The PE Classroom

Edexcel GCSE PE: Systems of the Body

The Skeletal System

Functions of the skeletal system:-
- Movement
- Support
- Blood Cell Production
- Muscle attachment
- Protection of vital organs
- Mineral storage
- (e.g. Calcium/Phosphorus)

Types of Bones:-
- Long Bones
- Short Bones
- Flat Bones
- Irregular Bones

Hinge Joints

Ball & Socket Joints

Joints allow movement and rotation. Synovial joints are where two or more bones meet.

They are made up of:-
- Synovial membrane
- Synovial fluid
- Joint capsule
- Ligament
- Cartilage
- Bursae

Condyloid Joints

Pivot Joints

Joint Actions

Flexion - narrowing of the angle at a joint

Extension - widening of the angle at a joint

Abduction - movement away from the body midline

Adduction - movement towards the body midline

Plantarflexion - widening of the angle at the ankle joint

Dorsiflexion - narrowing of the angle at the ankle joint

Rotation - the action of rotating around an axis

Circumduction - action of rotating 360 degrees around an axis

The Muscular System

Antagonistic Pairs -
As one muscle CONTRACTS, another muscle will RELAX:-
Pectoralis Major & Deltoid

Muscle Fibres

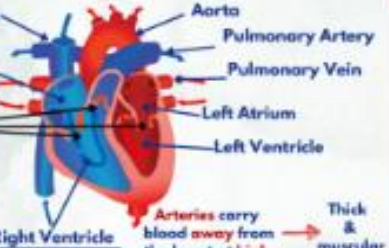
Type I	Type IIA	Type IIX
Slow Twitch	Fast Twitch	Fast Twitch
Slow Contractions	Fast Contractions	Very Fast Contractions
Aerobic Activity	Fatigue relatively quickly	Fatigue very quickly
e.g. Marathon	e.g. 800m	e.g. 100m

Involuntary Muscles
A muscle which you cannot control

Cardiac Muscles
A muscle found in the wall of the heart

Voluntary Muscles
A muscle which you can control

The Cardiovascular System



Valves Open and close to allow blood to pass through, preventing back-flow

Systolic blood pressure; pressure as the heart contracts → 130/
Diastolic blood pressure; pressure as the heart relaxes → 85

Arteries carry blood away from the heart at high pressure → Thick & muscular walls

Veins carry blood towards the heart at low pressure → Thin walls

Capillaries connect arteries and veins, allowing diffusion of gases → Very thin walls

Vasodilation
Blood vessels diameter decreases, restricting the amount of blood delivered to inactive areas

Vasoconstriction
Blood vessels become wider, increasing the amount of blood delivered to active areas

Heart Rate (HR)	No. beats per minute
Stroke Volume (SV)	Amount of blood ejected each beat
Cardiac Output (CO)	Amount of blood ejected per minute (HR * SV)
Anticipatory rise	Increase in HR just before physical activity

Red Blood Cells
Circulation of oxygen around the body

Platelets
Form blood clots following injury

White Blood Cells
Destroy pathogens

Plasma
90% water but also contains salts, enzymes, antibodies and other proteins

The Respiratory System

Trachea splits into two bronchi

Air travels through the trachea to reach lungs

Alveoli
Millions of tiny air sacs at the end of bronchioles, where gas exchange takes place

Bronchioles
Bronchi splits further into bronchioles

Diaphragm
Responsible for inspiration
Moves to a flat position when inhaling to push the lungs up, enabling air to rush in.
When exhaling moves to a dome position, allowing the lungs to lower and air to rush out.

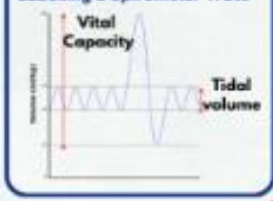
Gas Exchange at the Alveoli

→ The oxygen in the alveoli diffuses into the bloodstream and is transported to the working muscles

→ The CO_2 from the bloodstream diffuses into the alveoli in order to be exhaled by the lungs

	Inhaled Air	Exhaled Air
Oxygen	21%	16%
Carbon Dioxide	0.04%	4%
Nitrogen (+ other gases)	79%	79%

Labelling a Spirometer Trace



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Key Terms - Applied Anatomy and Physiology

Skeletal System

Tendons – Fibrous tissues that join bone to muscle.
Ligaments – Strong, flexible fibre that connects bones to other bones.
Flexion - Movement decreasing the angle between body parts (bending).
Extension - Movement increasing the angle between body parts (straightening).
Dorsi-Flexion - Flexing the toes so that they move closer to the shin.
Plantar-Flexion - Extending the toes down, away from the shin.
Adduction - Movement of a body part toward the body's midline.
Abduction - Movement of a body part away from the body's midline.
Rotation -The action of rotating around an axis or centre.
Circumduction - Moving in a circular shape. Allows for 360 degrees of movement.

Effects of Exercise

Short Term effects – What happens to the body during exercise.
Long term effects – What happens to the body in the weeks and months following continued exercise.
Bone Density – The amount of minerals in bone tissue.
Hypertrophy – When something increases in size and strength.
Minute Volume – The amount of air inspired per minute.
Capillarisation – An increase in the number of capillaries.

Cardiovascular System

Cardiovascular system -The system formed by the heart, blood and blood vessels. AKA the circulatory system.
Blood Vessels - Responsible for transporting blood; arteries, veins and capillaries.
Blood Pressure - The pressure of the blood against the walls of the walls of the blood vessels.
Systole - The phase of the heartbeat when the heart contracts and pumps blood from the chambers into the arteries.
Diastole - The phase of the heartbeat when the heart relaxes and lets the chambers fill with blood.
Arteries - Blood vessels that takes blood away from the heart.
Veins - Blood vessels that takes blood back to the heart.
Capillaries - Tiny blood vessels that link arteries with veins.
Vascular Shunting - The process that increases blood flow to active areas during exercise by diverting blood away from inactive areas.
Platelets - Responsible for the clotting of blood.
Plasma - The fluid part of blood, essential for transporting it around the body.
Red Blood Cells - Contain haemoglobin and are responsible for transporting oxygen around the body.
White Blood Cells - Are vital in fighting off disease or illness.
Vasodilation - When blood vessels get bigger (dilate), which cools you down.
Vasoconstriction - When blood vessels get smaller (constrict), which warms you up.

Respiratory System

Respiratory system - The system of organs and vessels that gets oxygenated blood to the body tissues.
Vital Capacity - The greatest amount of air that can be made to pass into and out of the lungs.
Tidal Volume - The amount of air inspired and expired with each normal breath.
Respiration - The movement of air from outside the body into the cells within tissues.
Diaphragm - A dome-shaped muscle that separates the chest from the rest of the body.
Trachea - The tube that takes air into the body. AKA the windpipe.
Bronchus - Tube along which air passes from the trachea to the lungs.
Bronchioles - Smaller branches coming off the bronchi.
Alveoli - Tiny sacs at the end of the bronchioles, where gas exchange takes place.
Haemoglobin - A type of protein found in every red blood cell. Attaches to oxygen and transports it around the body.

Muscular System

Voluntary Muscle - A muscle which is controlled by an individual.
Involuntary Muscle - A muscle which is not under an individual's control.
Cardiac Muscle - An involuntary muscle found in the wall of the heart.
Antagonistic Pair - Two muscles working together. One contracts while the other relaxes.
Agonist - The muscle which is contracting. Also known as the 'prime mover'.
Antagonist - The muscle which is relaxing.
Type I - Slow twitch muscle fibre.
Type IIa - Fast twitch muscle fibre.
Type IIx - Fast twitch muscle fibre.

Anaerobic & Aerobic:

Aerobic Respiration - The process of releasing energy from glucose, using oxygen.
Anaerobic Respiration - The process of releasing energy from glucose, without oxygen.
Aerobic Exercise - Exercising at a moderate intensity, allowing the body to utilise oxygen for energy production.
Anaerobic Exercise - Exercising at a high intensity, not allowing the use of oxygen for energy production.
Lactic Acid - A toxic acid produced in muscles during anaerobic exercise. Causes muscle cramps.
Oxygen Debt - The amount of oxygen needed at the end of physical activity to break down any lactic acid.
Fats - A rich source of energy, especially for long periods of exercise.
Carbohydrates - The body's main source of energy. Split into complex and simple forms.
Heart Rate - The number of times the heart beats per minute.
Stroke Volume - The amount of blood pumped by the heart each beat.
Cardiac Output - The amount of blood pumped by the heart each minute.
Cardiac Output = Stroke Volume X Heart Rate.