

Subject: PE
Year: 11
Term: 1b
Topic: Structure and function of the musculo-skeletal system

Knowledge Sequence:

- The functions of the skeleton applied to performance in physical activities and sports.
- Classification of bones.
- Structure of bones.
- Classification of joints.
- Movement possibilities at joints dependant on joint classification.
- The role of ligaments and tendons.
- Classification and characteristics of muscle types.
- Location and role of the voluntary muscular system.
- Antagonistic pairs of muscles.
- Characteristics of fast and slow twitch muscle fibre types.
- How the skeletal and muscular systems work together to allow participation in physical activity and sport.

Core texts:

- Edexcel GCSE (9-1) Physical Education

The Skeleton

Type of bone	Example	Function in Sport
Long	Femur, Humerus	Movement/Leverage – to generate strength and speed
Short	Carpals, Tarsal	Shock absorption – weight bearing/spreading load
Flat (plate)	Ribs, Cranium	Protection of vital organs, attachment of muscles to help movement
Irregular	Vertebra e, jaw	Provide shape, protection, surface for muscle attachment

Classification of joints

Pivot:

- One bone rotates around another.
- An example is the neck, which rotates around the atlas and axis (bones of the vertebrae).

Hinge:

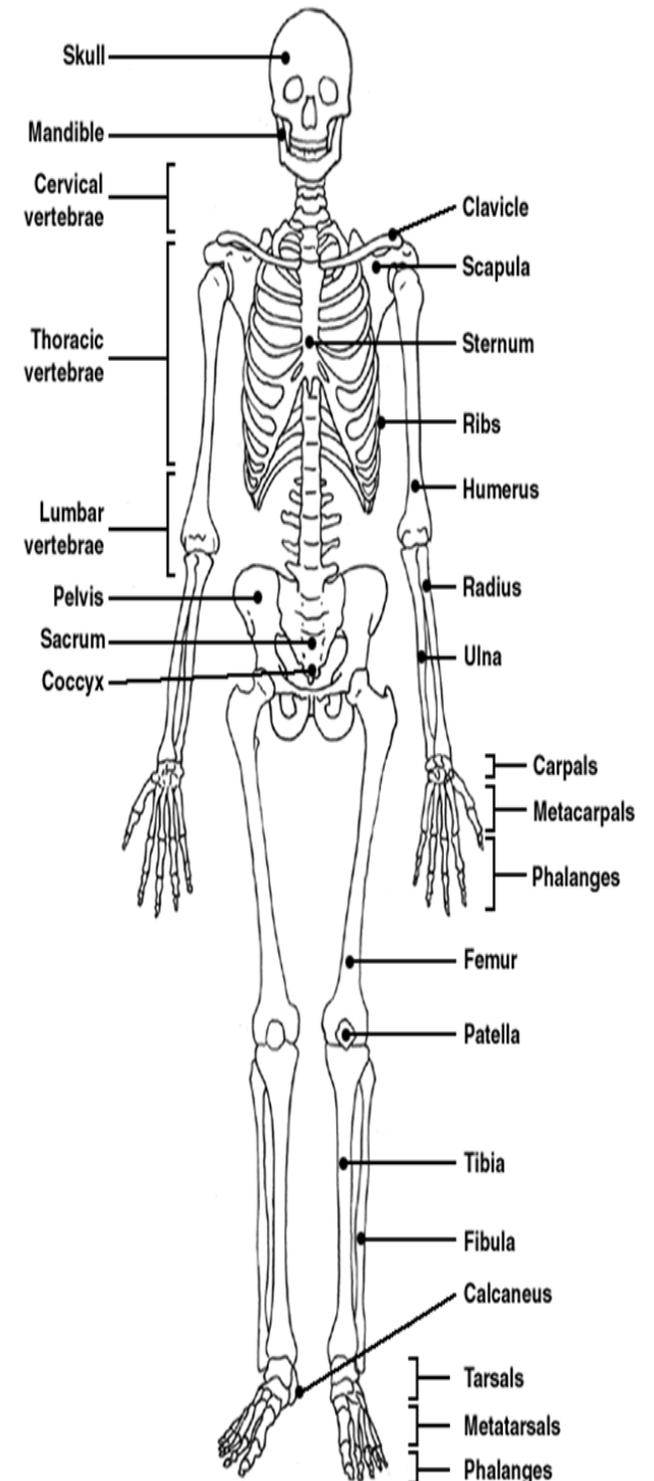
- Flexion and extension is the only movement possible.
- Examples include the elbow and knee.
- The movement is similar to the opening and closing of a hinged door.

Ball and socket:

- Allows the most movement of all joints.
- Allows arms and legs to move in almost any direction.
- Examples include the shoulder and the hip.

Condyloid:

- Allows circular movement.
- An example is the wrist.



The role of ligaments and tendons

Ligaments:

- Connect bones to bones.
- Are very strong.
- An example would be the cruciate knee ligaments.

Tendons:

- Connect muscles to bones.
- An example would be the Achilles tendon

Joint Actions

Movement patterns	Description	Example
Flexion	Decreasing the angle at a joint.	Running and jumping movements at the hips and knee. Throwing and racket sports actions at the elbow.
Extension	Increasing the angle at a joint.	Running and jumping movements at the hips and knee. Throwing and racket sports actions at the elbow.
Horizontal Flexion	Moving arm forwards in horizontal plane (starting from adducted position).	Throwing and racket sports movement at the shoulder.
Horizontal Extension	Returning arm to the abducted position (starting from the abducted position).	Throwing and racket sports movement at the shoulder.
Hyper Flexion	Flexion of a limb beyond the normal limit.	Running and jumping movements at the hip and knee.
Hyper Extension	The excessive joint movement in which the angle is straightened beyond its normal range.	Running and jumping movements at the hip and knee.
Adduction	Moving towards the midline of the body.	Adduction of the shoulder, in the backstroke
Abduction	Moving away from the midline of the body.	Taking one leg away from the other, like in side stepping.
Rotation/Circumduction	Moving a limb in a circular motion in either direction.	Movement in racket sports.
Pronation	The forearm, pronation is the movement of turning the palm over to face downwards.	Wrist action in racket sports.
Supination	Is the opposite of pronation, turning the palm up or forwards.	Wrist action in racket sports.
Plantar-Flexion	Extension of the ankle, pointing of the foot and toes.	Running, kicking and jumping movement at the ankle.
Dorsiflexion	Flexion of the foot in an upward direction.	Running, kicking and jumping movement at the ankle.

Classification and Characteristics of muscle types

Voluntary/skeletal muscles:

- Are attached to the end of bones.
- Are controlled by yourself through conscious thought.
- For example, choosing to move your arms up to catch a ball.

Involuntary/smooth muscles:

- Are located around organs.
- Are located in the blood vessels.
- Move without conscious thought.

Cardiac muscle:

- Is only found in your heart.
- It never gets tired.
- Moves without conscious control (involuntary).
- Used to pump blood around the body.

Muscle fibre types

Characteristics	Type 1 (slow twitch)	Type IIa (fast twitch)	Type IIb (fast twitch)
Oxygen use	Use oxygen	Use oxygen	Do not use oxygen
Colour	Red	Red	White
Contraction speed and strength	Slow	Fast	Very fast and powerful
Levels of fatigue	Do not get tired easily	Partially resistant to fatigue	Very high
Sporting example	Marathon runner	800m runner	100m sprinter

Antagonistic Pairs of Muscles

Agonist:

Muscle shortens.
Muscle is the prime mover.

Antagonist:

Muscle lengthens
Muscle relaxes.

- E.g. in the bicep curl, the biceps brachii is the agonist and the triceps brachii is the antagonist.