Summer transition work
BTEC Sport

This work contains all areas from unit 1 - Anatomy and physiology

You will need to read the knowledge organiser and then complete the worksheets that follow.

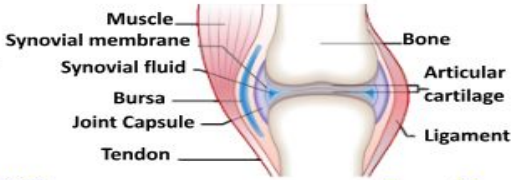
Please bring this in on your first day back after summer

Skeletal System

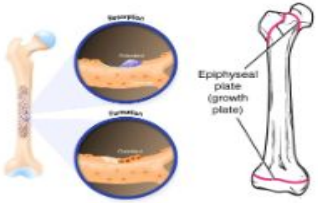
Functions

- Supporting framework
- Protection
- Attachment for muscles
- Blood cell production
- Storage of minerals
- Leverage
- Weight bearing
- Reducing friction at jo

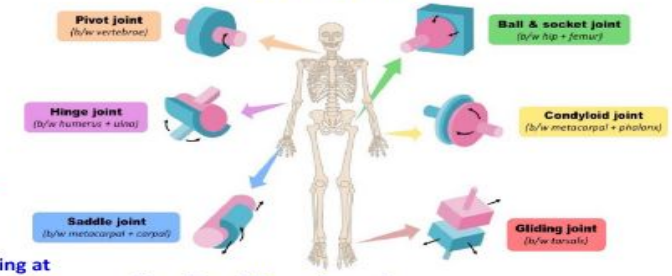
Structure of a joint



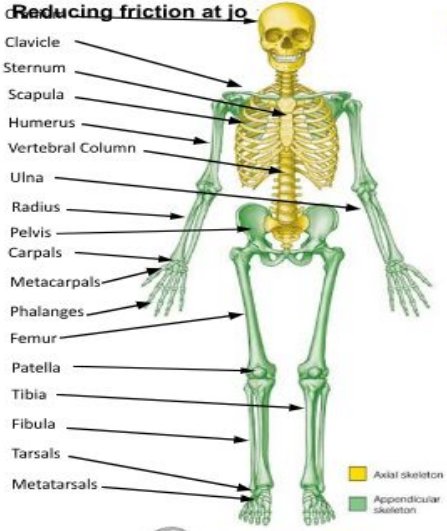
Bone Growth



6 Types of synovial joint



Bones



Types of Bone

Long Bones	Leverage and red blood cell production	Femur, Humerus
Short Bones	Weight bearing	Tarsals, Carpals
Flat Bones	Protection	Cranium, sternum
Irregular Bone	Individualised function	Pelvis
Sesamoid Bones	Reducing friction across a joint, embedded in a tendon	Patella

Bones forming at specific joints

Shoulder	Scapula, Clavicle, Humerus **Joint Type:** Ball & Socket
Elbow	Humerus, Radius, Ulna **Joint Type:** Hinge
Wrist	Carpals, Radius, Ulna **Joint Type:** Hinge
Hip	Illium, Pubis, Ischium, Femur **Joint Type:** Ball & Socket
Knee	Femur, Tibia, Fibula **Joint Type:** Hinge
Ankle	Tibia, Fibula, Talus **Joint Type:** Hinge

Short Term Effects of exercise

Increases of mineral uptake in bones due to weight bearing exercises.

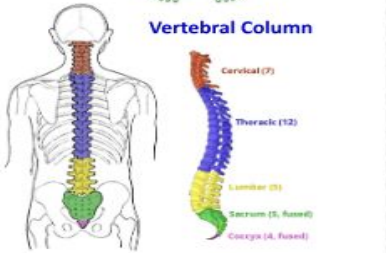
Long Term Effects of exercise

- Increased bone strength
- Increased ligament strength

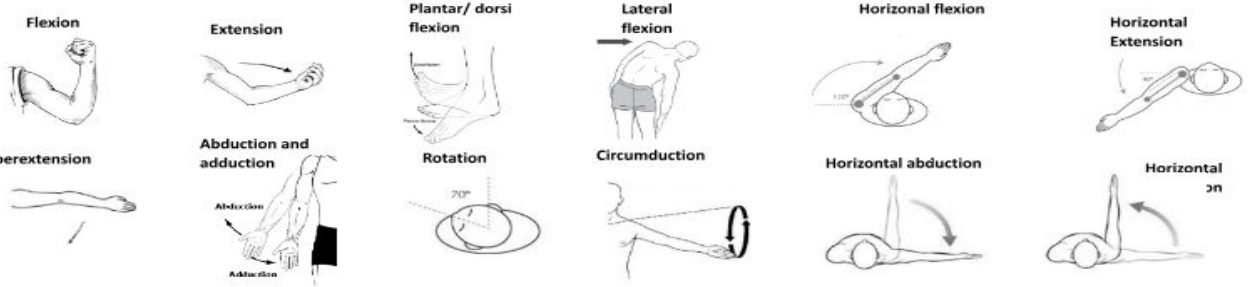
Kyphosis

Lordosis

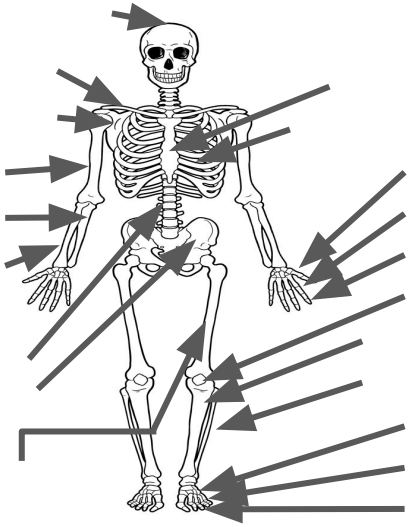
Vertebral Column



Ranges of movement at synovial joints



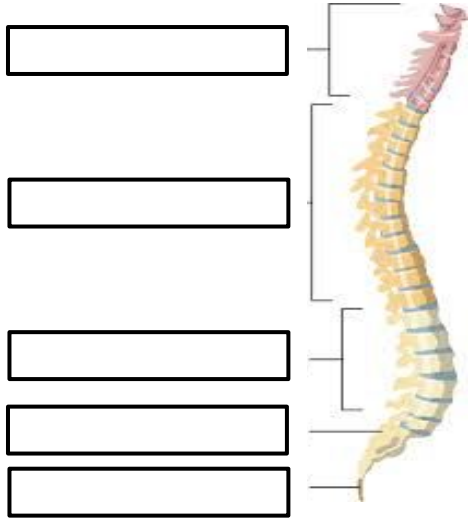
THE SKELETAL SYSTEM



FUNCTION OF A SKELETON
Movement

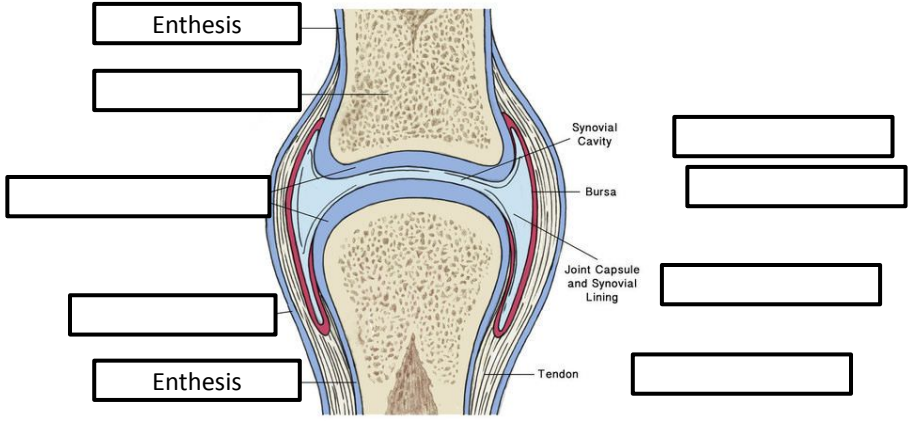
PROCESS OF BONE GROWTH

All bones are formed from _____, except the clavicle (collarbone) and some parts of the cranium (skull). Bone growth begins in the centre of the bone so growth goes both upwards and downwards. Cartilage remains around the bone until growth is complete. The process from cartilage to bone is known as _____



CLASSIFICATION OF BONES	
	FUNCTION
SHORT	WEIGHT BEARING AND PROVIDE SUPPORT

AREAS OF THE SKELETON		
	NO. OF BONES	LOCATION
AXIAL	80	SKULL, THORACIC CAGE, VERTEBRATE



TYPES OF JOINT MOVEMENTS	
MOVEMENT	**EXAMPLE IN SPORT**
FLEXION	WHEN YOU BRING YOUR LEG BACKWARDS IN PREPARATION TO KICK A FOOTBALL

Explain one **adaptation** of the skeletal system stating why it would benefit a performer.

TYPES OF SYNOVIAL JOINTS	
MOVEMENT	**EXAMPLE IN SPORT**
PIVOT	TURNING YOUR NECK TO LOOK UPWARDS OR SIDEWAYS WHEN PLAYING BADMINTON

Type	Meaning
	To the front or in front
	To the rear or behind
	Towards the midline or axis, an imaginary line down the centre of the body
	Away from the midline or axis
	Near to the root or origin (the proximal of the arm is towards the shoulder)
	Away from the root or origin (the distal of the arm is towards the hand)
	Above
	Below

Ligaments are tough elastic fibres that link_____

Tendons connect _____ _____ _____

Cartilage _____ bones rubbing together at joints.

State the three additional factors affecting the skeletal

The Muscular System

Three types of Muscles



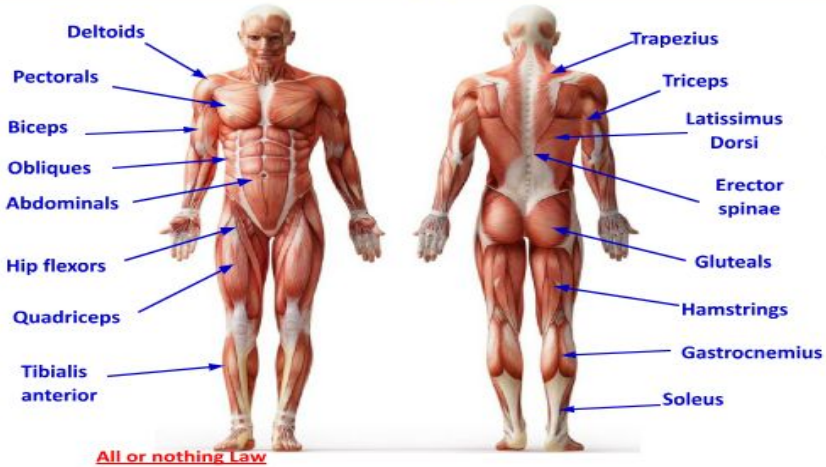
Cardiac, non-fatiguing | Involuntary, slow contraction | Skeletal, fatiguing

Three types of Muscle Contraction

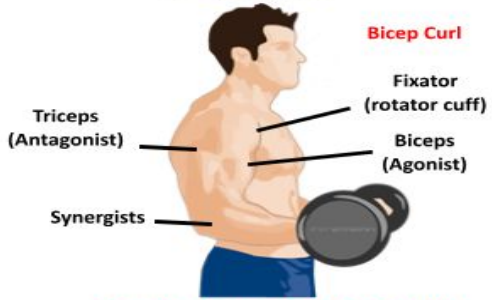
Isometric
Length of muscle does not change

Concentric
Muscle shortens

Eccentric



Antagonistic Pairs



Antagonistic pairs = muscles that work together to produce movement (One muscle contracts whilst the other relaxes

Agonist = muscle shortens to create movement

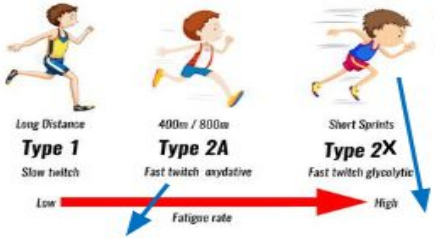
Antagonist = muscle relaxes during movement

Fixator = stops unwanted movement/stabilises

Synergists = Assists the agonist

- Slow contraction
- Slow to fatigue
- Suited to aerobic activities
- Uses oxygen
- Rich blood supply

Muscle Fibre Types



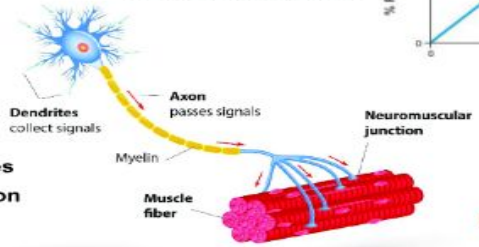
- Fast twitch fibres
- Fast contraction and powerful force
- Resistant to fatigue
- Need less oxygen
- Suited to speed, power and strength activities

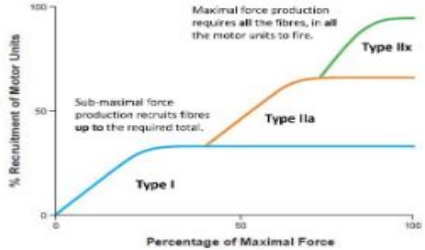
- Fast twitch fibres
- Rapid contraction
- Large force produced
- Fatigue so better suited to anaerobic short events
- Stop- start- sports

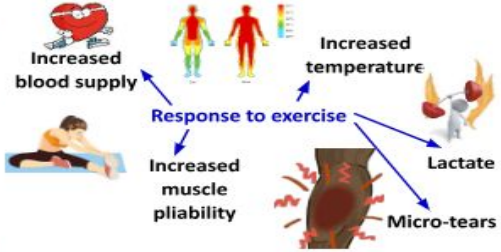
All or nothing Law

- Nerve stimulation is needed for contraction
- Motor units used which contain motor neurons.
- When a motor unit is stimulated all the muscles attached will contract

MOTOR NEURON



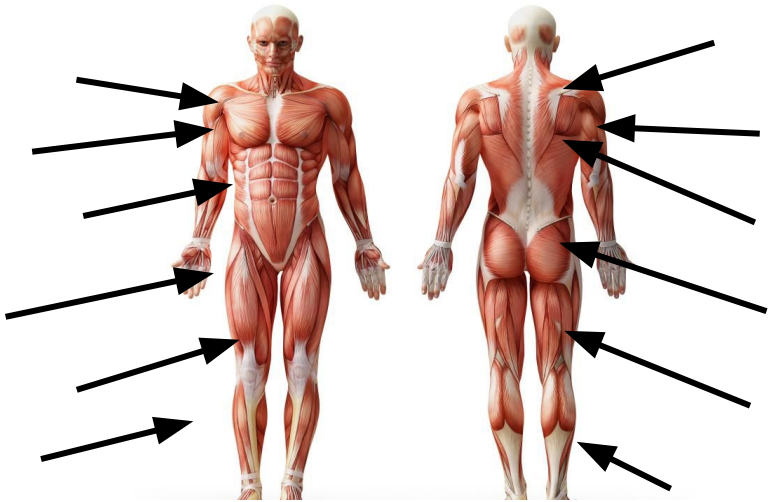




Additional Factors

Age: Muscle atrophy

Cramp: involuntary contraction



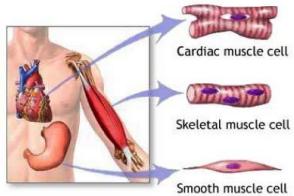
THE MUSCULAR SYSTEM

Muscle type	Characteristics and functions of each muscle type
Cardiac	
Skeletal / Voluntary	
Smooth / Involuntary	

Dennis is an athlete who swims regularly. What responses and adaptations will happen to Dennis' muscular system?

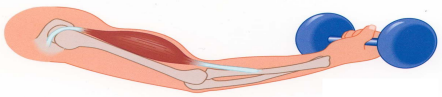
Responses

Adaptations

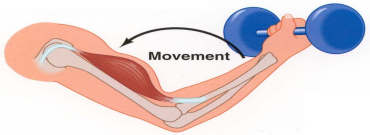


State the additional factors affecting the muscular system

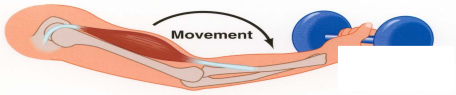
Muscle	Function
Triceps	
Deltoids	
Pectorals	
Biceps	



During an _____ contraction the length of a muscle does not change and the joint angle does not alter. However, the muscle is actively engaged in holding a static position.



During an _____contraction the muscle shortens as the muscle fibres contract.



An _____ contraction is when a muscle returns to its normal length after shortening against resistance.

ANTAGONISTIC PAIRS
Define these three terms: agonist, antagonist and antagonistic pairs.
Write down as many antagonistic pairs as you can think of.

TYPE 1

Slow twitch muscle fibres are designed to work _____ as they are excellent at using oxygen to help create energy.

LONG DISTANCE EVENTS

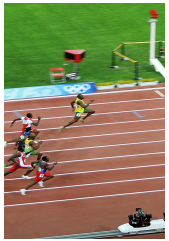
TYPE 2A

Fast twitch muscle fibres are designed to work _____.

They contract quickly with high force, but can work for a relatively long time.

INVASION GAMES PLAYER

TYPE 2X

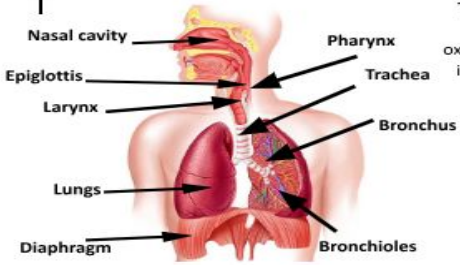


They are pure fast twitch muscle fibres, which work _____.

They contract very quickly with huge force, but they fatigue very quickly.

The Respiratory System

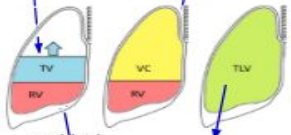
Structure of the Respiratory System



Lung Volumes

Tidal volume (amount of oxygen breathed in normal per breath

Vital capacity (maximal amount of air breathed out after maximum inhalation



Pulmonary ventilation (Total amount of air inhaled per minute)

Residual Volume (volume of air left in the lungs

Total Lung Volume (maximal amount of air breathed out after maximum inhalation

Mechanics of breathing

Inspiration (air in)

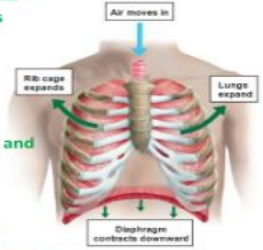
Intercostal muscles contract

Ribs lifted

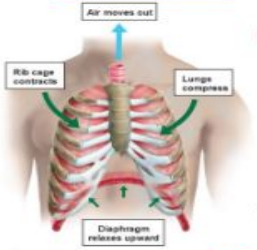
Diaphragm contracts and flattens

Thoracic cavity pressure drops

Air drawn in



Expiration (air out)



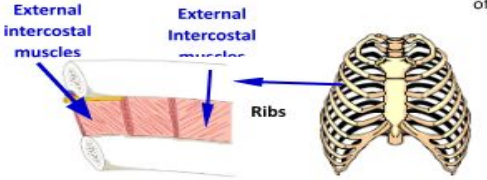
Intercostal muscles relax

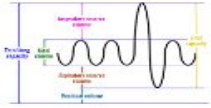
Ribs lower

Diaphragm relaxes

Thoracic cavity increased

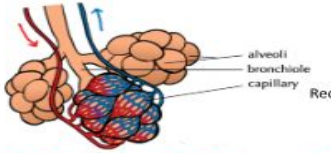
Air drawn out

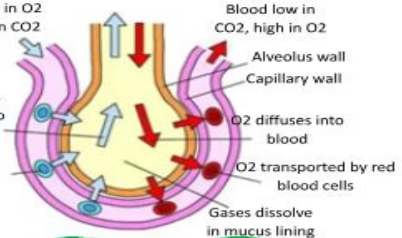


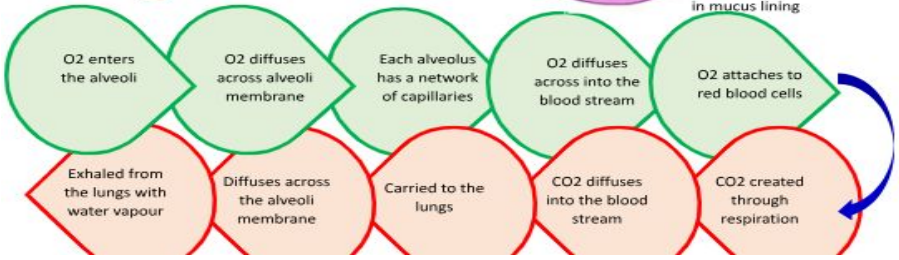


Gaseous Exchange

Process of exchanging oxygen and nutrients with waste products





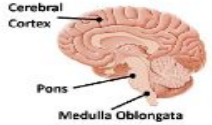


Control of ventilation

Neural Control of Ventilation

Voluntary ventilation

Breathing can be controlled voluntarily by the cerebral cortex (e.g. holding your breath)



Voluntary ventilation

Breathing is controlled by the respiratory control centre (Medulla Oblongata)

Chemical Control of Ventilation

Chemoreceptors

Located in the aorta and medulla oblongata

Detect changes in blood acidity (pH)
-Exercise will increase lactate production
-Breathing increases
- Latic acid is broken down faster

Detect changes in blood CO2 concentration
-Exercise will increase
-CO2 removed more rapidly
-Breathing rate increases (dependent on exercise intensity)

Response to Exercise (short term)

Increased breathing rate

Increased tidal volume

Response to Training (Long term)

Increased vital capacity

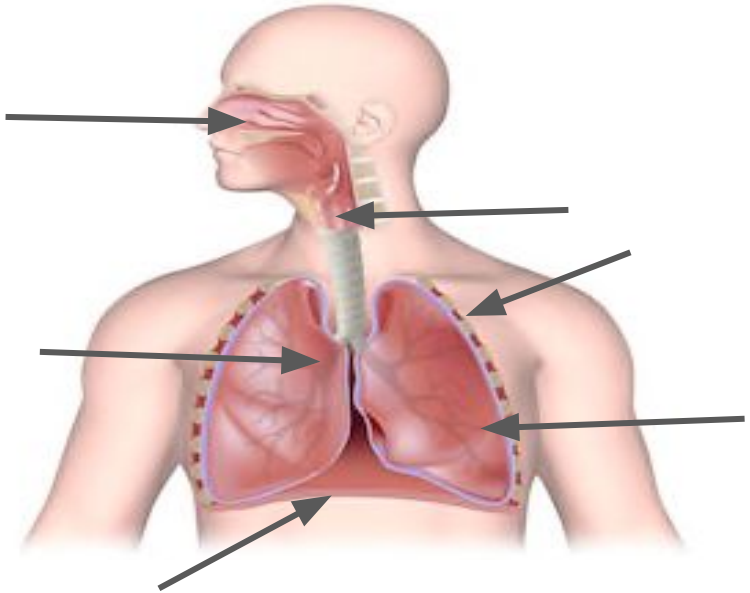
Increased strength of respiratory muscles

Increased diffusion rates (O_2/CO_2)

Additional Factors

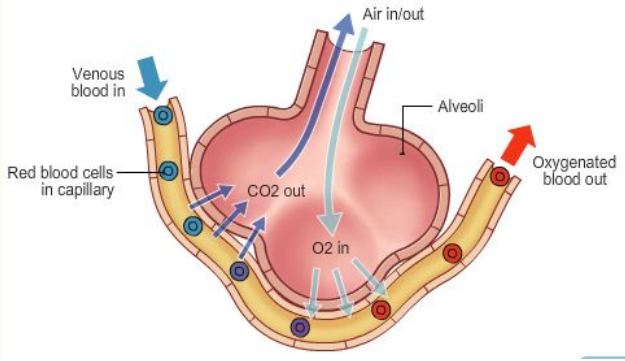
Asthma

Effects of altitude/ partial pressure



Describe the process of breathing in:

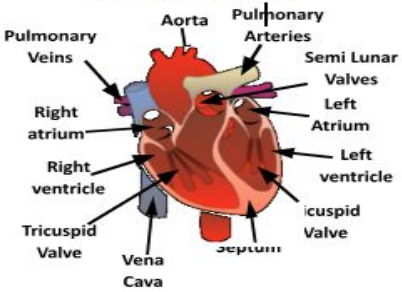
Breathing out:



Describe the gaseous exchange in 3 bullet points

The Cardiovascular System

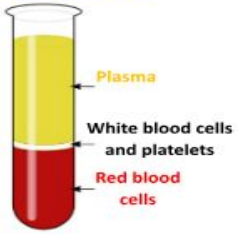
Structure of the Heart

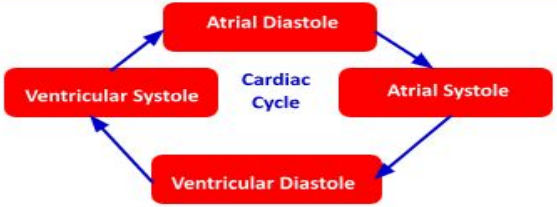


Functions of the System

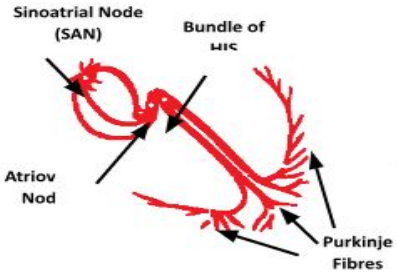
- Delivering oxygen and nutrients
- Removing waste products
- Thermoregulation
- Fighting infection
- Clot blood

Composition of blood





Conduction of the Heart



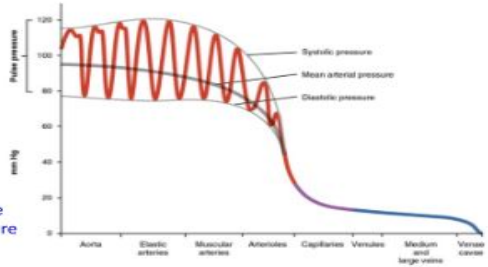
YOU THERE (YEAH, YOUUUUUU!!!)

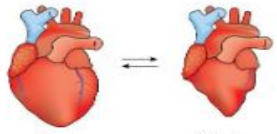
THERE'S A DIFFERENCE BETWEEN EXERCISING AND TRAINING. LEARN IT!!!

Exercise (Short term)
1) Anticipatory rise
2) Increased heart rate
3) Increased Cardiac output
4) Increased blood pressure
5) redirection of blood

Training (Long Term)
1) Cardiac hypertrophy
2) Decrease in resting heart rate
3) Decrease in resting stroke volume
4) Reduction in resting blood pressure
5) Decreased recovery time
6) Increased blood volume

Blood pressure





Diastolic **Systolic**

Neural control of heart rate

Sympathetic nervous system

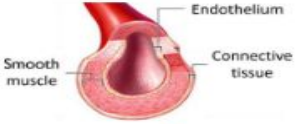
Excites – fight or flight
1) Secretes adrenaline
2) Increases heartrate
3) Increased blood pressure
4) Increases contractibility of the heart
5) Stimulates vasoconstriction/ vasodilation

Parasympathetic nervous system

Calms/relaxes
1) Decrease heart rate
2) Decrease blood pressure
3) Decrease cardiac output (Q)

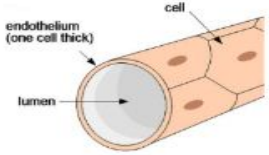
Structure of Blood Vessels

Artery / Arterioles



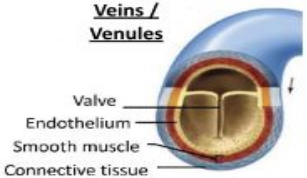
- Takes blood **A**way from the heart (exception the pulmonary artery)
- Oxygenated blood
- Thick elastic walls
- High pressure

Capillary

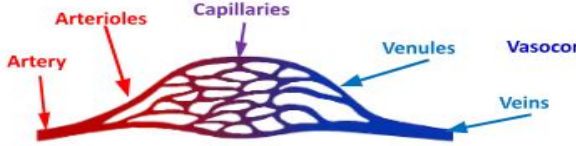


- One cell thick
- Diffusion
- Gaseous exchange (oxygen in CO_2 waste out)

Veins / Venules



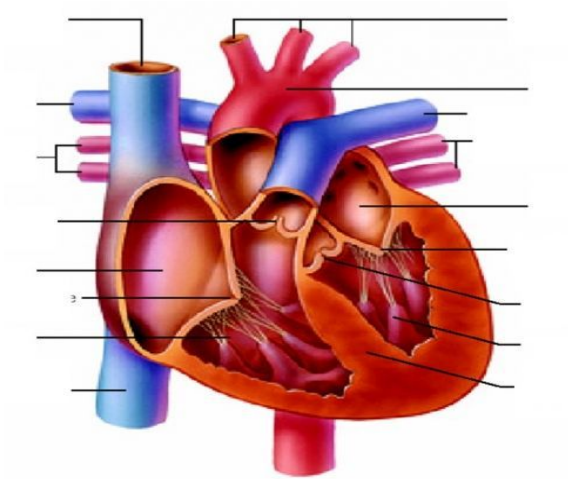
- Blood back to the heart
- Deoxygenated blood
- Thin walls
- Large lumen
- Lower pressure
- Valves



Vasodilation

Vasoconstriction

THE CARDIOVASCULAR SYSTEM



State the functions of the cardiovascular system?

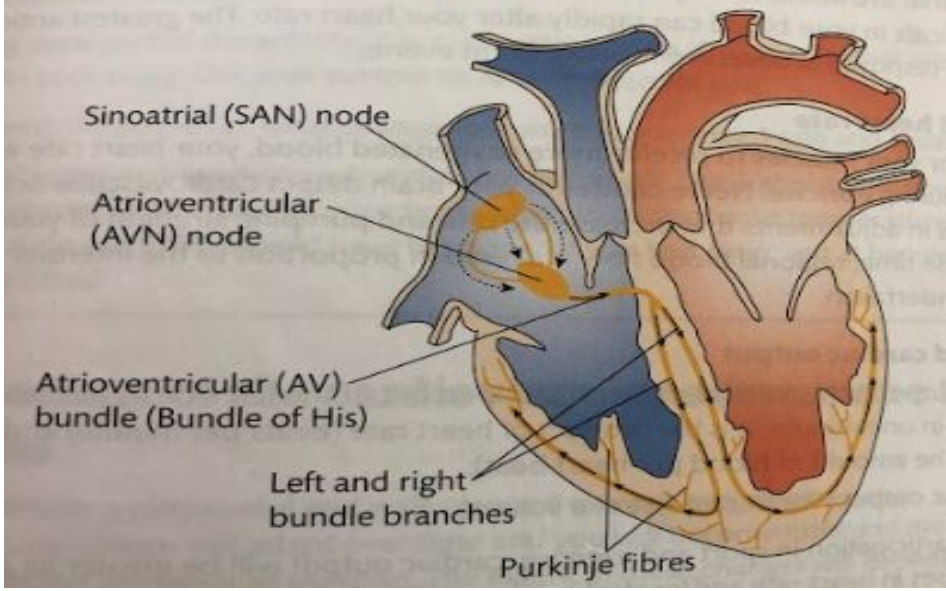
Describe the pathway of blood
The blood is pumped from the right ventricle through the pulmonary valve into the pulmonary artery carrying deoxygenated blood to the lungs.

Artery Function

Vein Function

Capillary Function

Nervous control of the cardiac cycle.
What is the role of the labels (to your right)?



Red blood cells

White blood cells

Platelets

Plasma

State the responses of the CV system in a single sport or exercise session	State the adaptations of the CV system due to exercise	State the additional factors of the CV system

Energy Systems

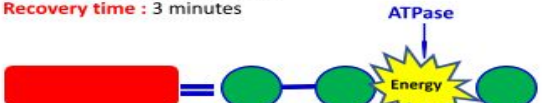
Adenosine Triphosphate (ATP)

The energy comes from breaking the bonds between each phosphate

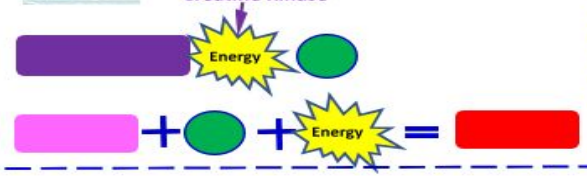
- ATP is the only usable form of energy in the body.
- The body has a store of 3 seconds of ATP.
- Then there are 3 systems that can resynthesise it

ATP-PC System

Type: Anaerobic
Fuel source : Phosphocreatine (PC)
Duration: 8-10 seconds
Used in : short explosive power
Recovery time : 3 minutes

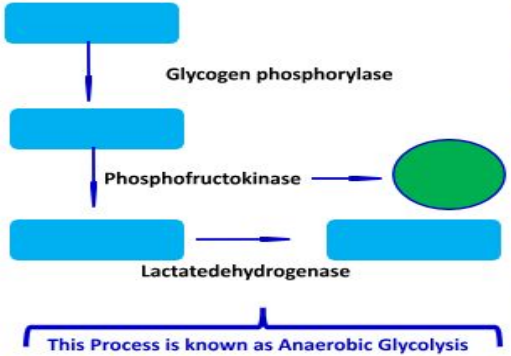


Let's Refuel using Creatine Phosphate



Lactate System

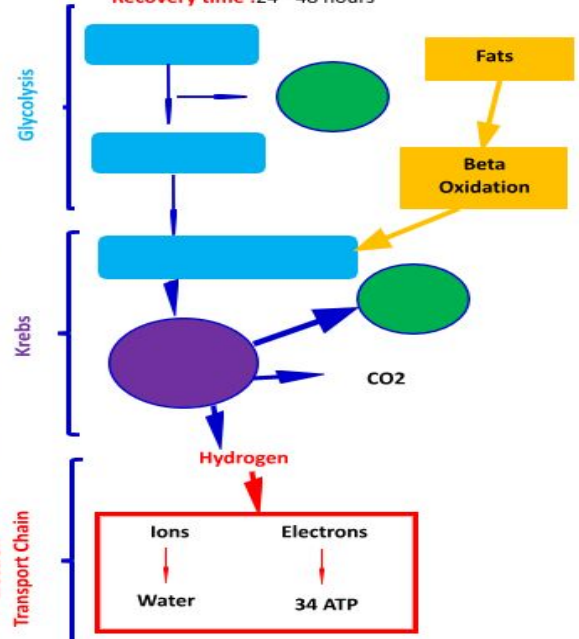
Type: Anaerobic Glycolysis
Fuel source : Glycogen
Duration: 10 secs to 2 mins
Used in : stop start games/ court sports/400m
Recovery time : 1-2 hours



This Process is known as Anaerobic Glycolysis

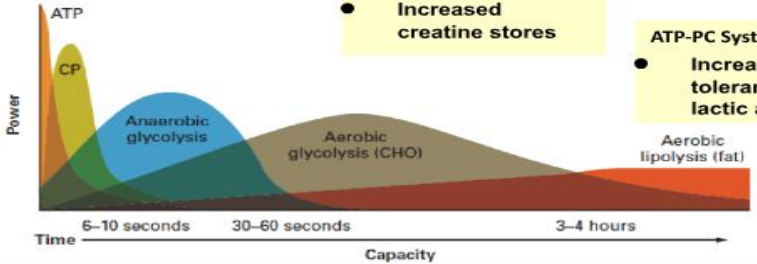
Aerobic System

Type: Aerobic Glycolysis
Fuel source : Glycogen and fat
Duration: Longer than 2 mins
Used in : Long distance and endurance events
Recovery time :24 - 48 hours



Total Yield: 38 ATP

Adaptations to Systems Long Term



ATP-PC System
- Increased creatine stores

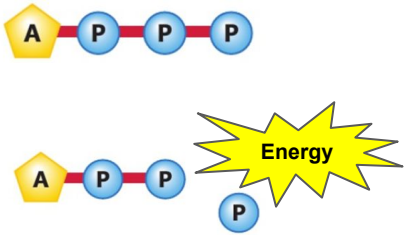
ATP-PC System
- Increased tolerance to lactic acid

Aerobic System
- Increased use of fats
- Increased storage of glycogen

THE ENERGY SYSTEM

Use these spaces to familiarise yourself with the energy system.

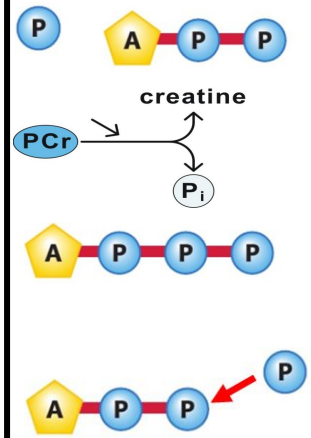
The role of ATP



What is ATP?

How does it release energy?

ATP-PC (Alactic System)



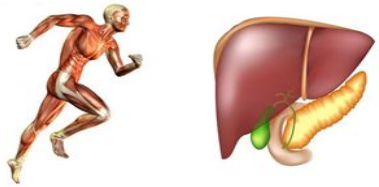
How long does ATP Last for?

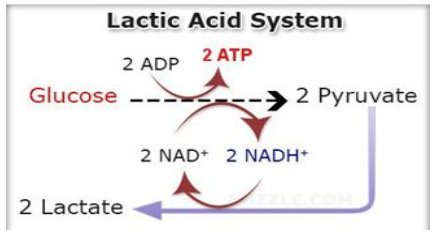
What compound is broken, allowing the phosphate molecule to join an ADP molecule to create a new ATP molecule?

How long does the ATP-PC System last for?

Energy System	Aerobic or Anaerobic?	Energy Source	How long does it last?	Recover Time	Sporting Examples
ATP-PC System	Anaerobic			1:10	

The Lactate System





Where is glycogen stored?

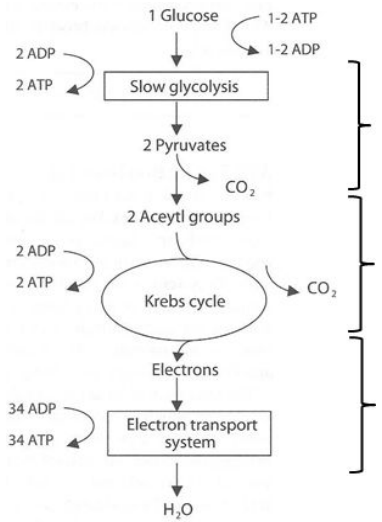
When one molecule of glycogen is broken down, how many ATP is produced? What else is produced?

What happens to that new substance? What does it turn into?

How long does the Lactate system last for? How long does it take to recharge?

Energy System	Aerobic or Anaerobic?	Energy Source	How long does it last?	Recover Time	Sporting Examples
Lactate System		Glucose Glycogen		8 minutes	

The Aerobic System

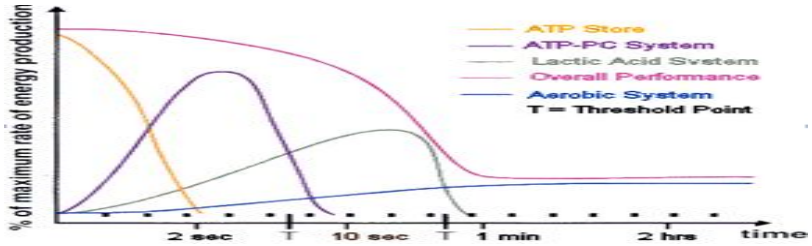


Stage 1 - anaerobic glycolysis

Stage 2 - Krebs Cycle

Stage 3 - The electron transport chain

Energy System	Aerobic or Anaerobic?	Energy Source	How long does it last?	Recover Time	Sporting Examples
Aerobic				Few hours but can be up to 2-3 days	



Adaptation	Explanation
Increase in creatine stores	
Increase tolerance to lactic acid	
Improved aerobic energy system	
The use of fat as an energy source	
Increase storage of glycogen	
Increase in mitochondria	

Additional factors - Diabetes, Hyperglycaemic and Hypoglycaemic attacks

Diabetes	Hyperglycaemic	Hypoglycaemic