ALLEN CAREER INSTITUTE KOTA (RAJASTHAN)

path to success

PRE-MEDICAL

ZOOLOGY

ENTHUSIAST | LEADER | ACHIEVER

STUDY MATERIAL

Locomotion and movement (Skeletal system)

ENGLISH MEDIUM

Copyright Statement

Sir Andrew Fielding Huxley (22 November 1917 - 30 May 2012) was a Nobel Prize winning. In 1952 he was joined by a German physiologist Rolf Niedergerke. Together they discovered in 1954 the mechanism of muscle contraction, popularly called the "sliding filament theory", which is the foundation of our modern understanding of muscle mechanics.

Hugh Esmor Huxley was a British molecular biologist who made important discoveries in the physiology of muscle. He was a graduate in physics from Christ's College, Cambridge. He worked on X-ray diffraction studies on muscle fibres. During his postdoctoral at Massachusetts Institute of Technology. he, with fellow researcher Jean Hanson discovered the underlying principle of muscle movement, popularised as the sliding filament theory in 1954. After 15 years of research, he proposed the "Swinging cross bridge hypothesis".

LOCOMOTION AND MOVEMENT-I (SKELETAL SYSTEM)

01. INTRODUCTION

- **Introduction**
- **Axial skeleton**
- **Appendicular skeleton**
- **Joints**
- **Disorders of skeletal system**

Skeletal system consists of a framework of bones and a few cartilages.

Two types of skeleton are endoskeleton and exoskeleton.

Exoskeleton develops from epidermis e.g. nails, horns, hooves, feathers, scales, claws etc.

Exoskeleton is ectodermal in origin and non living.

Endoskeleton is mesodermal in origin and is living in nature.

This system has a significant role in movement shown by the body. Imagine chewing food without jaw bones and walking around without the limb bones.

Bone and cartilage are specialised connective tissues. The former has a very hard matrix due to calcium salts in it and the latter has slightly pliable matrix due to chondroitin salts. In human beings, this system is made up of 206 bones and a few cartilages. It is grouped into two principal divisions - the axial and the appendicular skeleton.

<table>
<tr><td colspan="5">HUMAN SKELETON - 206 bones</td></tr>
<tr><td colspan="3">Axial-80</td><td colspan="2">Appendicular-126</td></tr>
<tr><td colspan="5">AXIAL SKELETON - 80 BONES</td></tr>
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<tr><td colspan="2">SKULL BONES - 22</td><td></td><td>True - 14</td><td>Cervical - 7</td></tr>
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<tr><td colspan="5">ASSOCIATED SKULL BONES - 07</td></tr>
<tr><td colspan="2">Hyoid Bone - 1</td><td colspan="3">Ear ossicles - 2x3 (Malleus, Incus, Stapes)</td></tr>
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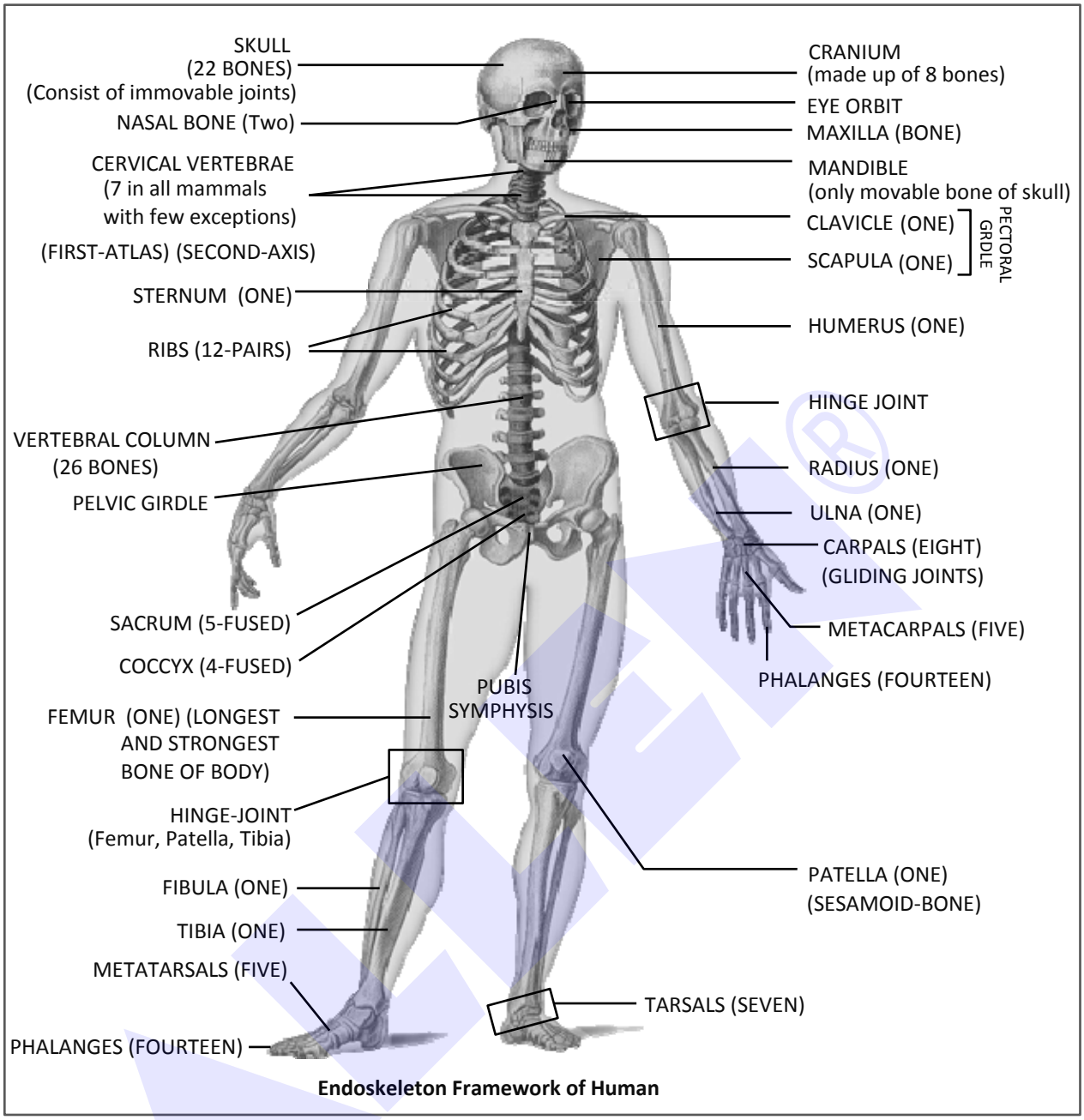


Endoskeleton Framework of Human

APPENDICULAR SKELETON - 126 BONES			
LIMB BONES - 120		**GIRDLE BONES - 06**	
Fore limb Bones - 60	Hind limb Bones - 60	Pectoral Girdle - 4	Pelvic Girdle - 2
Humerus – 1×2	Femur – 1×2	Scapula - 1×2	
Radius – 1×2	Patella - 1×2	Clavicle - 1×2	
Ulna - 1×2	Tibia - 1×2		(is formed by 2 hip bones and each hip bone is formed by fusion of 3 bones ilium, ischium and pubis)
Carpals - 8×2	Fibula - 1×2		
Metacarpals - 5×2	Tarsals - 7×2		
Phalanges - 14×2	Metatarsals - 5×2		
	Phalanges - 14×2		

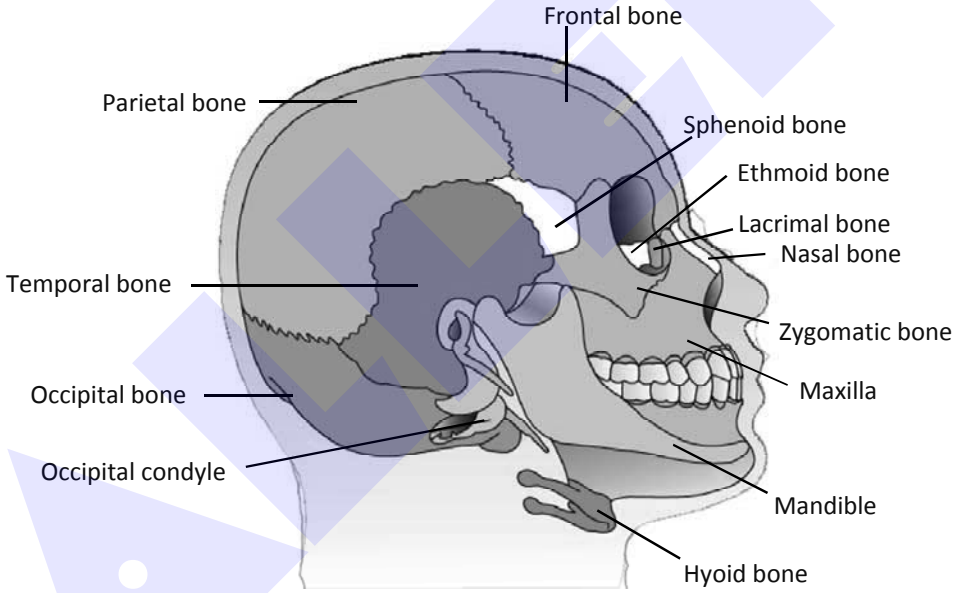
Phalangeal formula is 23333
Bones formed by ossification of tendons are called sesamoid bones.
Longest and strongest bone of human body is femur.
Smallest bone of human body is stapes.
Rabbit - axial skeleton 132 bones , appendicular skeleton 128 bones

02. AXIAL SKELETON

Axial skeleton comprises 80 bones distributed along the main axis of the body.
The skull, vertebral column, sternum and ribs constitute axial skeleton.

(1) SKULL

- The skull is composed of two sets of bones - cranial and facial, that totals to 22 bones.
- **Cranial bones are 8 in number (frontal-1, parietal-2, temporal-2, occipital-1, ethmoid-1 and sphenoid-1). They form the hard protective outer covering, cranium for the brain.**
- **Cavity of sphenoid bone is called sella turcica in which pituitary gland is present.**
- The facial region is made up of 14 skeletal elements (Inferior turbinals-2, Maxilla-2, Malar(Zygomatic)-2, Nasal-2, Palatine-2, Lacrimal-2, Vomer-1, Mandible-1) which form the front part of the skull.
- A single U-shaped bone called hyoid is present at the base of the buccal cavity and it is also included in the skull.
- **Hyoid bone is the only bone which is not attached with any other bone of the body.**
- **Tongue is attached with hyoid bone**



Diagrammatic view of human skull

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Each middle ear contains three tiny bones - Malleus, Incus and Stapes, collectively called **Ear Ossicles.** Joint between malleus and incus is hinge whereas joint between incus and stapes is ball and socket. Malleus is modification of articular bone, Incus is modification of quadrate bone, Stapes is smallest bone of body and is the modification of hyomandibular bone. The skull region articulates with the superior region of the vertebral column with the help of two occipital condyles (dicondylic skull). An opening is present at the base of occipital bone called foramen magnum. Medulla oblongata leaves out through foramen magnum and enter into the cavity of vertebral column. This extended part of medulla oblongata is called spinal cord.

Skull is monocondylic in reptiles and birds whereas dicondylic in amphibians and mammals.

All these bones of skull are joined together by suture.

Eg.
- Coronal suture : Between the frontal & parietal bone
- Lambdoidal suture : Between parietal & occipital
- Saggital suture : Between parietal & parietal

BEGINNER'S BOX — SKULL

1. Skull of Man is :-

(1) Monocondylic (2) Dicondylic (3) Tricondylic (4) Tetracondylic

2. Total number of skull bones in human :-

(1) 29 (2) 49 (3) 39 (4) 19

3. Single bone of lower jaw in human is :-

(1) Maxilla (2) Mandible (3) Nasal (4) Lacrimal

4. Spinal cord passes to brain through :-

(1) Foramen of Monro (2) Foramen of Magendie

(3) Foramen ovale (4) Foramen magnum

5. Total number of bone of human face:-

(1) 10 (2) 12 (3) 14 (4) 16

6. Number of bones pesent in human cranium is :

(1) 8 (2) 10 (3) 12 (4) 16

7. Joint between bones of human skull is :

(1) Hinge joint (2) Synovial joint

(3) Cartilaginous joint (4) Fibrous joint

8. Surface for attachment of tongue is :

(1) Palatine (2) Sphenoid (3) Ethmoid (4) Hyoid apparatus

9. Smallest bone in Human is :-

(1) Nasal (2) Patella (3) Stapes (4) Palatine

10. Joint between Incus & stapes is :-

(1) Ball & socket joint (2) Hinge joint (3) Pivot joint (4) Gliding joint

11. Joint between malleus & incus is :-

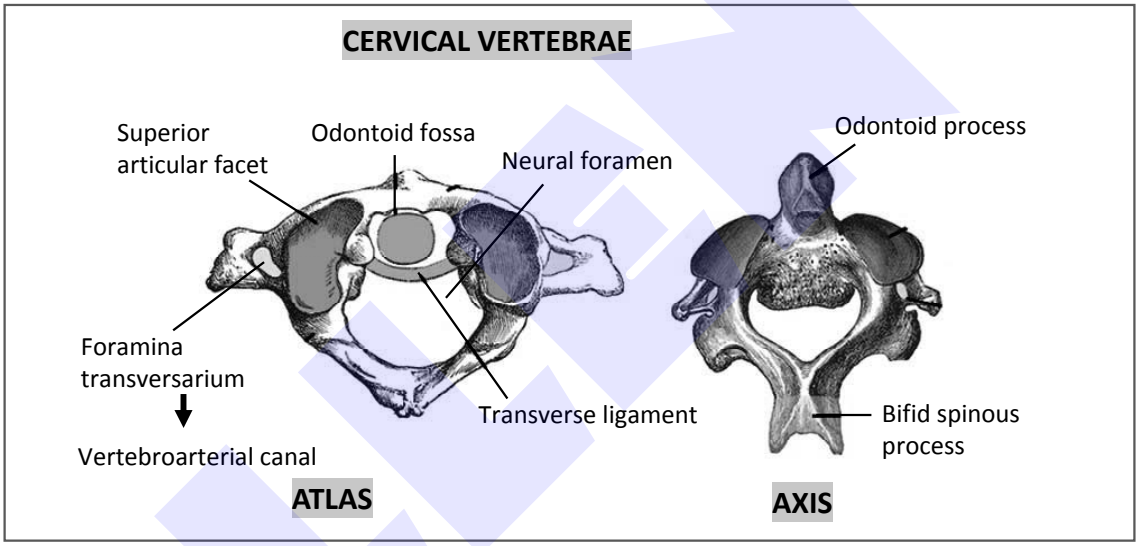
(1) Gliding joint (2) Ball & socket joint (3) Pivot joint (4) Hinge joint

(2) VERTEBRAL COLUMN

Our vertebral column is formed by 26 serially arranged units called vertebrae and is dorsally placed. It extends from the base of the skull and constitutes the main framework of the trunk. Each vertebra has a central hollow portion (neural canal) through which the spinal cord passes. The vertebral column is differentiated into cervical (7), thoracic (12), lumbar (5), sacral (1-fused) and coccygeal (1-fused) regions starting from the skull. The number of cervical vertebrae are seven in almost all mammals including human beings.

- Body of vertebrae called as centrum.
- Shape of centrum is like a short cylinder, with flat upper and lower surfaces (Amphiplatyan centrum).
- Centrum of two adjoining vertebrae is attached through intervertebral disc (cartilagenous joint).

(A) Cervical Vertebrae (Smallest vertebrae) :



- The number of cervical vertebrae are seven in almost all mammals including human being.
- All cervical vertebrae have apertures in their transverse process called as Foramina **transversarium**, which align to form **vertebroarterial canal.** Through this canal vertebral artery passes. This artery supply blood in brain and spinal cord.
- Spinous process of cervical vertebrae is bifid (Except C_7)
- Only C_7 has demifacets where upper part of head of **1st rib articulates.**
- First vertebra is the atlas and it articulates with the occipital condyles with condylar joint. Condylar joint is responsible for yes movement. (Upward and downward movement)
- Centrum, Pre and Postzygopophysis are absent in atlas.
- Second vertebrae is axis vertebrae. Atlas has an opening called odontoid fossa in which projection (Odontoid process) of axis fit and form pivot joint. No movement is the result of pivot joint (No movement means sideways movement)
- Post zygopophysis and centrum are present but prezygopophysis is absent in axis.

(B) Thoracic Vertebrae :

They are larger than cervical vertebrae.

They are identified by the presence of costal demifacetes on the centrum.

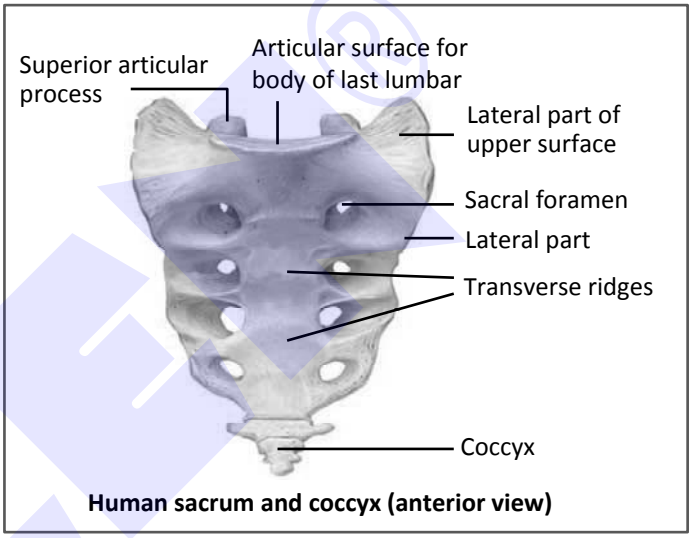
On their transvers processes, tubercular facets are present in which tubercle part of rib articulates.

(C) Lumbar Vertebrae :

These are the largest sized vertebrae because they have to support the weight of upper body.

(D) Sacrum :

Large flattened triangular bone formed by fusion of five sacral vertabrae.



Human sacrum and coccyx (anterior view)

(E) Coccyx :

It is vestigial in human and formed by fusion of 4 coccygeal vertebrae.

Human vertebral formula-

$C_7T_{12}L_5\ S_{(5)}Co_{(4)}$

Significance of vertebral column

- The vertebral column protects the spinal cord
- The vertebral column supports the head
- The vertebral column serves as the point of attachment for the ribs and musculature of the back.

BEGINNER'S BOX — VERTEBRAL COLUMN

1. In camel number of cervical vertebra is :-

(1) 6 (2) 7 (3) 8 (4) 9

2. Total number of vertebra in Human :-

(1) 30 (2) 26 (3) 40 (4) 35

3. Sacrum in Human is formed by fusion of :-

(1) 3 vertebrae (2) 5 vertebrae (3) 8 vertebrae (4) 6 vertebrae

4. Long neck of Girraffe or camel is due to:-
(1) More number of cervical vertebra
(2) More length of cervical vertebra
(3) Presence of pads between cervical vertebra
(4) Presence of extra bony plates

5. In humans, coccyx is formed by the fusion of vertebrae :
(1) 3 (2) 4 (3) 5 (4) 6

6. Coccygeal bone is a bone of :
(1) Skull (2) Pectoral girdle (3) Vertebral column (4) Pelvis

7. Foramen magnum is present in
(1) Base of medulla (2) Base of skull
(3) Apex of vertebral column (4) Base of brain

8. Pivot joint occurs at
(1) The hip and shoulder joint
(2) Between the atlas and the odontoid process of the axis
(3) Sternoclavicular joint
(4) Tempomandibular joint

9. The number of cervical vertebrae in mammals including human being are
(1) 7 (2) 8 (3) 9 (4) 10

10. The major function of intervertebral disc is
(1) absorb shock (2) String vertebrae together
(3) prevent injuries (4) prevent hyper extension

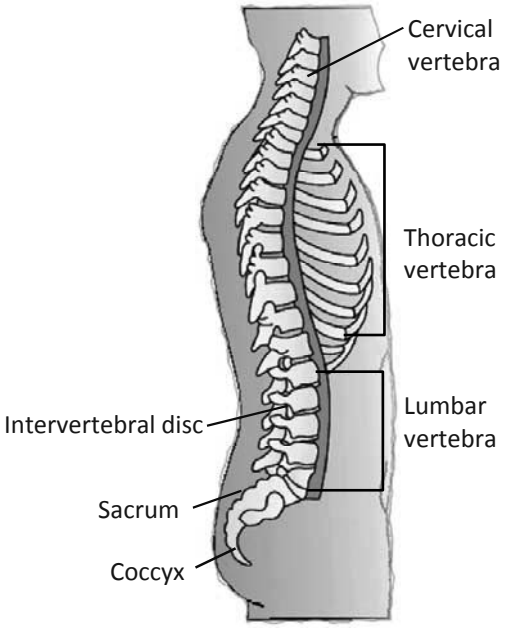
11. Cervical vertebrae are characterized by the presence of :-
(1) Long neural spine (2) Odontoid process
(3) Vertebro- arterial canals (4) Flat centrum

12. Number of cranial, cervical and thoracic bones in human are ....,..... and ..... respectively.
(1) 14,7,14 (2) 8,14,7 (3) 14,7,12 (4) 8,7,12

13. Which of following helps in rotation of the neck :-
(1) Atlas (2) Axis
(3) Cervical (4) Occipital condyle of skull

(3) STERNUM

Sternum is a flat bone on the ventral midline of thorax. There are three parts of sternum – prosternum (manubrium), mesosternum and metasternum (xiphoid process). Clavicle and 1st pair of ribs are attached with manubrium. 2nd to 7th pair of ribs are attached with mesosternum.
Xiphoid process is smallest part, lower half of 7th coastal cartilage articulate with it.



Vertebral column (right lateral view)

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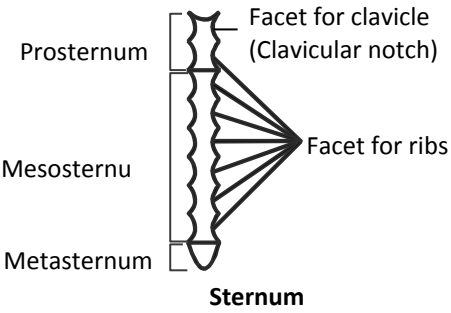
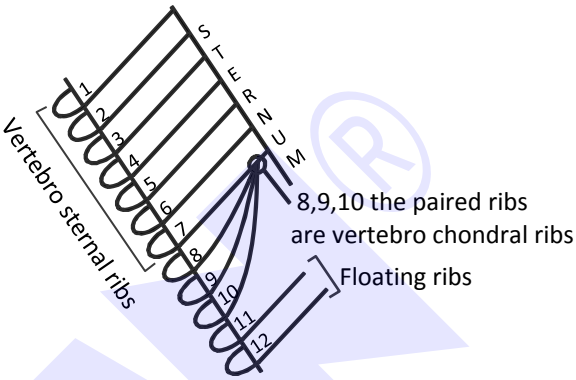


Sternum



Attachment of ribs with strenum and VC

(4) RIBS

Ribs : There are 12 pairs of ribs. Each rib is a thin flat bone connected dorsally to the vertebral column and ventrally to the sternum. It has two articulation surfaces on its dorsal end and is hence called bicephalic.

First seven pairs of ribs are called true ribs. Dorsally, they are attached to the thoracic vertebrae and ventrally connected to the sternum with the help of hyaline cartilage. The 8th, 9th and 10th pairs of ribs do not articulate directly with the sternum but join the seventh rib with the help of hyaline cartilage. These are called vertebrochondral (false) ribs. Last 2 pairs (11th and 12th) of ribs are not connected ventrally and are therefore, called floating ribs (false ribs). Thoracic vertebrae, ribs and sternum together form the rib cage.

There are five parts of rib cage :

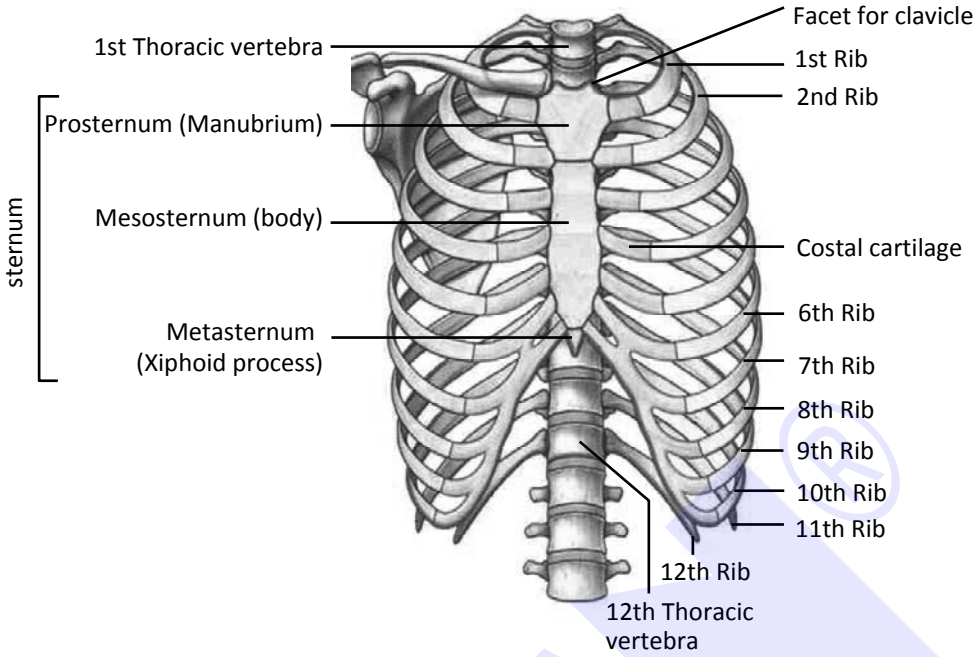
(A) Dorsal consist of vertebral column and ribs

(B) Ventral consist of sternum and ribs

(C) Lateral consist of ribs

(D) Anterior consist of neck and clavicle

(E) Posterior consist of diaphragm



Bones of thorax (front view)

BEGINNER'S BOX — STERNUM AND RIBS

1. Number of floating ribs in human :-

(1) 6 pairs (2) 5 pairs (3) 3 pairs (4) 2 pairs

2. 3 Pairs of false ribs present in:-

(1) Man (2) Pigeon

(3) Frog (4) Fish

3. Vertebrochondral ribs in human are :-

(1) 8^{th} , 9^{th} , 10^{th} ribs (2) 7^{th} , 8^{th} , 9^{th} ribs

(3) 9^{th} , 10^{th} , 11^{th} ribs (4) 6^{th} , 7^{th} , 8^{th} ribs

4. The total number of ribs in human body is :

(1) 10 (2) 12 (3) 24 (4) 36

5. Ribs are attached to :

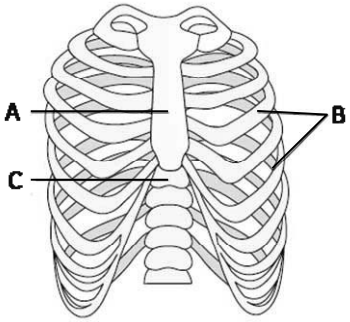
(1) Scapula (2) Sternum (3) Clavicle (4) Ilium

6. Match the following columns.

Column-A		Column-B	
A.	True ribs	i	06
B.	False ribs	ii	04
C.	Floating ribs	iii	14

(1) A-i, B-ii, C-iii (2) A-iii, B-i, C-ii (3) A-iii, B-ii, C-i (4) A-ii, B-iii, C-i

7. Identify A, B and C in the given diagram and choose the correct option.



(1) A–Sternum, B–Vertebral column, C–Ribs
(2) A–Ribs, B–Vertebral column, C–Sternum
(3) A– Ribs, B– Sternum, C–Vertebral column
(4) A–Sternum, B–Ribs, C–Vertebral column

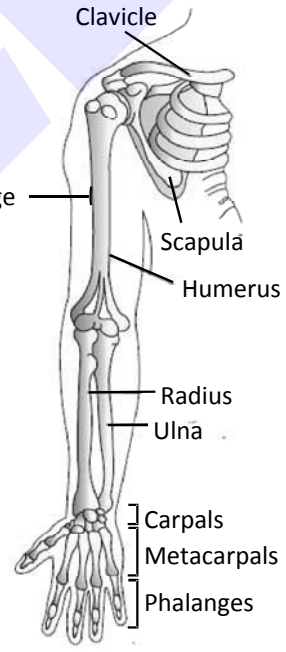
03. APPENDICULAR SKELETON

The bones of the limbs along with their girdles constitute the **appendicular skeleton.**

Each **limb** is made of 30 bones.

(1) FORE LIMB BONES

The bones of the hand (fore limb) are humerus, radius and ulna, carpals (wrist bones - 8 in number), metacarpals (palm bones - 5 in number) and phalanges (digits - 14 in number).



Right pectoral girdle and upper arm. (frontal view)

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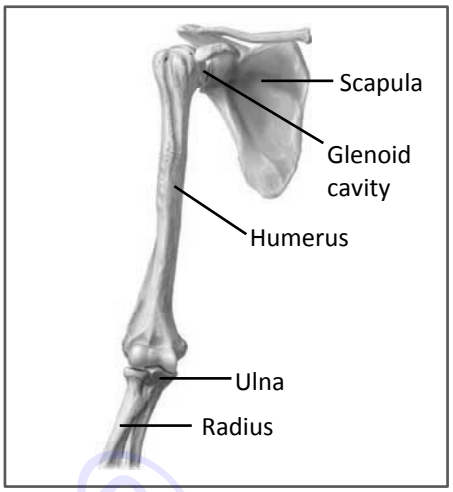
Humerus : Head of humerus articulates with the glenoid cavity of scapula to form shoulder joint (ball and socket joint). This bone has an elevated rough part on the shaft called deltoid ridge where deltoid muscles are attached. Lower end of humerus articulates laterally with radius and medially with ulna.

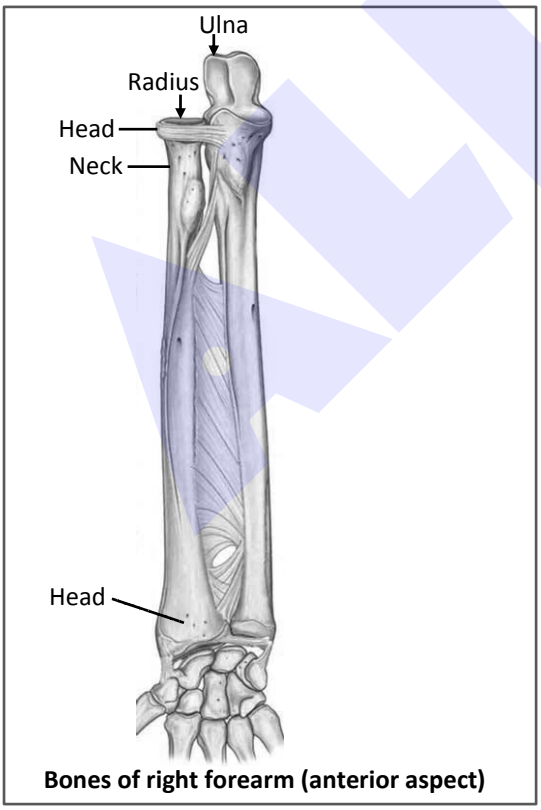


Radius and Ulna : Head of radius is disc shaped, covered with hyaline cartilage. Superior concave surface of head of radius articulates with the humerus at the elbow joint. Circumference of head of radius fits into socket of ulna to form radioulnar joint. Inferior surface of radius bears an articular area for scaphoid and lunate bone. Upper end of ulna articulate with humerus whereas lower and articulate with carpals.

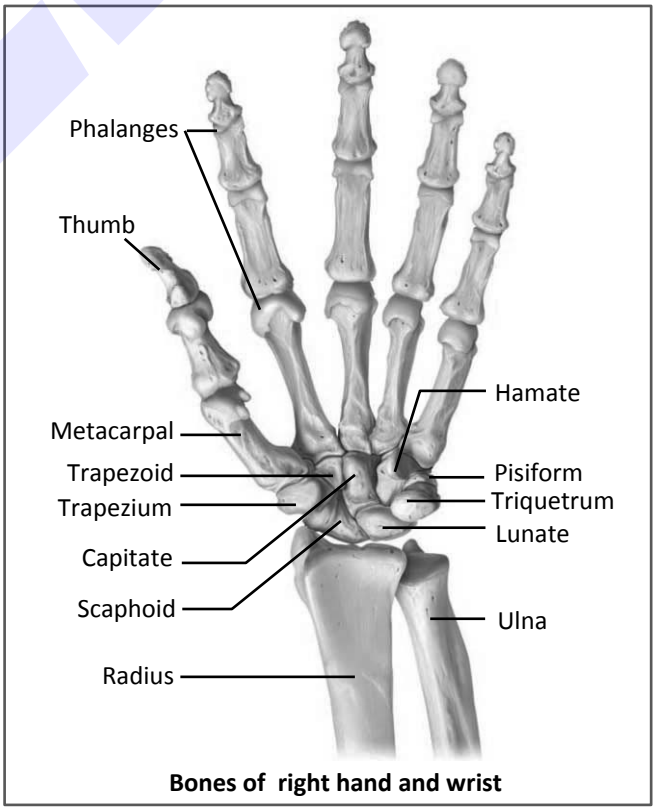
The only sesamoid bone of forelimb is pisiform

Metacarpal bones are 5 in number

Phalangeal formula is 23333



Bones of right forearm (anterior aspect)



Bones of right hand and wrist

(2) HIND LIMB BONES

Femur (thigh bone - the longest , strongest and heaviest bone), tibia and fibula, tarsals (ankle bones - 7 in number), metatarsals (5 in number) and phalanges (digits - 14 in number) are the bones of the legs (hind limb). A cup shaped bone called patella cover the knee ventrally (knee cap).

The only sesamoid bone of hind limb is patella

Phalangeal formula is 23333

(A) Femur :

Head of femur : Directed medially, upwards.

– Articulates with acetabulum to form the hip joint (Ball and Socket joint).

Lower end of femur is widely expanded to form two large condyles, one medial & one lateral.

(B) Patella bone :

Small, triangular, sesamoid bone. It is knee bone and located in the pateller groove of femur bone upon knee joint.

(C) Tibia :

Medial & larger bone of the leg.

Upper end articulates with femur bone.

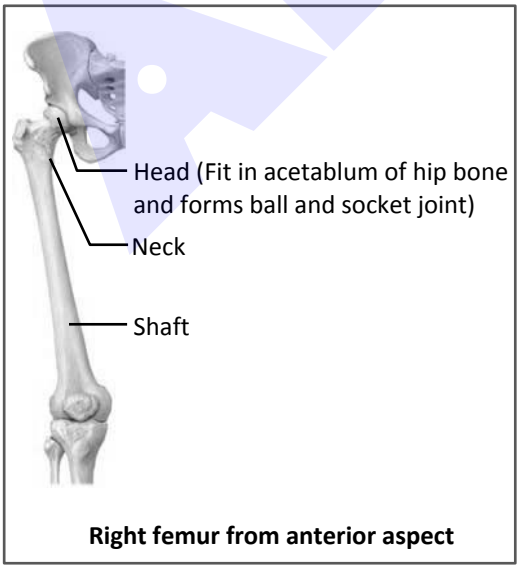
(D) Fibula :

Lateral & smaller bone of the leg.

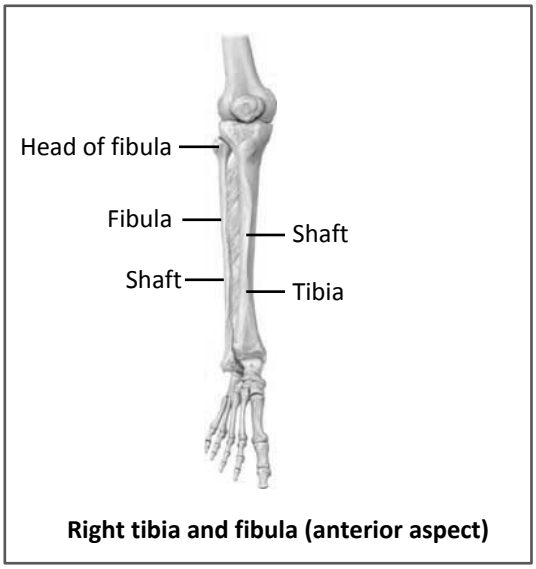
Its upper end articulates with the tibia

It does not participate in the formation of knee joint.

Its lower end fused with tibia and form inferior tibiofibular joint (immovable joint)



Right femur from anterior aspect



Right tibia and fibula (anterior aspect)

(E) Tarsals :

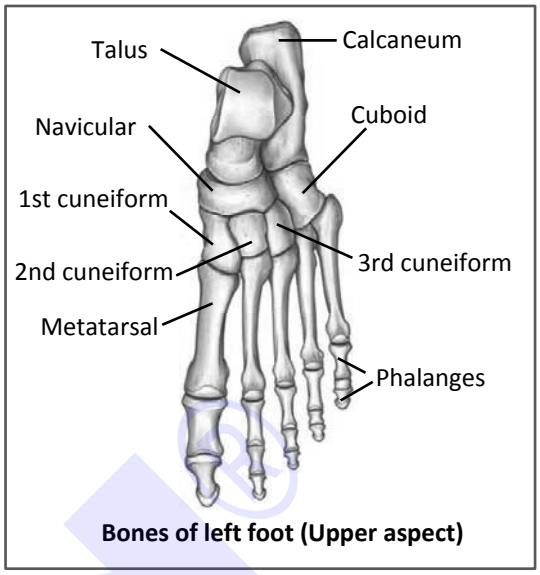
Ankle is made of seven tarsal bones arranged in two rows.

Proximal row : Talus above, Navicular in between and Calcaneum below.

Tarsal bones are much larger & stronger than carpal bones because they have to support & distribute body weight.

Talus is second largest tarsal bone, lies between tibia above & calcaneum below.

Calcaneum : Largest tarsal bone, forms the prominence of heal.



Bones of left foot (Upper aspect)

Communicate body weight towards posterior during standing condition.

Distal row :- Four tarsal bones lying side by side (cuneiform I, II, III and one cuboid)

(F) Metatarsals :

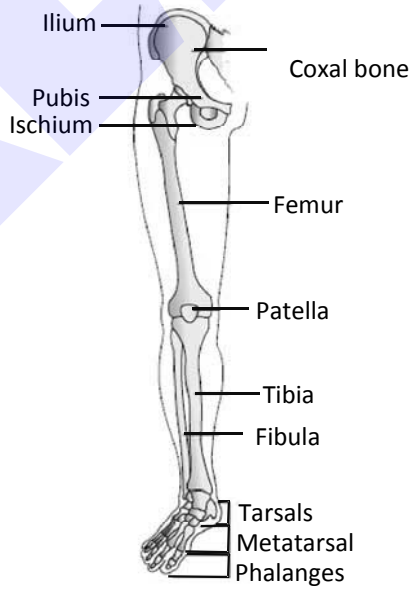
5 metatarsal bones which are **numbered medial to lateral.**

(G) Phalanges :

14 Phalanges, 2 for great toe & 3 each for other four **toes**.

As compared to Phalanges of hand, these are small in size.

Digital formula = 2,3,3,3,3



Right pelvic girdle and lower limb bones (frontal view)

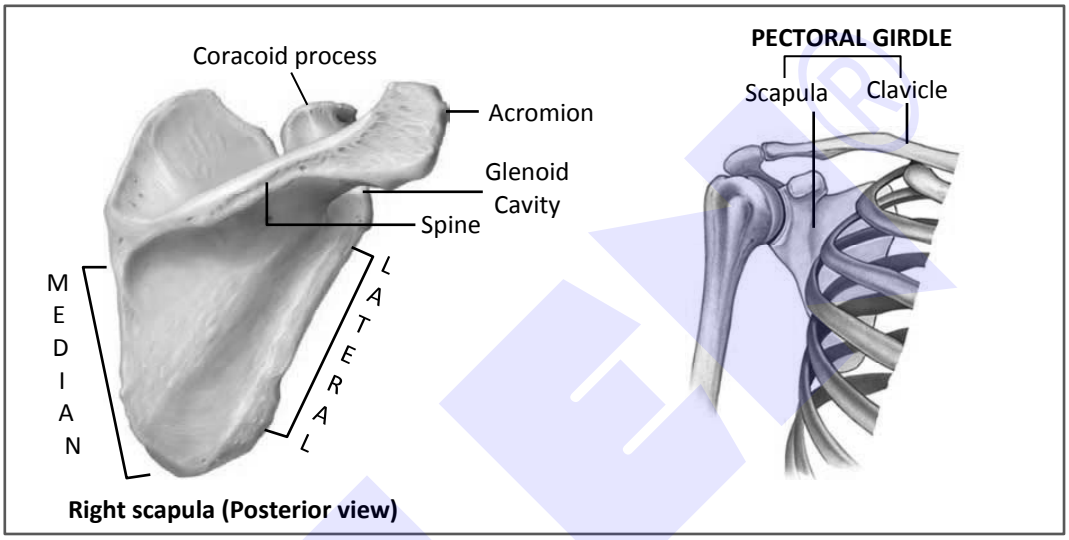
NCERT XI Page No. 311, Figure No. 20.10

(3) GIRDLES

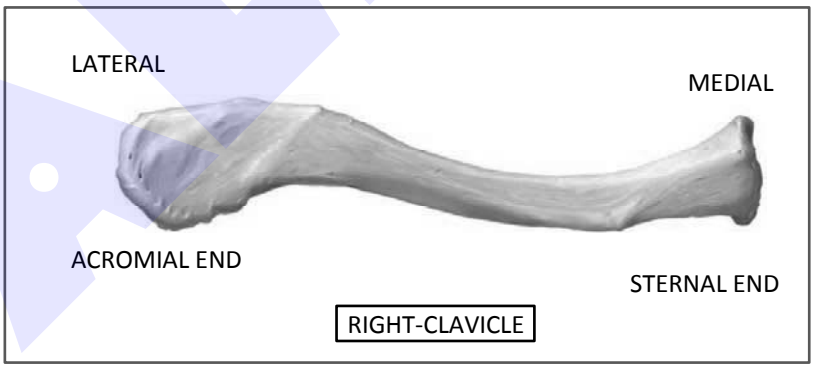
(A) Pectoral Girdle :

Pectoral and **Pelvic girdle** bones help in the articulation of the upper and the lower limbs respectively with the axial skeleton. Each girdle is formed of two halves.

Each half of pectoral girdle consists of a clavicle and a scapula. Scapula is a large triangular flat bone situated in the dorsal part of the thorax between the second and the seventh ribs. The dorsal, flat, triangular body of scapula has a slightly elevated ridge called the spine which projects as a flat, expanded process called the acromion.

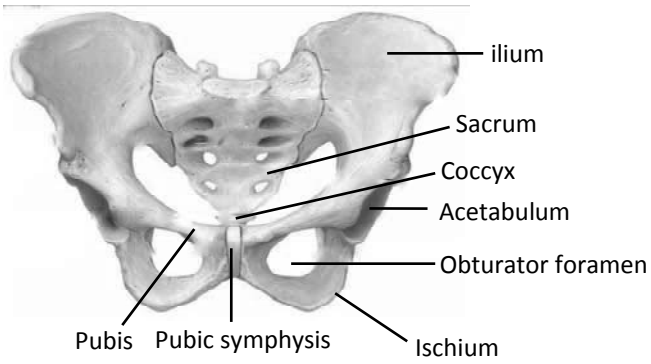


The clavicle (beauty bone) (collar bone) articulates with this. Below the acromion is a depression called the glenoid cavity which articulates with the head of the humerus to form the shoulder joint. Each clavicle is a long slender bone with two curvatures. This bone is commonly called the collar bone.



(B) Pelvic Girdle :

Pelvic girdle consists of two coxal bones. Each coxal bone is formed by the fusion of three bones – ilium, ischium and pubis. At the point of fusion of the above bones is a cavity called acetabulum to which the thigh bone articulates. The two halves of the pelvic girdle meet ventrally to form the pubic symphysis containing fibrous cartilage.



Human pelvis from anterior aspect

Differences Between Male and Female Pelvis		
Features	**Female Pelvis**	**Male Pelvis**
1. General width	Hips are wider	Hips are narrower
2. Pubis	Longer, More rectangular	Short, Triangular
3. Sacrum	Shorter, wider	Narrower, longer

BEGINNER'S BOX — APPENDICULAR SKELETON

1. Os innominatum consist of :-
(1) Pubis (2) Ischium (3) Ilium (4) All of the above

2. Total number bones in Appendicular skeleton of human :-
(1) 126 (2) 80 (3) 44 (4) 33

3. Longest bone of human skeleton :-
(1) Femur (2) Humerus (3) Tibia (4) Radius

4. Digital formula of Hand of Human is :-
(1) 23333 (2) 03322 (3) 33332 (4) 02233

5. Scapula is part of:-
(1) Skull (2) Pelvic Gridle (3) Pectoral Girdle (4) Vertebral column

6. Obturator foramen present between:-
(1) Ilium & Ischium (2) Ischium & Pubis (3) Ilium & pubis (4) Scapula & Clavicle

7. Number of tarsal bones in Human in each hind limb
(1) 2 (2) 7 (3) 6 (4) 5

8. Which one is bone of fore limb :
(1) Humerus (2) Femur (3) Tibia (4) Fibula

9. A cup shaped cavity for articulation of femur head is :
(1) Acetabulum (2) Glenoid cavity (3) Sigmoid notch (4) Obturator foramen

10. Number of bones present in a forelimb of human :
(1) 30 (2) 32 (3) 35 (4) 40

04. JOINTS

Joints are essential for all types of movements involving the bony parts of the body. Locomotory movements are no exception to this. Joints are points of contact between bones, or between bones and cartilages. Force generated by the muscles is used to carry out movement through joints, where the joint acts as a fulcrum. The movability at these joints vary depending on different factors. Joints have been classified into three major structural forms, namely, fibrous, cartilaginous and synovial.

(1) FIBROUS JOINTS

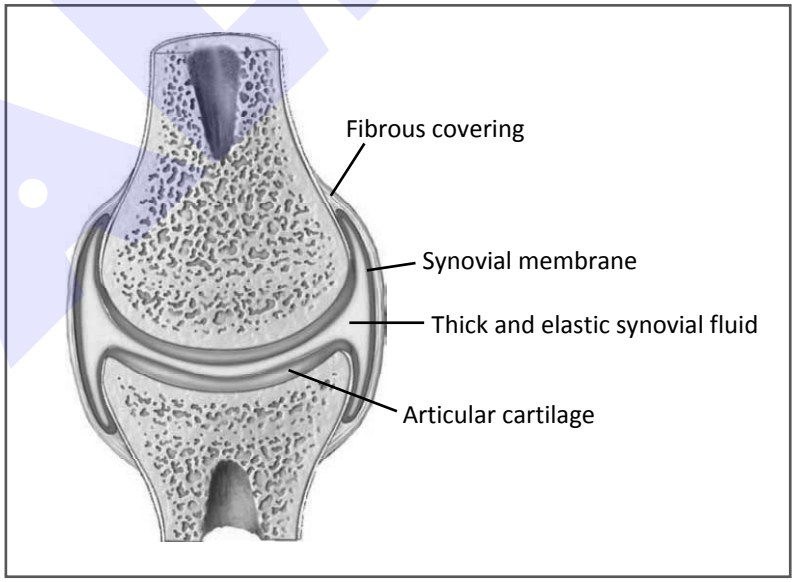
Fibrous joints (Immovable joints) (SYNARTHROSIS) do not allow any movement. This type of joint is shown by the flat skull bones which fuse end-to-end with the help of dense fibrous connective tissues in the form of sutures, to form the cranium.

(2) CARTILAGINOUS JOINTS

In **cartilaginous joints** (SYNCHONDROSIS), the bones involved are joined together with the help of cartilages. The joint between the adjacent vertebrae in the vertebral column is of this pattern and it permits limited movements.

(3) SYNOVIAL JOINTS

Synovial joints (DIARTHROSIS) are characterised by the presence of a fluid filled synovial cavity between the articulating surfaces of the two bones. Such an arrangement allows considerable movement. These joints help in locomotion and many other movements. Ball and socket joint (between humerus and pectoral girdle), Hinge joint (knee joint), Pivot joint (between atlas and axis), Gliding joint (between the carpals) and Saddle joint (between carpal and metacarpal of thumb) are some examples.



Maximum degree of mobility can be seen with a ball and socket synovial joint because ball can rotate in a hollow spherical socket on infinite axis.

JOINTS

1.	HEAD OF HUMERUS AND GLENOID CAVITY OF SCAPULA	BALL AND SOCKET JOINT
2.	HUMERUS - RADIUS -ULNA	HINGE JOINT
3.	RADIUS - ULNA	RADIOULNAR (PIVOT)
4.	Between CARPALS	GLIDING JOINT
5.	Between CARPALS AND METACARPAL OF THUMB	SADDLE JOINT
6.	Between PHALANGES	HINGE JOINTS
7.	ACETABULUM OF HIP BONE AND HEAD OF FEMUR	BALL AND SOCKET JOINT
8.	KNEE JOINT	HINGE JOINT
9.	TIBIA - FIBULA	TIBIO FIBULAR
10.	ANKLE JOINT	HINGE JOINT
11.	Between TARSALS	GLIDING JOINTS
12.	PUBIS - PUBIS	PUBIS SYMPHYSIS
13.	Between CRANIAL BONES	SUTURES
14.	Between ATLAS AND AXIS	PIVOT JOINT
15.	INTERVERTEBRAL DISCS	CARTILAGENOUS
16.	Between STERNUM AND RIBS	CARTILAGENOUS

- Study of body movements is called kinesiology
- Study of joints is called arthrology
- Comparative study of skull is called craniology

05. DISORDERS OF SKELETAL SYSTEM

(1) ARTHRITIS

ARTHRITIS : It is caused by the inflammation of the joints. This is of several types, e.g., **rheumatoid arthritis, osteoarthritis** and **gouty arthritis**.

(A) The Rheumatoid Arthritis :

It is diagnosed by the presence of rheumatoid factor (a type of immunoglobulin-IgM). It's primary symptom is inflammation of synovial membrane. If it is left untreated, then the membrane thickens and synovial fluid increases, exerting pressure that causes pain. The membrane then starts secreting abnormal granules, called **pannus**, which after accumulating on the surface of the cartilage, cause its erosion. As a result, the fibrous tissues are attached with the bones and become ossified, making the joints immovable. Its treatment concentrates on reduction of pain and inflammation by heat treatment and physiotherapy and, in extreme cases, replacement of the damaged joints.

(B) Osteoarthritis :

Is a degenerative joint disease characterised by the degeneration of the articular cartilage and proliferation of new bones. Usually, afflicted joints are of spine, knees and hands.

(C) Gouty Arthritis or Gout :

It is caused either due to excessive formation of uric acid, or inability to excrete it. It gets deposited in joints as monosodium salt.

(2) OSTEOPOROSIS

It is age-related disorder characterised by decreased bone mass and increased chances of fractures. Decreased level of estrogen is a common cause.

BEGINNER'S BOX — JOINTS AND DISORDERS

1. Elbow joint is :-
(1) Ball & socket (2) Pivot (3) Gliding (4) Hinge

2. Shoulder joint is present between:-
(1) Glenoid cavity of pectoral girdle & head of humerus
(2) Coracoid process of pectoral girdle & head of humerus
(3) Radius, ulna and humerus
(4) Radius and humerus

3. Head of humerus is articulated with pectoral girdle by a joint :
(1) Hinge (2) Ball and socket (3) Immovable (4) Pivot joint

4. Which one is a ball and socket joint ?
(1) Knee joint (2) Elbow joint
(3) Humerus and pectoral girdle (4) Atlas & Axis

5. Which one of the following is correctly matched?
(1) Hinge joint – between vertebrae
(2) Gliding joint –between zygophysis of the successive vertebrae
(3) Fibrous joint – between phalanges
(4) Cartilaginous joint – skull bones

6. Bones become fragile in
(1) Gout (2) Osteoporosis (3) Arthritis (4) Myasthenia gravis

7. Symphysis is made of
(1) Fibrocartilage (2) Synovial fluid (3) Elastic cartilage (4) Hyaline cartilage

8. Which one is cartilaginous joint?
(1) Synchondrosis (2) Symphysis (3) Diarthrosis (4) Both (1) and (2)

9. Deposition of uric acid crystals within the synovial joint causes
(1) Gout (2) Paralysis (3) Osteoarthritis (4) Rheumatoid arthritis

10. The example of pivot joint is
(1) Hip joint (2) Ankle joint
(3) Between atlas and axis (4) Metacarpophalengeal joint

BEGINNER'S BOX — ANSWERS KEY

SKULL

Que.	1	2	3	4	5	6	7	8	9	10	11
Ans.	**2**	**1**	**2**	**4**	**3**	**1**	**4**	**4**	**3**	**1**	**4**

VERTEBRAL COLUMN

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13
Ans.	**2**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**3**	**4**	**2**

RIBS AND STERNUM

Que.	1	2	3	4	5	6	7
Ans.	**4**	**1**	**1**	**3**	**2**	**2**	**4**

APPENDICULAR SKELETON

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**4**	**1**	**1**	**1**	**3**	**2**	**2**	**1**	**1**	**1**

JOINTS AND DISORDERS

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**4**	**1**	**2**	**3**	**2**	**2**	**1**	**4**	**1**	**3**

HUMAN SKELETON - 206 bones				
Axial-80		Appendicular-126		
AXIAL SKELETON - 80 BONES				
SKULL SKELETON- 29		**STERNUM - 01**	**RIBS - 24**	**VERTEBRAL COLUMN - 26**
SKULL BONES – 22			True - 14	Cervical - 7
Cranial - 8	Facial - 14		False - 6	Thoracic - 12
Frontal - 1	Maxilla - 2		Floating-4	Lumbar - 5
Parietal - 2	Palatine -2			Sacral - 5
Temporal - 2	Zygomatic - 2			Coccygeal - 4
Occipital - 1	Nasal - 2			
Ethmoid - 1	Lacrimal - 2			
Sphenoid -1	Inferior Turbinals - 2			
	Mandible - 1			
	Vomer - 1			
ASSOCIATED SKULL BONES - 07				
Hyoid Bone – 1		Ear ossicles - 2x3 (Malleus, Incus, Stapes)		

APPENDICULAR SKELETON - 126 BONES			
LIMB BONES – 120		**GIRDLE BONES - 06**	
Fore limb Bones - 60	Hind limb Bones - 60	Pectoral Girdle - 4	Pelvic Girdle - 2
Humerus – 1×2	Femur – 1×2	Scapula - 1×2	
Radius – 1×2	Patella - 1×2	Clavicle - 1×2	
Ulna - 1×2	Tibia - 1×2		(is formed by 2 hip bones and each hip bone is formed by fusion of 3 bones ilium, ischium and pubis)
Carpals - 8×2	Fibula - 1×2		
Metacarpals - 5×2	Tarsals - 7×2		
Phalanges - 14×2	Metatarsals - 5×2		
	Phalanges - 14×2