



# JOINTS AND MUSCLES

# Lesson Objectives:

- Discuss the types of joints.
- Describe movement in the hinge and ball and socket joints.
- Discuss the three types of muscles.
- Explain how skeletal muscles function in the movement of a limb.
- Explain how skeletal muscles function in the movement of a limb.
- Explain the importance of locomotion to man

When two Skeletons  
decide to go to a party  
where do they meet?

A Joint!



# Joints







**A joint is formed where two bones meet.  
Most joints allow the rigid skeleton to move.**

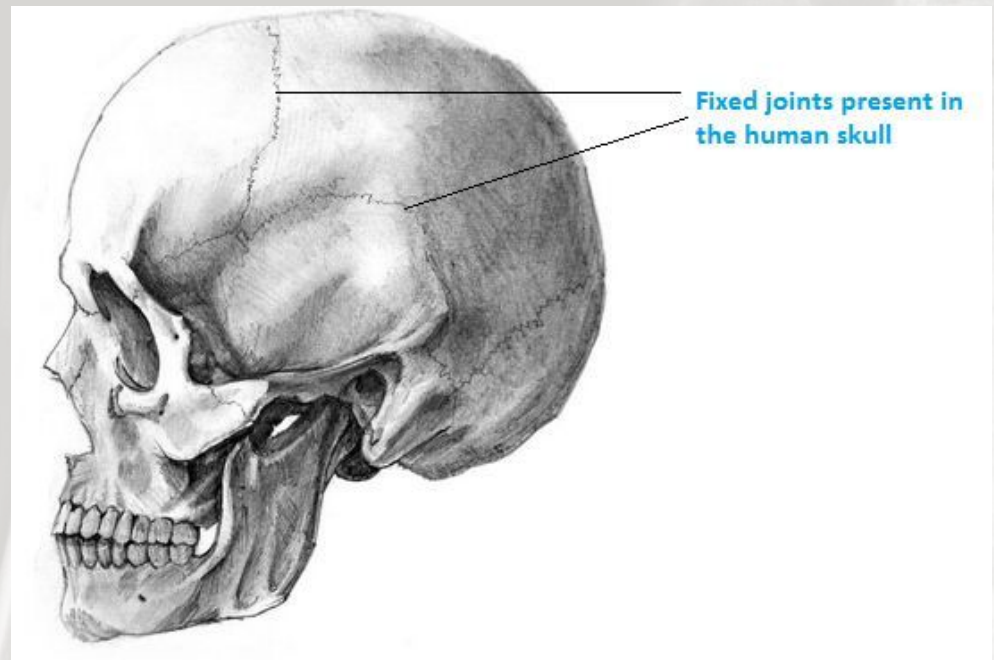
**There are three types of joints:**

- **Fixed joints**
- **Partially movable joints**
- **Moveable joints**



# Fixed Joints

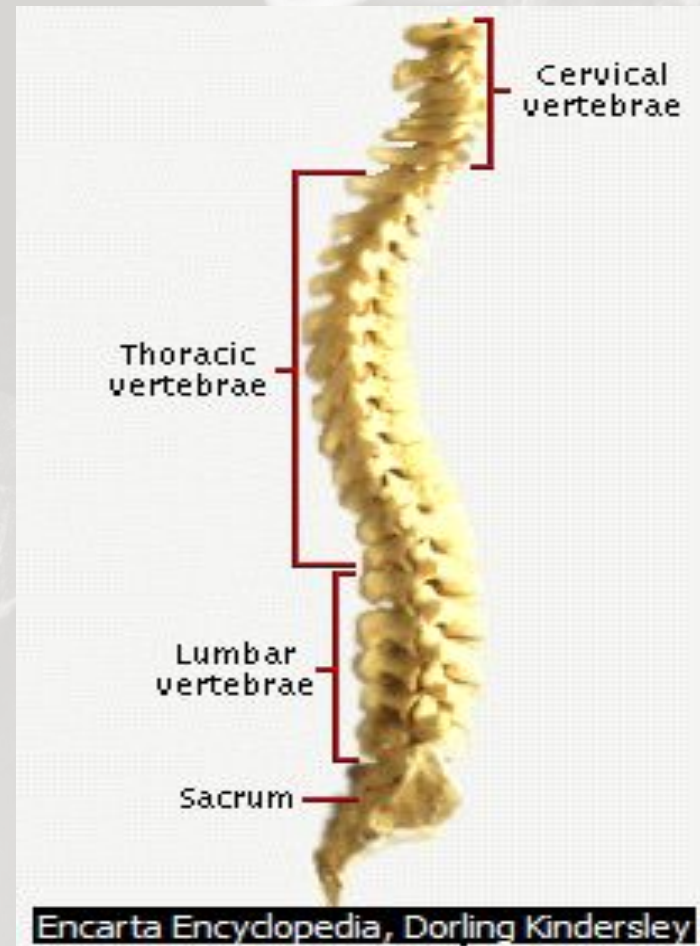
At a Fixed Joint the bones are joined firmly together by fibrous connective tissue which allows no movement, e.g. the cranium is made of several bones joined by fixed or immovable joints.





# Partially Movable Joints

At a Partially Movable Joint the bones are separated by cartilage pads which allow slight movement, e.g. **the vertebrae are separated by intervertebral discs of cartilage.**





# Moveable Joint

At Moveable joints or synovial joints the articulating surfaces of the bones are covered with articular cartilage and synovial fluid fills the joint cavity between the bones. The bones are held together by ligaments.

There are two types of moveable joints:

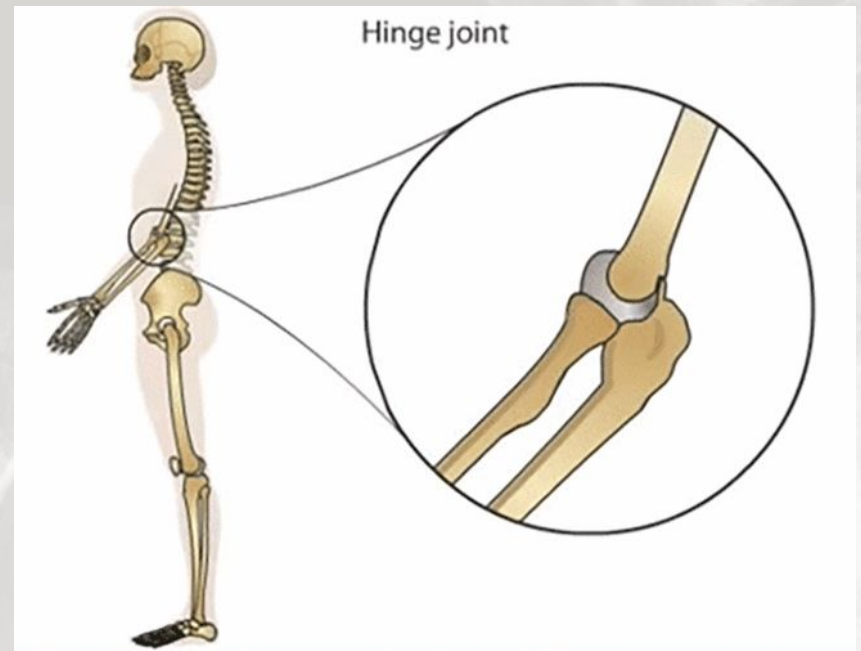
- Hinge Joints
- Ball and Socket Joints



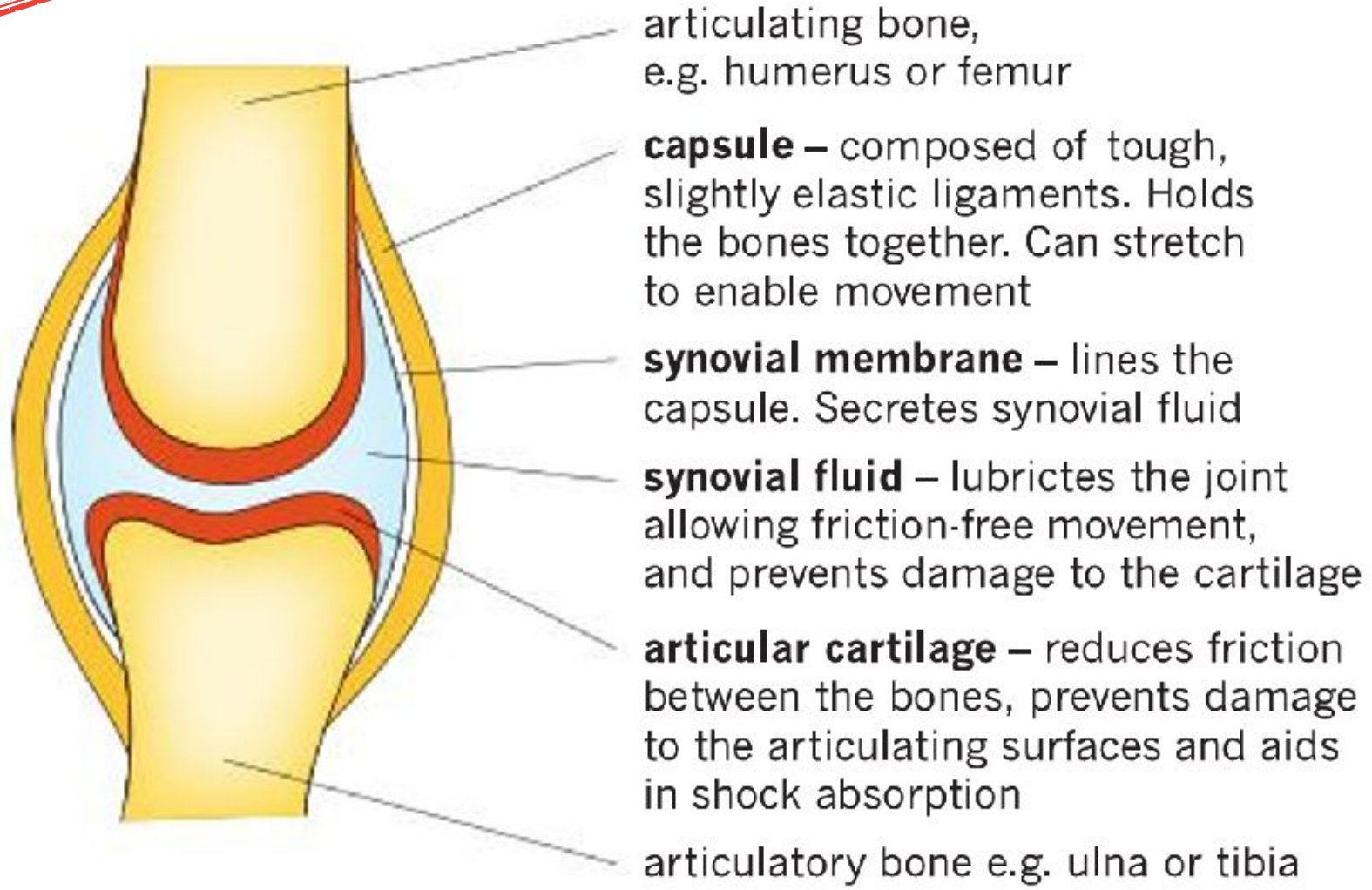


# Hinge Joint

Hinge joints are formed when the **ends of the bones meet**. They allow movement in one plane (direction) only. This limited movement provides strength and the joints are capable of bearing heavy loads, e.g. the elbow, knee, finger and toe joints.



**IMPORTANT  
DIAGRAM!**



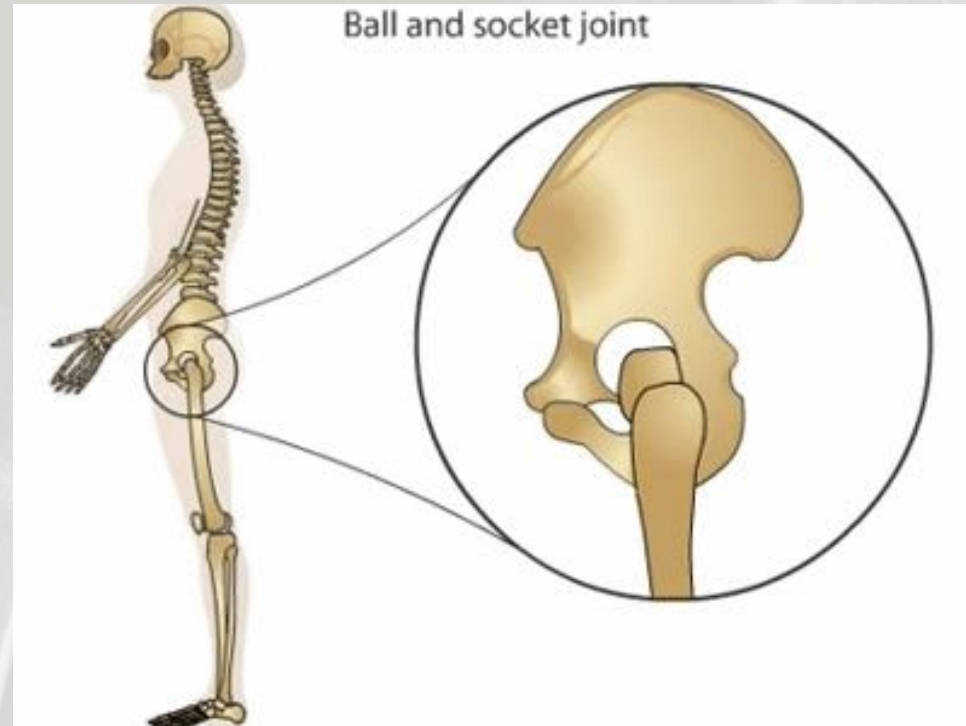
## Structure and functions of the parts of a generalised hinge joint

Source: Concise Revision Course: Human and Social Biology

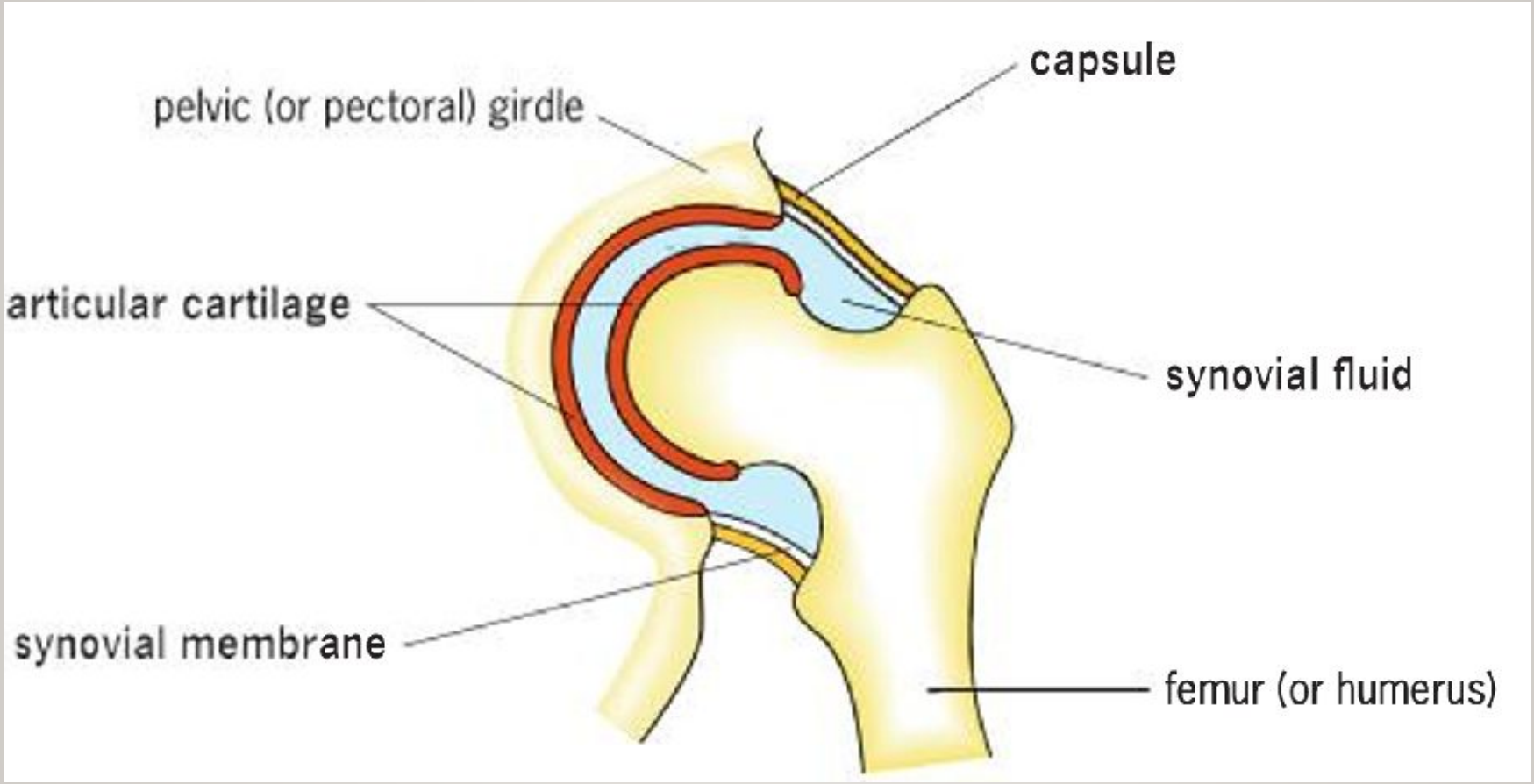


# Ball and Socket Joints

Ball and socket joints are formed where a ball at the end of one bone fits into a socket in the other bone. They allow rotational movement in all planes. The free range of movement provides less support and makes the joints more susceptible to dislocation than a hinge joint, e.g. the shoulder and hip joints.



**IMPORTANT  
DIAGRAM!**



Structure of the parts of a ball and socket joint

Source: Concise Revision Course: Human and Social Biology



State the three types of joints and where they can be found in the human body.



# Muscles





# Muscles

Muscles are responsible for movement in the human body. Muscles can cause either locomotion of the organism itself or movement of internal organs.

There are three types of muscles:

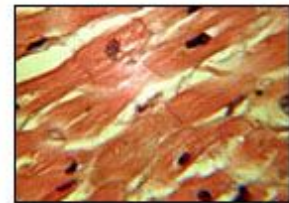
- Cardiac
- Smooth
- Skeletal



Skeletal muscle



Smooth muscle



Cardiac muscle

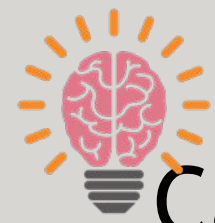


# Muscles con't

Cardiac and Smooth muscle contraction occurs **without conscious thought** and is necessary for survival.

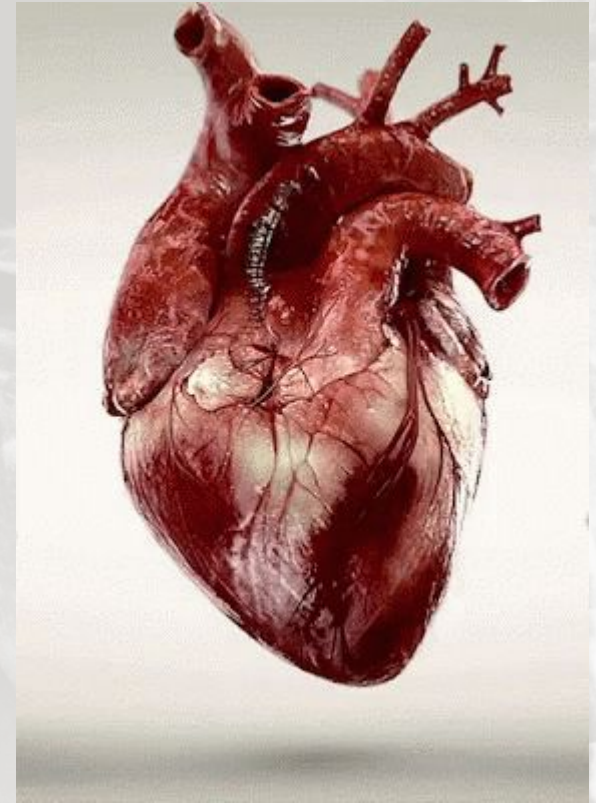
Skeletal muscle is a form of striated muscle tissue existing under control of the somatic nervous system- i.e. it is **voluntarily controlled**.





# Cardiac Muscle

Cardiac muscle make up the walls of the human heart. Cardiac muscle is adapted to be highly resistant to fatigue: it has a large number of mitochondria, enabling continuous aerobic respiration via oxidative phosphorylation, numerous myoglobins (oxygen-storing pigment) and a good blood supply, which provides nutrients and oxygen.





# Smooth Muscle

Smooth muscle is found in the walls of all the hollow organs of the body (except the heart). Its contraction reduces the size of these structures.

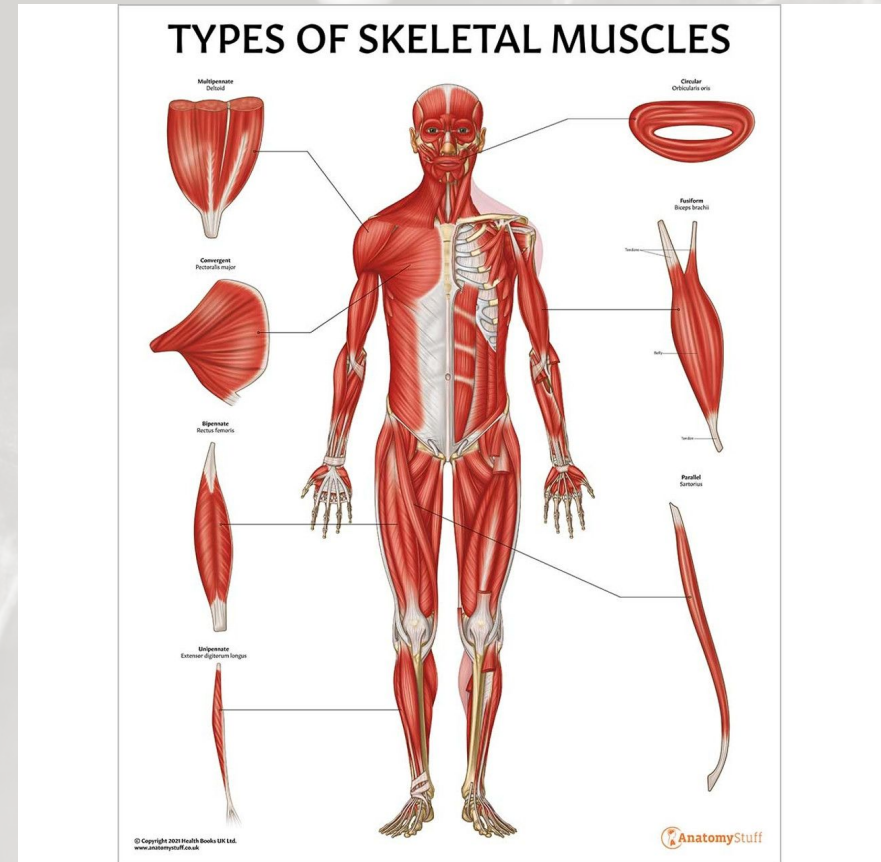
- Regulates the flow of blood in the arteries
- Moves your breakfast along through your gastrointestinal tract
- Expels urine from your urinary bladder
- Sends babies out into the world from the uterus
- Regulates the flow of air through the lungs

The contraction of smooth muscle is generally not under voluntary control.



# Skeletal Muscle

Skeletal muscles consist of bundles of multinucleate muscle fibres which are surrounded by connective tissue. Tendons attach these muscles to the bones of the skeleton.







# Movement of a limb

When a muscle contracts it exerts a pull, but it cannot exert a push when it relaxes.

Therefore, two muscles, known as an **antagonistic pair**, are always needed to produce movement at a moveable joint:

- **The flexor muscle** is the muscle that bends the joint when it contracts.
- **The extensor muscle** is the muscle that straightens the joint when it contracts



Explain how an antagonistic pair of muscles work to move a limb?





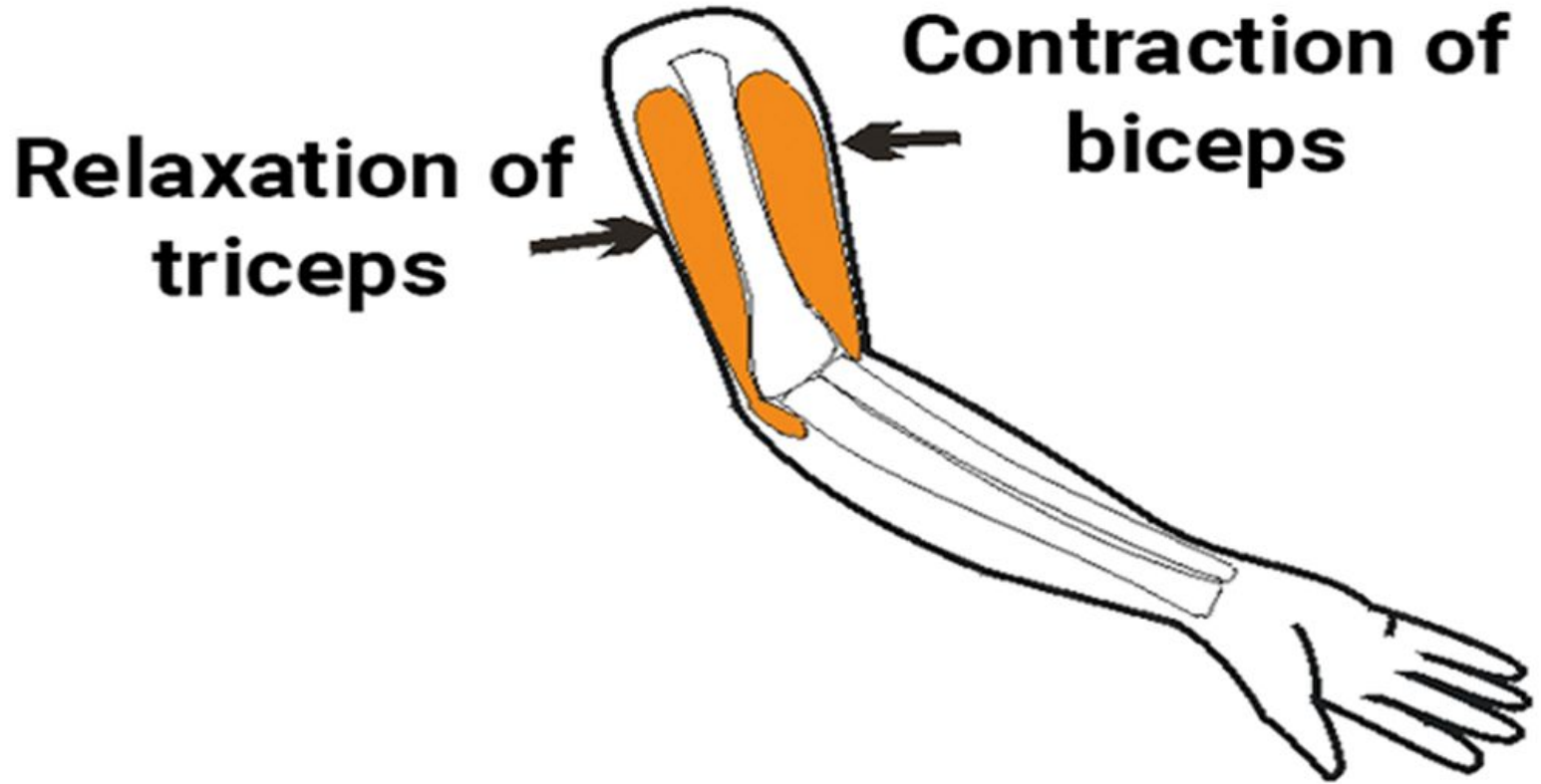
# Movement of the elbow joint

The **biceps and triceps muscles** move the radius and ulna causing the elbow joint to bend or straighten:

- The biceps is the flexor muscle. Its origin is on the scapula which does not move, and its insertion is on the radius close to the elbow joint.
- The triceps is the extensor muscle. Its origin is on the scapula and top of the humerus which do not move, and its insertion is on the ulna close to the elbow joint. To bend the elbow joint, the biceps contracts and the triceps relaxes. To straighten the elbow joint, the triceps contracts and the biceps relaxes.

**IMPORTANT  
DIAGRAM!**

# Flexion



Gif: Contraction and Relaxation of Triceps and Biceps

Source: [toppr.com/ask/content/story/amp/importance-of-muscles-in-movement-of-bones-124460/](https://toppr.com/ask/content/story/amp/importance-of-muscles-in-movement-of-bones-124460/)

**IMPORTANT  
DIAGRAM!**

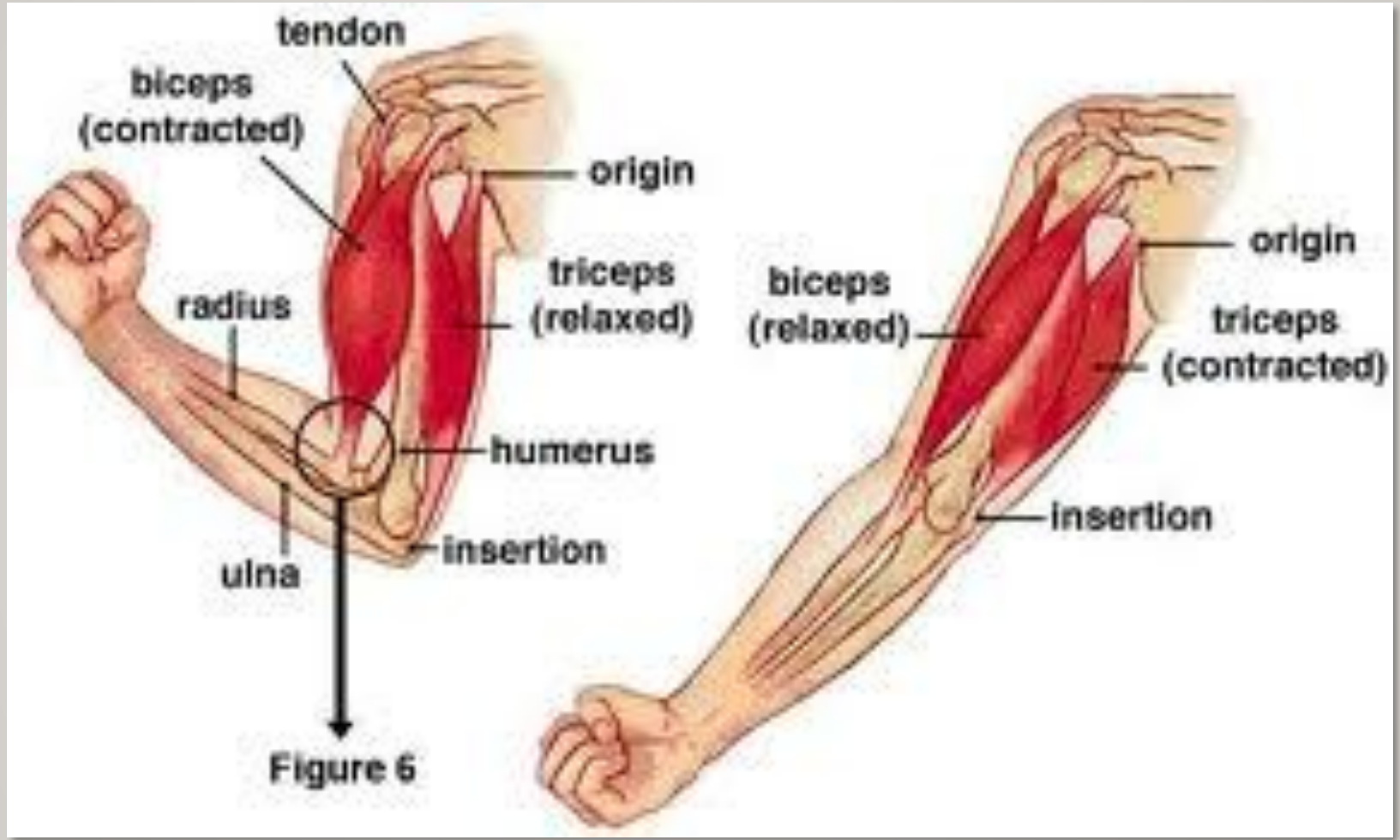


Diagram: Contraction and Relaxation of Triceps and Biceps



State three reasons why it's important for humans to move (locomotion)





## Lesson Review Questions:

1. What is a joint?
2. How does movement at a hinge joint differ from movement at a ball and socket joint?
3. Identify TWO places in the human body where you would find EACH type of joint named in 2. above.
4. Explain how muscles of the leg bring about bending and straightening of the knee joint.
5. Name the muscle that bends Jaden's elbow joint and the muscle that straightens it.

# Summary

- A Joint is a place in the human body where two bones meet.
- There are three types of joints: fixed, partially movable and moveable.
- There are two types of moveable joints: the hinge joint and the ball and socket joint.
- There are three types of muscles: cardiac, smooth and skeletal
- Limbs move by the contraction and relating of antagonistic muscle pairs e.g. triceps and biceps.

# Lesson Sources:

- Concise Revision Course - Human and Social Biology - a Concise Revision Course for CSEC® Textbook by Anne Tindale and Shaun deSouza
- Human & Social Biology for CSEC® Examinations 6th Edition Student's Book by Phil Gadd