.

Example of how these systems work together in a stressful situation:

- The sympathetic impulses become stronger as a reaction to stress, the heart beats faster, blood vessels dilate, hairs stand on end. The sweat glands produce more sweat and blood pressure rises due to the constriction of small arterioles in the skin. Adrenaline is produced and the metabolic rate is increased.
- When the stressful situation passes the parasympathetic nerves take over and help the function of the organs return to normal and prepare the body for rest.



Autonomic Nervous System

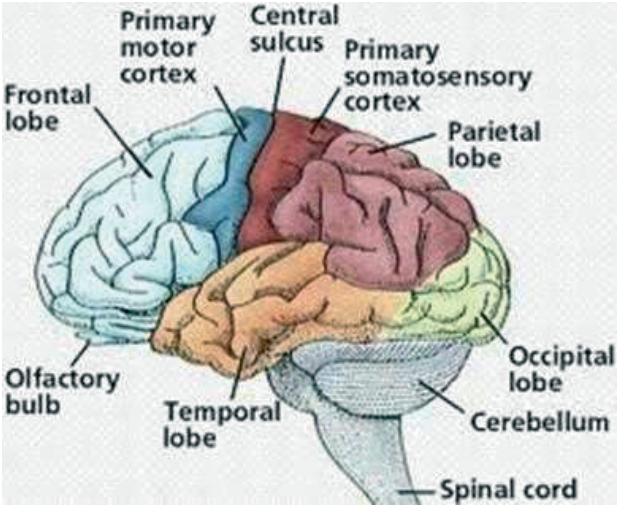
Cerebrum

The cerebrum (forebrain) is the largest portion of the brain. It is a dome shaped area of nervous tissue split into two halves:

- The left hemisphere – which controls the right side of the body. In most people he left hemisphere is more important for language, numerical and scientific skills
- The right hemisphere – which controls the left side of the body. The right side is the creative side and is important for musical and artistic ability.

The grey matter on the surface of the brain is made up of nerve cell bodies and is where the main functions of the cerebrum are carried out. These include all conscious activities such as touch, taste, smell, hearing, vision and all voluntary muscular movement. The cerebrum also controls the powers of reasoning, learning, emotion and memory.

The white matter of the brain and spinal cord consists of nerve fibres (axons) in white myelinated sheaths.



Cerebellum

The cerebellum deals with movement. It helps to control our balance and posture. It maintains muscle tone and co-ordinates muscles during activities such as walking and running. It is also responsible for learning skills such as playing the piano or riding a bike. It is found in the posterior aspect of the brain.

Medulla Oblongata

The medulla oblongata is a mass of grey matter that is the continuation of the spinal cord. It controls what you have no conscious control over such as regulating the heart and breathing rates, constriction and dilation of the blood vessels, body temperature and the reflex actions of sneezing, coughing, vomiting and swallowing.

Pons

The pons forms a bridge (pons is Latin for bridge) that transmits messages between the spinal cord, cerebellum and cerebrum. It controls what you have no conscious control over such as blood pressure or body temperature.

Thalamus

The thalamus co-ordinates impulses from sense organs such as the skin, eyes, nose and taste buds before they reach the cerebrum.

Autonomic Nervous System

Hypothalamus

The hypothalamus controls the activities of the autonomic nervous system and an endocrine gland called the pituitary gland. The hypothalamus is one of the main regulators of homeostasis, helping to maintain a constant internal environment in the body.

Sensory Neurons

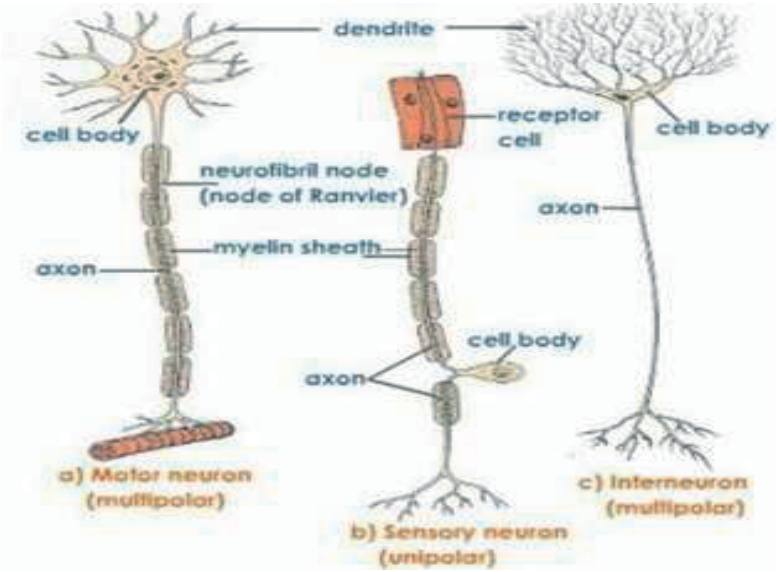
Sensory neurons are more commonly known as sensory nerves – they carry nerve impulses from sensory nerve endings in organs such as the skin, and transmit the impulse to the brain and spinal cord. Sensations transmitted by sensory neurons include heat, cold, pain, taste, smell, sight and hearing.

Motor Neurons

Motor neurons are more commonly known as motor nerves – they carry nerve impulses from the brain, through the spinal cord to the skeletal muscle, glands and smooth muscular tissue to stimulate them into carrying out their work

Association Neurons consist of:

- Mixed nerves – which consist of a combination of motor and sensory nerves
- Interneurones – which carry nerve impulses from sensory neurons to motor neurons. They are only found in the brain and spinal cord.



Autonomic Nervous System

The Olfactory System

The nose is what gives us our sense of smell and the yuck or yum effect when we smell something and can be a great warning of danger and it is the olfactory receptors which do this and they are found at the top of the nasal cavity. These receptors are neurones with cilia projections which come into contact with the airborne particles which have been breathed in and dissolved in mucous.
This chemical stimulus is passed to the chemoreceptors of the olfactory cells, which convert the stimulus into nerve impulses which are then transmitted to the brain.

The Endocrine System

The endocrine system is made up of a number of glands that produces and secretes hormones throughout the body. These glands do not have ducts, and so their products pass directly into the blood stream. These hormones help to regulate the activities of the body, and maintain it through times of stress by upholding a constant environment. They also contribute to the reproductive process.
The main functions of the endocrine system include growth, development and reproduction. It also regulates the metabolism, homeostasis, the immune system and the process of apoptosis by which the death and removal of cells is ordered.

Hormones are chemical messengers that regulate cellular activity and coordinate various functions in the body. These hormones can either be synthesised from steroids such as the sex hormones and those of the adrenal cortex, or from amino acids such as insulin and oxytocin. Hormones travel through the blood stream and can influence the activity of the organs.
Hormonal messages are slower acting than other nervous messages and take years to have full effect. There are a number of processes which are stimulated by hormones. These include the synthesis of new molecules, changes in the permeability of the plasma membrane, the transportation of substances into or out of cells, changes in the rate of metabolic reactions and the contraction of the cardiac muscle.

Assignment Three

Explain the Autonomic System

The Skeletal System

The skeletal system consists of the bones and joints of the body. There are 206 bones in the body. The skeleton helps give the body its shape and supports the weight of all the other tissues. It provides attachment for muscles and tendons and helps to protect vital organs from injury (i.e. skull protects brain, ribs protect heart and lungs).

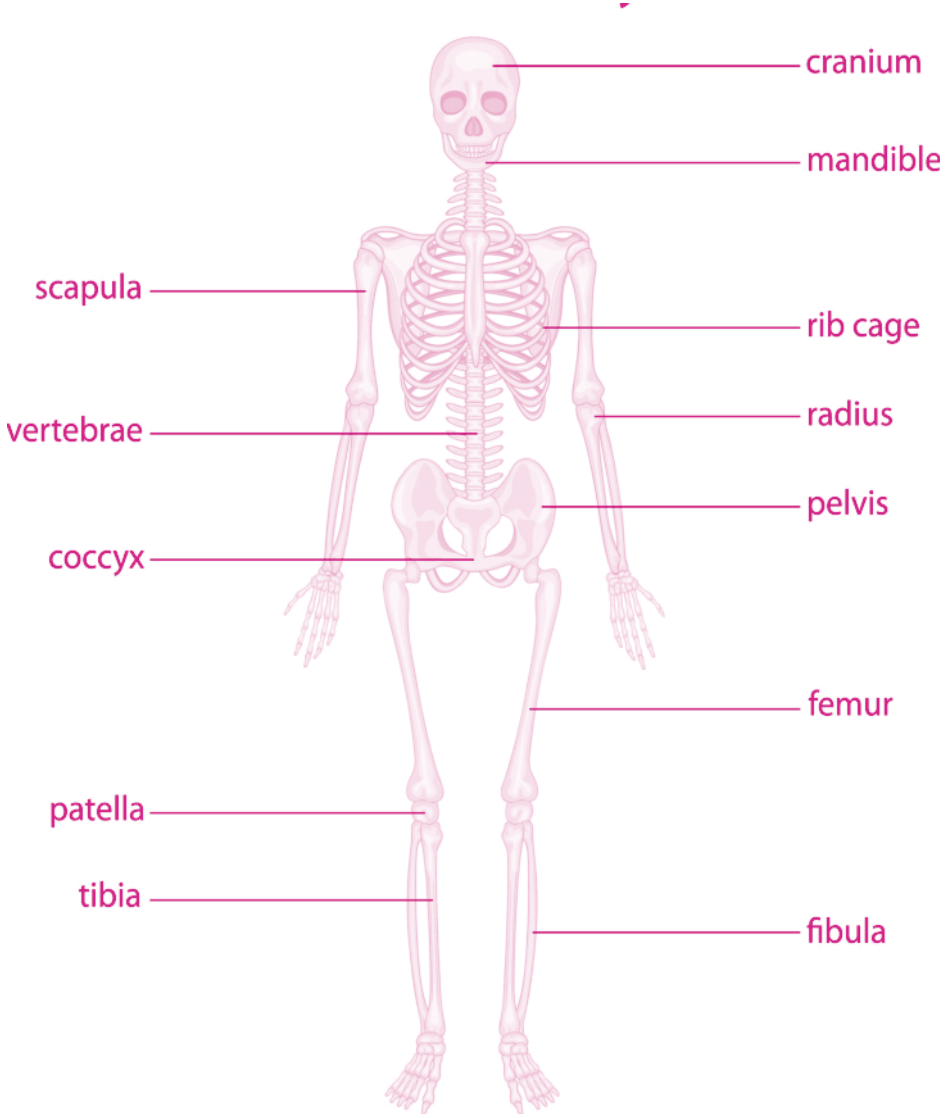
The skeletal system provides a strong framework for the body, whilst the joints hold the bones together and offer flexibility and movement. Bones are required by the human body for structure and movement, and provide sites of attachment for the muscles which pull on the bones to generate movement when they contract.

The skeleton needs to be strong as it bears the weight of all the other tissues of the body. By supporting the weight of the body, it enables us to stand.

There are two types of bone, compact and cancellous, which help to give shape to our body, and protect vital organs and tissues.

Red and white blood cells plus platelets are produced within the red bone marrow of the bone. Bones also store minerals such as calcium and phosphorus which help strength the bones. The bones will release these minerals into the blood stream if needed elsewhere in the body. Depending on the levels of calcium in the blood, the bones release or absorb it to maintain stable levels. This process is known as mineral homeostasis and it is controlled by hormones. When fully developed, the bone consists of water, calcium salts and organic matter.

The tissue of the bone is made from cells called osteoblasts.
There are two main types of bone tissue, both of which are found in every bone. Compact bone tissue is the hard section of the bone that forms the main shaft of long bones. It is known as dense bone and provides the firm framework for the body.



The Skeletal System

The osteocytes (mature bone cells derived from osteoblasts) are living bone cells that are located in rings around a central haversian canal. It is through here that nerves, blood and lymphatic vessels pass to nourish the bone and take away waste.

The spongy bone tissue is called cancellous bone, which is lighter, with an open 'air bubble' appearance. It is found at the ends of long bones and the centre of other bones. It is made up of a web of thin processes of bone with the spaces filled by red bone marrow.

The blood vessels run through every layer of cancellous bone, transporting nutrients and oxygen. Each bone is made up of two types of marrow: red and yellow.

The red marrow creates red blood cells, whilst the yellow marrow is found in the central cavities of long bones. The yellow marrow is a store for fat. One of the connective tissues is called cartilage. It consists of collagen and elastin fibres and is a flexible and durable tissue. It cushions and absorbs shock and throughout the body there are three types: hyaline, fibrous and elastic.

The hyaline cartilage covers the articular bones surfaces, fibrous cartilage is strong and rigid and found between the spinal discs, and elastic cartilage is flexible and found in the auditory canal and pinna of the ear.

Ligaments are a white fibrous connective tissue that links bones together at the joint. It is dense and inelastic but is flexible enough to allow the joint to move freely within a safe range.

Tendons attach muscles to the periosteum of a bone. They enable bones to move when skeletal muscles contract, and are tough fibrous cords of tissue.

Bone Shapes Long, short, flat, irregular and sesamoid are all classifications of bone.

Long bones are the bones of the limbs, except for the wrist and ankles. They have a long shaft called the diaphysis, with ends called the epiphysis. Smooth cartilage covers the articular surfaces of the shaft endings, and a flat plate of hyaline cartilage called the epiphyseal cartilage grows between the diaphysis and epiphysis. As this cartilage grows, it turns into bone in order for the bone to grow in length.

Short bones are cube-shaped and commonly found in the wrist or ankle. Flat bones tend to resemble plates with broad surfaces such as the sternum and scapulae.

Irregular bones vary in shape and include the vertebrae and some facial bones.

The Skeletal System

Sesamoid bones are small and rounded and are embedded in a tendon. An example of this is the patella (knee cap) which is found in the quadriceps femoris tendon.

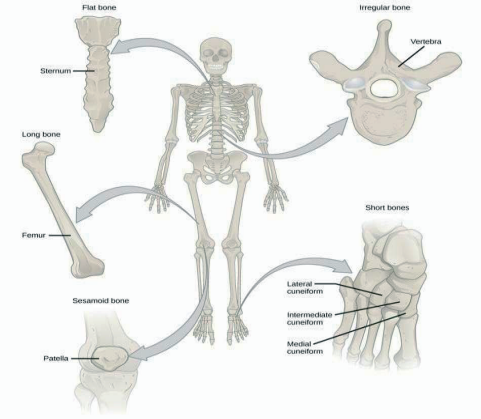
Ligaments are made up of bands of strong fibrous connective tissue which are silvery in appearance; they help prevent dislocation of the joints by holding the bones and muscle together. The ligaments stretch to allow movement.

Joints are
where one or more bones meet up with another bone
- Fibrous joints are fixed joints that are unable to move, i.e. joints between the skull bone
- Cartilaginous joints move slightly but only have limited movement, i.e. the joints between the bones of the vertebral column and the intervertebral discs
- Synovial joints are freely moveable joint, i.e. the joint of the knee of elbow.

The skeletal system has several important functions which are:-
- Gives the body support, movement capability and height
- Protects delicate areas with none such as the skull and rib cage
- Is responsible for red blood cell formation in marrow cavities and calcium storage
- It maintains posture by using the anti-gravity muscles
- Transmits sound waves
- It allows for attachment of muscles
- Levers to push against the ground to allow walking

There are four different types of bone:
- Long
- Short
- Flat
- Irregular

The bones are attached to each other via joints in several ways which allows a variety of movement



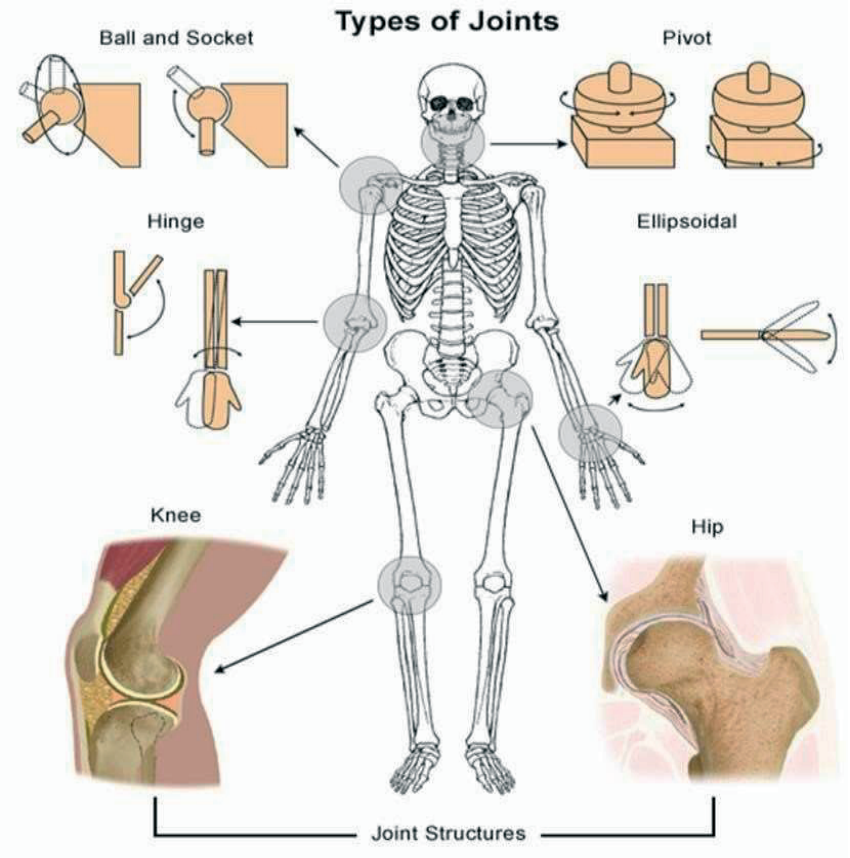
The Skeletal System

The three main joints are:

- Fixed, fibrous joints such as the skull
- Cartilaginous, slightly movable joints, such as pelvis
- Senoia, freely movable joints such as ball & socket, hinge, pivot and gliding joints

The four main type of joint movement are:

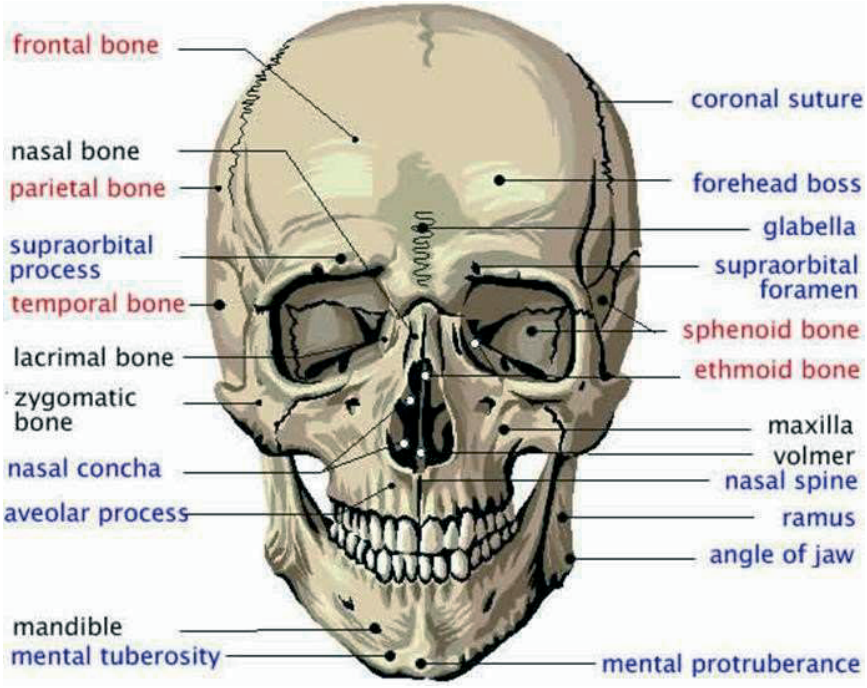
- Gliding – feet and hands – closely articulating bones
- Angular- flexion, extension, abduction adduction
- Rotation – allows the bone to pivot on its own axis
- Circumfusion – the bone follows an imaginary cone shaped path as it moves



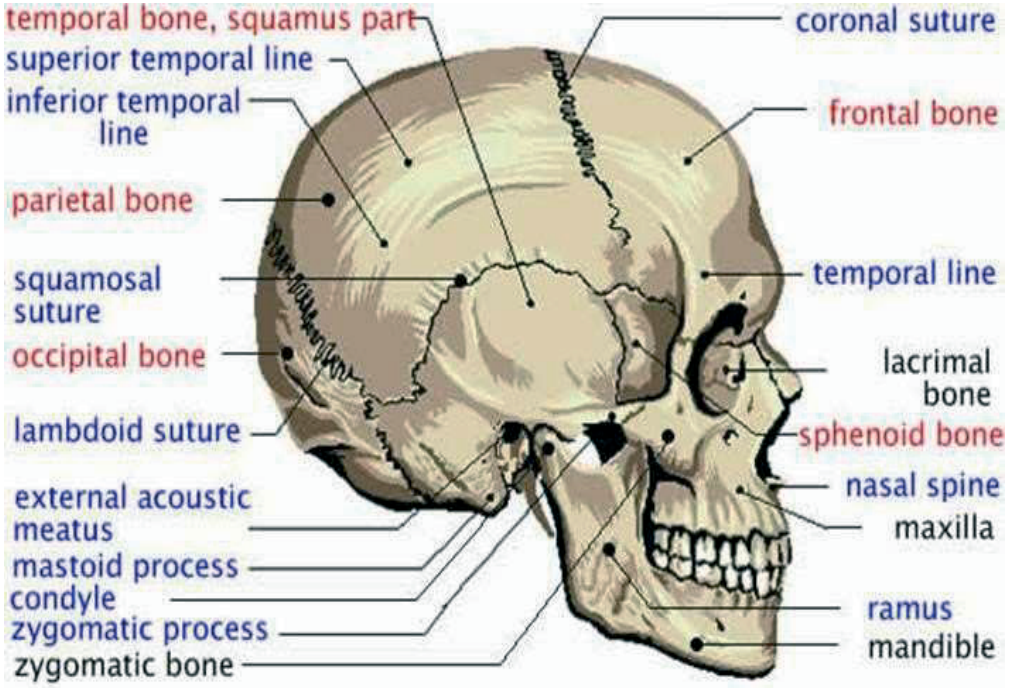
The Skeletal System

Bones of the skull

Front View



Side View

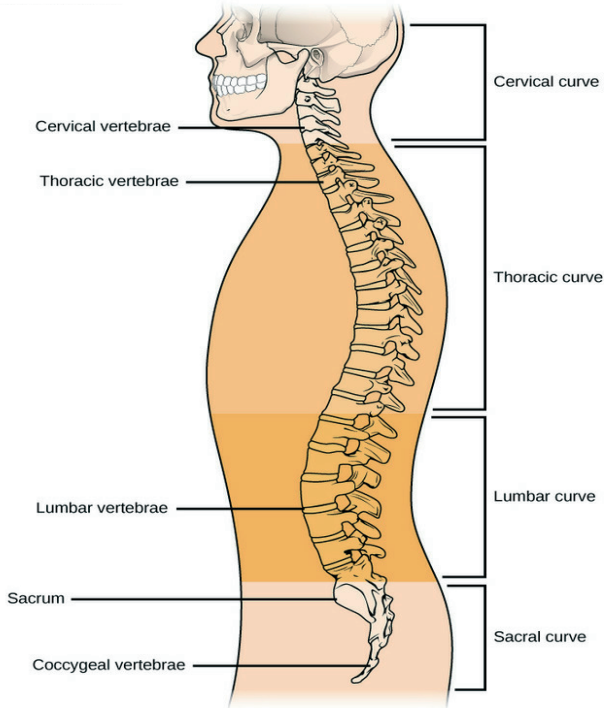


The Skeletal System

Vertebra of Spine

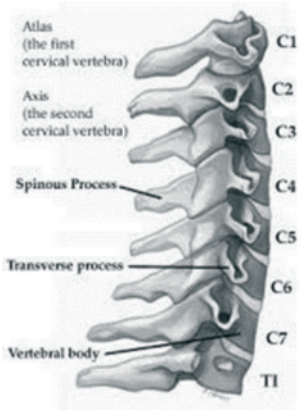
The spine provides a central axis to the body and consists of 33 individual irregular bones called vertebrae as follows:

Part of vertebrae	No bones	Location
Cervical	7	Bones in the neck
Thoracic	12	Bones of the midspine
Lumbar	5	Lower back
Sacral	5	Fused to form the sacrum
Coccygeal	1	Fused to form the coccyx/tail bone



Vertebra of Neck

The neck comprises seven bones known as the cervical vertebrae. These are the smaller vertebrae in the spine, their bone tissue is denser than those in any other region of the vertebral column.



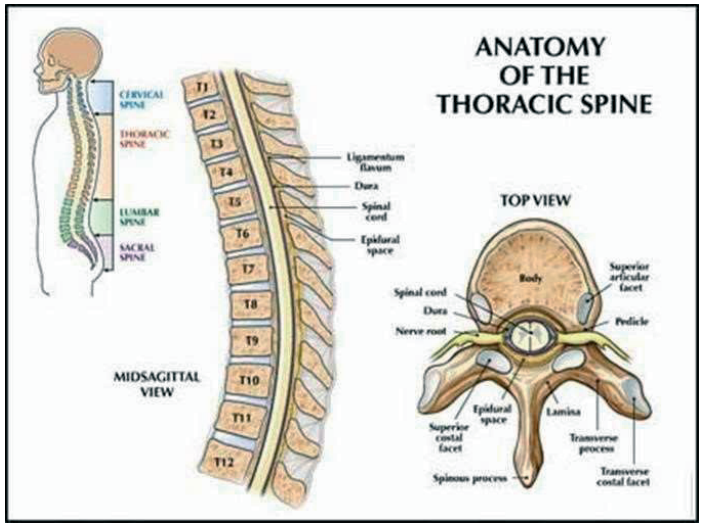
The top two cervical vertebrae are named C1 and C2.

- C1 is called the atlas and is the bone that sits on top of the vertebral column embedded in the base of the skull. The atlas supports and balances the head. Sliding joints on either side of the atlas allow the head to move up and down
- C2 is called the axis which has a peg-like hook that fits into a notch in the atlas. The ring and peg structure of the atlas and axis allows for the movement of the head from side to side
- The transverse processes of the cervical vertebrae are distinctive in that they have transverse foramina (holes) which serve as passageways for the arteries leading to the brain
- The spinous processes of the 2nd – 5th cervical vertebrae are uniquely forked to provide attachment for the elaborate lattice of muscles of the neck
- The spinous processes of the 7th cervical vertebrae is longer and can be felt through the skin as it protrudes beyond the other cervical spines

The Skeletal System

Vertebra of Mid-Spine

There are 12 thoracic vertebrae of the mid-spine and these lie in the thorax where they articulate with the ribs. These vertebrae lie flatter and downwards to allow for attachment of the large muscle groups of the back.



Vertebra of Lower Back

There are 5 vertebrae that lie in the lower back and they are much larger in size than the vertebrae above them as they are designed to support body weight.

Main Postural Faults Of The Spine

There are three types of condition that can affect the spine, which can be characterised by backache, spinal stiffness and sometimes nerve disorders.

Kyphosis This is an exaggerated curvature of the thoracic vertebrae causing round shoulders, or a hunched back.

Lordosis This is an exaggerated curvature of the lumbar vertebrae giving the appearance of a protruding abdomen and hollow back.

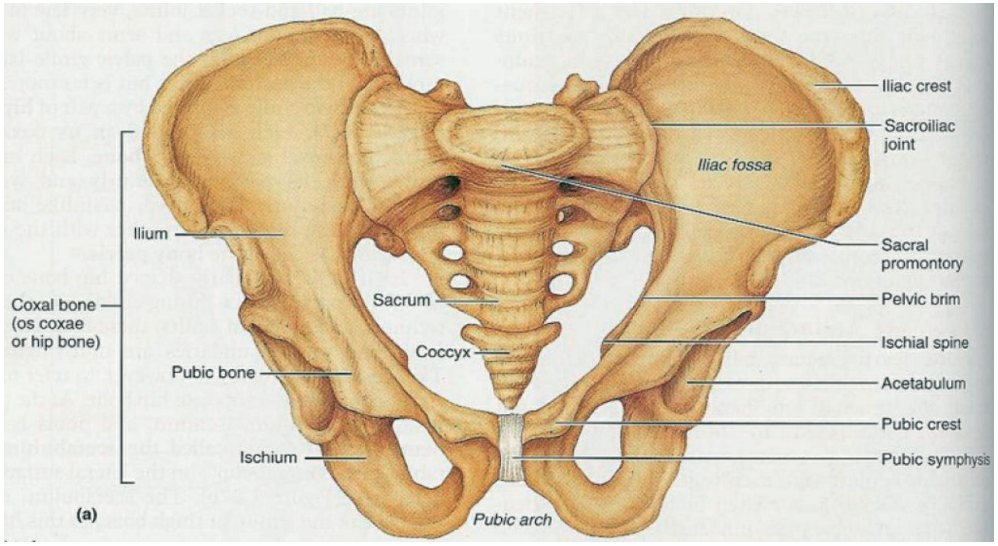
Scoliosis This is an exaggerated lateral or s-shaped curvature of the spine, making one shoulder appear higher than the other.
Due to increased blood circulation, massage will help nourish the skeletal system by bringing nutrients to the bones. Joints may be taken through a wider range of movement having received massage therefore improving flexibility.

Sacrum

The sacrum is made up of five fused vertebrae that form a flat, Triangular shaped bone lying in between the pelvic bones.

The Skeletal System

Bones Of The Pelvic Girdle



Your pelvic girdle consists of the two hip bones. The hip bones are connected to each other anteriorly at the pubic symphysis, and posteriorly to the sacrum at the sacroiliac joints to form the pelvic ring. Commonly referred to as your hip bones, the two major bones in your pelvis are your innominate, or coxal bones. Each coxal bone is made up of three smaller bones that fuse together: your ilium, ischium and pubic bone.

The ilium is the largest bone in the pelvic girdle. The upper border of the iliac crest is a site of attachment for muscles of the anterior and posterior abdominal walls. The ischium forms the posterior part of the pelvic girdle and the pubis is two pubic bones in the most anterior portion of the pelvis. They provide attachment sites for some of the abdominal muscles and fasciae. The ischia are the weight carrying bones used for sitting. The pubic bones meet at the front of the pelvis and are linked together by a bridge of flexible cartilage.

A woman's pelvis is shallower and wider than a man's, which helps when a woman goes in to the labour.

The pelvic girdle supports the vertebral column and the body's weight, whilst also offering protection to delicate organs The coccyx is made up of four coccygeal vertebrae fused together.

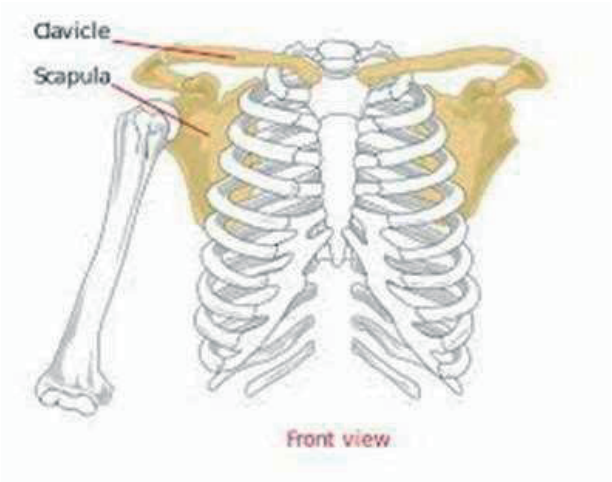
Hip Joint

The legs are connected to the pelvis by the hip joint. The head of the femur or thigh bone, fits inside a deep socket in the pelvis called the acetabulum to make the hip joint, which is a 'ball and socket' joint. The pelvis is joined to the spine at the sacrum - a bone made up of up to five fused vertebrae in the lower part of the spine. The sacrum forms the back wall of the pelvis.

Bones of the Shoulders

The shoulder girdle connects the upper limbs with the thorax and consist of four bones:

- Two clavicle
- Two scapula



The Skeletal System

Bones of the Shoulders

The shoulder girdle connects the upper limbs with the thorax and consist of four bones:

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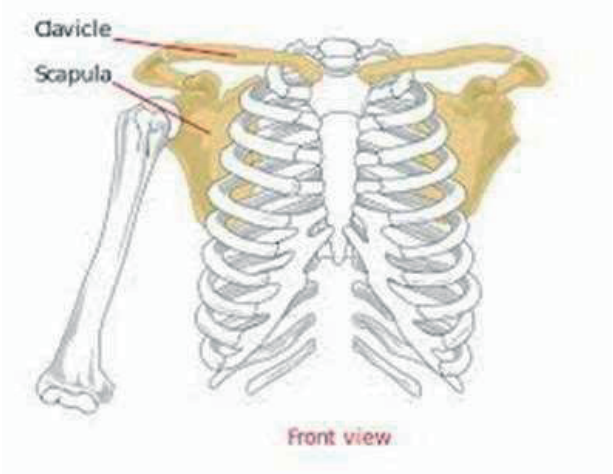
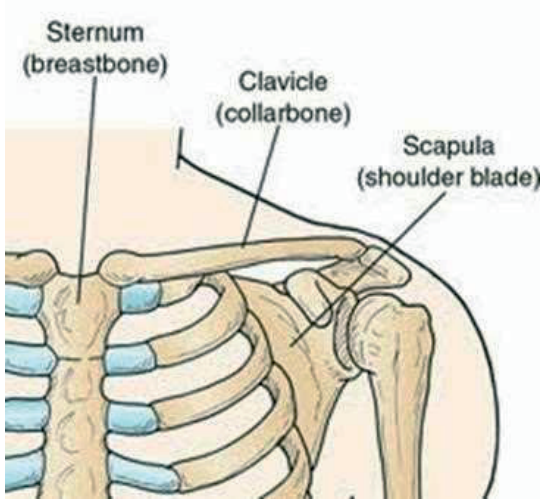
- Two scapula



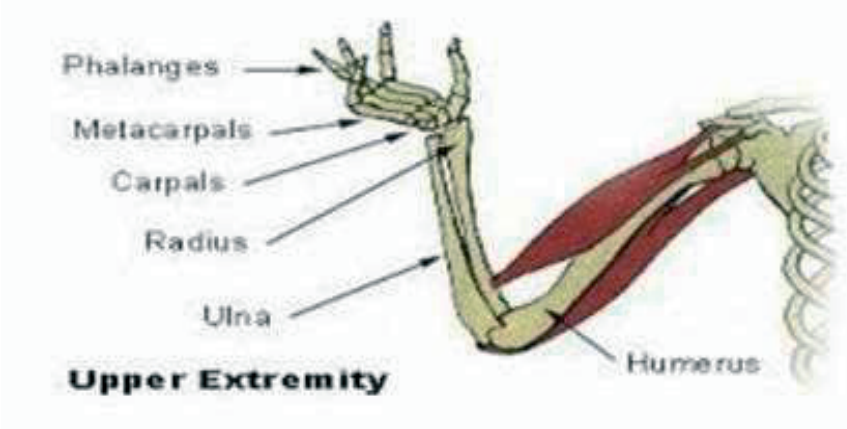
The clavicle forms the anterior part of the shoulder girdle. It is a long, slender bone with a double curve which is located at the base of the neck and runs horizontally between the sternum and the shoulders. It articulates with the sternum at its medial end and the scapula at its lateral end. The clavicle acts as a brace for the scapula, helping to hold the shoulders in place.

The scapulae forms the posterior part of the shoulder girdle and are located on either side of the upper back. The scapulae are large, flat bone, triangular in outline, which articulates with the clavicle and the humerus. The scapula has several prominent processes that serve as attachments for muscles and ligaments. The combined action of the scapula, clavicle, humerus and associated muscles allows for movement of the shoulder and upper limbs.



Bones of the Upper Arm

The humerus is the long bone of the upper arm and is the largest bone of the upper extremity. The head of the humerus bone articulates with the scapula to form the shoulder joint and the distal end of the bone joints with the radius and ulna bones of the forearm to form the elbow joint.



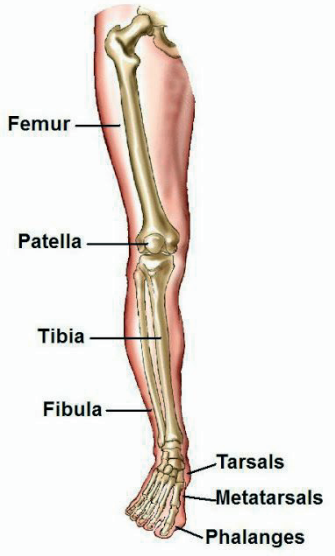
The Skeletal System

Bones Of The Arm and Hand

The bones of the arm consist of the humerus in the upper arm with the forearm comprising of the radius and ulna. The wrist is made up of eight small bones of irregular size called carpals. These fit closely together and are held in place by ligaments. The proximal row of carpals articulate with the ulna and the radius and consist of the scaphoid, lunate, triquetral and pisiform. The distal row of carpals articulates with the metacarpals and is made up of trapezium, trapezoid, capitate and hamate. The metacarpals are the five long bones in the palm of the hand. Each end articulates with the wrist bones and the finger bones. The finger bones are called phalanges. There are a total of 14 phalanges per hand; two in the thumb, and three in each finger.

Bones Of The Leg and Foot

The leg is made up of the femur, patella, tibia and fibula, with each foot having seven tarsals, five metatarsals and 14 phalanges. The longest bone in the body is the femur, which is the thigh bone, and the distal ends of the femur articulate with the patella.
The patella makes up the kneecap, and is located anterior to the knee joint.
The fibula and tibia make up the lower section of the leg. The fibula can be found on the lateral side of the tibia and the end forms the part of the ankle on the lateral side. The seven tarsals consist of the talus, calcaneum, cuboid, cuneiform (lateral, intermediate and medial) and navicular, with five metatarsals and fourteen phalanges in each foot. It is the metatarsals and phalanges which go on to form the toes. The bones of the feet form arches which are designed to support the body's weight and provide leverage. The arches are maintained by the ligaments and muscles.



Assignment Four

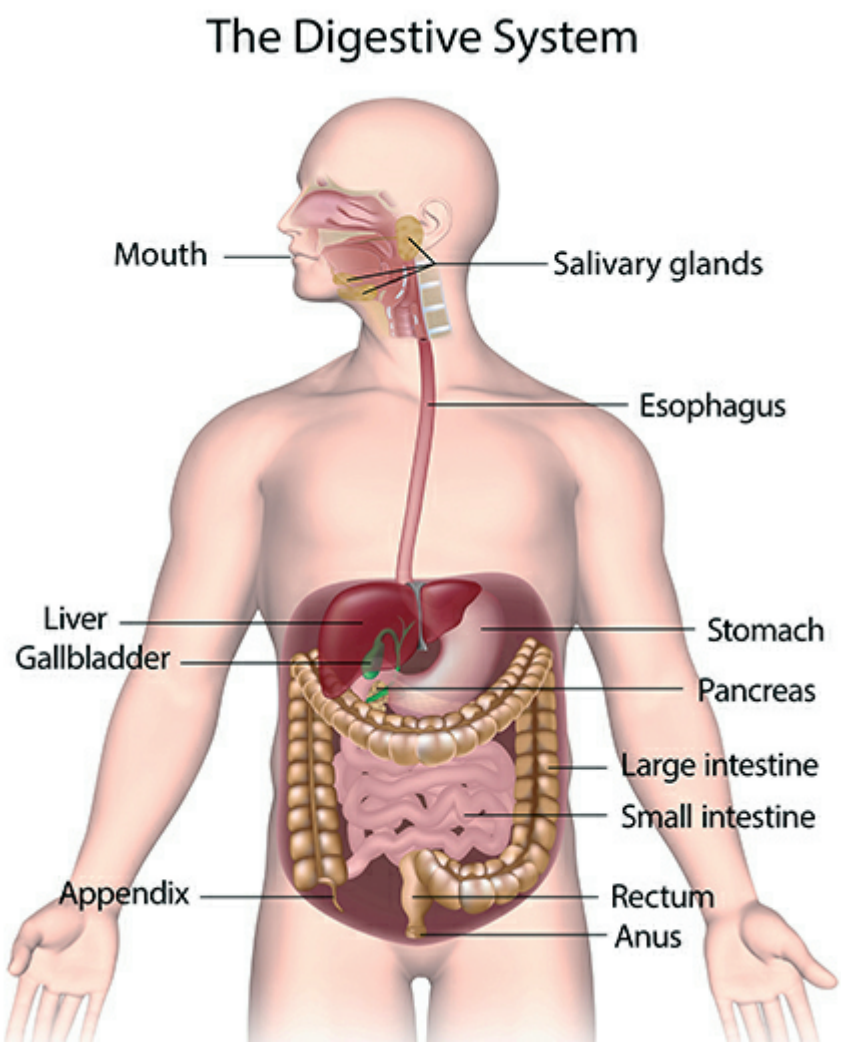
For this assignment you are required to explain the skeletal structure

The Digestive System

The digestive system works in the following way – food is taken in via the mouth and broken down with saliva (chewed) before being swallowed. The food then passes into the oesophagus and by peristaltic action passes to the stomach.
As the food passes along the alimentary canal, chemicals attach to the substance to convert it from complex insoluble product to a substance which can be absorbed by the blood from the small intestine.
The digestive system changes the food we eat into small, simple molecules that can be absorbed into the bloodstream and used by the body to produce energy or as building materials for repairing itself or growing. Food takes on average 24 hours to pass through the digestive tract. The digestive tract, also known at the alimentary canal, is more than 10 metres long and beings at the mouth and ends at the anus.
Therefore, the function of the digestive system is the physical and chemical breakdown of food. Following the ingestion, fluid and food are processed by the digestive organs so that nutrients can be absorbed from the intestines and circulated around the body. Any residue of food that is not digested is solidified and eliminated from the body in the form of faeces. The mouth pharynx, oesophagus, stomach, small intestine large intestine, rectum and anus make up the digestive tract.
There are also associated digestive organs which have important roles in the process being:

- Three pairs of salivary glands
- Pancreas
- Liver
- Gallbladder

It is always important as a therapist when massaging the abdomen that your movements go in a clockwise direction as this follows the natural path of waste, to go in the other direction does not feel nice at all for the client



Assignment Five

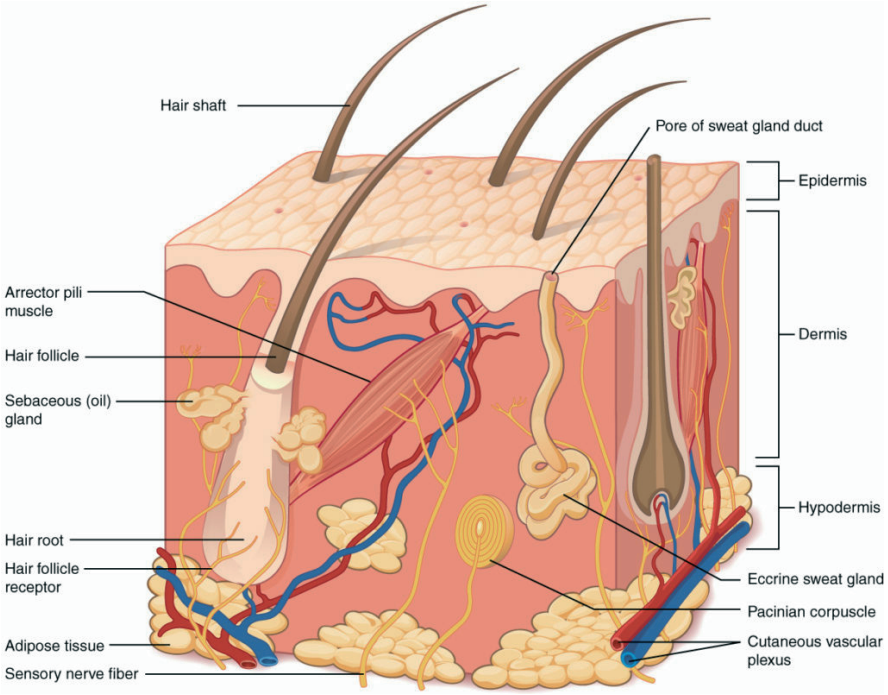
For this assignment you are required to explain in detail the digestive system.

The Skin

The skin is the largest organ of the body. The skin functions in a number of different ways to protect us from external elements:

- Prevents the absorption of harmful substances
- Helps regulate body temperature
- Acts as a barrier to keep out infection
- Melanin in the skin protects us from the harmful effects of UV light
- Provides a waterproof coating that prevents us from becoming dehydrated
- Provides an energy reserve in the form of stored fat

The skin covers the entire surface of the body and weighs approximately one ninth of our total body weight. It is thinnest on the eyelids and thickest on the soles of the feet. The skin is continually shedding and renewing itself. We are able to feel sensations such as pain or heat because of sensors in the skin which transmit messages to the brain and outer skin plays a major role in maintaining body temperature and in protecting the body from harm The skin varies in colour due to age, race inherited factors and external factors such as climate.



The skin can vary in thickness depending upon where it is on the body, i.e., eye and lip skin is very thin whereas hand and foot skin is thicker. The thickness of the skin can affects its colour, for example thin skin will look more pink as the blood in subcutaneous tissue will show through, whereas thicker skin, such as on the soles of the feet, tends to look yellow.

There are also medical reasons for skin colour to change such as with rashes where the skin will be more red, heart or lung conditions which will turn the skin blue, or jaundice which will yellow the skin.

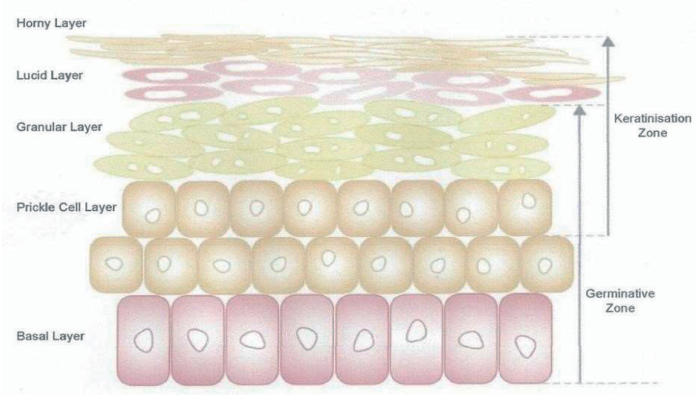
With age and sun damage the skin will lose some of its elasticity due to lack of collagen, at which time wrinkles will appear. The skin secretes an oily substance known as 'sebum' which will help to maintain the skin's suppleness, although there are no sebaceous glands on the palms of the hand or soles of the feet.

The skin also secretes sweat which is usually the result of temperature changes - this is known as insensible perspiration, but can be due to fear or nervousness which is known as sensible perspiration. This last form is produced by apocrine sweat glands.

The Skin

The skin is made up of three layers called:

- Epidermis
- Dermis
- Subcutaneous



Epidermis

The epidermis is the upper portion of the skin and consists of five layers:

• Horny layer (stratum corneum)

Outermost layer of the epidermis, made up of several layers of flattened, mostly dead overlapping cells. These cells help to reflect UV light. Black skin, which evolved to withstand strong UV light, has a thicker stratum corneum than Caucasian skin. It takes about 3 weeks for the epidermal cells to reach the stratum corneum from the stratum germinativum. The cells are then shed through a process called desquamation.

• Clear layer (stratum lucidum)

This layer is only found in thicker areas of the skin such as the palms of the hands or the soles of the feet. Found below the horny layer and consists of dead keratinized cells without a nucleus. The cells are transparent, which allows the passage of sunlight into the deeper layers.

• Granular layer (stratum granulosum)

In this layer the cells being to die. These cells have what looks like granules within them caused by the nuclei breaking up. These granules are known as kerathohyalin granules and later form keratin.

• Prickle cell layer (stratum spinosum)

Made up of cells which have a spikey surface to connect with surrounding cells. This is the layer that begins to synthesise keratin.
In this layer the cells are living. Pigment granules called melanin may be found here.

• Basal layer (stratum germinativum)

Column shaped cells responsible for producing new epidermal cells. Cells divide and move up to higher layers. The remaining cells divide to fill the gaps. This process of cell division is caused mitosis.
As the new cells are produced they push older cells above them towards the surface of the skin, until they finally reach the horny layer. It takes 3 – 6 weeks for the skin cells to be pushed up from the basal layer to the horny layer.

• Germinative Zone

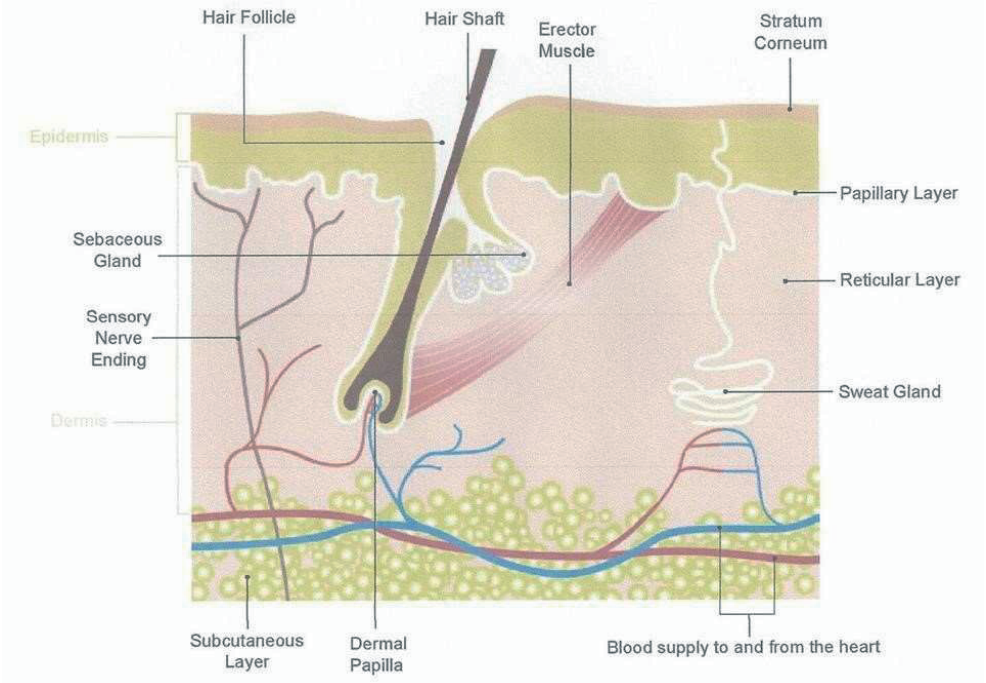
This zone is the epidermis contains two other important cells – Langerhan and Melanocyte cells.

Langerhan cells absorb and remove foreign bodies that enter the skin. They move out of the epidermis and into the dermis below, then finally enter the lymph system – the body's waste disposal system.

Melanocyte cells are responsible for the production of melanin in the skin. These protect the other epidermal cells from the harmful effects of UV. Melanin helps determine our skin colour; the more melanin present, the darker our skin tone.

The Skin

Dermis



The dermis lies below the epidermis, and connects with the basal layer and is often described as the "true skin". It is responsible for the strength and elasticity of the skin. It contains lots of specialised cells and structures, including nerves, blood vessels, glands and hair follicles. It consists of two layers:

- Papillary layer

This is the upper section and contains small tubes called capillaries, which carry blood and lymph. It also has nerve endings. This layer provides nutrients for living layers of epidermis. It contains a thin arrangement of collagen fibre.

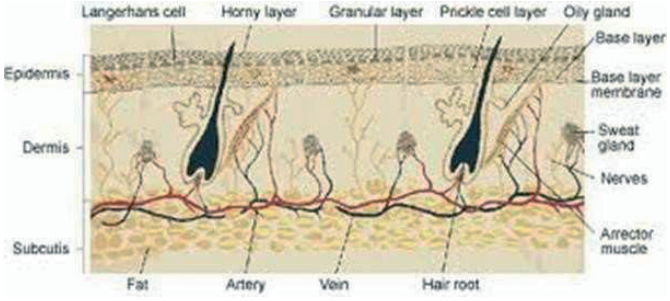
- Reticular layer

Consists of two types of protein:

- Elastin fibres which give the skin its elasticity
- Collagen fibres which give the skin its strength

These fibres are held in a gel-like substance called 'ground substance'. The collagen and elastin fibres form a strong network which gives us our youthful appearance. As we age, these fibres in the skin begin to harden and fragment; the network starts to break down and our skin starts to lose its elasticity and show visible signs of ageing. Blood circulation to the skin declines; nutrients do not reach the surface, resulting in sallow skin. The fatty layer beneath the skin grows thinner so we look more drawn as our bone structure is more prominent. The reticular layer is vital to our skin's health and appearance and so it is essential that it is looked after in order to prevent signs of ageing.

Subcutaneous layer



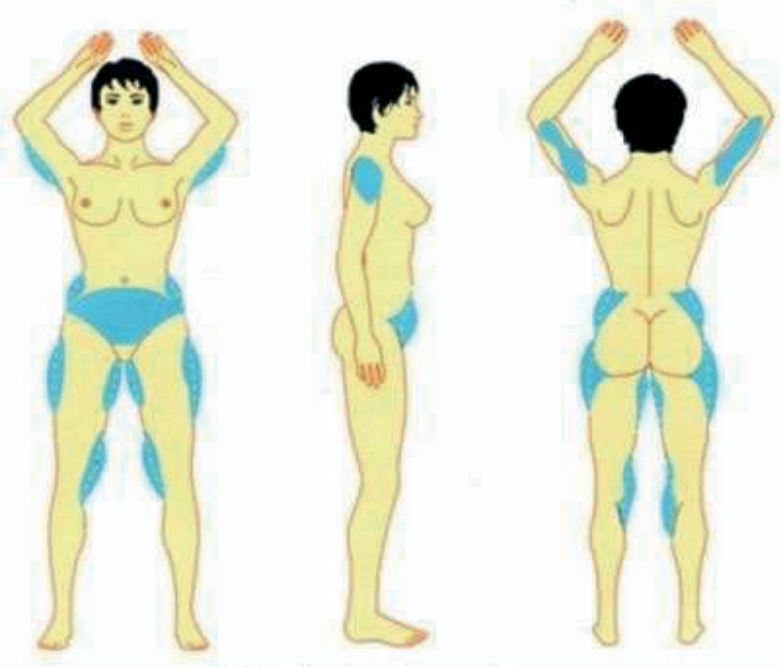
The subcutaneous layer is situated below the dermis. It consists of adipose tissue (fat) and areolar tissue. The adipose tissue helps to protect the body against injury and acts as an insulating layer against heat loss, helping to keep the body warm. The areolar tissue contains elastic fibres, making this layer elastic and flexible. Muscle is situated below the subcutaneous layer and is attached to bone.

The Skin

Adipose Tissue

This is a loose connective tissue whose specific purpose is to store fat. Adipose tissue is found under the skin and around organs, it acts as a food reserve. As it is also a poor conductor of heat it assists in maintaining body temperature by preventing heat loss. It is thought that massage affects the adipose tissue as it softens the hard fat under the skin and helps to disperse it. The distribution of the fat layer under the skin varies according to sex, age and lifestyle.
Women tend to have a thicker layer of adipose tissue than men, giving the female form a softer outline. Following the menopause, women may have a tendency to put on weight in the more masculine areas such as the waist and abdomen rather than the hips and thighs and may also find it harder to lose.

Fat Distribution (Female)



Appendages of the skin

• Hair – hairs are dead structures that are made of a hardened protein called keratin and grow out from follicles. Most of the body is covered with hairs, with the exception of the palms of the ands and the soles of the feet. They help to keep the body warm and are also a form of protection. The eyelashes prevent substances from entering the eyes, and the hairs that line the nose and ears help to trap dust and bacteria. The hair is made up of three layers:

• Cuticle – which is the outer part of the hair and consist of a single layer of scale like cells. These cells overlap rather like tiles on a roof. No pigment is contained within this layer

• Cortex – lies inside the cuticle and forms the bulk of the hair. It contains melanin, which determines the colour of the hair. The cortex helps to give strength to the hair.

• Medulla – is the inner part of the hair and is not always present. Air sacs in the medulla determine the colour tone and sheen of the hair because of the reflection on light.

• Hair follicles – is an indentation of the epidermis with the walls of the follicle being formed from a continuation of the cellular layer of the skins surface. They are in the form of deep pits that extend into the dermis.

• Arrector pili muscle – are small muscles attached to the hair follicles. When we are cold or frightened the contraction of these muscles cause the hairs to stand on end. This results in the appearance of goose bumps. Air is trapped between the skin and hair and is warmed by body heat.

The Skin

• Sweat Glands – Sweat consists of 99.4 per cent water, 0.4 per cent toxins and 0.2 per cent salts. There are two type of sweat glands in the body:

• Eccrine glands – which excrete sweat and are found all over the body. The sweat duct opens directly on to the surface of the skin through an opening called a pore. Sweat is a mixture of water, salt and toxins. Black skins contain larger and more numerous sweat glands that white skins.

• Apocrine glands – these are found in the armpits, around the nipples and in the groin area. They secrete a milky substance. These glands are larger than eccrine glands are attached to the hair follicle; they are controlled by hormones and become active at puberty. Body odour is caused by the breaking down of the apocrine sweat by bacteria. Substances called pheromones are present in this milky substance, the smell is thought to play a part in sexual attraction between individuals and the recognition of mothers by their babies.

• Sebaceous glands – are small, sac-like structures which produce a substance called Sebum. These glands are found all over the body except for the soles of the feet and the palms or hand. They are more numerous on the scalp and areas of the face, such as the nose, forehead and chin. The glands are attached to the upper part of the follicle and its duct enters directly into the hair follicle. Hormones control the activity of these glands and as we get older the secretion of sebum decreases, causing the skin to become drier.

• Sebum – is a fatty substance and is the skin's natural moisturiser. It keeps the skin supple and helps to waterproof it. Men generally secrete more sebum than women. Sebum and sweat mix together on the skin to form an acid mantle. The acid mantle maintains the pH (acid/alkaline level) of the skin.

• Blood and capillary network – blood is supplied to the skin by small blood vessels known as blood capillaries, these enter the lower regions of the dermis and rise to supply the pilo-sebaceous follicles and the sub-epidermal network which also supplies the epidermis. The blood flow within the skin operates as an aid to vital respiration. Capillaries also help with the heat regulation by dilating (widening) and constricting (narrowing) to prevent body heat losses.

• Sensory Nerves – the skin contains sensory nerve endings that detect changes in the environment and send messages to the brain. These nerves respond to touch, pressure, pain, cold and heat and allow us to recognise objects from their feel and shape.

• Motor Nerves – the skin contains motor nerve endings that convey impulses from the brain, though the spinal cord to the muscles, glands and smooth muscular tissue.

• Fibres – nerves are cord-like structures carrying impulses from the periphery, muscles and joints to the brain and spinal cord. Messages pass along the nerve fibres as electrical impulses via a network of interlocking fibres surrounding the upper part of the follicle forming a collar. Fibres extend to the sebaceous glands, epidermis, erector pili and sweat glands.

The Skin

• Sensation – the skin contains sensory nerve endings that send messages to the brain. These nerves respond to touch, pressure, pain, cold and heat and allow us to recognise objects from their feel and shape

• Excretion – waste products and toxins are eliminated from the skin through the sweat glands.

• Absorption – the hair follicles, the sebaceous gland opening, and the skin are able to absorb, penetration can be affected by the health and condition of the skin.

• Protection – the stratum corneum protects the body against its environment. The
structure, rate of replacement and physical repair properties of the outer layer protect against bacterial invasion and minor injury. The skin is waterproof and contains body fluid whilst preventing entry of large quantities of fluid through the epidermis.

• Elimination – sweat is eliminated from the skin to aid heat regulation.

• Heat regulation – it is important for the body to have a constant internal temperature of 36.8 degress Celsius (C) for our bodies to function. The skin helps to maintain this temperature by:
•Vasoconstriction – this occurs when the body becomes cold. The blood vessels constrict reducing the flow of blood through the capillaries. Heat lost from the surface of the skin is therefore reduced.

•Vasodilation – this occurs when the body becomes too hot. The capillaries expand and the blood flow increases, this allows heat to be lost from the body by radiation.

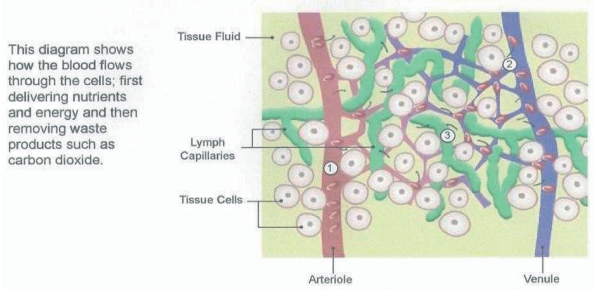
•Goose bumps – contraction of the arrector pili muscle when we are cold causes the hairs to stand on end, keeping a layer of warm air close to the body. This was probably of more use to our ancestors, who were generally hairier.

•Shivering – when we are cold this helps to warm the body, as the contraction of the muscles produces heat within the body.

•Sweating – in hot conditions the rate of sweat production increases. The eccrine glands excrete sweat onto the skin surface and heat is lost as the water evaporates from the skin.

Blood Flow

The blood circulates throughout the body to all the cells, carrying vital nutrients and energy – such as oxygen, glucose and other raw materials essential for the body's health, maintenance and growth. The vacuum action of MDM treatment assists in the stimulation of microcirculation near the skin's surface. This promotes increased blood flow to the area, which promotes collagen and elastin production in the skin, as well as cell renewal (skin regeneration), aiding tissue repair and revealing smoother and fresher skin.



Blood is under high pressure as it flows through the capillary network, forcing fluid out into the tissue and becoming tissue fluid. This fluid contains useful substances like oxygen and nutrients essential for the cells. Blood cells and large proteins remain in the capillary As the blood becomes deoxygenated, pressure is reversed and some of the fluid contain waste products will re-enter the capillaries and be carried away Excess fluids, waste products and large molecule-like proteins that were unable to re-enter the blood are taken up by lymph capillaries and carried to lymph nodes where the fluid is processed and enters back into the blood nearer the heart.

Assignment Six

For this assignment you are required to explain in detail the skin

Assesment Exam

The following questions have been set so you can find out how much you have learned and where you maybe need to concentrate more study.

Please allow yourself 60 minutes and do not refer back to the manual as you are not helping yourself by doing that.

Assessment Exam

1/ who is Galen and which century did he live in?

2/ Who is the great Scottish Anatomist and did he follow the Galen system?

3/ What muscles act on the anterior leg?

4/ What muscles act on the posterior leg?

5/ There are 6 levels of structural organization: What are they?

6/ What are the expected learning outcomes and learning methods of this course?

7/ Explain the Lymphatic System in detail minimum 300 words

8/ Explain how the nervous systems works. Minimum 300 words

9/ Explain the following three systems in detail. Minimum of 300 words
Autonomic System
Sympathetic System
Parasympathetic System

10/ The Brain contains approx. one billion neurons and is protected by various safety features.
What is the very first safety system built in to protect the brain?

Assesment Exam

11/ Explain the Bodies blood flow. Minimum 100 words

12/ what is deemed to be the biggest organ of the human body? What is its structure and how does it work. Minimum of 300 words

13/ The Skeletal system has 206 bones. Name and explain the four different types.

14/ The skeletal system has several important functions what are they?

15. What does Proximal and Distal mean?

16/ Do the muscles work in synchronised patterns YES or NO

17/ The central nervous are located in your brain and spinal cord but where are the Peripheral nerves located?

18/ Where do the Autonomic nerves lead from and go to?

19/ Is the heart a voluntary muscle - YES or NO

20/ What is adipose tissue?

21/ Name the six functions of the skin and what they do

22/ Does the heart move voluntarily or is it involuntary?

23/ The spinal cord is a continuation of the medulla oblongata and extends downwards through the vertebral column, finishing on a level with the lumbar vertebrae. What is it protected by?

Assesment Exam

23/ The spinal cord is a continuation of the medulla oblongata and extends downwards through the vertebral column, finishing on a level with the lumbar vertebrae. What is it protected by?

24/ The muscular system is truly awesome and helps move the body which has 639 named muscles, these muscles make up 40-50% of body weight. Its important to note that a muscles name can give you clues to the way it works and its features. The name either reflects a muscles shape or its attachment. Please name five superficial muscles and 5 deep tissue muscles.

25/ Please explain the Digestive system in as much details as possible