

Bones and Joints

L3 Personal Trainer

Your Challenges for This Course!

- Open Debate – everyone has the opportunity to join in
- Ask Questions – the only ‘stupid’ question is one that you do not ask
- Confidentiality – inside and outside
- Patience – not everyone learns at the same pace
- Enthusiasm – controlled not bubbling over
- Professionalism – how other people view you
- Input – and lots of it ..

Functions of Bone

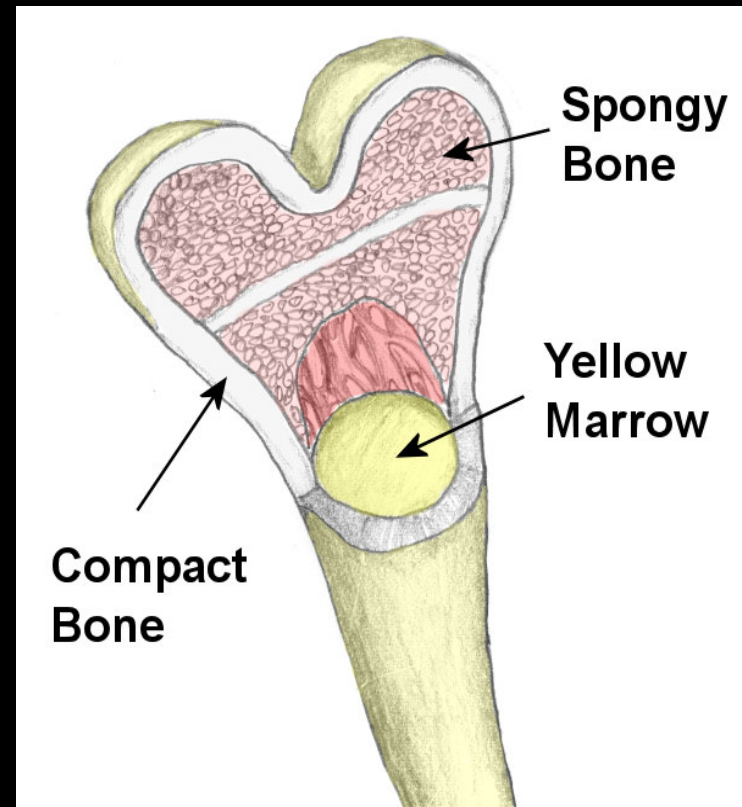
- Protection – vital organs
- Movement – attachment for muscles (via tendons)
- Production – of blood cells (in marrow in medullary cavity of long bones)
- Storage – minerals (calcium, magnesium, potassium, phosphorous)
- Shape – structure

Some other Functions of Bone

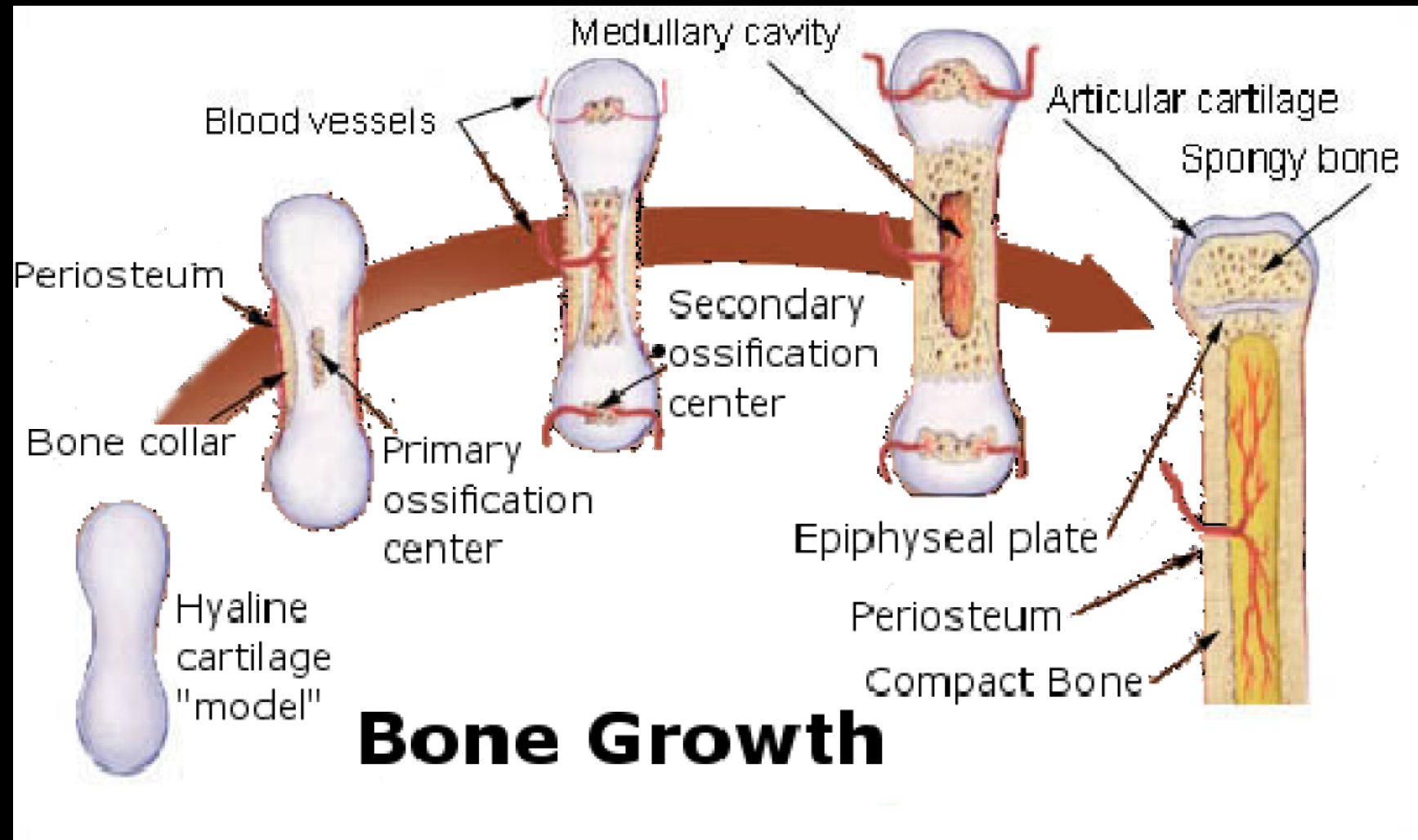
- Fat Storage – yellow bone marrow has a reserve of fatty acids
- Controls Phosphate Metabolism – by releasing fibroblast growth factor which stops kidneys from reabsorbing phosphates
- Metabolism – release Osteocalcin, which helps boost insulin levels helping to control blood sugars and uptake
- Acidity of blood – buffers the blood pH levels by absorbing and releasing alkaline salts

Structure of Bone

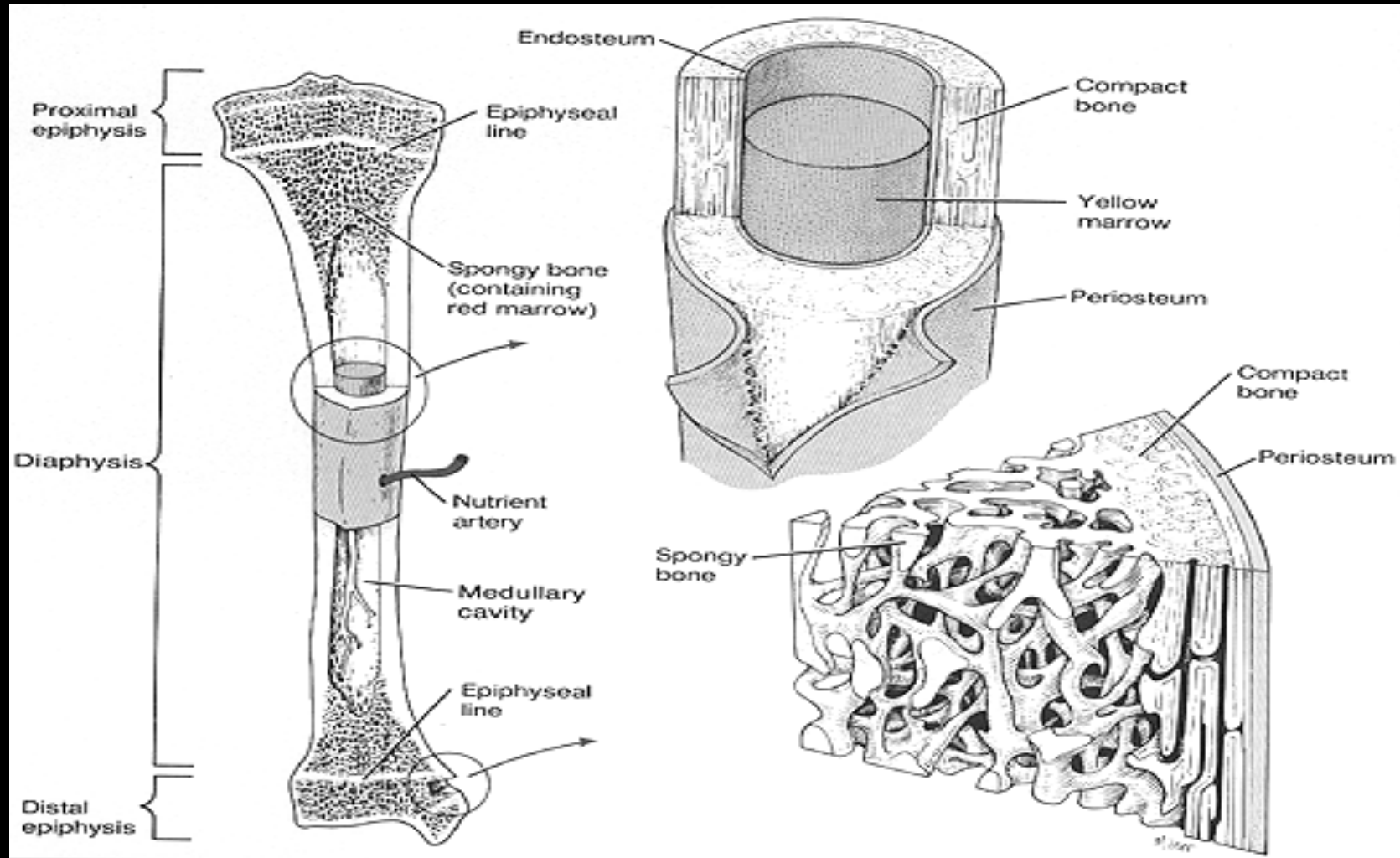
- Diaphysis – shaft of the bone
- Epiphysis – ends of the bone (spongy bone)
- Periosteum – sheath around bone
- Epiphyseal plates –
- growth plates



Bone Growth



Bone structure



Types of Bones

- Long Bones – humerus, femur
- Short Bones – Tarsals, Carpals
- Flat Bones – Sternum, Cranium, Pelvis
- Irregular Bones – Spinal vertebrae
- Sesamoid Bones- patella (small bones within tendons that rub over another bony surface)

Bone Features

- *articular process* A projection that contacts an adjacent bone.
- *articulation* The region where adjacent bones contact each other — a joint.
- *condyle* A large, rounded articular process.
- *crest* A prominent ridge.
- *epicondyle* A projection near to a condyle but not part of the joint.
- *facet* A small, flattened articular surface.
- *foramen* An opening through a bone.
- *fossa* A broad, shallow depressed area.

Bone Features

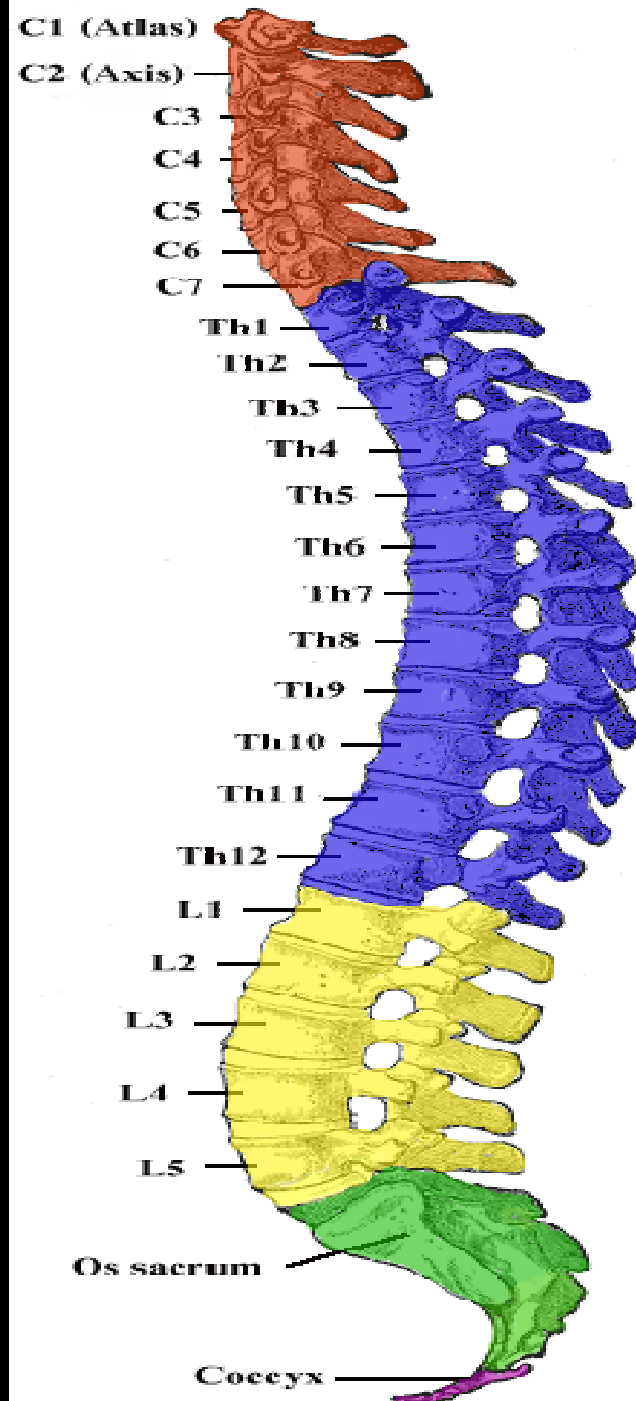
- **Spinous process** A long slender projection
- *malleolus* One of two specific protuberances of bones in the ankle.
- *process* A relatively large projection or prominent bump.(gen.)
- *spine* A relatively long, thin projection or bump.
- **head** Ball shaped articular surface
- *trochanter* One of two specific tuberosities located on the femur.
- *tubercle* A projection or bump with a roughened surface, generally smaller than a tuberosity.
- *tuberosity* A projection or bump with a roughened surface.

Axial and Appendicular

- Axial – Cranium, Sternum, Vertebral Column, Ribs
- Appendicular Skeleton – Shoulder Girdle, Arms, Pelvic Girdle, Legs

Vertebral Column

- Made up of 33 bones
- 7 cervical (neck)
- 12 thoracic (rib cage)
- 5 lumbar (large)
- 5 sacral (part fused)
- 4 coccyx (fused)



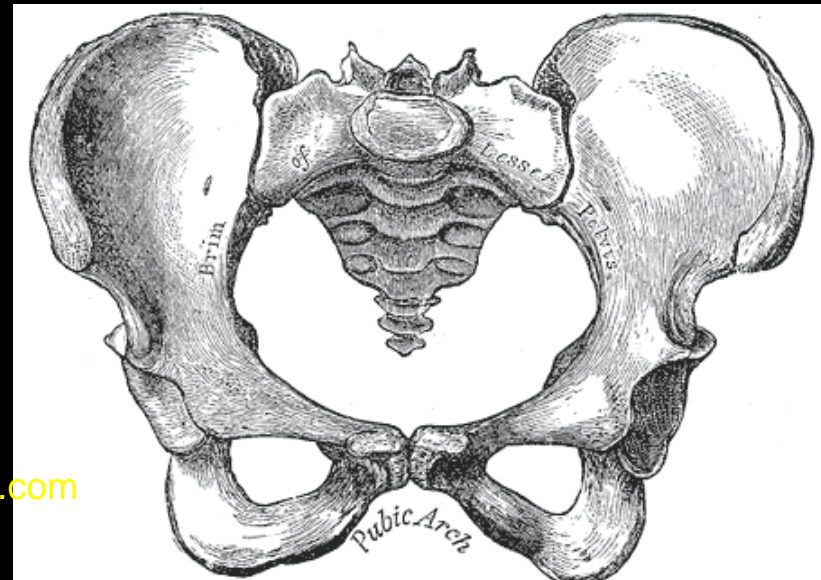
Shoulder Girdle

- Clavicle – collar bone
- Scapula – shoulder blade
- Humerus – attaches into the glenoid cavity



Pelvic Girdle

- Ilium – articulates with sacral vertebrae
- Ischium – sitting bones (itchy bum!)
- Pubis – pubic bones (can split during child birth – ouch!!)



Types of Joint (Articulations)

- **Immovable – Fibrous, eg skull**
- **Slightly Movable – Cartilaginous, eg vertebral column**
- **Freely Moveable – Synovial, eg knee, elbow**

Synovial, Freely Movable Joints

- Articular Cartilage – smooth and slippery buffer where two bones meet
- Synovial Cavity – area that separates two bones
- Ligament – attaches bone to bone
- Synovial Membrane – lubricates the joint, thickens and releases synovial fluid
- Periosteum – outer lining of bones, ligament attachment

Types of Synovial Joint

- Hinge – Knee, elbow, phalanges
- Gliding – Carpals, Acromioclavicular (hand)
- Pivot – Atlas and Axis (neck), Radius and Ulna
- Condylloid – Metacarpals (start of fingers)
- Ball and Socket – Hip, Shoulder
- Saddle - Thumb

Joint Actions (Anatomical Terms)

- Flexion and Extension
- Protraction and Retraction
- Hyper Extension
- Adduction and Abduction
- Elevation and Depression
- Plantar Flexion and Dorsi Flexion
- Horizontal Flexion and Horizontal Extension
- Lateral Flexion and Lateral Extension
- Hyperextension
- Circumduction
- Rotation