

Level 3 Cambridge Technical Extended Certificate

Unit 1

Anatomy & Physiology

Learning Aim A1

The Skeletal System





Learning Outcomes



A1	Structure of the skeletal system
A2	Function of skeletal system
A3	Joints Overview
A3	Synovial Joints
A4	Acute responses of the skeletal system to exercise
A5	Chronic adaptations of the skeletal system to exercise
A6	Additional factors affecting the skeletal system



Learning Aim - A



Task 1

Mind Map Learning aim A = Retrieval

I: STRUCTURE
Label the bones



6: ADDITIONAL FACTORS
Describe the difference between Osteoarthritis and Rheumatoid Arthritis.

What is Osteoporosis and how can it be prevented?

4/5: RESPONSES/ ADAPTATIONS of the skeletal system to exercise.

Responses (short term)

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-

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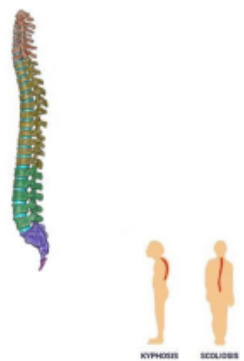
Adaptations (long term)

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-

-

Label the vertebral column



Describe the process of bone growth. Include the following key words: osteoblasts, osteoclasts, epiphyseal plate.

Unit 1
Learning Aim A: The Skeletal System
Revision Map

2: FUNCTION
List the 8 functions of the skeleton:

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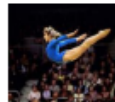
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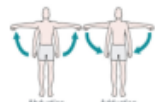
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Hyperextension of the spine

Lateral flexion of the spine

Abduction Adduction

3: JOINTS

**Fibrous:** Fixed joints that do not allow any movement.

**Cartilaginous:** Slightly moveable joints.

**Synovial:** Freely moveable joints that allow the greatest range of movement. Most joints in the body are synovial.

Identify the function of each bone type.

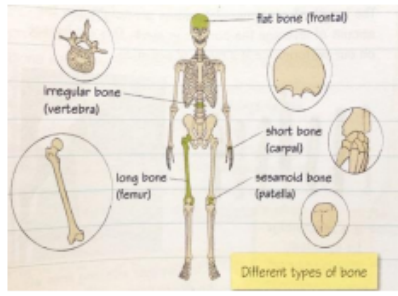
-LONG

-SHORT

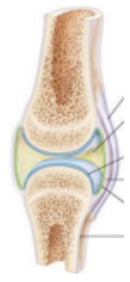
-FLAT

-SESAMOID

-IRREGULAR



Label the synovial joint below



Give characteristics of each type of synovial joint

Pivot	
Saddle	
Ball & Socket	
Condylloid	
Hinge	
Gliding	

Task 2



Dice Bingo



Independently, roll both dices to reach a bingo square (along the corridor and up the stairs).

Within that square, you need to read and answer the exam question on your mini-whiteboards.

First person to accurately recall a line will win a prize.



Dice Bingo - Unit 1 - Skeletal system

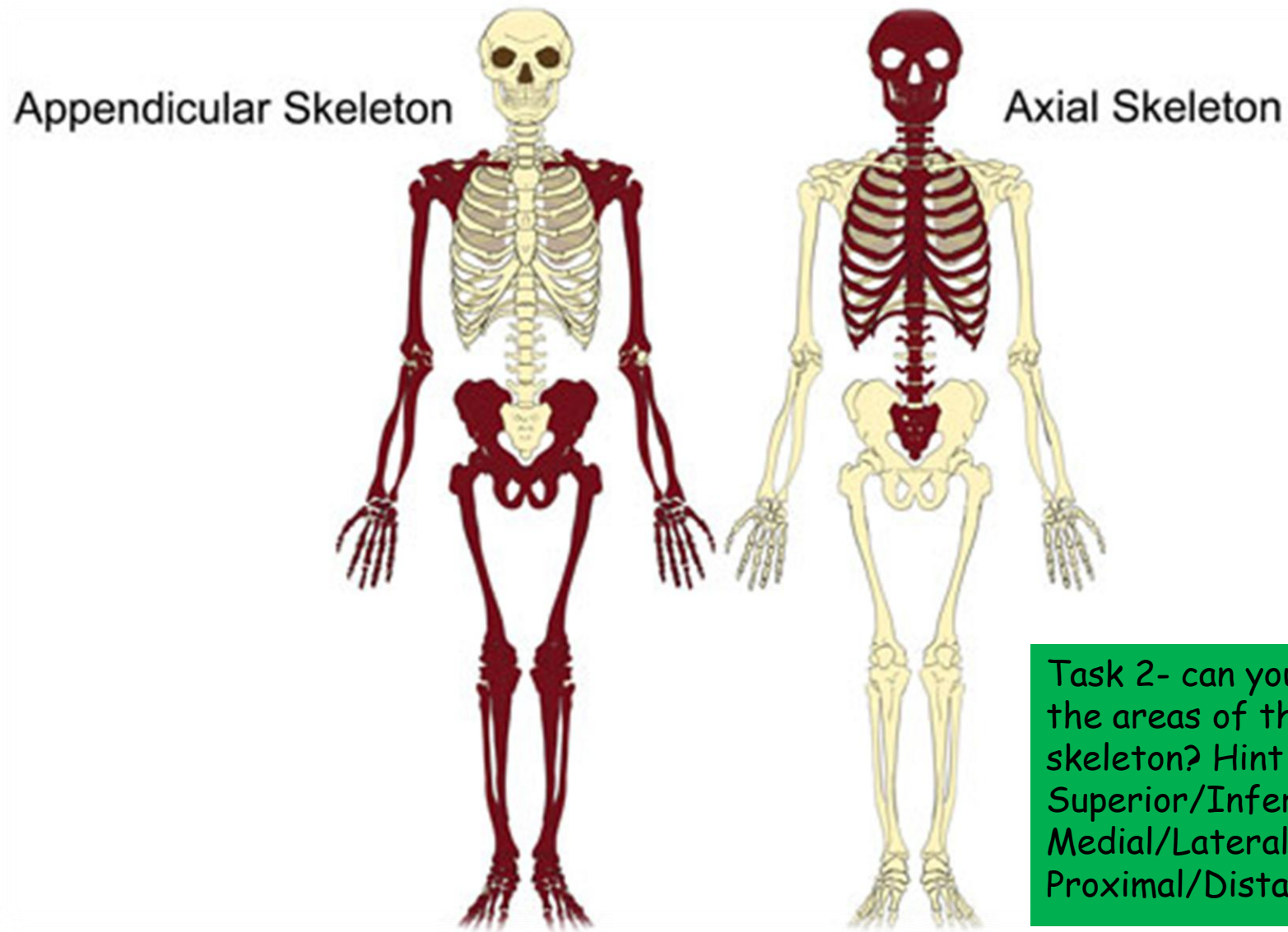


1	1. Identify the five main functions of the skeletal system.	2. Name the three types of joints and give an example of each.	3. Describe the structure and function of a long bone.	4. Explain the term ossification.	5. Define postural deviations.	6. Describe the role of the skeleton in blood cell production.
2	7. Explain how ligaments support	8. Compare axial and appendicular skeletons.	9. Describe the effects of exercise on bone density.	10. Identify three synovial joint types used in sport.	11. Explain how the skeleton provides sites for muscle attachment.	12. Explain the term osteoporosis and one risk factor.
3	13. Identify the bones that form the shoulder girdle.	14. Outline the movement possibilities at a hinge joint.	15. Describe what is meant by a fixed joint.	16. Explain the function of synovial fluid.	17. Name the bones of the vertebral column.	18. Describe the structure of a synovial joint capsule.
4	19. Explain how the skeletal system provides protection during sport.	20. Describe how bones grow and repair after injury.	21. Identify the six types of bones and give one sporting example for each.	22. Explain the role of cartilage in joint movement.	23. Describe a sport-related example of a ball-and-socket joint movement.	24. Explain the term epiphyseal plate.
5	25. Identify the bones involved in the knee joint.	26. Explain how exercise improves posture.	27. Describe kyphosis and one cause.	28. Describe lordosis and its effect on movement.	29. Describe the structure and function of the pelvis.	30. Explain the role of calcium in bone health.
6	31. Explain how the skeletal system contributes to movement leverage.	32. Describe scoliosis and its potential impact on sporting performance.	33. Explain the process of bone remodelling.	34. Identify the bones in the lower limb.	35. Describe how synovial joints enable multi-directional movement.	36. Outline short-term and long-term effects of exercise on the skeletal system.
	1	2	3	4	5	6

Task 3

The structure of the Skeletal System

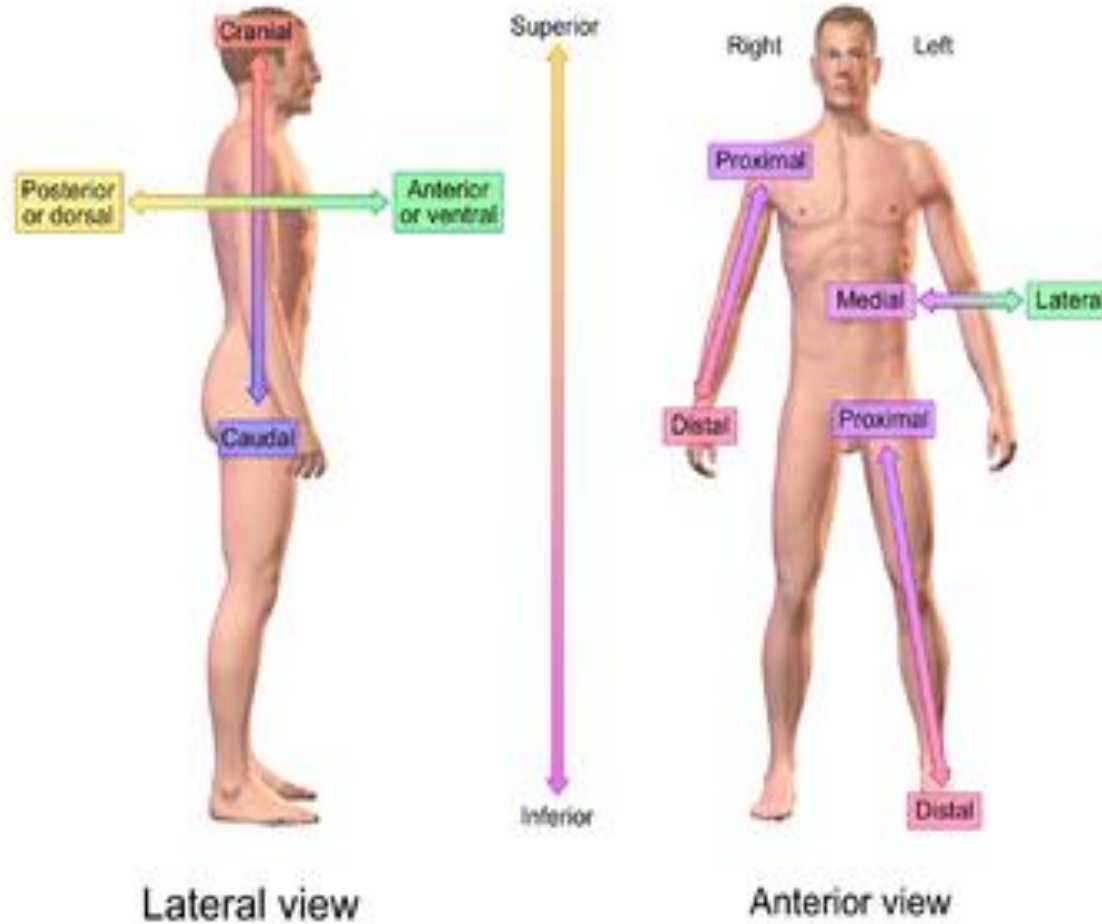
Task 1: label all of the bone of the skeleton...



Task 2- can you include the areas of the skeleton? Hint
Superior/Inferior
Medial/Lateral:
Proximal/Distal



Areas of the skeleton



Anterior: Front
Posterior: Back

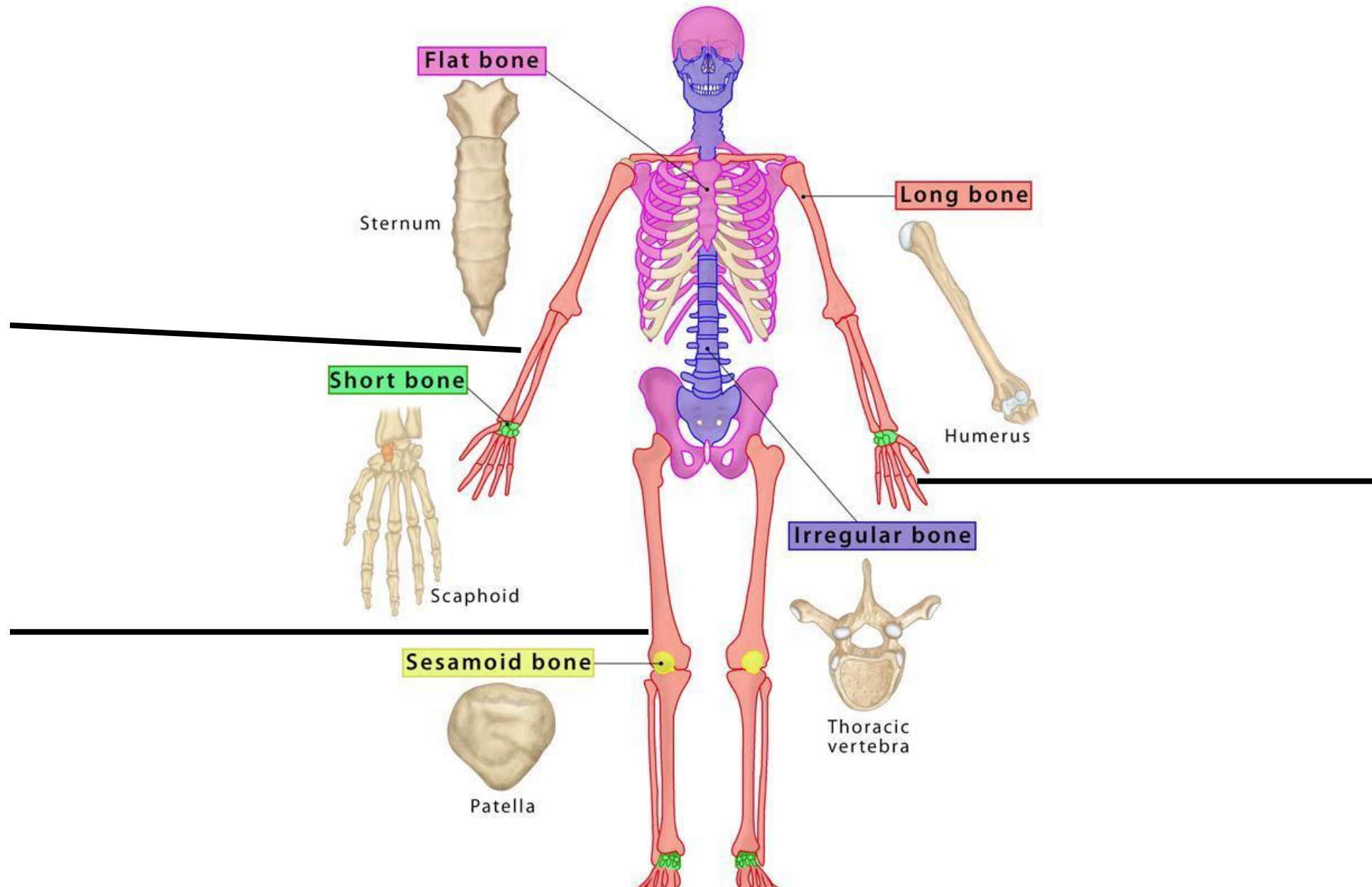
Superior: Above
Inferior: Below

Medial: Towards middle
Lateral: Away from middle

Proximal: Near to origin
Distal: Away from origin

Task 4

Types of Bones



Task 1: give a type of bone and sporting example as to how it is used.

Found in hands and feet - carpals and tarsals

Are small and compact bones

Function - weight bearing, for small intricate movements, act as shock absorbers and stability

Sporting example - gymnastic performing a handstand: The carpal bones in the wrists help stabilise the hand and support the body's weight while the gymnast is inverted.

Landing from a jump (e.g., in gymnastics or figure skating): The tarsal bones in the ankles absorb the impact forces, providing support and reducing injury risk.





Femur, Humerus, tibia, radius, ulna (bones in your limbs)

Circular in shape at each end and have a long shaft

Function - mainly used for creating movement, support, red blood cell production

Sporting example - The femur acts as a lever at the hip joint, allowing the player to swing the leg forward. Simultaneously, the tibia and fibula assist in extending the knee to make contact with the ball. The length and shape of these long bones provide a large surface area for muscle attachment, which allows for greater force production and efficient movement. This enables powerful and accurate kicks, essential for passing or shooting in football.



Sternum, cranium, scapular, pelvis

Cover larger surface area
Thinner in thickness

Function - they are there to protect vital organs and provide an area for attachment for muscles

Sporting example - A sporting example is during a rugby tackle, where the sternum and ribs protect the heart and lungs from impact.

In **boxing**, the **cranium** protects the **brain** from trauma when taking punches to the head. Similarly, the **sternum** and **ribs** help protect the **heart and lungs** from body shots.

In **gymnastics**, the **scapula** (shoulder blade), a flat bone, plays a key role in upper body strength and control. It provides a large surface for attachment of muscles such as the trapezius and deltoid, which are essential for supporting body weight during movements like handstands, vaulting, or ring routines.



The vertebra

Does not have a set shape

Function - protection and small intricate movements

Sporting example - gymnast performing a back handspring. The vertebrae allow for the necessary spinal flexion and extension as the gymnast arches and snaps through the movement. The irregular shape of each vertebra provides strength and support for the upper body while enabling controlled motion. Additionally, they protect the spinal cord from impact and excessive strain during high-level movements.

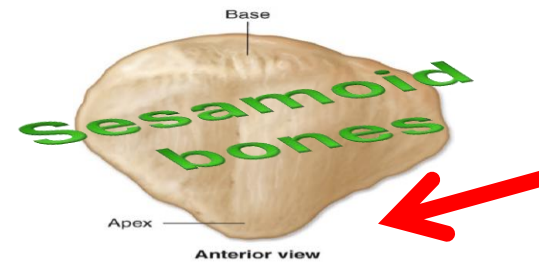
During weightlifting when an athlete performs a deadlift, the spine must remain stable and aligned to safely support the heavy load. The vertebrae provide both protection for the spinal cord and attachment points for postural muscles like the erector spinae. This helps the lifter maintain proper form and reduces the risk of injury from spinal flexion under pressure.

Irregular
bones



HOW TO DO A BACK HANDSPRING





The patella and pisiform (wrist)

Does not have a set shape

Function - weight bearing, small intricate movements, increase the mechanical efficiency of muscles by improving leverage

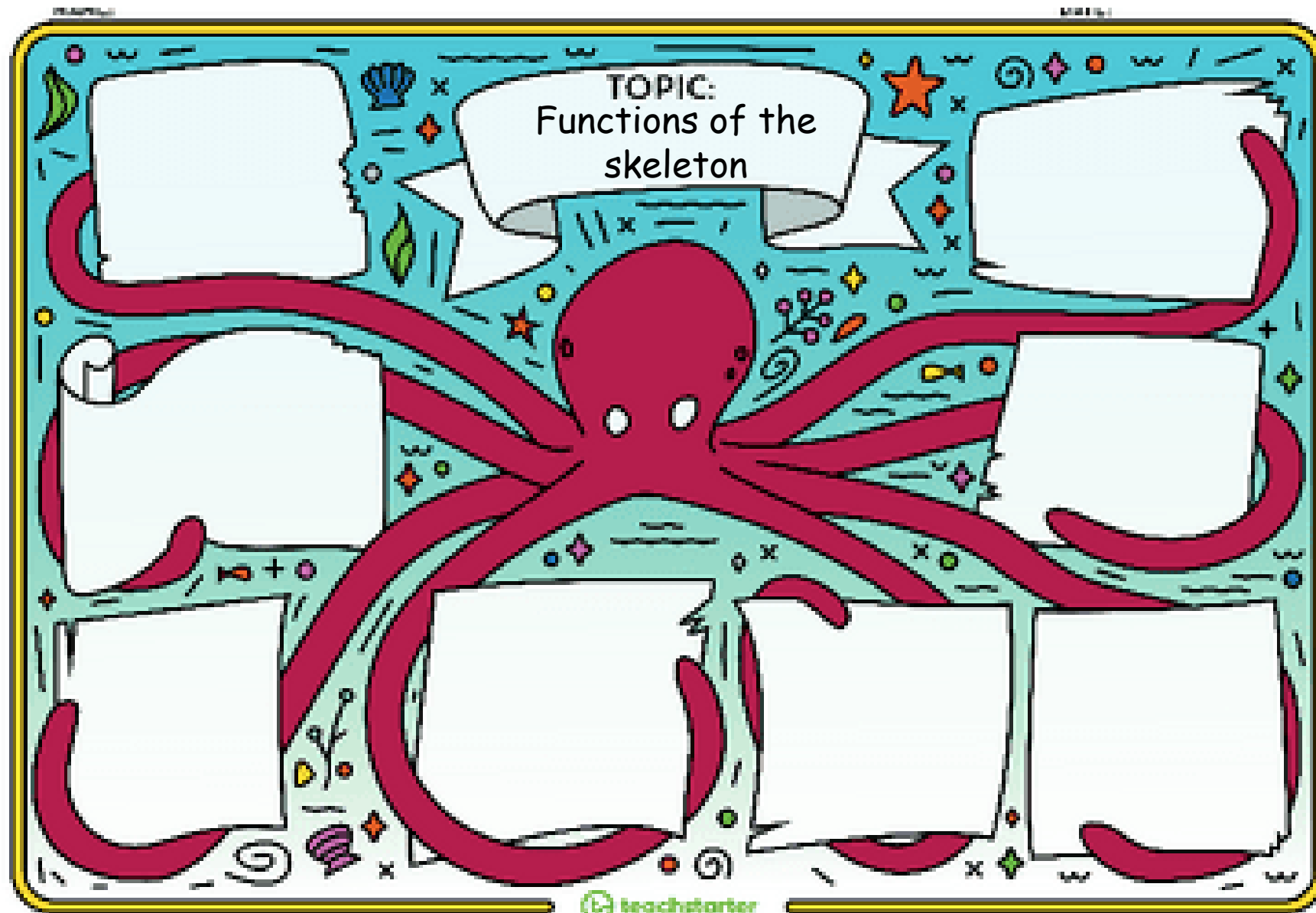
Sporting example - in sprinting, the patella enhances the force generated by the quadriceps during knee extension, which is essential when pushing off the blocks. This allows for powerful, explosive movements and reduces tendon wear by decreasing friction across the knee joint.

In ballet, dancers frequently perform jumps, pliés, and deep knee bends. The patella reduces friction and protects the quadriceps tendon as it glides over the knee joint. It also enhances knee extension strength, allowing for graceful, controlled leg movements and safe landings under load.

Task 6

Octopus Retrieval

Task: Identify in each of the octopus tentacles the functions of the skeleton + description



Functions of the skeletal system

Support

The skeleton allows for the body to maintain shape. It provides a framework for the soft tissues of the body.



Protection

The skeleton protects vital tissues and organs. Examples include the cranium which protects your brain and the vertebral column which protects your spinal cord.

Muscle attachment

The skeleton provides a surface for your muscles to attach to, meaning that the body can move.



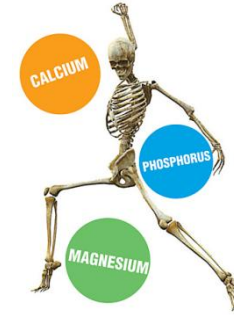
Blood cell production

Bone marrow, in the centre of bones, is the site of blood cell production. This is an essential function as large number of blood cells die every minute.

Functions of the skeletal system

Mineral store

Bones store essential minerals such as calcium and phosphorus which are essential for growth. These are released into the blood when required.

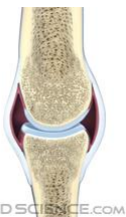


Leverage

Bones provide a lever system against which muscles can pull to create movement.

Weight bearing

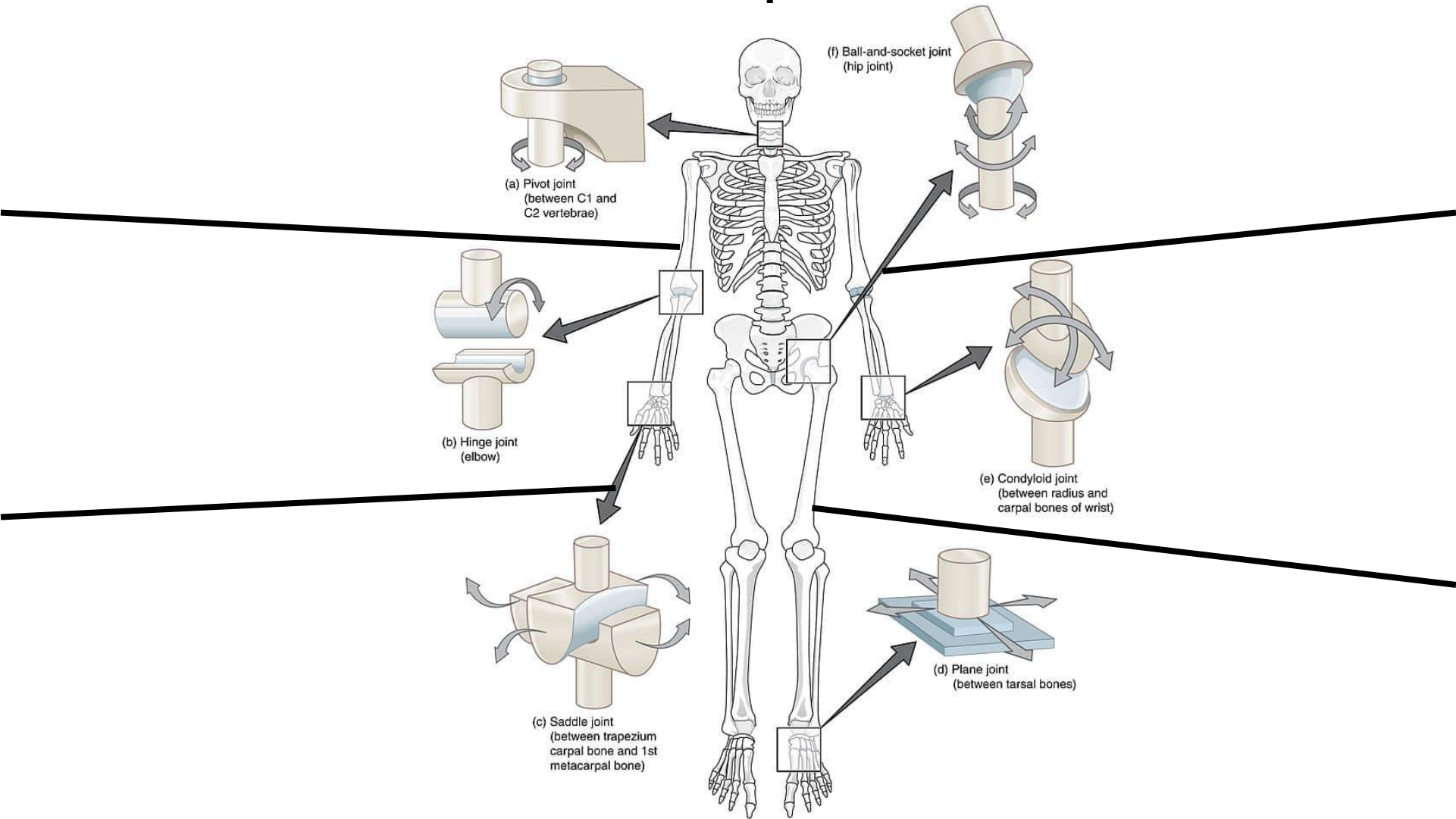
Bones are strong in order to support the weight of tissues and muscles. They provide strength to prevent injury.



Reducing joint friction

Synovial joints are an essential part of the skeleton as they prevent bones from rubbing against one another.

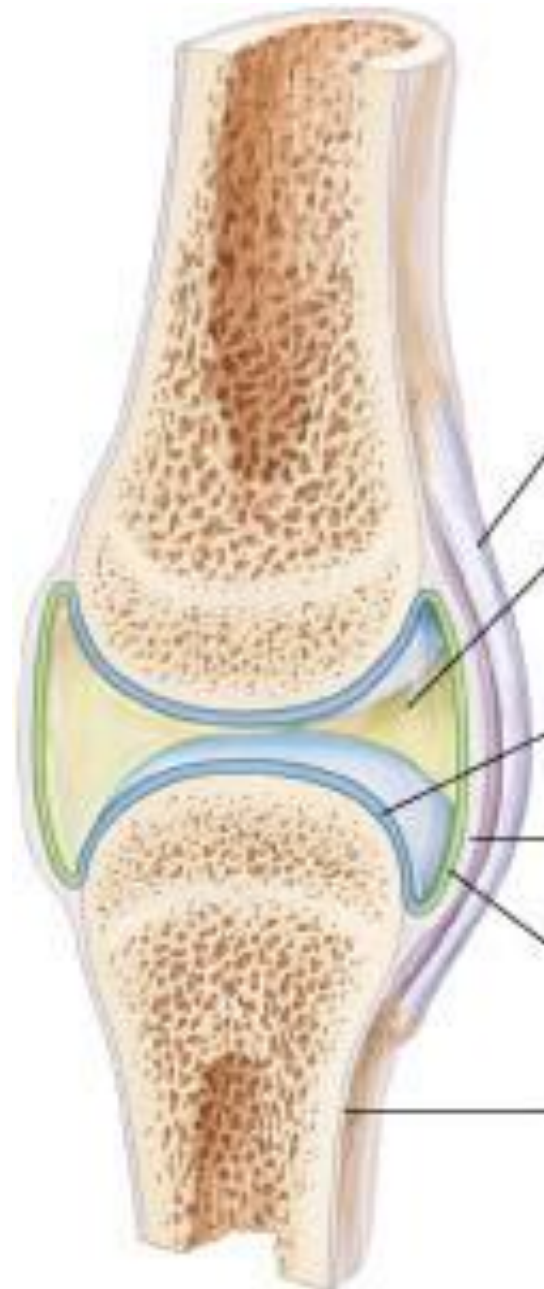
Task 7



Task 8

Structure of a Synovial Joint

Task: Label the synovial joint



Task 9



Function 2.

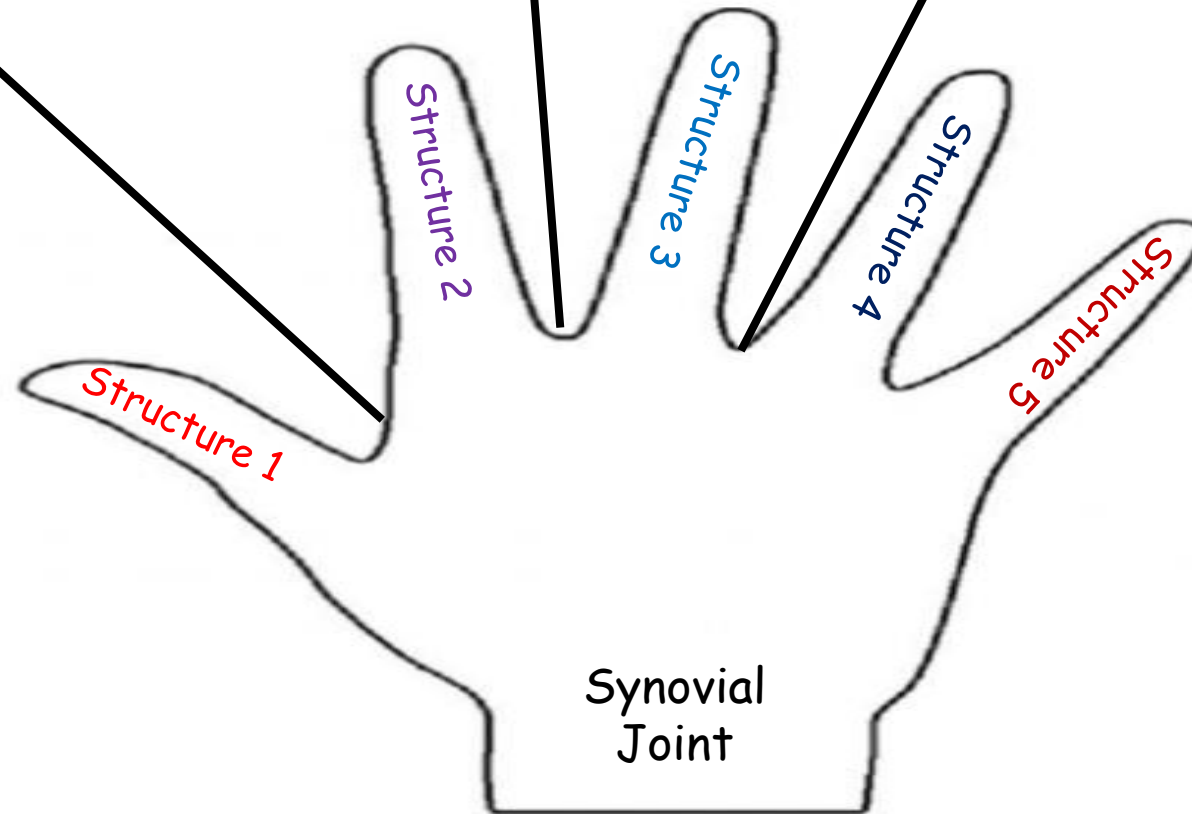
High Five Retrieval

Function 3.



Function 4.

Function 1.



Function 5.

Task: Identify the structure of a synovial joint in each finger/thumb and then describe the function of each structure above it.

Task 10



High Five Retrieval

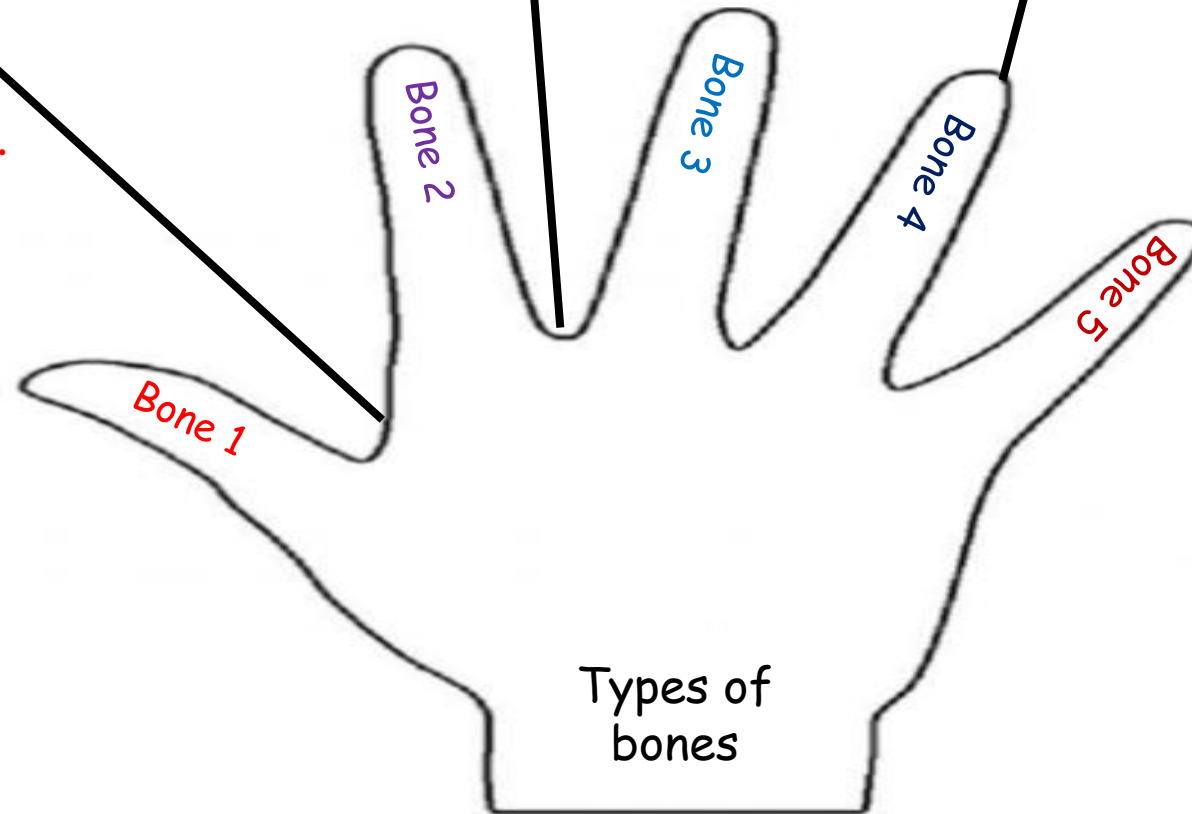


Description 2.

Description 3.

Description 4.

Description 1.



Description 5.

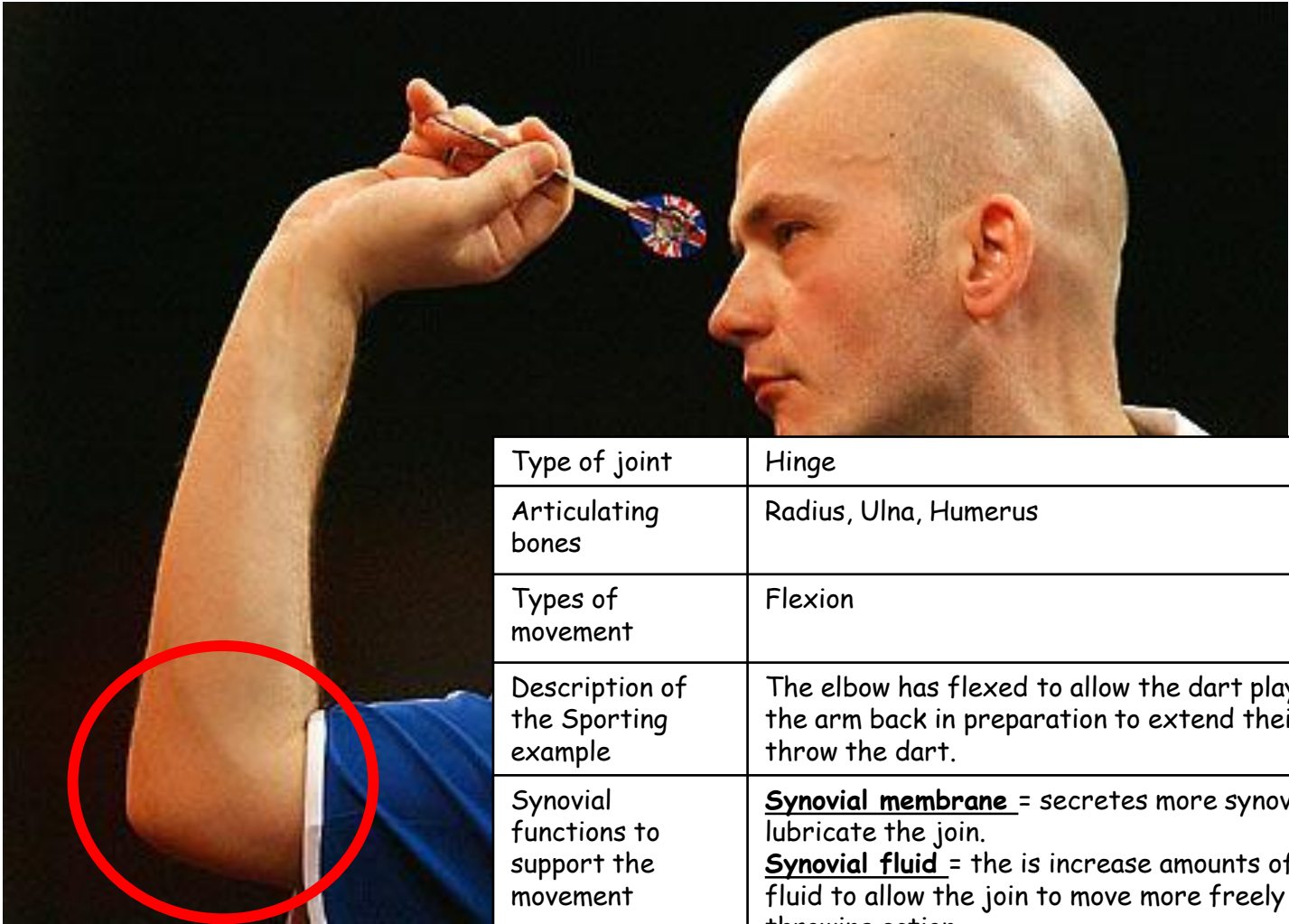
Task: Identify the types of bones in each finger/thumb and then give a description above it.

Task 11

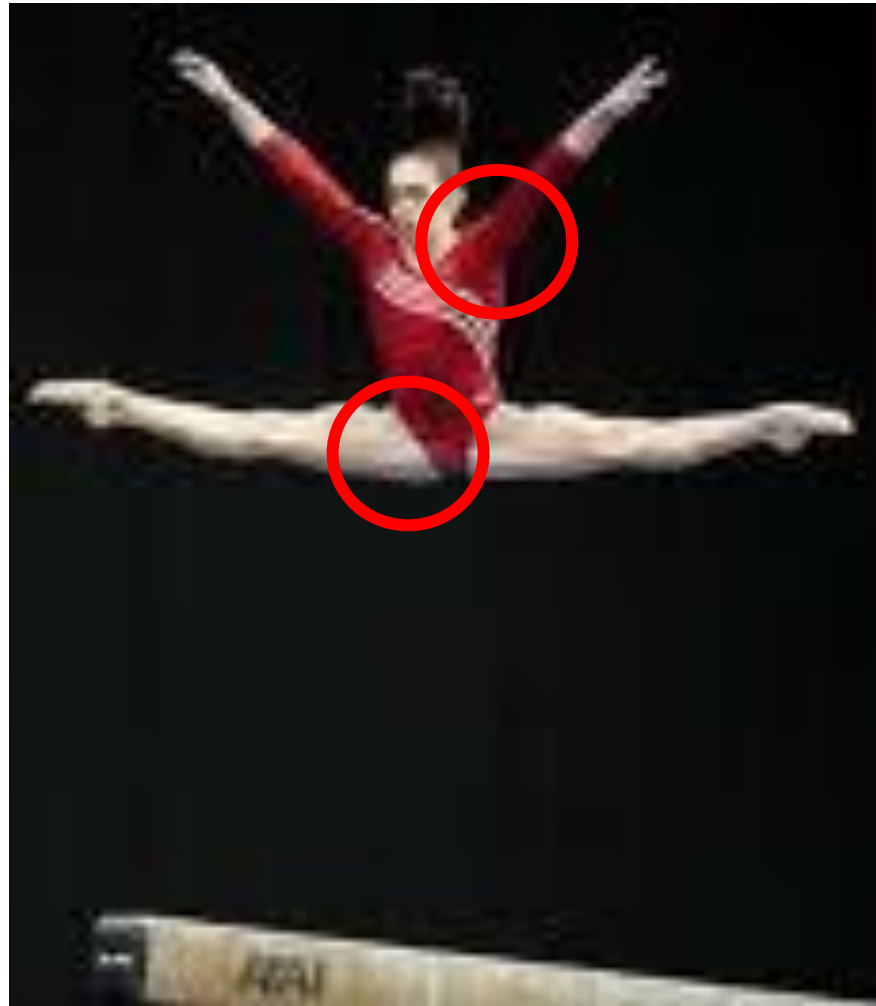
For the next four slides
create a movement
analysis for each action

- Type of joint
 - Articulating bones
 - Types of movement
- Description of the Sporting example
 - Synovial functions to support the movement
- Bone function to support the movement





Type of joint	Hinge
Articulating bones	Radius, Ulna, Humerus
Types of movement	Flexion
Description of the Sporting example	The elbow has flexed to allow the dart player to pull the arm back in preparation to extend their arm to throw the dart.
Synovial functions to support the movement	<u>Synovial membrane</u> = secretes more synovial fluid lubricate the join. <u>Synovial fluid</u> = the is increase amounts of synovial fluid to allow the join to move more freely - smoother throwing action <u>Articular cartilage</u> covers ends of humerus and radius/ulna - to ensure bones do not rub together causing friction
Bone function to support the movement	The lever of the arm provides the movement for muscle to attach and work across the joint to bring about flexion and extension when throwing the dart.



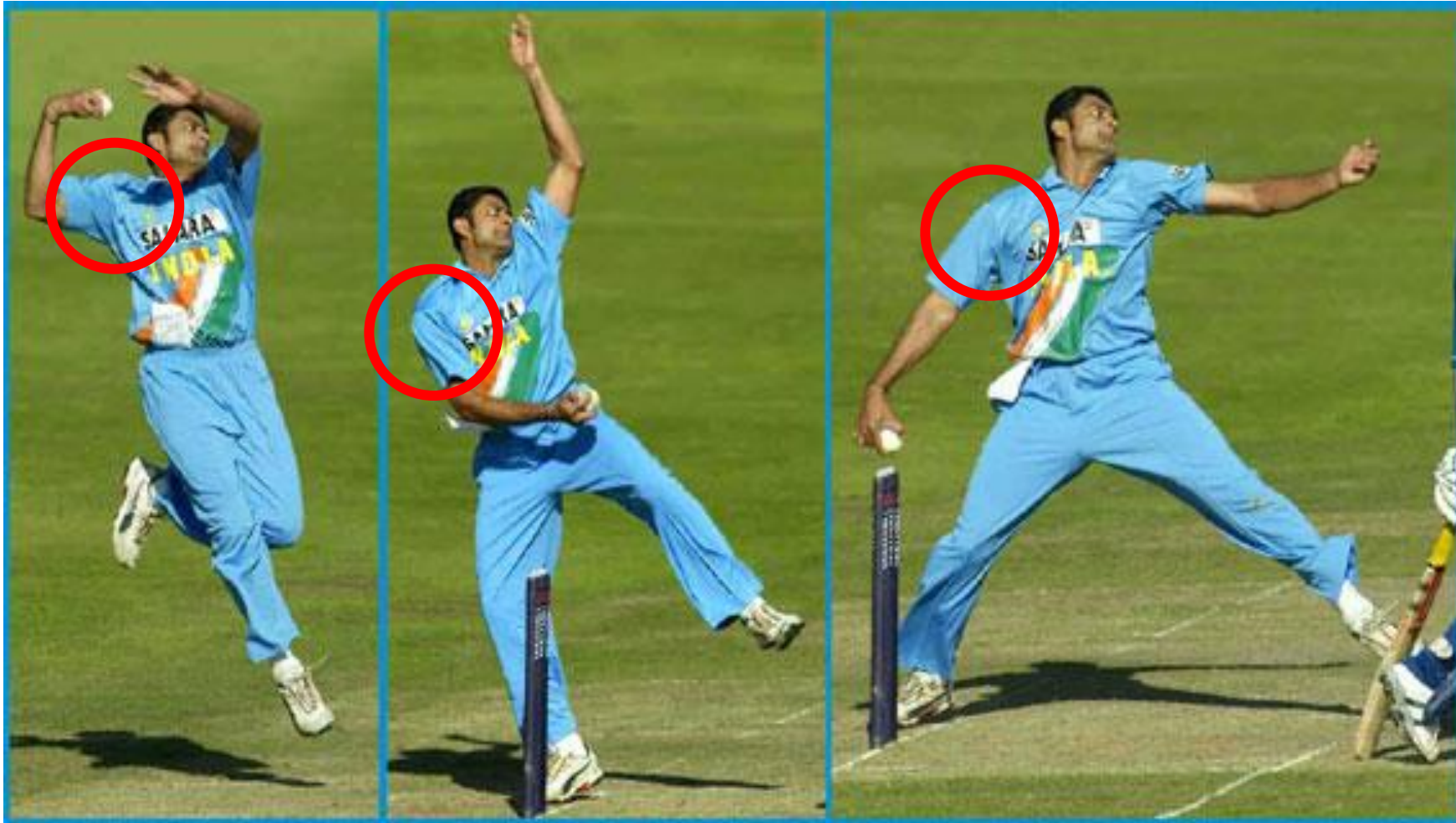


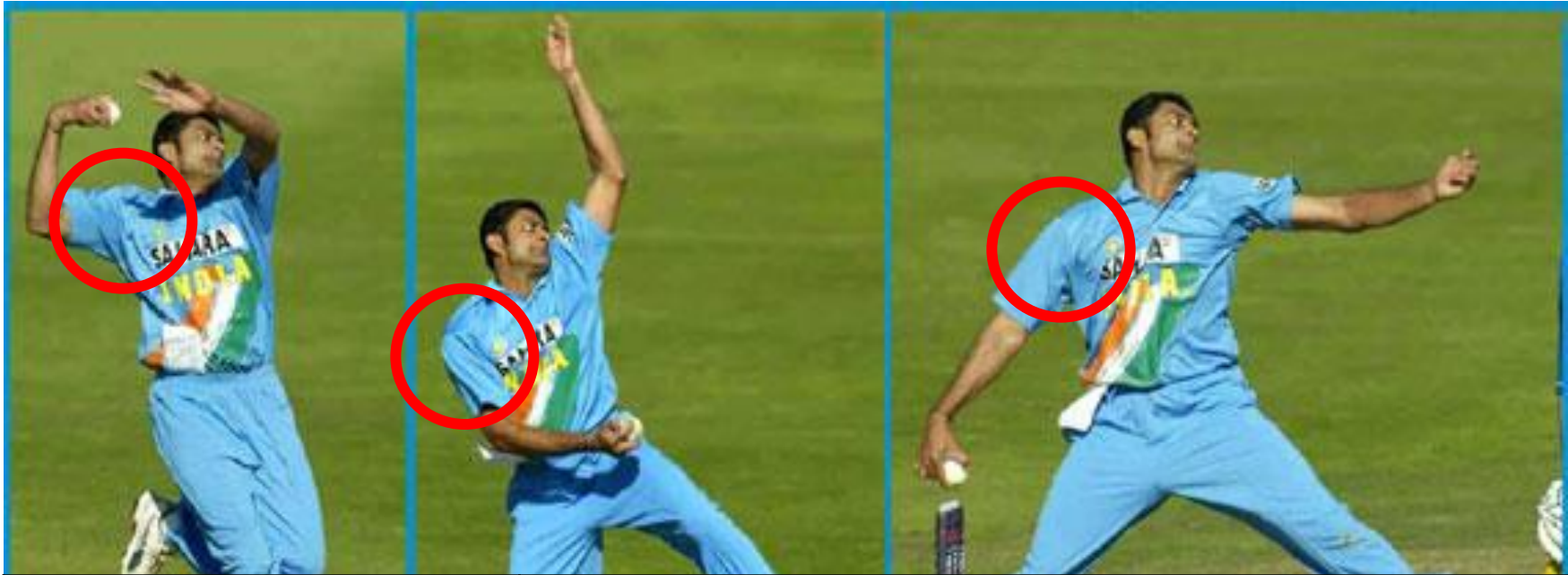
Type of joint	Ball and socket at the hip and shoulder
Articulating bones	Hip = femur and head of the pelvis Shoulder = humerus and scapula
Types of movement	Abduction at both joints
Description of the Sporting example	To create the straddled shape with the legs and arms they are both moving away from the centre line of the body.
Synovial functions to support the movement	<u>Synovial membrane</u> = secretes more synovial fluid lubricate the join. <u>Synovial fluid</u> = the is increase amounts of synovial fluid to allow the join to move more freely - smoother movement into and out of the jump - makes the movement look more aesthetically pleasing. <u>Articular cartilage</u> covers ends of humerus and femur - to ensure bones do not rub together causing friction and wearing away of the bone.
Bone function to support the movement	The lever of the arm and legs provides the movement for muscles to attach and work across the joint to bring about abduction and adduction when preforming this move.



Type of joint	Hinge
Articulating bones	Femur, tibia, patella
Types of movement	Extension
Description of the Sporting example	The knee has fully extended in the final phase of kicking the football allowing the player to make contact with, the ball and apply as much power as possible in the follow through.
Synovial functions to support the movement	<u>Synovial membrane</u> = secretes more synovial fluid lubricate the join. <u>Synovial fluid</u> = the is increase amounts of synovial fluid to allow the join to move more freely - smoother throwing action <u>Articular cartilage</u> covers ends of humerus and radius/ulna - to ensure bones do not rub together causing friction
Bone function to support the movement	The lever of the legs provided the movement for muscle to attach and work across the joint to bring about flexion and extension when preparing and executing a powerful kick in football.







Type of joint	Ball and socket
Articulating bones	Shoulder = humerus and scapula
Types of movement	Circumduction - extension, flexion, abduction and adduction
Description of the Sporting example	The arm will extend, flex, abduct and adduct to be able to preform the bowling technique.
Synovial functions to support the movement	<u>Synovial membrane</u> = secretes more synovial fluid lubricate the join. <u>Synovial fluid</u> = the is increase amounts of synovial fluid to allow the join to move more freely - smoother throwing action <u>Articular cartilage</u> covers ends of humerus and radius/ulna - to ensure bones do not rub together causing friction
Bone function to support the movement	The lever of the legs provided the movement for muscle to attach and work across the joint to bring about flexion and extension when preparing and executing a powerful kick in football.



Exam question time



Learning Aim A = Skeletal System - Revision – exam questions

A1	Structure of the skeletal system	Location of major bones - cranium, clavicle, ribs, sternum, scapula, humerus, radius, ulna, carpals, metacarpals, phalanges, pelvis, vertebral column (cervical, thoracic, lumbar, sacrum, coccyx), femur, patella, tibia, fibula, tarsals and metatarsals. Type of major bones - long, short, flat, irregular, sesamoid Areas of the skeleton - axial, appendicular, spine, curves of the spine, neutral spine alignment, postural deviations (kyphosis, scoliosis). Process of bone growth - osteoblasts, osteoclasts epiphyseal plate
A2	Function of skeletal system	Functions of the skeleton during sporting actions - supporting framework, protection, attachment of skeletal muscle, source of blood cell production, mineral storage, leverage, weight bearing, reduce friction across a joint Functions of the different types of bones - long (provides leverage, red blood cell production), short (weight bearing), flat (protection), sesamoid (reduce friction across a joint)
A3	Joints Overview	Classification of joints - fibrous (fixed), cartilaginous (slightly moveable), synovial (freely moveable) Location of joints - upper skeleton (shoulder, elbow, wrist, cervical and thoracic vertebrae); lower skeleton (hip, knee, ankle, lumbar, sacrum, coccygeal vertebrae). Bones forming joints - (shoulder, elbow, wrist, hip, knee, ankle and use in sporting actions)
A3	Synovial Joints	Structure and function of components of synovial joints - joint capsule, bursa, articular cartilage, synovial membrane, synovial fluid, ligaments. Types of synovial joints (ball & socket, hinge, pivot, condyloid, gliding and saddle) and range of movement in sporting actions (flexion, extension, dorsiflexion, plantarflexion, lateral flexion, horizontal flexion and horizontal extension, hyperextension, abduction, adduction, horizontal abduction and adduction, rotation, circumduction).
A4	Acute responses of the skeletal system to exercise	Acute effects - simulated increase of mineral uptake in bones due to weight bearing exercise.
A5	Chronic adaptations of the skeletal system to exercise	Chronic effects - increased bone strength, increased ligament strength
A6	Additional factors affecting the skeletal system	Skeletal disease - arthritis, osteoporosis and effect of exercise in offsetting these conditions. Age - young children and resistance training issues stunting bone growth

