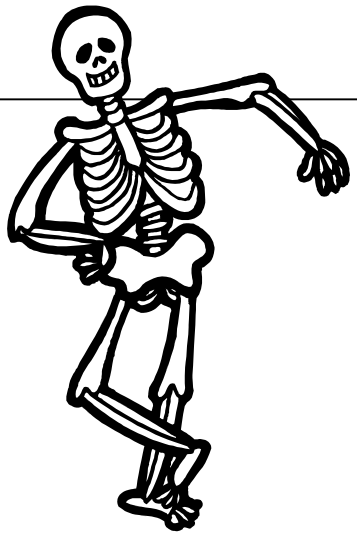
The Skeletal system

The skeletal system provides the structural framework of the human body, and its joints permit the varied movements we explore in dance.

The role of bones in joints is key for understanding and describing human movement.



The composition of bone allows it to serve in the following key functions.

- Support
- Protection
- Movement
- Blood cell production
- Mineral storage

SHORT BONES
Are cubical in shape and are found in the upper portion of the hand and feet:
E.g. Carpals & Tarsals

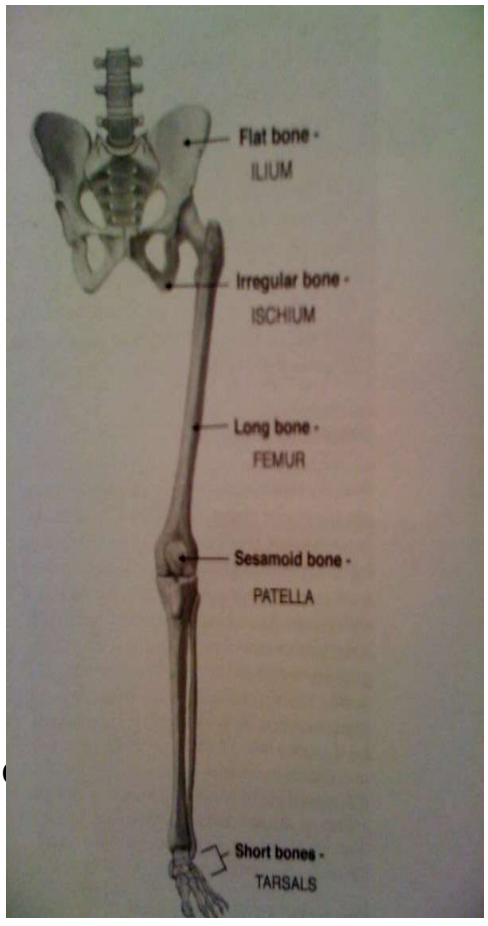
These bones aid with shock absorption, transmission of forces and small complex movements.

Bones come in a variety of shapes and sizes. They can be classified according to their shape into five types:

- **Long bones**
- **Short bones**
- **Flat bones**
- **Irregular bones**
- **Sesamoid bones**

LONG BONES
Are tubular in shape and much longer than they are wide. They are found in the limbs, where they serve as levers to enhance movement.
E.g. Thigh bone / Femur.
Clavicles
Humerus
Radius
Ulna
Metacarpals & metatarsals
Phalanges
Tibia
Fibula
The long bones in the lower body are generally longer and stronger to bear weight, while the ones in the upper body are smaller and lighter for reaching and to manipulate objects.

FLAT BONES
Are relatively thin and flat, but often slightly curved in shape. These bones commonly protect important soft underlying structures (such as the brain), and their shape also allows for extensive attachment of muscles.
E.g. Pelvis / ilium
Ribs
Sternum
Scapulae
Some of the skull



IRREGULAR BONES
Exhibit complex and varied shapes. Their shape is adapted to special purposes; and they serve a variety of functions including protecting the spinal cord, supporting body weight, transmitting loads, providing sites for muscle attachment and facilitating movement.
E.g. Vertebrae
Lower pelvis – Ischium & pubis

SESAMOID BONES
Are bones that form within a tendon. They help protect the tendon from excessive wear due to rubbing against the underlying bone, and they change the angle of the tendon so that the muscle can produce more effective force.
E.g. Kneecap / Patella

1. A) List the five types of bones:

   1.

   2.

   3.

   4.

   5.

   B) Identify one particular bone in the body for each type listed above:

   1.

   2.

   3.

   4.

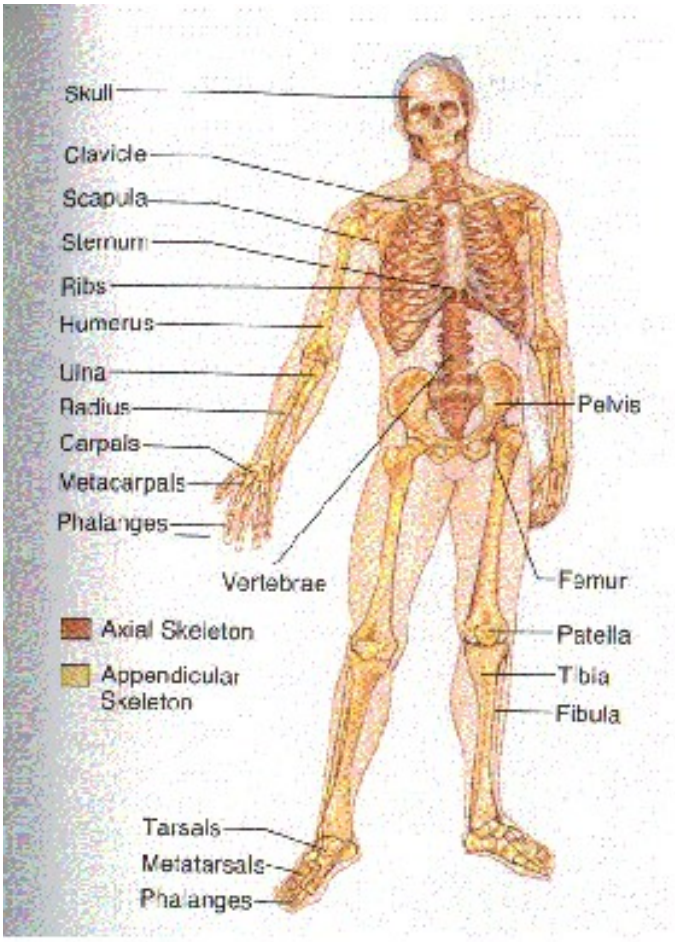
   5.

THE HUMAN SKELETON
There are 206 bones in the adult human skeleton, 177 that can engage in voluntary movement. The major bones of the skeleton are shown in the figure here:

The skeleton has two major divisions – the axial and the appendicular skeleton.

The **axial** portion forms the central upright 'axis' of the skeleton and includes the skull, vertebral column, sternum and ribs. The skull contains 28 bones. The sternum and the 12 ribs with their adjoining cartilages help form the thorax, which provides important protection for the lungs and heart. 33 vertebrae form the vertebral column. The segmented make-up of the spine allows it to be flexible and capable of a wide variety of movements.

The **appendicular** skeleton is composed of the bones the limbs, which are hung on or attached to the axial skeleton as seen on the figure above. The appendicular skeleton contains two subdivisions. The upper extremity = shoulder girdle, upper & lower arm, wrist and hand. Lower extremity = pelvic girdle, thigh, lower leg, ankle and foot.



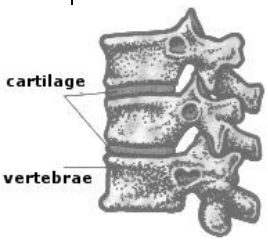
C) Identify and describe the difference between the **axial** and **appendicular** divisions.

CARTILAGINOUS JOINTS

Are united directly by cartilage and there is no space between the bones. Cartlidge cells are surrounded by a matrix that is like a firm like gel in consistency. This gives cartilage less rigidity and more shock-absorbing capacity.

E.g. of Cartilaginous joints
Intervertebral discs (between vertebrae)
Pubis

This type of joint involves a pad or disc of microcartilage, a design that allows slight movement as well as shock absorption.

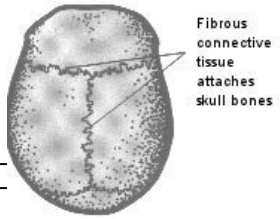


FIBROUS JOINTS

Are held together by either very short fibres (sutures), cords (ligaments) or sheets (interosseous membranes) or fibrous connective tissue.

In each case they connect directly and there is no space between the bones being connected.

E.g. of Fibrous joints:
Sutures of the skull
Middle joint between bones of forearm
Two joints between bones of lower leg

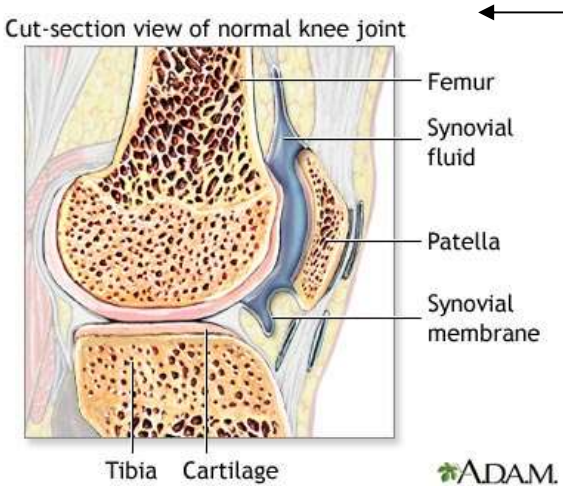


JOINTS

The human skeleton is composed of various bones joined together to form segments or links. The connection between adjacent bones or cartilage is termed a joint, or articulation.

These have two main functions: to bind the skeleton together and to provide mobility. There are three classes of joints:

- Fibrous
- Cartilaginous
- Synovial



SYNOVIAL JOINTS

These joints differ in that bones are not directly connected to each other and there is actually space between the joining bones. The space is called a joint cavity. Although the space is very small, it generally allows a large degree of movement.

Synovial joints are the most common type of joint in the human body, and almost all of the joints found in the limbs are synovial.

E.g. of Synovial joints
Shoulder, elbow, wrist, hip, **knee** and ankle.

The ends of the bones that come together forming a synovial joint are covered with articular cartilage – a thin layer of hyaline cartilage covering joint surfaces that helps decrease friction and aids in shock absorbency.

Synovial joints are surrounded by a sleeve like structure made of fibrous tissue called the joint capsule. The capsule's make-up gives strength and allows it to withstand tension applied in many directions. The capsule is lined on the inside with synovial membrane, which produces synovial fluid. Synovial fluid helps to lubricate the joint and will change consistency dependent on temperature or pace of joint movement. E.g. when warm the fluid / joint has less resistance to movement.

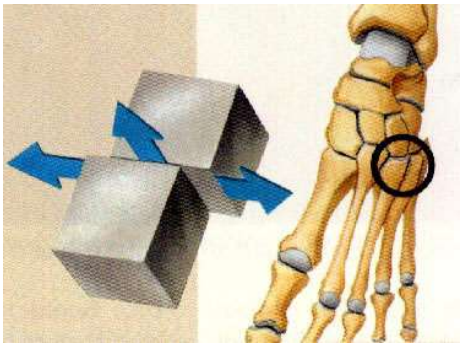
When injury or irritation occurs, a discharge in the joint of synovial fluid follows, which produces noticeable swelling.

Synovial joints are reinforced by ligaments; strong bands of tissue that bind the bones together. They prevent dislocation and add stability. They also limit the direction and extent of movement allowed at a joint.

GLIDING OR PLANE JOINTS

Joint surfaces that are flat or slightly curve in shape.

E.g. between carpal bones
tarsal bones
Facet joints of vertebrae



HINGE JOINTS

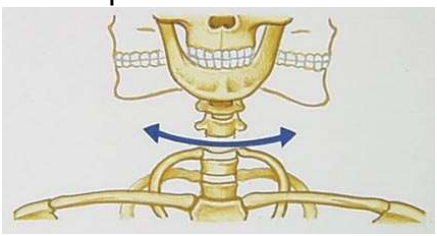
Are composed of a spool-shaped surface that fits into a concave surface.

E.g. Ankle
Elbow
Knee

PIVOT JOINTS

Are composed of an arch or ring shaped surface that rotates about a rounded or peg-like pivot.

E.g. Upper forearm
Between first and second vertebrae of the spine



TYPES OF SYNOVIAL JOINT

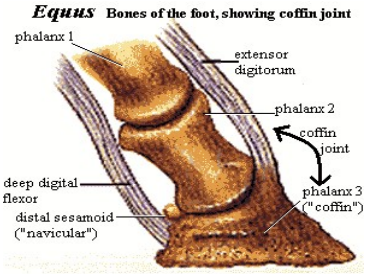
Synovial joints vary considerably in shape and movement that they allow. There are 6 types of synovial joints.

- Gliding
- Hinge
- Pivot
- Condyloid or ellipsoid
- Saddle
- Ball-and-socket

CONDYLOID / ELLIPSOID JOINTS

Consist of an oval-shaped condyle that fits into an elliptical cavity.

E.g. Wrist
Knuckles of hands and Feet



SADDLE JOINTS

Are composed of saddle-shaped bone that fits into a socket, which is concave-convex in the opposite direction.

E.g. Thumb

BALL-AND-SOCKET JOINTS

Consist of a ball-shaped head that fits into a socket. Ball-and-socket joints are the most freely moveable type of joint in the body.

E.g. Shoulder
Hip

2. A) Identify and describe, with example, the three types of joints.

B) Identify and describe, with example, the six types of synovial joints.

JOINTS: MOVEMENT

There are 6 basic joint movements:

- Flexion
- Extension
- Abduction
- Adduction
- External rotation
- Internal rotation

These terms occur in pairs that have opposite meanings. **E.g.** flexion – extension, bringing the arm to the front (shoulder flexion) or bringing the arm back (shoulder extension)

FLEXION

Involves bringing anterior surfaces towards adjacent anterior surfaces, or bringing posterior surfaces towards adjacent posterior surfaces – ***BENDING.***

E.g. bringing the front of the forearm towards the front of the upper arm is elbow flexion (bending the elbow).

ABDUCTION

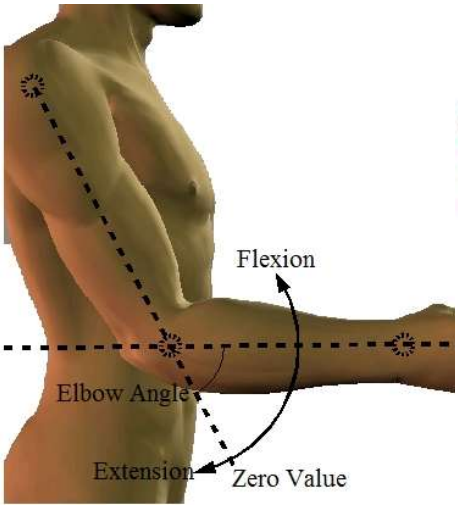
Involves moving a segment of the body away from the median plane or middle of the body –***DRAWING AWAY***

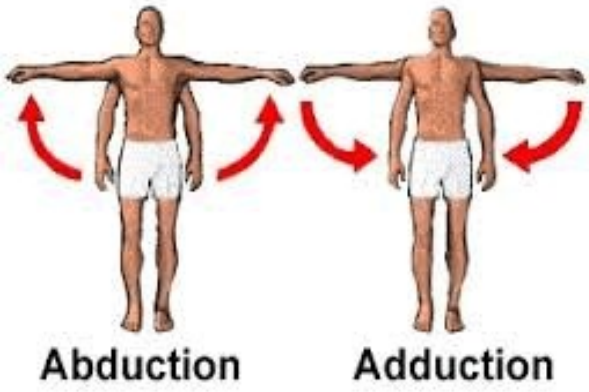
E.g. moving the arms away from the body out to the side and up into fifth position.

EXTERNAL ROTATION

Moving the anterior surface of a limb outward or away from the middle of the body – ***OUTWARD ROTATION.***

E.g. external rotation of the hip occurs during turnout from parallel to first position.





EXTENSION

Is the opposite of flexion, bringing the anterior surface away from adjacent anterior surfaces, back toward anatomical position – ***STRAIGHTENING.***

E.g. straightening the knee from a bent position during rising from a plié or in a develope.

ADDUCTION

Is the opposite of abduction, returning the body segment back toward anatomical position and the middle of the body – **BRING TOWARD**.

E.g. bringing the arms down from a fifth position.

INTERNAL ROTATION

Is the opposite to external rotation, bringing the anterior surface of the limb inward, toward the midline of the body – ***INWARD ROTATION.***

E.g. in jazz dance when the thigh is rotated inward so that the knee faces

3. A) Identify, and describe, with example, the six possible movement of a joint.

1.

2.

3.

4.

5.

6.