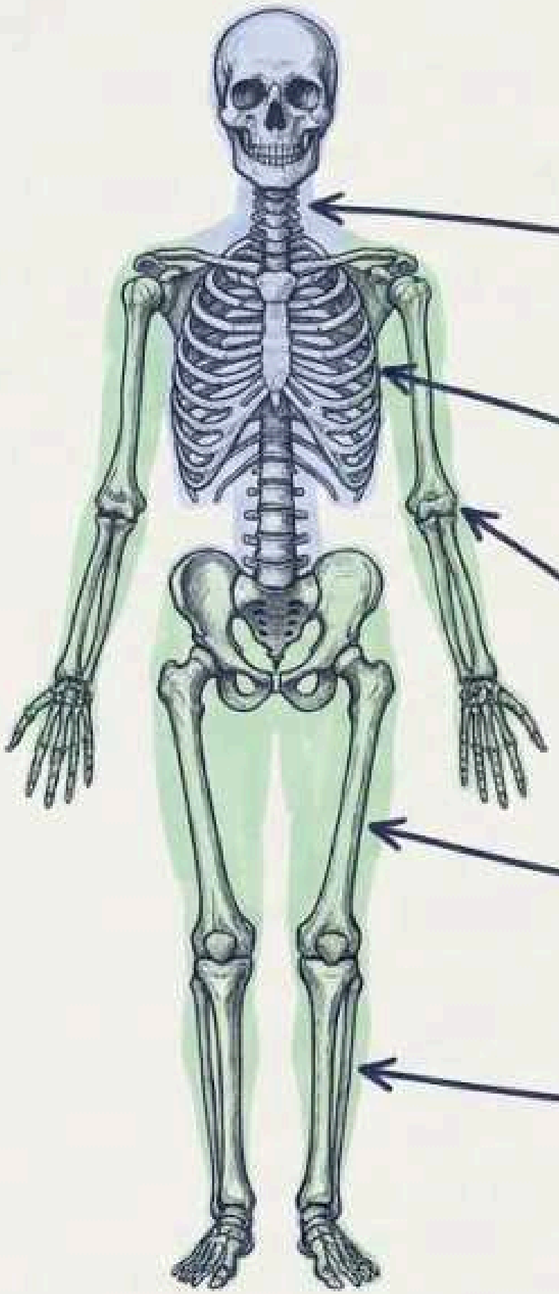
¶ 2.1

270 (Newborn) —Fusion→ 206 (Adult)



Support:
Structural framework.

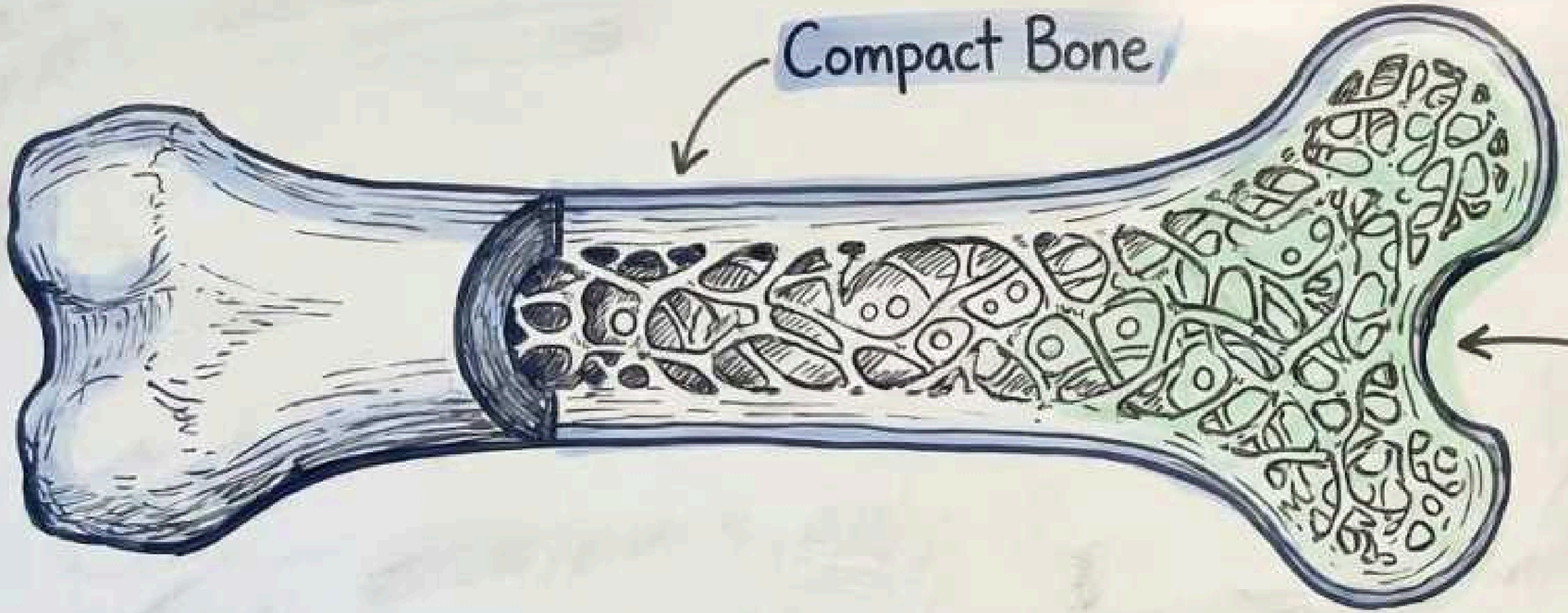
Protect:
Shields vital organs.

Move: Levers for muscle attachment.

Produce: Red marrow factories for blood cells.

Store:
Mineral reservoir. Ca^{2+} PO_4^{3-}

¶2.2



Compact Bone	Spongy Bone
- Location: Dense outer layer. - Structure: Cylindrical units called osteons. - Vascularity: Blood vessels run through central canals.	- Location: Inner core. - Structure: Lattice of thin struts called trabeculae (aligned along stress lines); light but strong. - Contents: Houses red marrow.

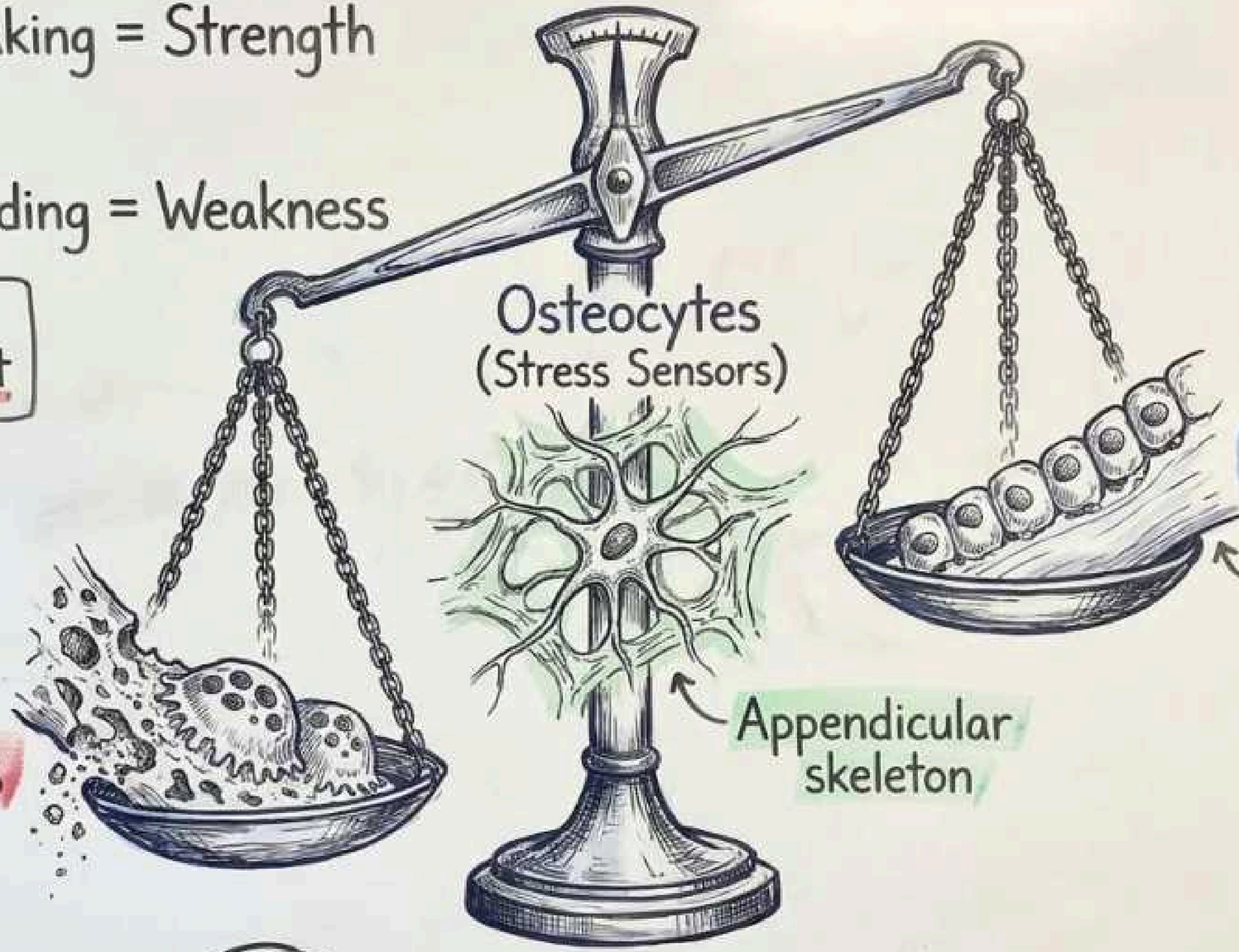
¶2.3

Building > Breaking = Strength

Exercise

Breaking > Building = Weakness

Spaceflight / Long bed rest



Osteocytes (Stress Sensors)

Building

Osteoblasts

Axial skeleton

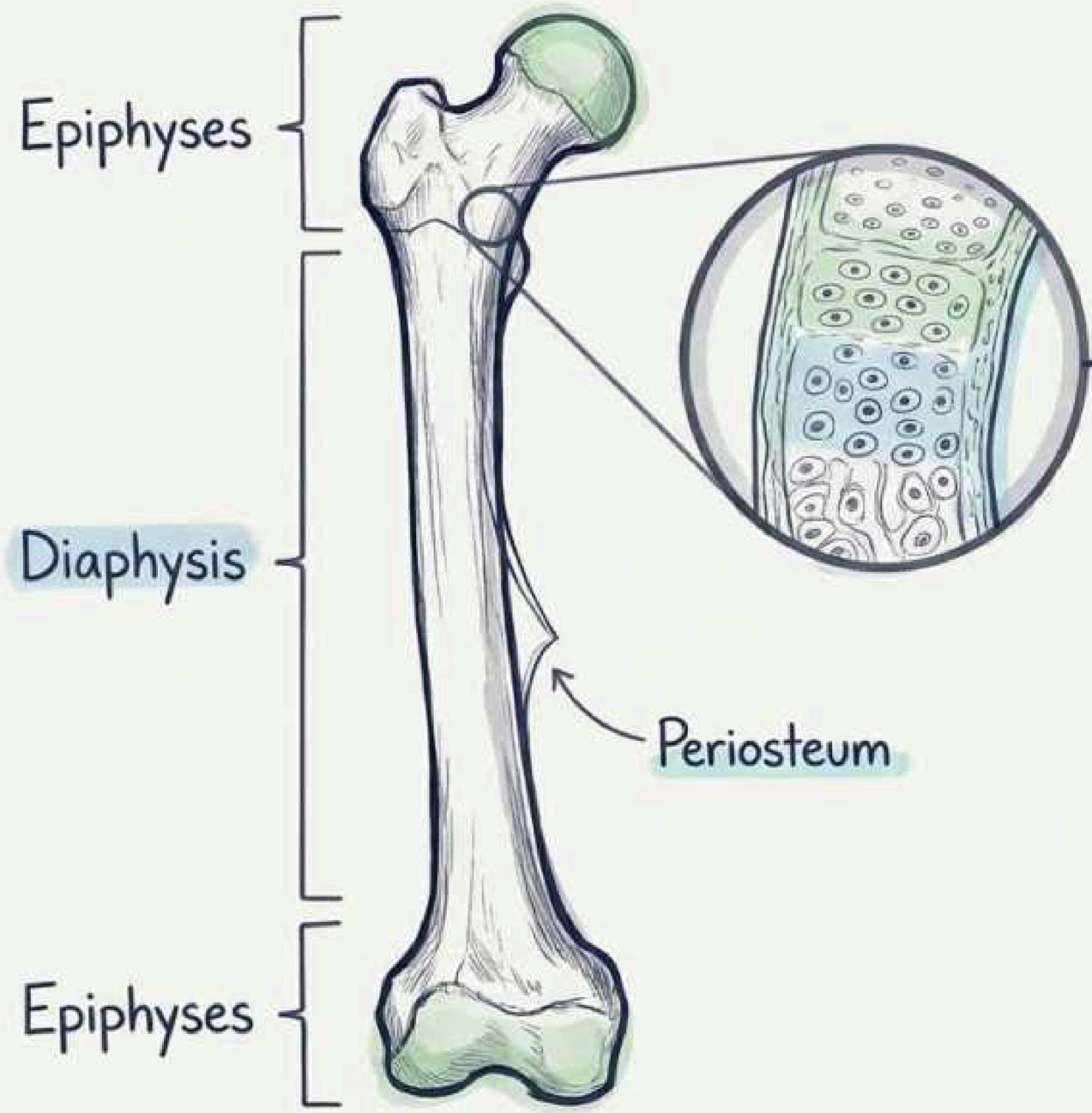
Breaking

Osteoclasts

Appendicular skeleton

10% of adult skeleton replaced annually.

¶2.4



Puberty

Growth plates close (calcify).
Explains why adults stop growing taller.

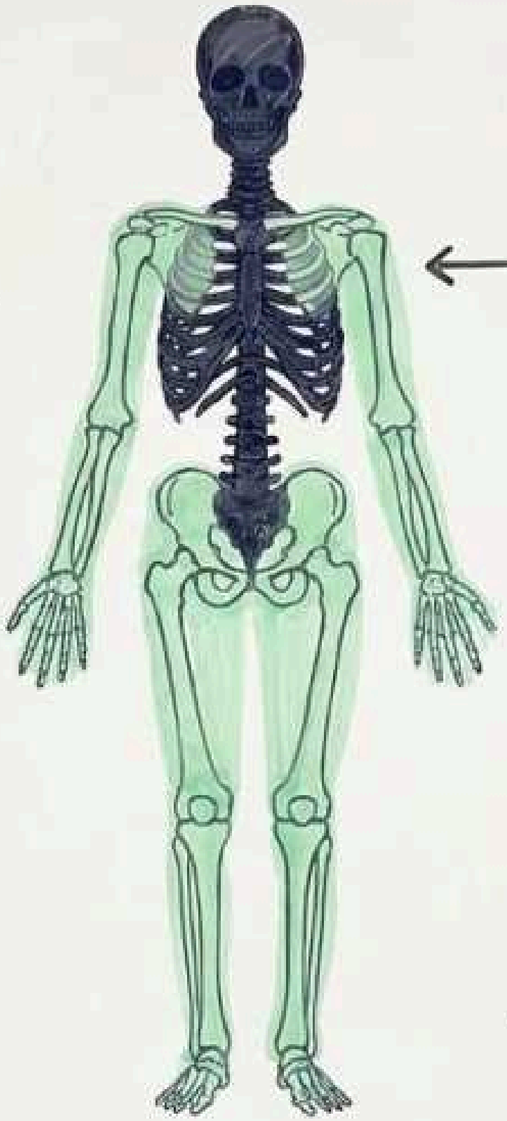
¶2.5



Axial Skeleton

- Skull, vertebral column, ribs, sternum.
- 80 bones.

PROTECTS



Appendicular Skeleton

- Limbs and attaching girdles.
- 126 bones.

MOVES

80 (Axial) + 126 (Appendicular) = 206 Bones

¶2.6

Cranium (8 Bones)

Frontal

Parietal (2x)

Temporal (2x)

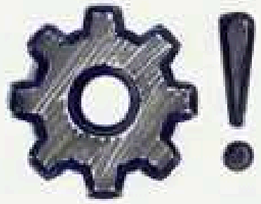
Facial Skeleton (14 Bones)

Occipital

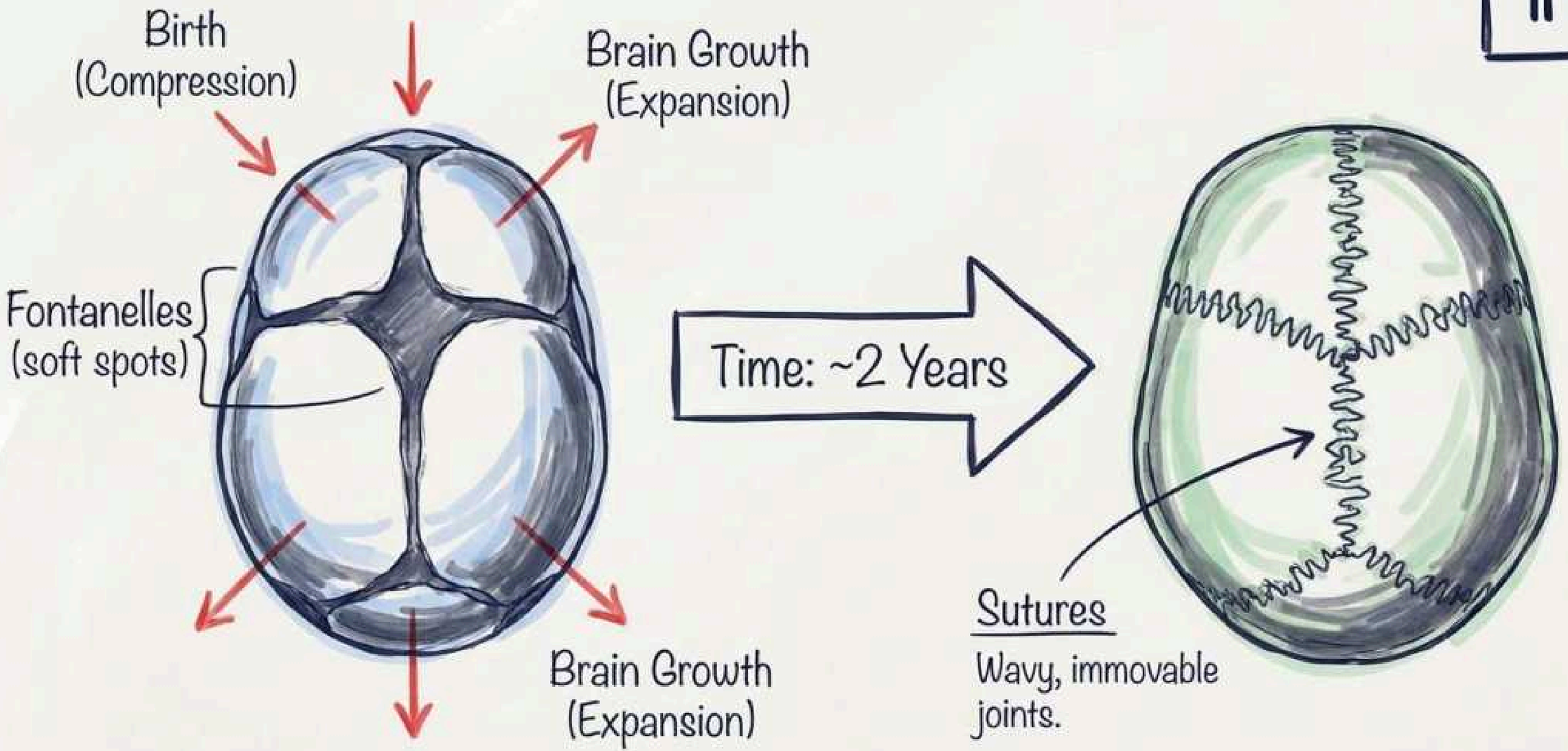
Maxilla

Mandible

The ONLY movable skull bone.



¶2.7


Birth
(Compression)
Brain Growth
(Expansion)
Fontanelles
(soft spots)
Brain Growth
(Expansion)
Time: ~2 Years
Sutures
Wavy, immovable
joints.

¶2.8



Cervical: 7 vertebrae
(Neck)

Thoracic: 12 vertebrae
(Upper back, each joined to a pair of ribs)

Lumbar: 5 vertebrae
(Lower back)



Carries the most weight

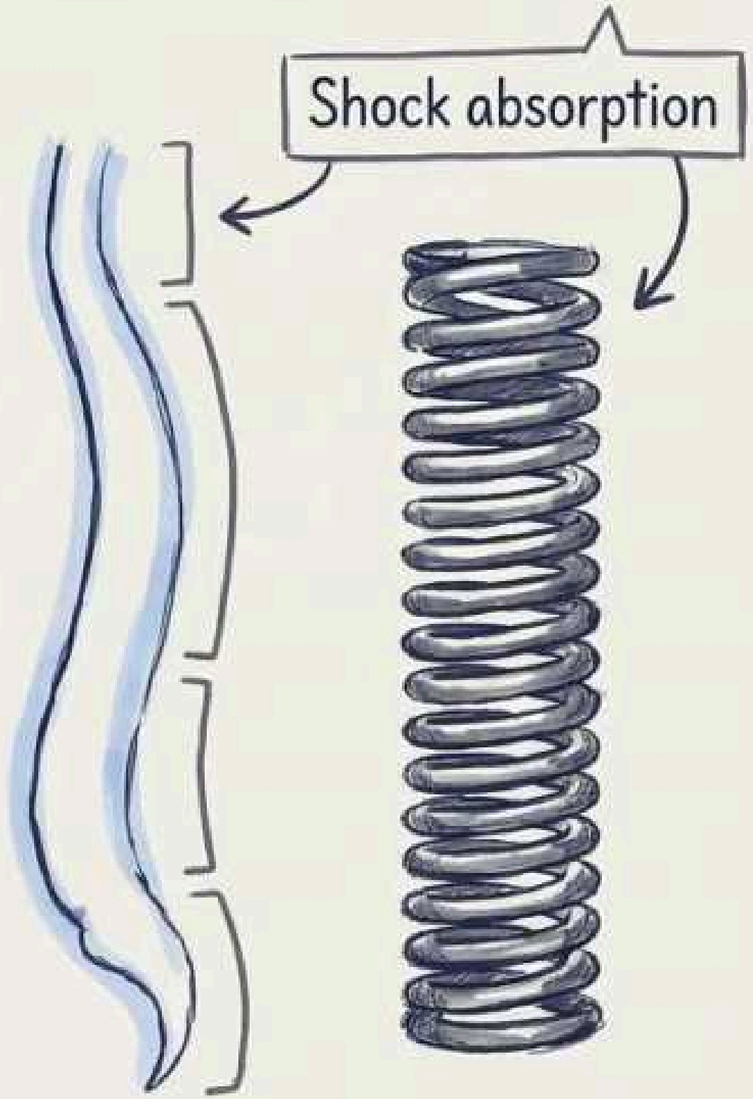
Sacrum: 5 fused vertebrae

Coccyx: 1 fused tailbone

Childhood count: 33 vertebrae

7 (C) + 12 (T) + 5 (L) + Fused (Sacrum/Coccyx)
= Reduced Adult Count

Hooke's Law: $F = -kx$

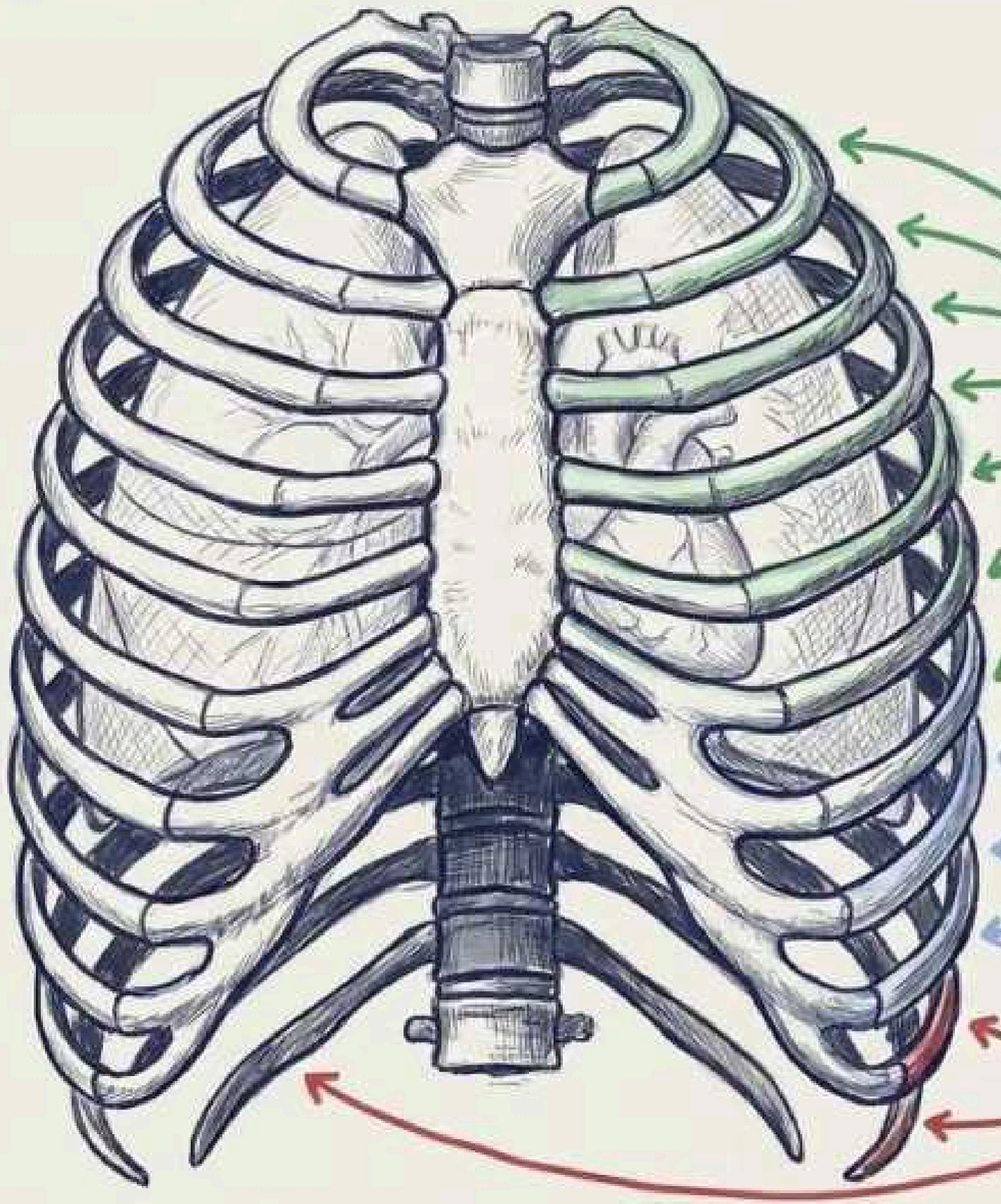


¶2.9



Herniation
(Slipped disc)
pressing on
nerve root.

¶2.10

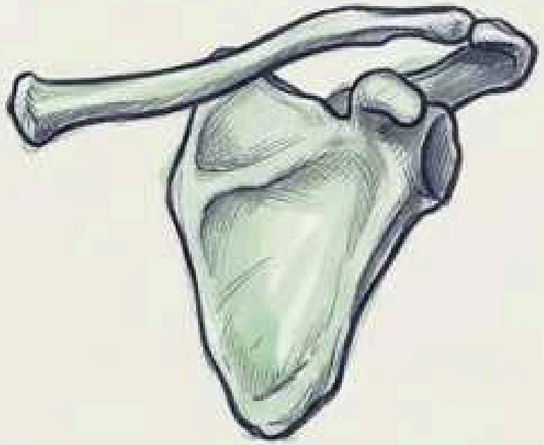


True Ribs:
Attach directly to sternum via cartilage.

False Ribs:
Attach indirectly to sternum.

Floating Ribs:
No front attachment.

¶2.11



Pectoral Girdle:
Clavicle (collarbone) & Scapula (shoulder blade). Attaches to trunk.

↓



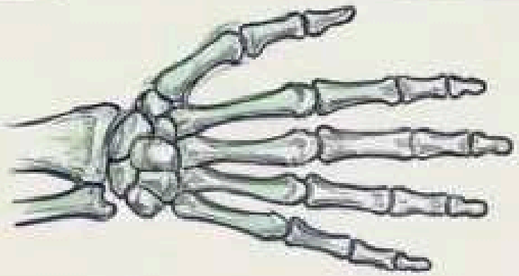
Arm: Humerus.

↓



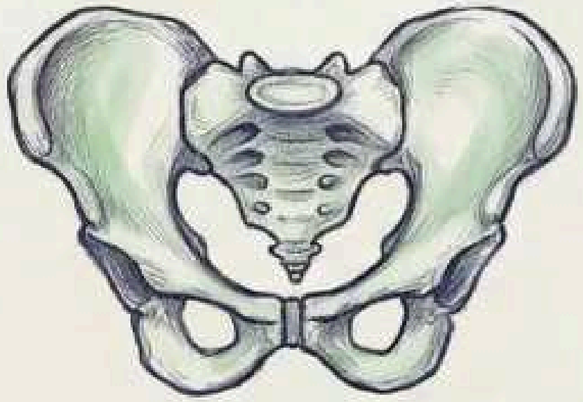
Forearm:
Radius (thumb side) & Ulna (little-finger side).

↓



Hand: 8 Carpal bones (wrist)
5 Metacarpals (palm)
14 Phalanges (fingers)

¶2.12



Pelvic Girdle:
Two hip bones + sacrum = Pelvis.



Female pelvis: wider, rounder, suited for childbirth.



Thigh: Femur. Longest and strongest bone in the body.





Knee: Patella.



Leg: Tibia (shinbone, thick) & Fibula (slender, lateral).



Foot: Tarsals, Metatarsals, Phalanges.

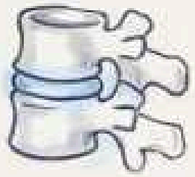
¶ 2.13

Movement: 0 (None) — Low (Slight) — MAX (Free)

Fibrous Joints
(e.g., Skull sutures)

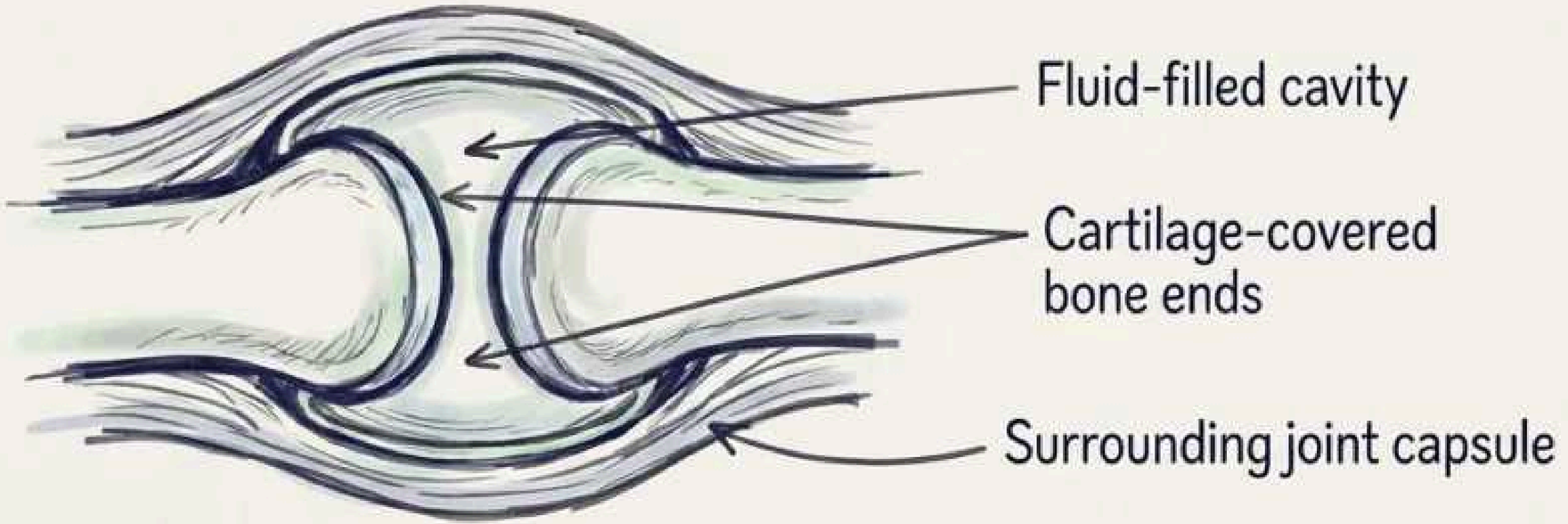


Cartilaginous Joints
(e.g., Vertebrae)



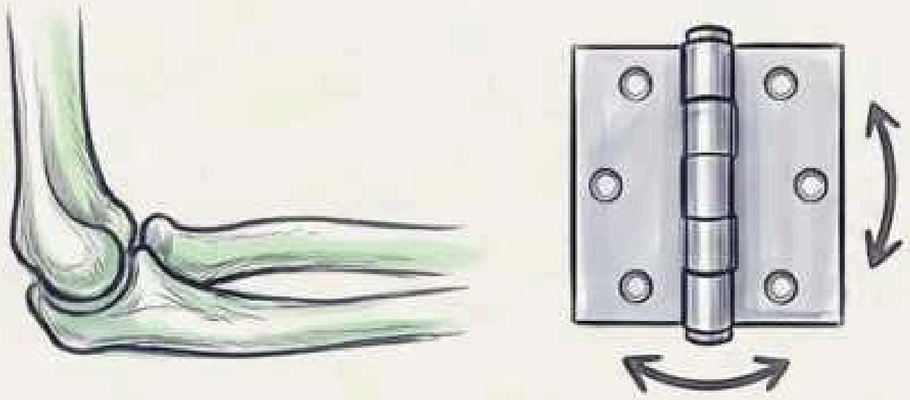
Synovial Joints
(e.g., Knee, shoulder)



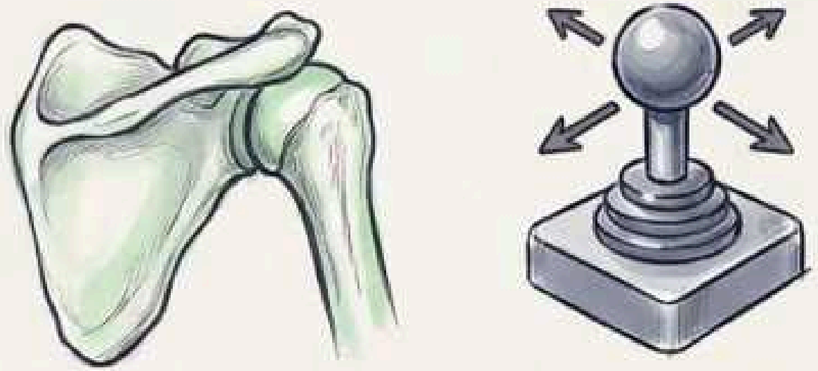


¶ 2.14

Hinge
(Moves in one plane)

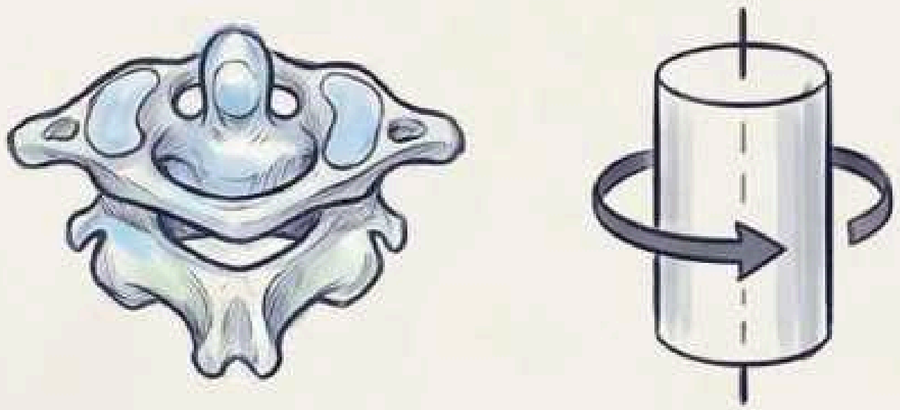


Ball-and-Socket
(Moves in all directions)

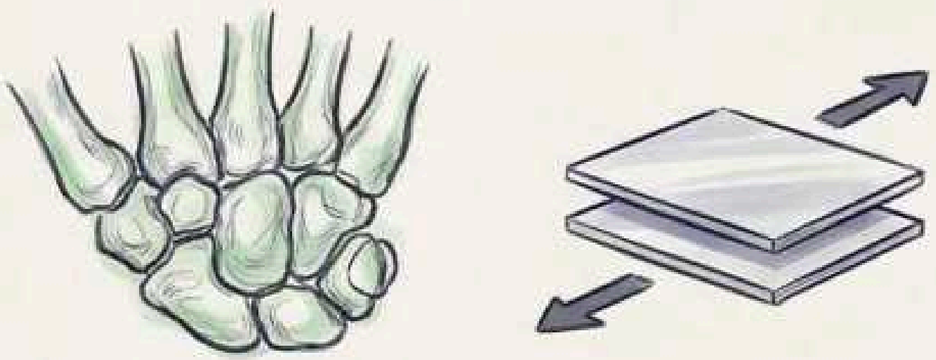


Most mobile, but most easily dislocated.

Pivot (Rotation)



Gliding (Sliding)



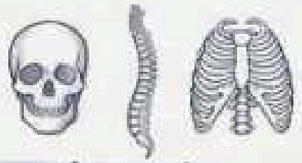
	Mechanism:	Target/Risk:
Osteoporosis	Mechanism: Loss of bone density.	Older women (post-menopause); fractures in hip, spine, wrist.
Osteoarthritis	Mechanism: Mechanical wearing down of joint cartilage.	Target/Risk: Age and cumulative use.
Rheumatoid Arthritis	Mechanism: Autoimmune disease.	Target/Risk: Immune system attacks the joint lining.



¶ 2.16

SKELETON (206 Bones)

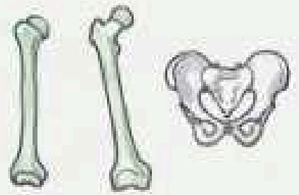
Functions:
- Support
- Protect
- Move
- Store
- Make Blood.

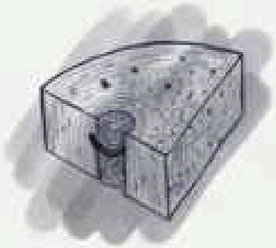
Divisions:


Axial (Skull/Spine/Ribs)

&

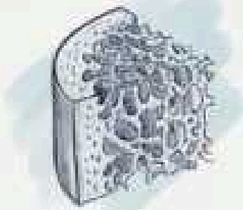
Appendicular (Limbs/Girdles).



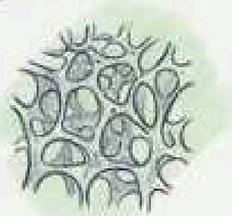
Tissues:


Compact (dense) &

Spongy (trabeculae).

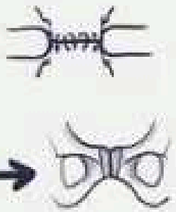


Built/broken by cells.



Joints:
Fibrous (Fixed)

→ Cartilaginous →



→ Synovial (Free).



NEXT: The Muscular System