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A-Level PE
SIL

Click On the following playlist to help you complete these tasks:

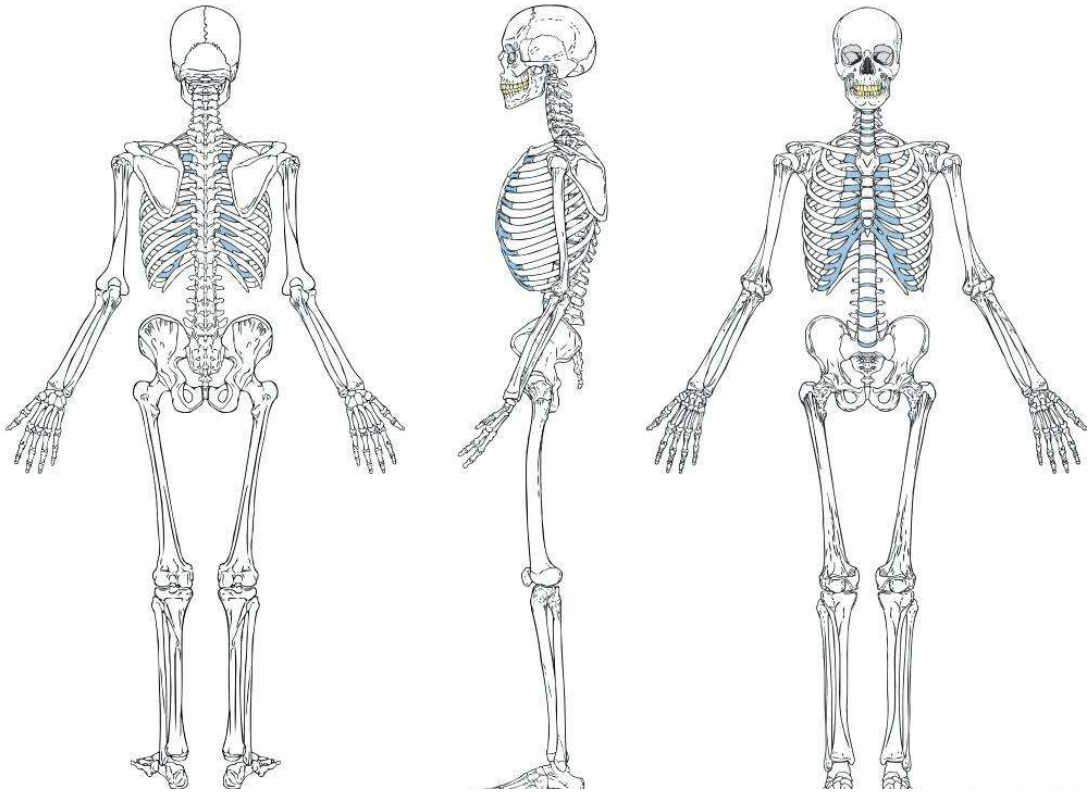
James Morris PE

Joints, Movements & Muscles

The Skeleton:

Starter Task: From what you can remember from GCSE PE, in the box below, draw and label your own skeleton with as many bones as you can remember… (it can be a stick man!!!)…

Task: Label the skeletons below with the correct bones…



Match up the type of bone to the examples on the right:

Flat	Sternum, Ribs, Pelvis & Cranium…
Long	Patella…
Short	Femur, Radius, Tibia & Humerous…
Irregular	Vertebrae…
Sesamoid	Carpals & Tarsals…

Types of movement:

Movement	Description	Where can this take place?	Sporting example
Flexion	Any movement which decreases the angle at a joint.	e.g. elbow, knee, wrist, shoulder, hip…	e.g. upward phase of a bicep curl…
Extension			
Abduction			
Adduction			
Rotation			
Plantar-flexion			
Dorsi-flexion			
Horizontal flexion			
Horizontal extension			

Joints:

Define the following terms below:

- **Joints:**

_____

- **Ligaments:**

_____

- **Tendons:**

_____

- **Cartilage:**

_____

Task: Fill in the blanks below to describe the different types of joints in the body…

Type of joint	Description	Example(s)
Hinge		e.g. Knee, ankle & elbow
	A ball shaped head articulates with a socket to give a large range of motion in all 3 planes,	
Pivot		e.g. radio-ulna
	Flat similar sized bones articulate with limited motion	
Condyloid		e.g. Wrist

Planes of Movement:

We classify all movements across 3 planes of movement. These are;

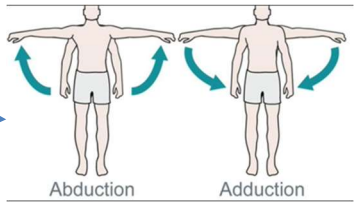
- **Frontal Plane**

This plane lies _____ and divides the body into anterior (_____) and posterior (_____) parts.

<u>Example movements:</u>

Abduction: Shoulder & Hip

Adduction: Shoulder & Hip



- **Sagittal Plane**

This plane lies _____, dividing the body into _____ and _____ parts.

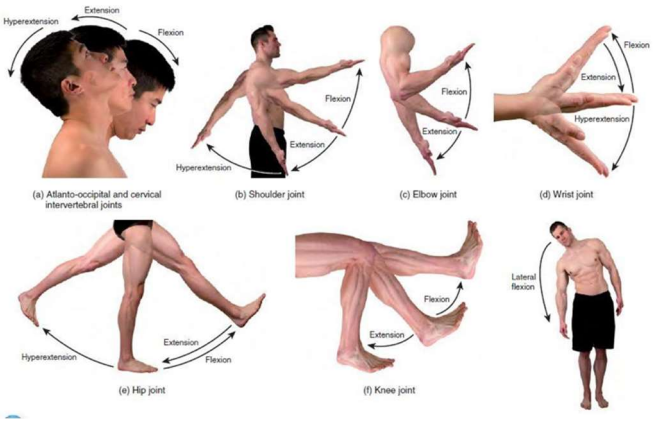
<u>Example movements:</u>

Flexion: (e.g. , &)

Extension: (e.g. , &)

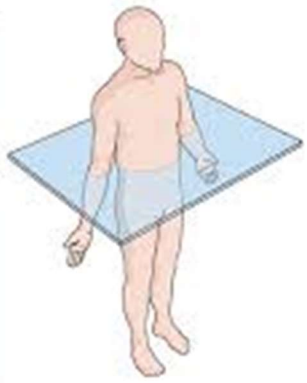
Plantar-flexion: (e.g.)

Dorsi-flexion: (e.g.)



- **Transverse**

This plane lies _____ and divides the body into superior (_____) and inferior (_____) parts.



<u>Example movements:</u>

Horizontal flexion (e.g. &)

Horizontal extension (e.g. &)

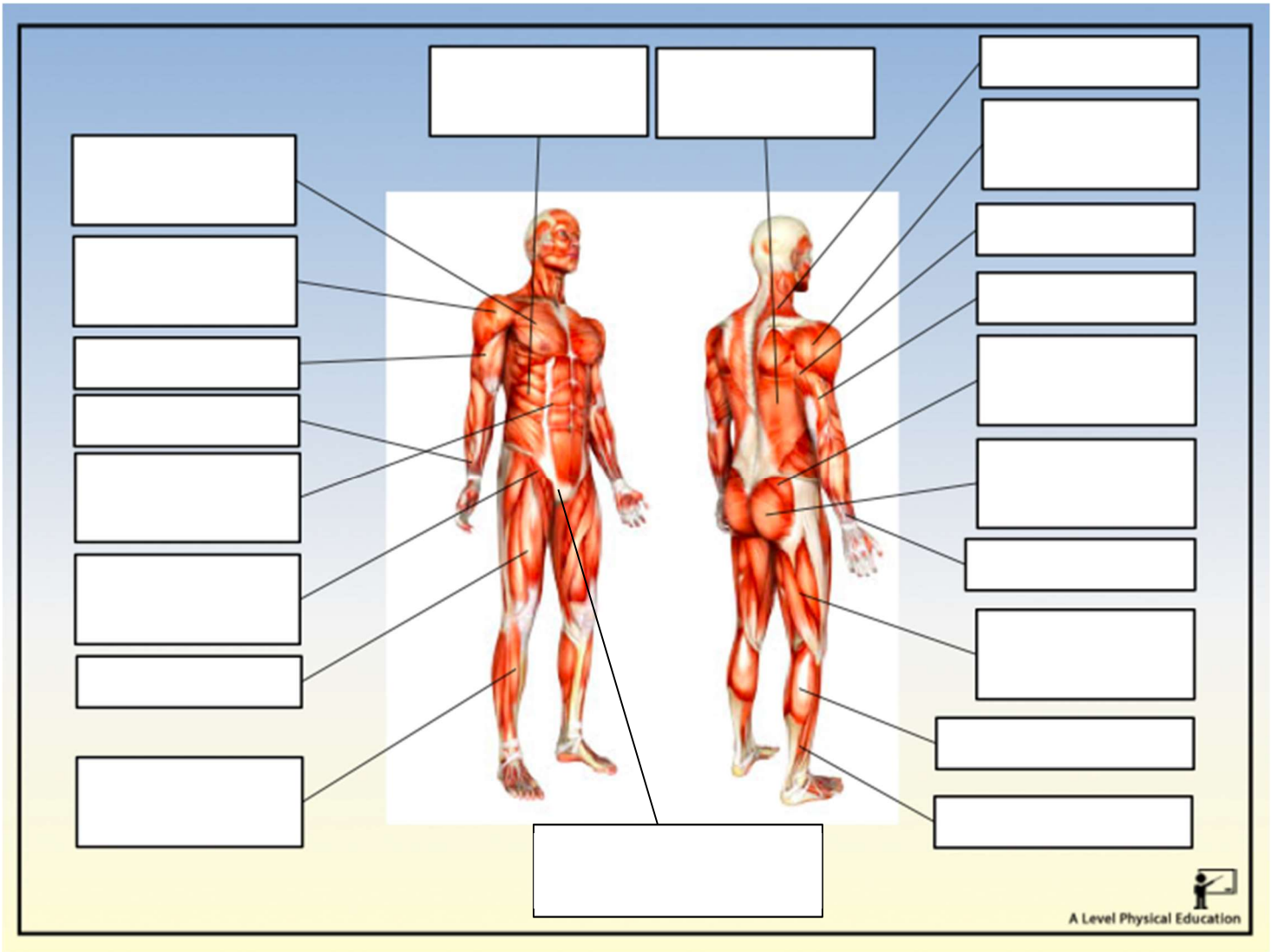
Rotation (e.g. &)

The Muscular System

Starter Task: In the box below, name as many muscles as you can remember from GCSE PE; (in brackets, explain where it is located)…

E.g. Biceps (front of upper arm…)

Task: Fill in the blanks to label al the muscles correctly…



Key Terms:

Agonist:

_____

_____

Antagonist:

_____

_____

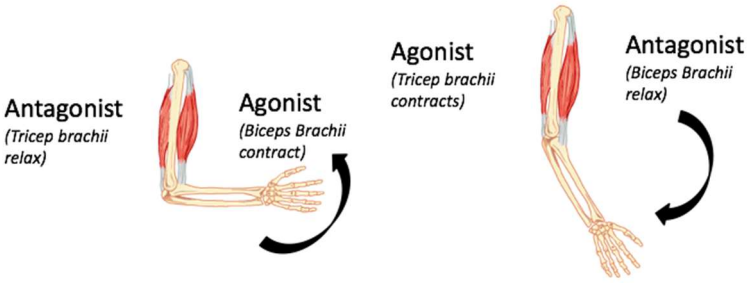
Fixator:

_____

_____

Using the diagram (see right) explain what an antagonistic pair is?

-



What other antagonistic pairs can you think of?

-
-
-

Task: Attempt to identify the agonist and antagonist muscles for the following movements…

Movement	Agonist	Antagonist
Flexion - Wrist		
Flexion - Elbow		
Flexion - Shoulder		
Flexion - Hip		
Flexion - Knee		
Flexion - ankle		

Types of contraction

Isotonic: The muscle changes in length during the contraction.

- **Concentric -**

E.g. _____

- **Eccentric -**

E.g. _____

Isometric: The muscle contracts, but does not change in length.

E.g. _____

Movement Analysis

When asked to complete a movement analysis in the exam, we must be able to…

- Name the agonist / antagonist…
- Name the contraction type…
- Name the movement taking place…
- Name the joint type…
- Name the articulating bones...

Exam hint: This will often be done by giving you an image of a sporting movement and asking you to analyse the movement taking place…

E.g. Complete a movement analysis for the movement about to take place at the right knee of the athlete in the image below.

Agonist:

Contraction type:

Antagonist:

Contraction type:

Movement:

Joint type:

Articulating bones:

Movement Analysis Tables:

Once these tables are filled in, they will cover every single movement analysis scenario that you can be asked…!

Knee:

Type of joint:

Articulating bones:

Plane(s) of movement:

	Flexion	Extension
Agonist		
Contraction type		
Antagonist		
Contraction type		

Sporting Example:

Before kicking a ball in any sport (e.g. football, rugby, American football etc…), you have to flex your leg at the knee joint.

Then to kick the ball, you must extend your leg at the knee joint, which is about to take place in the image (see right)…

The more you flex it originally, the greater the backswing you have, therefore, he ball should travel further / faster etc…

Elbow:

Type of joint:

Articulating bones:

Plane(s) of movement:

	Flexion	Extension
Agonist		
Contraction type		
Antagonist		
Contraction type		

<u>Sporting example:</u>

During the upwards phase of a bicep curl, flexion at the elbow joint takes place.

During the downwards phase, extension of the elbow joint occurs.

Task: List other sporting examples whereby flexion and extension of the elbow occurs;

-
-

Ankle:

Type of joint:

Articulating bones:

Plane(s) of movement:

	Dorsi-Flexion	Plantar-Flexion
Agonist		
Contraction type		
Antagonist		
Contraction type		

Sporting examples:

During a volley in football, plantar-flexion of the ankle will take place. This allows the player to strike the ball cleanly, accurately and powerfully.

During a lunge, the trailing leg dorsi-flexes at the ankle to hold the pose.

Wrist:

Type of joint:

Articulating bones:

Plane(s) of movement:

	Flexion	Extension
Agonist		
Contraction type		
Antagonist		
Contraction type		

Sporting examples:

Draw an arrow showing which picture is flexion and which is extension…

Flexion

Extension

Extension: e.g. Tennis backhand shot…

Flexion: e.g. Tennis forehand shot…

Shoulder:

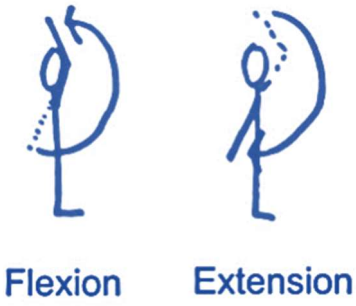
Type of joint:

Articulating bones:

Plane(s) of movement:

	Agonist	Contraction Type	Antagonist	Contraction Type
Flexion				
Extension				
Abduction				
Adduction				
Medial Rotation				
Lateral Rotation				
Horizontal Flexion				
Horizontal Extension				

Sporting examples:



Flexion:

_____

Extension:

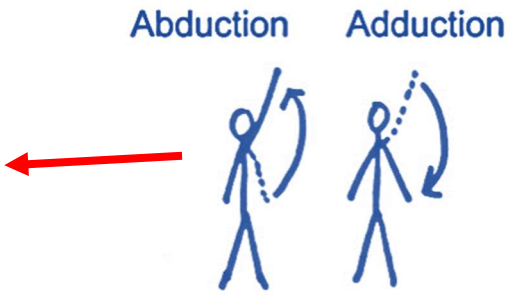
_____

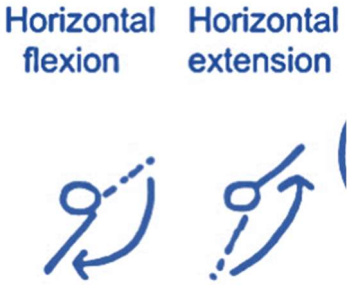
Abduction:

_____

Adduction:

_____





Horizontal Flexion:

_____

Horizontal Extension:

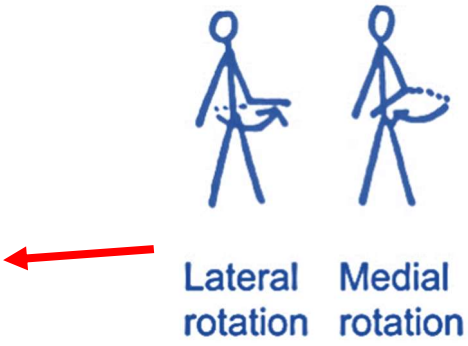
_____

Lateral Rotation:

_____

Medial Rotation:

_____



Hip:

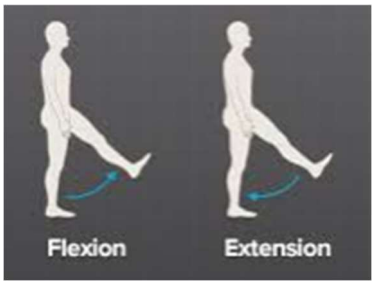
Type of joint:

Articulating bones:

Plane(s) of movement:

	Agonist	Contraction Type	Antagonist	Contraction Type
Flexion				
Extension				
Abduction				
Adduction				
Medial Rotation				
Lateral Rotation				
Horizontal Flexion				
Horizontal Extension				

Sporting examples:



Flexion:

_____

Extension:

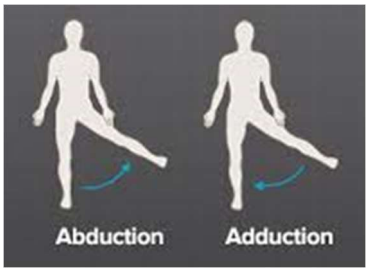
_____

Abduction:

_____

Adduction:

_____



Horizontal Flexion:

_____

Horizontal Extension:

_____

Lateral Rotation:

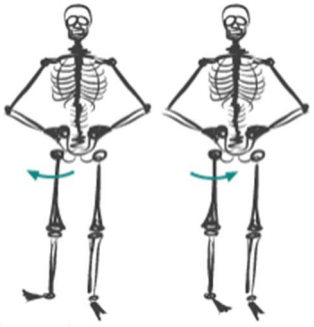
_____

Medial Rotation:

_____

Lateral rotation

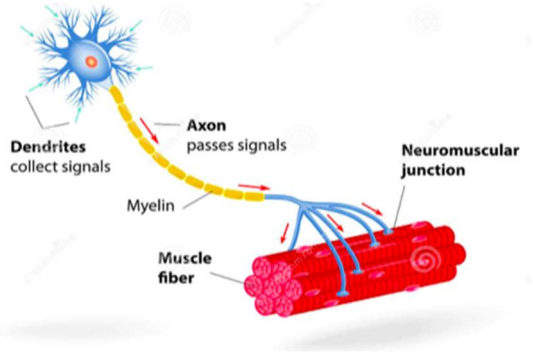
Medial rotation



Motor Units & Muscle Fibres

Task:

Use the diagram to draw and label a motor unit in the box below…



Motor Unit:

_____

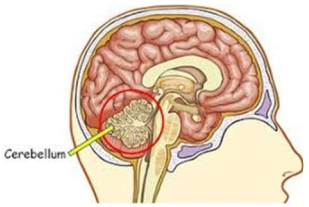
Motor Neurone:

_____

_____

- Skeletal muscle can only contract if it is stimulated by an electrical impulse sent from the central nervous system.
- A motor unit functions to carry nerve impulses from the brain and spinal cord to the muscle fibres, initiating muscle contractions...

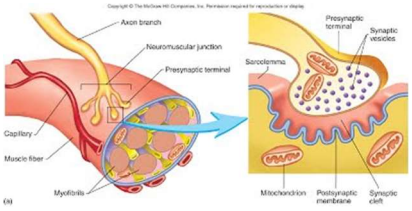
Creating a muscle contraction:



1)._____

_____

_____



2)._____

_____

_____

_____

_____

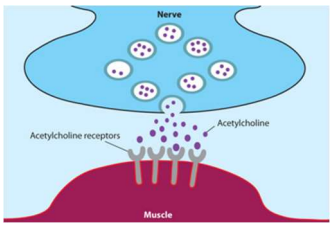
3)._____

_____

_____

_____

_____



4)._____

_____

_____

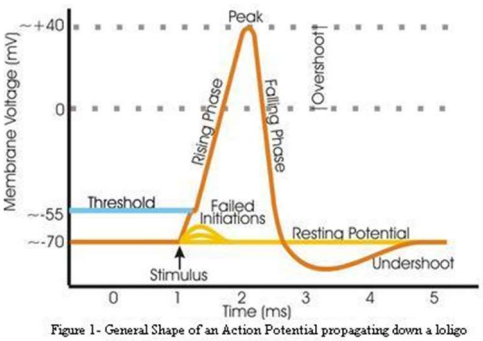


Figure 1- General Shape of an Action Potential propagating down a loligo axon. Source picture take from Wikipedia.

5).

_____

_____

_____

_____

Explain the All-or-none law by filling in the gaps…

If the impulse is above the _____, then _____ muscle fibres attached to that motor unit will contract. If the impulse is below the _____, then _____ of the muscle fibres attached to the motor unit will contract.

To vary the strength of a muscle contraction, we can…

-
-

Sporting context: This is why we can over or under hit a shot in a game as we have recruited the wrong size and amount of muscle fibres...

The strength of a muscle contraction is also dependent on the type of _____ _____ that is recruited.

Muscle Fibres:

Type 1 / Slow Oxidative (SO)

Type 2a / Fast Oxidative Glycolytic (FOG)

Type 2b / Fast Glycolytic (FG)

Type 1 (Slow Oxidative):

These are structurally designed to store oxygen in myoglobin and process oxygen in the mitochondria, which allows athletes to work aerobically.

> Myoglobin: A protein that transports O2...
> Mitochondria: The site of aerobic energy production…

They produce a _____ force, but resist _____ for a long period of time.

Which type of athlete would predominantly use these?

_____

Type 2a (Fast Oxidative Glycolytic):

Structurally designed to produce a large amount of _____, quickly.

However, they also have the ability to resist _____, but not for as long as Slow Oxidative muscle fibres.

Which types of athletes will predominantly use these?

_____

Type 2b (Fast Glycolytic):

Structurally designed to work _____, with large stores of phosphocreatine.

> **Phosphocreatine:** A high energy compound stored in muscle cells as used as fuel for high intensity energy production.

However, they fatigue very _____.

Which type of athlete will predominantly use these?

_____

Task: Fill in the gaps in the table to identify key characteristics of the 3 muscle fibres…

	Number / size of muscle fibres	Force produced	Contraction speed	Colour	Myoglobin levels	Mitochondria levels	Resistance to fatigue
Type 1	Few fibres and small in size.		Slow	Red		High	
Type 2	Many fibres and large.			Pink	Moderate		Moderate
Type 3		High	Very fast			Low	Low

<u>Muscle fibre recovery rates:</u>

Type 1 muscle fibre:

- 1:1 or 1:0.5

Type 2a and 2b muscle fibres:

- 1:3+

Why is there a difference in recovery rates from type 1 to type 2a/b fibres…?

_____

_____

_____