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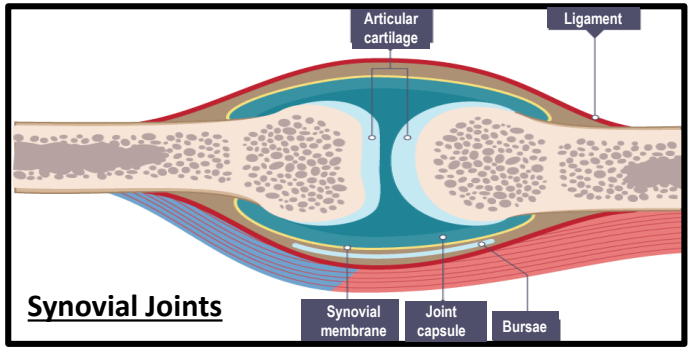
Unit 1.1 Skeletal System

FUNCTION OF THE SKELETON

- **Support:** the bones are solid and rigid. They keep us upright and hold the rest of the body – the muscles and organs – in place.
- **Movement:** the skeleton helps the body move by providing anchor points for the muscles to pull against.
- **Structural shape and points for attachment:** the skeleton gives us our general shape such as height and build. The skeleton also provides anchorage points for the muscles to attach via tendons, so when muscles contract movement occurs.
- **Protection:** certain parts of the skeleton enclose and protect the body's organs from external forces e.g. the brain is inside the cranium. This function is especially important in activities that involve contact. E.g. rugby, boxing.
- **Production of Blood Cells:** the bone marrow in long bones and ribs produce red and white blood cells.
- **Mineral Storage:** bones store several minerals e.g. calcium, which can be released into the blood when needed.



Synovial Joints

Ligaments
Attaches bone to bone to keep the joint stable e.g. knee when kicking the ball or restricts movement/prevents movement to stop injury.

Cartilage
Found between bones and prevents friction by stopping the bones from rubbing together.

Synovial Membrane
Secrets synovial fluid.

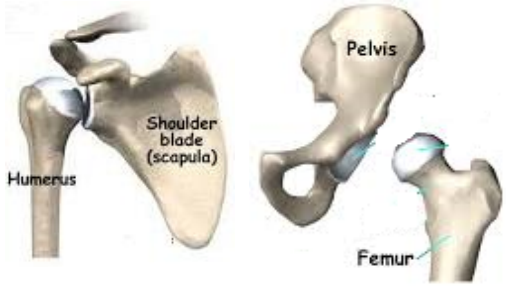
Synovial Fluid
Is produced by the synovial membrane and helps lubricate the joint.

Joint Capsule
This is lined with synovial membrane. It encloses the joint making sure the cartilage and synovial fluid remain in place.

Bursae
Fluid filled sac providing cushion between bones and tendons. This stops friction at the joint.

Tendons
Attach muscle to bone. When a muscle contracts to move a joint, it is the tendon which pulls on the bone, keeps muscles/bones stable or holds join in place.

Types of Joint: Ball and Socket Joint



Location in Body: Shoulder and Hip
Type of Movement Allowed by Joint: Flexion, Extension, Adduction, Abduction, Rotation

Hinge Joint

Location in Body: Knee and Elbow
Type of Movement Allowed by Joint: Flexion and Extension

BONES LOCATED AT JOINTS:

Shoulder = Scapula and Humerus
Elbow = Humerus, Radius, Ulna
Hip = Pelvis, Femur
Knee = Femur, Tibia, Patella

TYPES OF JOINTS - a place where two bones meet

Fixed - skull and pelvis
Slightly Moveable - spine
Synovial Joints

- **Pivot -** vertebrae
- **Condyloid - w**rist
- **Saddle -** thumb
- **Gliding -** clavicle
- **Ball and Socket -** shoulder and hip
- **Hinge -** knee and elbow

TYPES OF BONES

Flat bones: protect vital organs e.g. cranium protects your brain, ribs protect heart and lungs

Long bones: enable gross (large) movements e.g. femur, tibia and fibula in the leg which allow us to run, humerus, radius and ulna in arm which allows us to throw a ball

Short bones: enable fine (small) movements e.g. fingers allowing you to spin a cricket ball

Irregular: vertebrae

Sesamoid: Patella

Key Stage 4 – BTEC Health & Fitness / Skeletal System – HT1

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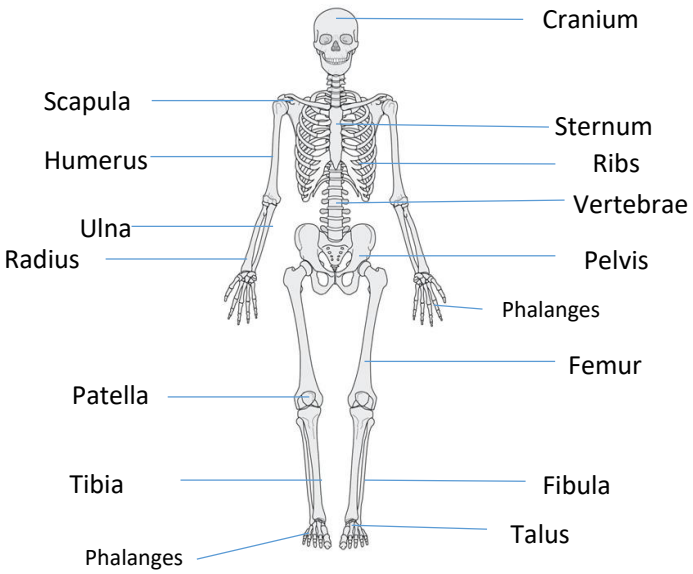
Unit 1.1 Skeletal System



STRUCTURE OF THE SKELETON

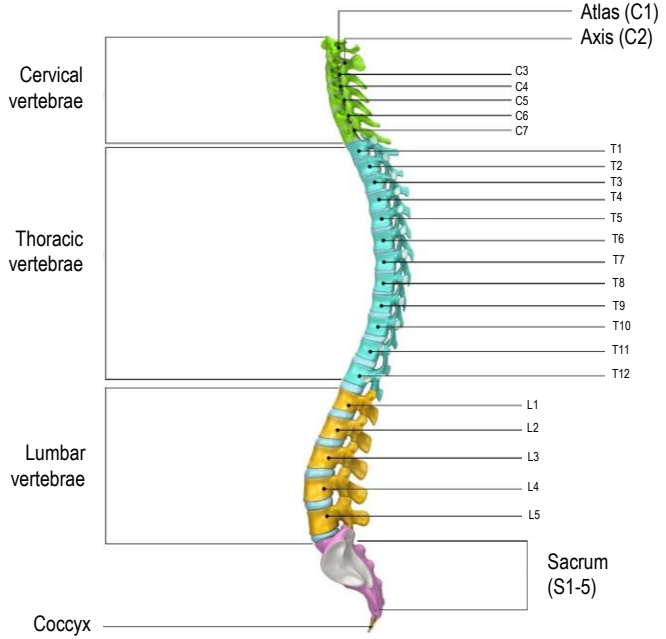
AXIAL-Cranium, sternum, ribs and vertebrae

APPENDICULAR- clavicle, scapula, humerus, radius, ulna, carpals, tarsals, pelvis, femur, tibia, fibula, and phalanges.

Lordosis: Also called swayback, the spine of a person with lordosis curves significantly inward at the lower back.

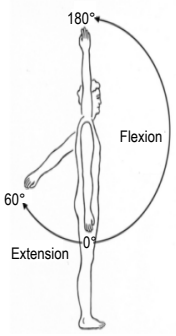
Kyphosis: Kyphosis is characterized by an abnormally rounded upper back (more than 50 degrees of curvature).

Scoliosis: A person with scoliosis has a sideways curve to their spine. The curve is often S-shaped or C-shaped.



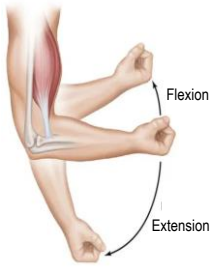
Flexion and extension at the shoulder

- The **Deltoid** causes flexion at the shoulder
- The **Latissimus dorsi** causes extension at the shoulder



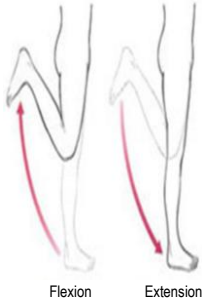
Flexion and extension at the elbow

- The **Biceps** cause flexion at the elbow
- The **Triceps** cause extension at the elbow



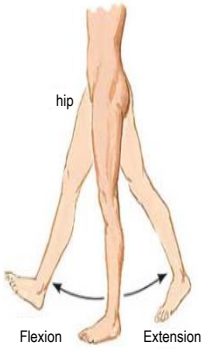
Flexion and extension at the knee

- The **Hamstrings** cause flexion at the knee
- The **Quadriceps** cause extension at the knee



Flexion and extension at the hip

- The **Hip Flexors** cause flexion at the hip
- The **Gluteals** cause extension at the hip

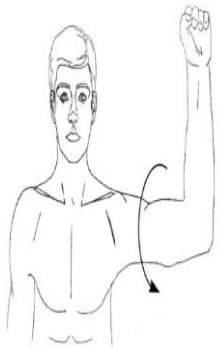


Flexion and extension at the ankle

- The **Tibialis Anterior** causes dorsiflexion at the ankle
- The **Gastrocnemius** cause plantar flexion at the ankle

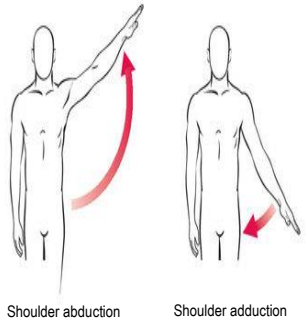
Rotation of the Shoulder

- The **Rotator Cuff** causes rotation at the shoulder



Abduction and Adduction at the shoulder

- The **deltoid** causes abduction at the shoulder
- The **Pectorals / Latissimus Dorsi** cause adduction at the shoulder



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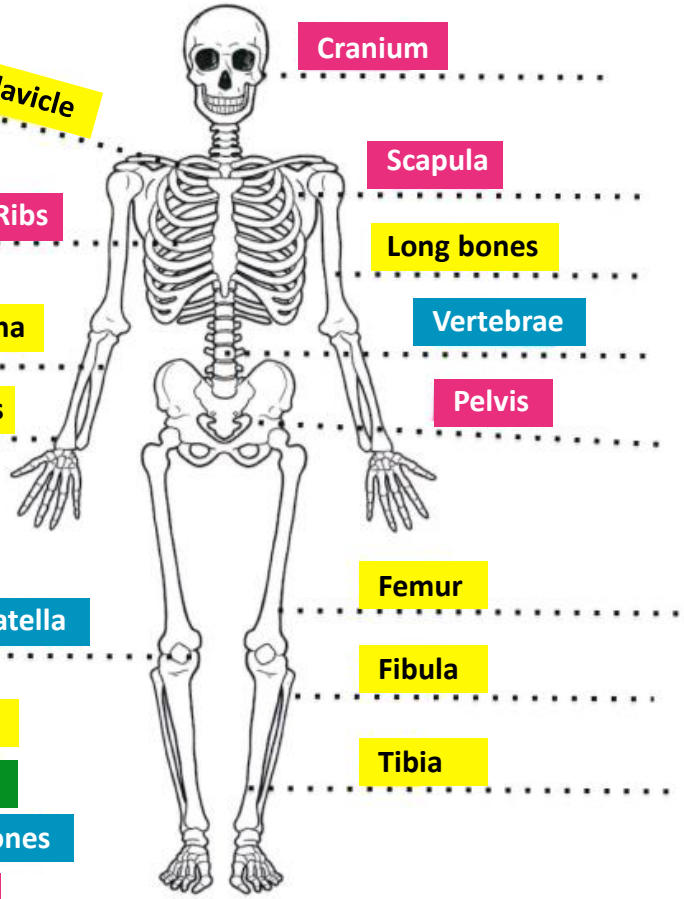

Long bones

Short bones

Irregular bones

Flat bones

Shape & support

Forms the frame to which our muscles can attach and in which our organs can sit

Movement

Movement occurs when muscles contract and pull on bones making them move about a joint

Protection

Internal organs are soft, delicate and easily damaged

Blood production

The centre of some large bones contains red bone marrow, which creates red blood cells

Types of Joints

Provide a large range of movement in every direction. Found at the hip & elbow

Ball & socket

Hinge

Act like a hinge on a door, allowing movement in one direction. Found at the elbow & knee

Skeletal System

Chapter 1 - Knowledge Organiser

Types of Movement

Involves bending a part of the body	Flexion			Extension	Involves straightening a part of the body
A sideways movement towards the centre of the body	Adduction			Abduction	A sideways movement away from the centre of the body
Movement in the ankle where the toes are brought closer to the shin	Dorsiflexion			Plantar flexion	Movement in the ankle that points the foot away from the leg
A turning point around an imaginary line	Rotation			Circumduction	Occurs when the end of a bone moves in a circle

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Unit 1.2 Muscular System

Types Of Muscles

CARDIAC- Found in the heart wall
- Oxygen dependent, involuntary
- aids blood flow through the heart

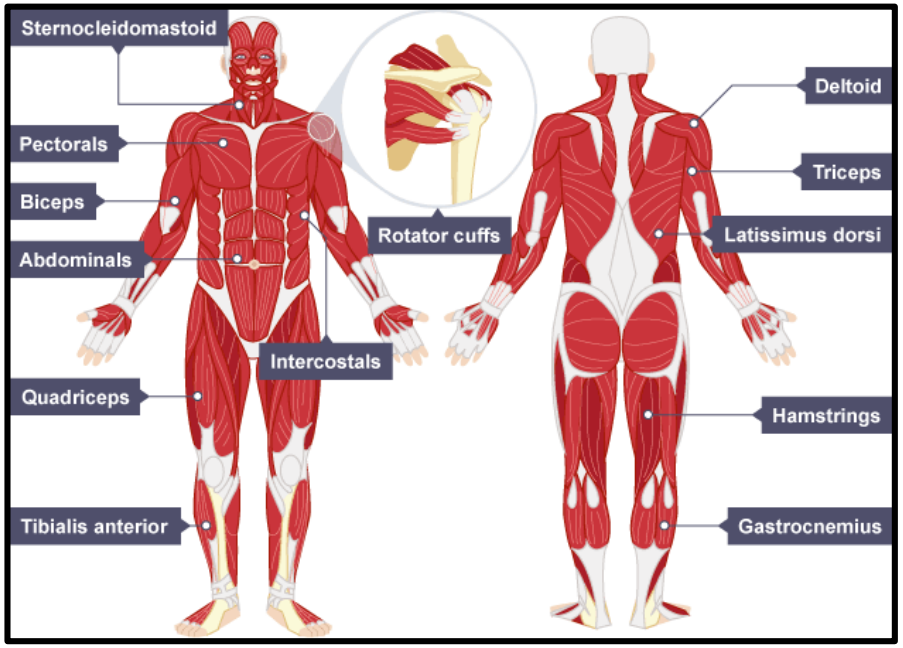
SMOOTH- Found in internal organs, digestive tract, blood vessels and lungs.
- can work without oxygen, involuntary
- aids digestion, helps distribution of blood.

SKELETAL- Found around the body
- can work with or without oxygen, works voluntarily.
- aids with movement.

Muscle fibre types

Type 1- Slow twitch fibres- red in colour, slow contraction speed, low force, fatigue slowly and uses oxygen..

Type 2- fast twitch fibres- white in colour, fast contraction speed, fatigue quickly, contract without oxygen.



Muscular Contractions

Isotonic Contractions

These contractions occur when there is movement of the body. The ends of the muscles move closer together to cause the movement.

Isometric Contractions

This type of contraction takes place when the body is being held in the same position. The length of the muscle during these contractions stays the same length.

Isotonic Concentric Contraction occurs when the muscle shortens e.g. biceps contracting concentrically during the upwards phase of a bicep curl / triceps contracting concentrically during the upwards phase of a press-up

Isotonic Eccentric Contraction occurs when the muscle lengthening (antagonist) is under tension. An eccentric contraction provides the control of a movement on the downward phase and it works to resist the force of gravity e.g. biceps contracting eccentrically when lowering the weight in a bicep curl / triceps contracting eccentrically during the downwards phase of a press-up.

- **How do MUSCLES WORK?**
- Muscles can only PULL they cannot push. This means that they must work in pairs to allow parts of the body to move back and forth. THESE PAIRS ARE CALLED **ANTAGONISTIC PAIRS.**
- **Antagonistic Pairs**
- A muscle must work in partnership with another muscle to allow movement to occur.
- The muscle that causes the movement (the pulling muscle) is called the **AGONIST** or **PRIME MOVER**. When this muscle contracts in becomes shorter.
- During this time the other muscle within this partnership is relaxing. This muscle is called the **ANTAGONIST** and is lengthening while it relaxes.

EXAMPLES:
- When we flex our elbow the bicep is the **agonist** and the tricep is the **antagonist**. However these roles are reversed when the elbow extends ,with the tricep becoming the **agonist** and the bicep becoming the **antagonist**.
- When dorsiflexion occurs in our ankle the tibialis anterior is the **agonist** and the gastrocnemius is the **antagonist**. However these roles are reversed when plantar flexion occurs at the ankle, with the gastrocnemius becoming the **agonist** and the tibialis anterior becoming the **antagonist.**

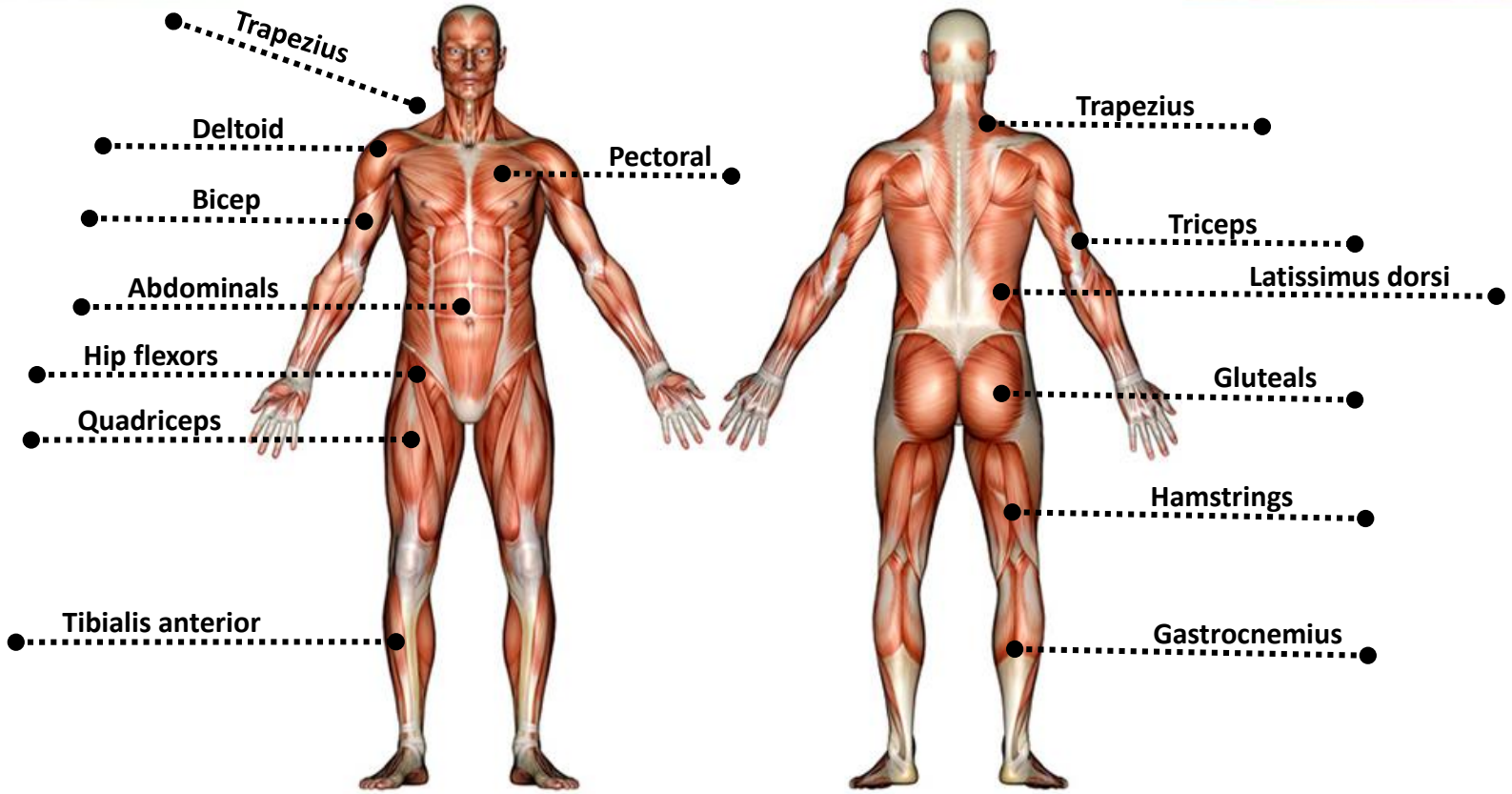
Antagonistic Muscle Pairs

HAMSTRINGS	QUADRICEPS
Bicep	Tricep
HIP FLEXORS	GLUTEALS
DELTOID	LATISSIMUS DORSI

Key Stage 4 – BTEC Health & Fitness / Muscular System – HT1

Muscular System

Chapter 1 - Knowledge Organiser



Where a muscle joins a stationary bone

Origin

Insertion

Where a muscle joins a moving bone

Muscular System

Chapter 1 - Knowledge Organiser

The muscle the contracts during movement (prime mover)

Agonist

Antagonistic pair

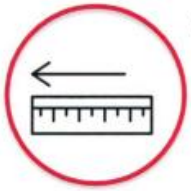
Antagonist

The muscle that relaxes during movement

Muscle Contractions

Isotonic contractions

Where muscles change length as they contract

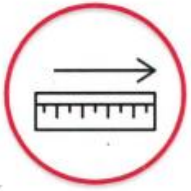


Concentric contractions

Muscle contractions where the muscle shortens

Isometric contractions

Where muscles contract, but stay the same length



Eccentric contractions

Muscle contractions where the muscle lengthens

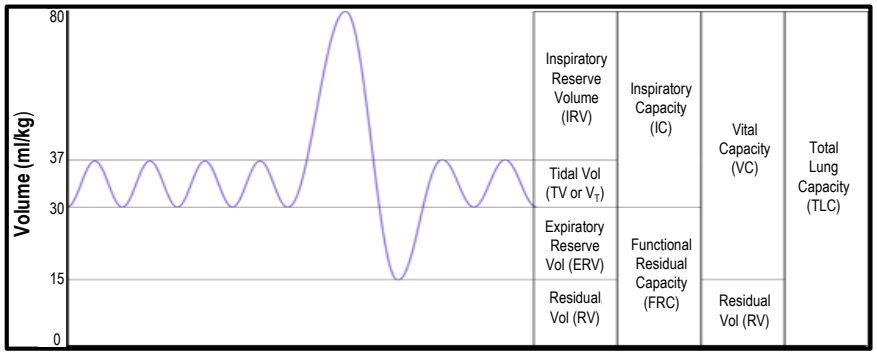
Muscle Fibers

Slow twitch fibers

Use oxygen. They take longer to get going but can work for longer

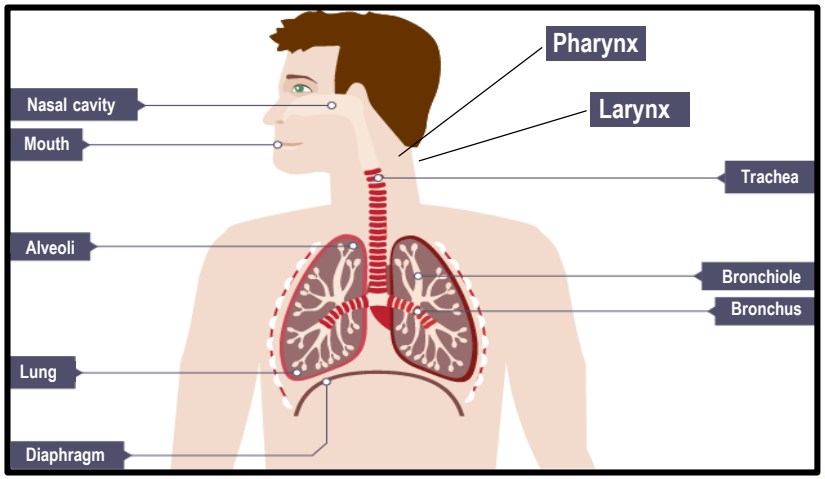
Fast twitch fibers

Thicker, quicker to contract and more powerful, but tire quicker



The Pathway of Air into the Body

- When we breathe in, air moves through the **mouth and nose**.
- It then travels down the **trachea**.
- Near the lungs the trachea divides into two tubes called **bronchi** (one enters left lung and the other the right).
- Once in the lungs the bronchi split into smaller bronchi before dividing into even smaller tubes called **bronchioles**.
- At the end of each bronchiole are openings to the **alveoli**. There are usually several alveoli coming from one bronchiole, forming a little clump that resembles a cluster of grapes.
- At the alveoli gaseous exchange occurs. Capillaries carrying blood surround each alveoli resulting in oxygen being passed into the bloodstream from the alveoli in exchange for carbon dioxide which passes from the blood stream into the alveoli.

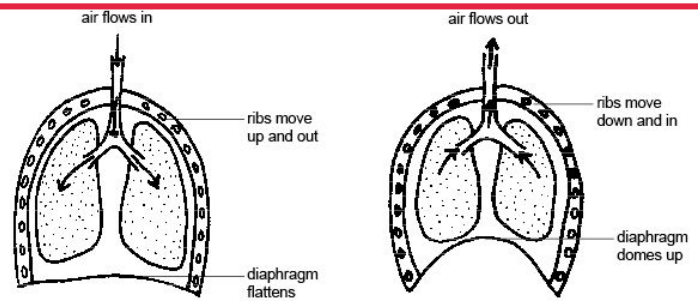


Inspiration (How we breathe in):

- The diaphragm contracts and flattens.
- The intercostal muscles contract which causes the rib cage to rise.
- Both these actions cause the chest cavity to increase in size / volume.
- This reduces the pressure in the chest cavity, due to this the air passes from the higher pressure outside the lungs to the lower pressure inside the lungs.
- This causes the lungs to expand and fill the chest cavity

Expiration (How we breathe out):

- The diaphragm relaxes and bulges up, returning to its original dome shape.
- The intercostal muscles also relax causing the ribs cage to lower.
- Both these actions cause the chest cavity to decrease in size / volume.
- The reduction in the size of the chest cavity increases the pressure of the air in the lungs and causes it to be expelled.
- The air passes from the high pressure in the lungs to the low pressure in the bronchi and trachea.



Gaseous Exchange

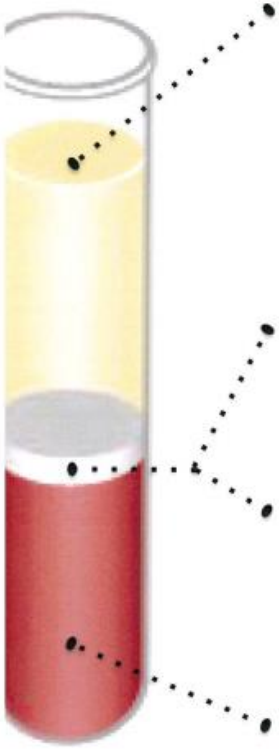
- Takes place at the **Alveoli** through **diffusion**
- Oxygen (high concentration) diffuses through the capillaries into the blood stream (low Oxygen concertation) to be sent to the heart.
- Carbon dioxide (high concentrations) In the capillaries replaces the oxygen (**exchanged**) in the alveoli (Low carbon dioxide concentration) so that it can be removed from the body.

Key features of the Alveoli (help diffusion):

- Alveoli walls are only **one cell thick** and are **moist** – easy to exchange gases
- They are **very small**, however their are **millions** within the lungs – large surface area
- Covered with **huge network of capillaries** – constant blood supply

UNIT 1·4 Circulatory System

Chapter 3 - Knowledge Organiser



Plasma
Allows substances to dissolve and be transported easily

Platelets
Causes blood to clot when there is damage to blood vessels

White blood cells
Defends the body against pathogens by creating antibodies

Red blood cells
Contains hemoglobin, which reacts with oxygen from the lungs to form oxyhemoglobin

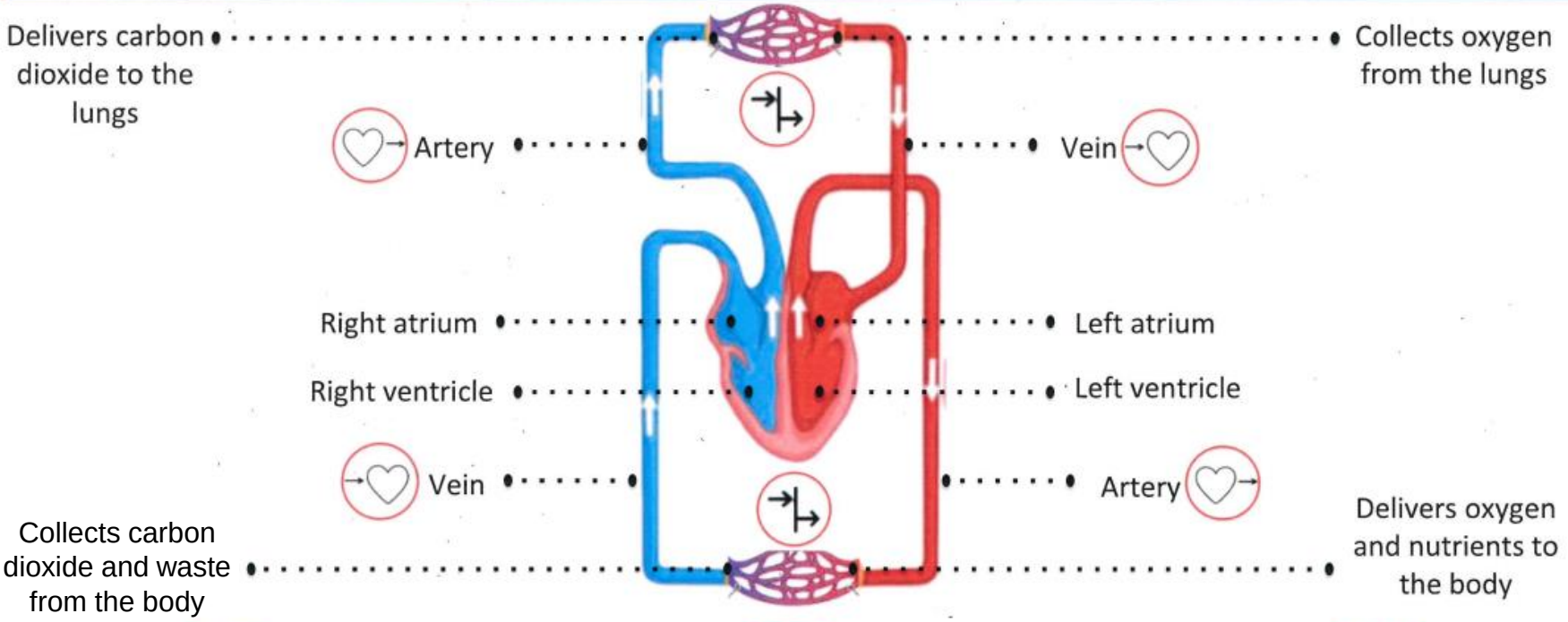
Arteries
Transports oxygenated blood away from the heart at high pressure
- Thick outer wall
- Narrow lumen

Veins
Transports deoxygenated blood to the heart at low pressure
- Thin outer wall
- Wide lumen

Capillaries
Allows substances to pass into and out of cells
- Single cell thick

Circulatory System

Chapter 3 - Knowledge Organiser



Heart rate (HR) × Stroke volume (SV) = Cardiac output (CO)

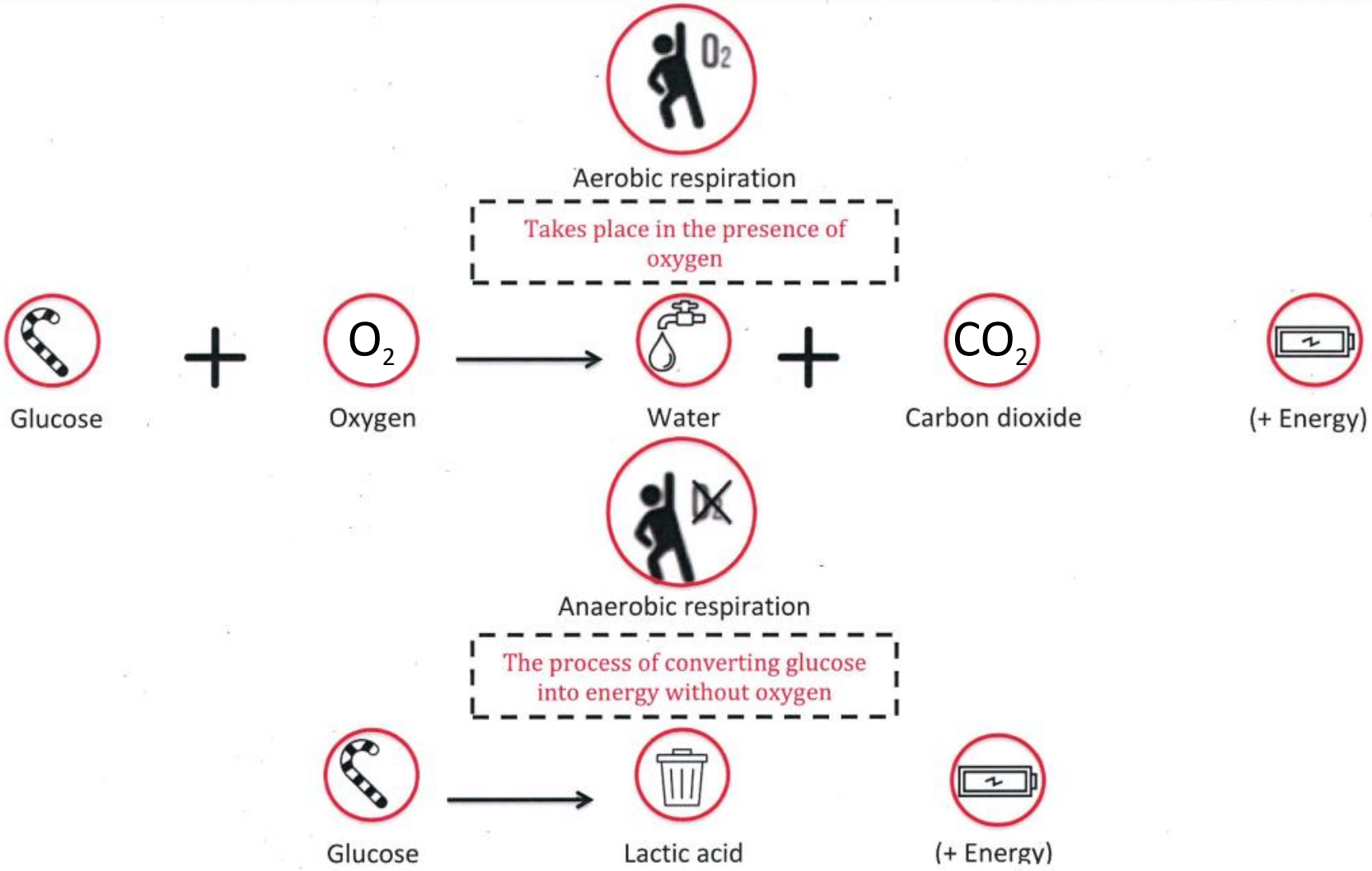
Measures the heart beats per minute (bpm)

Volume of blood pumped out of the heart by each ventricle in one beat

Amount of blood expelled from the heart each minute

UNIT 1.5 Energy Supply

Chapter 4 - Knowledge Organiser



UNIT 2.1 The Effect of Exercise

Chapter 4 - Knowledge Organiser

Effects of Exercise

Short-term

Heat control		Body temperature will rise and your skin will redden
Sweating		Helps to cool the body down
Breathing & heart rate increase		Helping to send more oxygen to the working muscles
Nausea		A feeling of sickness with an inclination to vomit

Long-term

Heart size		Becomes thicker and stronger. Increases stroke volume
Resting heart rate		The heart becomes more efficient
Stroke volume		Increase in the volume of blood pumped out of the heart per beat
Tolerate lactic acid		More efficient at reprocessing waste products of exercise

Health, Fitness and Fitness Components

UNIT 3.1

Relationship between Health and Fitness

Health
Health is your physical, mental and social well-being and not merely the absence of disease.

If you are unable to train due to poor health, your fitness levels can be negatively affected. However, if you are still able to train despite ill health, your fitness levels will not be negatively affected.

Fitness
This relates to your ability to perform tasks within your daily life without becoming overly tired.

Components of Fitness and Physical Activity

The different components of fitness which can be improved through physical training are outlined below. Different sports require different components to perform different skills.

Components of Fitness

Cardiovascular Endurance
The ability to exercise for a prolonged period of time

Agility
The ability to rapidly change direction and body position

Reaction Time
The ability to quickly respond to a cue

Speed
The ability to travel a certain distance quickly

Balance
The ability to maintain a stable centre of gravity in order to avoid falling

Static Strength
The ability to exert against an immovable object

Maximal Strength
The maximum force produced in order to move larger loads

Dynamic Strength
The ability to create a force repeatedly for a long period of time

Explosive Strength
Force exerted in one quick muscular contraction

Strength
The ability to overcome resistance

Power
The ability to apply a force quickly

Flexibility
The ability to quickly respond to a cue

Coordination
The ability to time the movement of the whole body or individual body parts in relation to external or internal cues

Muscular Endurance
The ability to quickly respond to a cue

Key Stage 4 – BTEC Health & Fitness / Components – HT1

UNIT 4.1 Principles of Training & Overload

Chapter 7 - Knowledge Organiser

S — **Specificity**

Training must focus on specific activities to improve the athlete's fitness or particular muscle groups needed for their sport and/or position

P — **Progression**

Occurs when the body adapts to training and moves to a new level of fitness

O — **Overload**

When the level of training is raised to a level higher than normal. This can achieved by an increase in any of the FITT principles

R — **Reversibility**

If training intensity is reduced or stopped, there can be deterioration of any progress previously made

T — **Tedium**

Boredom! This is an indicator that training needs to changed and made more interesting and useful

F — **Frequency**

How often you train

I — **Intensity**

How hard you train

T — **Time**

How long you train for

T — **Type**

Activities need to be useful and enjoyable. Vary activities to avoid tedium