Anatomy of the Human Skeleton with Yoga Poses Workbook

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Chapter 1: Introduction to the Skeleton

The human skeleton is a framework of bones that supports the body, protects vital organs, and allows movement. It also produces blood cells and stores minerals such as calcium and phosphorus.

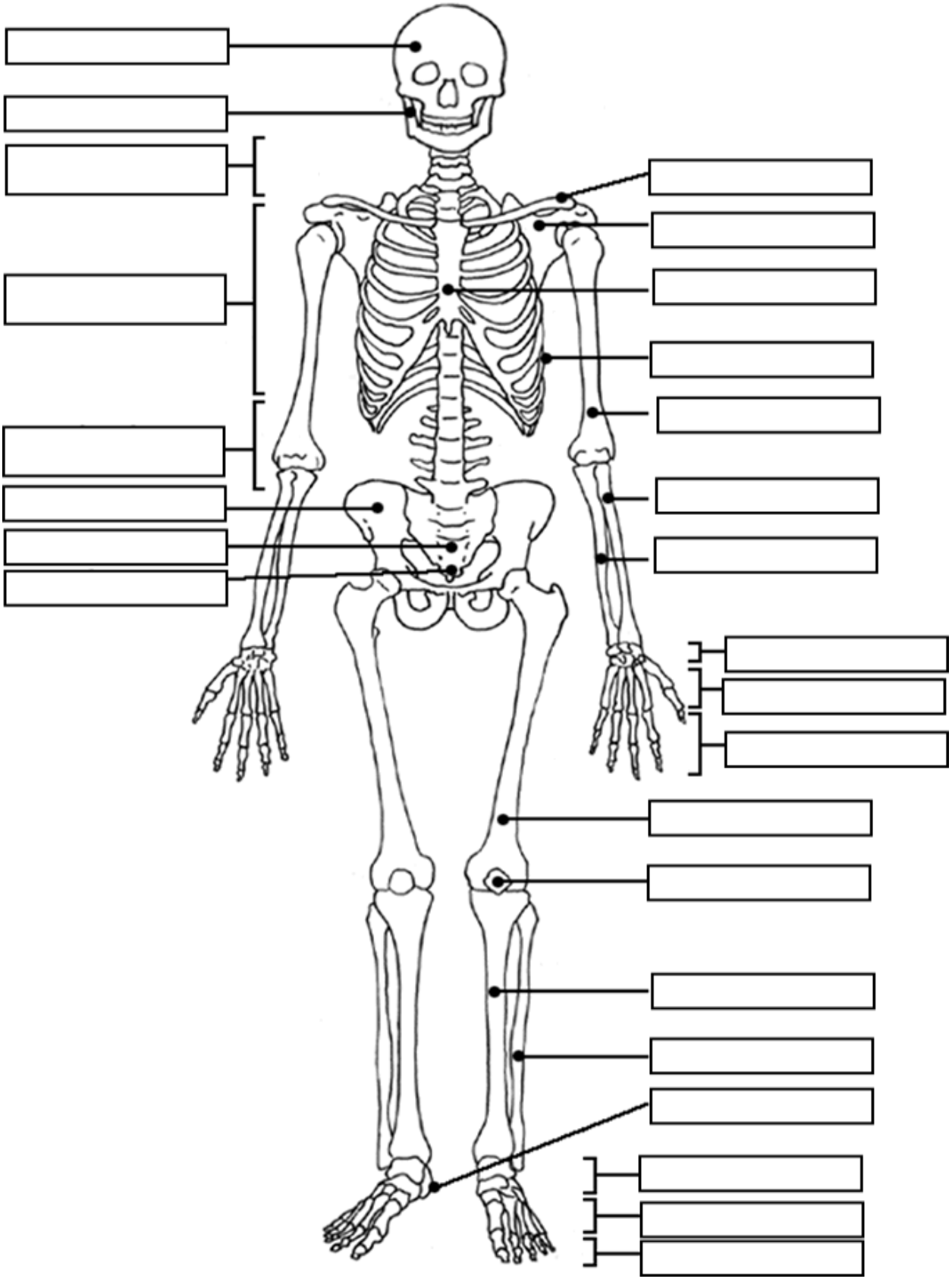
Key Functions of the Skeleton:

- **Support:** Provides a structural framework for the body.
- **Protection:** Shields organs such as the brain, heart, and lungs.
- **Movement:** Works with muscles to enable motion.
- **Storage:** Stores minerals and fats.
- **Blood Cell Production:** Produces red and white blood cells in the bone marrow.

Quick Facts:

- The adult human body has **206 bones**.
- Babies are born with about **270 bones**, some of which fuse during growth.

Label the bones in the diagram



For each of the 26 labeled bones write 3 yoga poses that would affect that particular bone.

1.a.

b.

c.

2.a.

b.

c.

3.a.

b.

c.

4.a.

b.

c.

5.a.

b.

c.

6.a.

b.

c.

7.a.

b.

c.

8.a.

b.

c.

9.a.

b.

c.

10.a.

b.

c.

11.a.

b.

c.

12.a.

b.

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13.a.

b.

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14.a.

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15.a.

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16.a.

b.

c.

17.a.

b.

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18.a.

b.

c.

19.a.

b.

c.

20.a.

b.

c.

21.a.

b.

c.

22.a.

b.

c.

23.a.

b.

c.

24.a.

b.

c.

25.a.

b.

c.

26.a.

b.

c.

Some yoga poses can be dangerous for people with bone disorders, such as osteoporosis or osteopenia, because they can put stress on the spine or bones:

- **Forward bends**: These can cause fractures in the front of the spine. To modify, bend your knees and tilt your pelvis instead of bending at the spine.
- **Twists**: Avoid poses that involve rounding the spine to twist. Inhale and lengthen your spine before twisting.
- **Backbends**: Avoid full backbends.
- **Inversions**: Avoid inversions unless you have a strong practice.
- **Arm and hand balances**: Avoid poses that put all your weight on your hands, like a handstand.
- **Repetitive or rapid movements**: Avoid movements that are repeated or done quickly, like rolling like a ball or jumping your feet to your hands.
- **Weighted movements**: Avoid movements that involve holding a weight, like a Russian twist with a dumbbell.

Some yoga can be beneficial for people with osteoporosis, and some yoga teachers have developed approaches to use yoga to treat osteoporosis.

According to Yoga International:

Editor's' note: The below recommendations are intended to be general recommendations for yoga practitioners and teachers. They are not a replacement for the personal advice of a health professional.

Yoga may be an effective part of the treatment for osteoporosis: A recent small studyfound that practicing yoga for as little as eight to ten minutes daily can increase bone density.

Also, according to Bill Reif, physical therapist and author of *The Back Pain Secret: The Real Cause of Women's Back Pain and How to Treat It*, "With a regular practice, yoga will improve strength, flexibility, balance, coordination, endurance, muscle mass, agility, and energy level—all important for older adults with osteoporosis."

As more students with osteoporosis make their way into yoga class seeking these benefits, it's important that both they and their teachers know what osteoporosis is and how best to accommodate and benefit those with the condition.

DEFINITION AND PREVALENCE

Osteoporosis (from the Greek "porous bone") is a disease in which bones become less dense, predisposing them to fractures.

Osteoporosis is often referred to as a "silent" disease—because loss of bone density is not easily perceptible, a patient may not know she has the disease until she breaks a bone or finds her upper back rounding as the result of asymptomatic vertebral fractures.

In 2010, around ten percent of U.S. adults over 50 (or an estimated 10.2 million) had osteoporosis. Around 44 percent of adults over 50 (an estimated 43.4 million) had low bone mass.

When bone mass is low but not low enough to be classified as osteoporosis, the condition is called osteopenia, or "bone poverty." It precedes, but does not always lead to, osteoporosis. While lower bone density means greater risk of fractures (most commonly in the spine, hip, and wrist), more fractures occur in those with osteopenia rather than those with osteoporosis—in large part because a greater number of people have osteopenia.

Many of those with low bone density are women: Women are four times more likely to develop osteoporosis than men.

Reif says, "For women, a drop in estrogen at the time of menopause leads to a more rapid and significant loss of bone mass. For men, a drop in testosterone, often beginning around age 70, can cause it. Also, certain medications (notably steroids), medical conditions (such as rheumatoid arthritis and eating disorders) can contribute to osteoporosis."

Other risk factors include family history, smoking, small and thin stature, sedentary lifestyle, insufficient calcium, vitamin D, or protein, and excessive consumption of alcohol or sodium.

The common medical recommendations for osteoporosis and osteopenia—medication, calcium and vitamin D supplements, avoiding alcohol and tobacco, and drinking plenty of water to avoid falls caused by dehydration—also include at least 90 minutes a week of weight-bearing and muscle-strengthening exercise.

But, when it comes to osteoporosis, all exercise is not equal.

EXERCISING WITH OSTEOPOROSIS

While those with osteopenia can often participate safely in most activities with their doctor's approval, Reif explains that those with osteoporosis are better off avoiding certain exercises: "Osteoporosis weakens the bones and joints, so jumping or dynamic weight-bearing activities are not recommended. These include activities like jumping rope or high-intensity step aerobics classes. It's also a good idea to avoid intense cardiovascular exercise like running, or even walking on uneven surfaces."

Reif advises caution for many sports as well. "Activities that may involve quick changes of direction, like basketball, baseball, football, or tennis could result in falls or bone shearing. These activities have a high fracture rate, especially in the hips, femurs, and lower back.

Even golf can be risky for the spine, because of the rounding of your back when you bend forward repeatedly to retrieve a ball and the quick twisting motion of the swing. These spinal movements can cause small fractures over time, weakening the spine further, or they can result in one large fracture, possibly immobilizing you." Reif says that while these fractures may gradually heal, the structural weaknesses and postural misalignments they cause usually remain and can even worsen with age.

According to Reif, moderate weight-bearing activities have the greatest benefit for those with osteoporosis. He explains, "Exercises that work against gravity are more effective in stimulating bone formation."

Among the weight-bearing movements that Reif suggests for his patients with osteoporosis are walking, slow jogging, climbing stairs, the racquet sport pickleball, and low-impact dancing. "These provide positive stress for bones, which helps to maintain or increase their density." However, Reif also points to the limitation of many of these forms of exercise, which is that "They largely impact the legs."

For those who wish to challenge the arms as well, Reif recommends yoga. "Many poses in yoga are weight-bearing on all four limbs, helping us build bone density in the arms as well as the legs."

CAN EVERYONE WITH OSTEOPOROSIS DO YOGA?

Those with osteopenia can often practice a broader range of poses requiring more extreme spinal movement than those with osteoporosis can. But since the degree to which one has lost bone density will determine the types of exercise and the ranges of movements that are safe, Reif encourages those with osteoporosis or osteopenia to seek medical assessment and get their doctor's advice as to whether or not yoga asana is a good idea for them, and any specific movements they should avoid.

With those for whom osteoporosis has led to thoracic kyphosis (rounding of the upper back) or fractures, yoga should be approached with particular caution.

"Greater thoracic kyphosis means increased risk," says Reif. "Folding forward or twisting while the spine is in a C-shape, for example, are dangerous for the thoracic vertebrae made vulnerable by low bone density." As for those with a history of fractures, Reif points out that people who have already experienced at least one vertebral fracture have an increased risk of sustaining an additional fracture within the following year.

In cases of advanced osteoporosis, yoga (asana) may be inadvisable. "Non-weight-bearing activities—swimming, water aerobics, exercise biking—may be the only exercise that the bones can tolerate," notes Reif.

Students who have been given their doctor's permission to practice yoga should always let their teachers know about their condition and their doctor's recommendations.

Yoga teachers should make sure that students with osteoporosis have obtained their doctor's permission to practice yoga, confirm whether they were given specific advice as to which movements to avoid, and keep in mind the general recommendations below.

DO'S

When practicing yoga with osteoporosis, or when teaching students with osteoporosis, Reif recommends emphasizing the following poses and actions.

1. Do…practice neutral-spine postures. Students with osteoporosis should make neutral-spine poses like mountain the crux of their practice and should work on aligning the spine optimally in these poses.

"Tip the tailbone back enough that you create a curve in the lower back, and bring your head back over your shoulders. Imagine a plumb line dropping from your ear down through your shoulders, hips, and ankles. Maintain this optimal spinal position during most postures and flows," Reif advises.

What about those with rounded upper backs who are unable to create a neutral spine? "Come as near neutral as possible."

For example: Mountain, reclining hand to big toe pose (using a strap), low lunge, the warrior poses, tabletop, and plank are all neutral-spine poses.

2. Do…focus on lengthening. Having arranged your spine in its neutral or near-neutral shape, work to elongate it since, according to Reif, "With osteoporosis, the weakened vertebrae sometimes collapse to the point of fracture." Lengthening the spine creates space between the vertebrae, preventing or correcting that collapse.

For example: "Think often of a marionette string pulling up from your head no matter what position you're in," says Reif. Alternatively, imagine lifting up into an object—like a book or jug of water—balanced on the crown of your head.

3. Do…include poses that encourage the hands to bear weight. Bring your hands to the mat! As noted, one of the advantages of yoga over other exercises is that bearing weight on the hands allows us to build bone density in the arms as well as the legs.

For example: Tabletop, plank, forearm plank, chaturanga, reverse tabletop, and downward facing dog.

(Please note: It is not safe to bear much weight on the hands if the upper back is rounded. In tabletop, work to indent the space between the shoulder blades, and only proceed to poses like chaturanga, plank, and downward facing dog once this is possible. Avoid arm balances like crow that call for a rounding of the back.)

4. Do…include gentle backbends. Because osteoporosis is so often accompanied by thoracic kyphosis, it's especially important to work on gentle backbends, which move the thoracic spine in and lift the chest, improving thoracic spine extension, according to Reif.

Even mild forward folds are not recommended for those with osteoporosis (see Don't #2), but some mild backbending is fine. "The extension movement is much less risky than flexion because of the strength of cortical bone in vertebrae," Reif explains. (Please note: Big backbends can be compressive, which is contraindicated and will be addressed in the Don'ts section.)

For example: Bridge, sphinx, baby cobra, camel pose (with hands on your lower back), lying down over a foam roller or rolled-up blanket (placed horizontally under the thoracic spine), and restorative backbends. This practice for kyphosis is safe for many of those with osteoporosis.

5. Do…include mild sidebends and twists. Reif points out that "Varied spinal movement is important for preserving the health and strength of the vertebral bones," although any pose that rounds the back should be avoided.

These varied movements include mild sidebends and twists, which Reif says "will allow you to maintain the greatest flexibility of your spine without causing the fractures associated with osteoporosis."

But how far should you go? "The less the torso approaches end range [of motion] the less the strain," says Reif, who encourages yoga students with osteoporosis to go only as far as they can without sacrificing spinal length.

When sidebending, go only as far as you can without collapsing the waist on the side to which you are bending. When twisting, go only as far as you can while maintaining a gentle inward curve in the lower back.

For example: Bend to the side by just a few degrees while standing or lunging, as well as in reverse warrior, gate pose, or while reclining in bananasana. Enjoy gentle reclining twists like "windshield-wipering" the legs from side to side. And when doing more vigorous twists, keep a neutral spine (i.e., do not round the back), twisting by only a few degrees.

6. Do…move from pose to pose slowly. To decrease the risk of falling, it's important that students with osteoporosis move from pose to pose slowly.

For example: Come up slowly from positions like half forward fold (bending the knees and bringing the elbows to the knees for a modified chair pose before rising to mountain pose) to decrease the risk of a head rush and a fall. Before stepping a foot back for a pose like warrior I or crescent, always make sure the front foot is well-grounded.

7. Do…challenge balance without sacrificing stability. Because a fall could mean a fracture for students with osteoporosis, it's vital to work on balance in yoga class. But, to avoid a fall, they should initially challenge their balance while making the most of the support available to them.

For instance, in standing balance poses, have them bring a hand to the wall to steady themselves, or keep the toes of the foot they're about to lift on the mat until they feel stable. Reif notes, "You will still improve balance and coordination even if you are not in the 'full' pose."

For example: • In warrior III, keep your back toes (or the ball of your back foot) on the ground at first, while you work to bring most of your weight into the standing leg. (Lighten your back toes only if you do not feel challenged here.)

• When practicing standing hand to big toe pose, place the foot of your lifted leg on a wall, or bend your knee and place your foot on a chair. (Lighten your foot only if you do not yet feel challenged here.)

• Practice tree pose with your hand touching the wall, gradually lightening your hand on the wall when you are sure you are stable.

8. Do… add some weights. Rather than increasing the challenge with more extreme poses, keep the pose straightforward and use light hand and/or ankle weights.

If a student with osteoporosis is comfortable in a pose like bird dog, it can be tempting for her to turn that pose into a big backbend (by bending her back knee and bringing her lifted hand up behind her to encircle her lifted ankle).

Instead, Reif would recommend lifting a weight with the front hand and strapping an ankle weight around the back ankle. "The weight should be an amount that you can lift 10 to 12 repetitions without strain, perhaps one to two pound dumbbells or ankle weights."

For example: Hold hand weights with the arms overhead, alongside you in chair pose, or out to the sides in warrior II. And strap an ankle weight around the ankle of the lifted foot in single-leg balance poses like warrior III.

DON'TS

According to Reif, it's essential for yoga students with osteoporosis to avoid extremes in range of movement. The poses and practices below are those he recommends avoiding.

1. Don't….do crunches or sit-ups. While core strength is important to support the lower back, "These poses require loaded lumbar flexion, placing a high demand on the lower back as you work to lift the weight of the upper body, leading to fractures in the thoracic or lumbar vertebrae," explains Reif.

Instead: Work on core stability in all neutral-spine poses by drawing the belly in and up on the exhale. From a lying down position, work the core by lifting and lowering the legs rather than the upper body, keeping the spine in its neutral position.

2. In fact, avoid poses that require spinal flexion (rounded-back poses). Students with osteoporosis should avoid not only sit-ups and crunches, but all poses that require spinal flexion (rounded-back poses) because of the stress that puts on the lower back. This means steering clear of forward folds, even mild ones, and also avoiding hugging the knees in as you lie on your back—as you would for wind relieving pose or happy baby.

Certainly, rolling up to stand, a challenging movement to do well for even the strongest of yoga students, is one that students with osteoporosis should always avoid.

Instead: Skip *uttanasana* (standing forward fold) in favor of *ardha uttanasana* (half standing forward fold). In this "flat-back pose," you might bring the hands to blocks, the seat of a chair, or to a wall, in order to maintain your optimal spinal shape.

Choose upright seated poses like staff over forward folds like stretch of the west (leaning back if necessary to curve the lower back in toward the belly and lift the chest).

To stretch the hamstrings, instead of going deeper into a forward fold, practice lying down hand to big toe with a strap around the foot of the lifted leg. In all of these poses, focus both on keeping the spine in its neutral position and on lengthening.

3. Don't…practice big backbends. While some gentle backbending, as mentioned above, is fine for students with osteoporosis, big backbends like upward facing dog, wheel, bow, and camel pose with hands on the heels, can be dangerously compressive. As Reif explains, "The thoracic spine is the area of the spine at greatest risk for those with advanced osteoporosis: This is where the majority of stress is placed in any rounding of the spine, but also in extreme spinal extension (backbending)."

Instead: Stick with the milder backbends recommended on the Do's list above.

4. Don't…practice extreme twists and sidebends. "Trunk rotations cause torsional stress on the spine. The discs and vertebral bones are stressed most when in a rounded position combined with a big twist. Think of the motion involved with shoveling dirt or snow: That's when many spines are injured," says Reif.

That means that moving into a deep chair pose twist or a Marichi's pose with your elbow to the outside of your thigh is off limits. Big sidebends (for instance, bringing your hand to your shin in gate pose or reverse warrior), often have an element of twisting to them and can be compressive too.

Instead: Stick with the milder twists and sidebends listed in the Do's above.

5. Don't…start an inversion practice. Those diagnosed with low bone density who have practiced inversions regularly throughout their lives and are able to keep their neutral-spinal alignment in these poses may be able to safely practice inversions such as headstand, shoulderstand, and handstand, though they would be wise to consult with their doctors first.

If given permission to practice inversions, students with osteoporosis should practice them at the wall in order to minimize the risk of falling.

For those who haven't already been practicing poses like these regularly, if you've been diagnosed with osteoporosis, this is not the time to start. "The weakened, low-density vertebrae will not tolerate the compression [of these inversions], especially if there is a loss of cervical curve," Reif says.

Instead: For many of the circulatory and energetic benefits of inversions, practice milder inversions like downward facing dog, bridge, and legs up the wall.

6. Don't…take fast-paced, competitive classes. What's the rush? Many—though not all—vinyasa flow or power yoga classes transition quickly from pose to pose, and stability is of the essence for students with osteoporosis. Steer clear of the classes and the teachers that encourage you to move so fast you risk your balance.

Instead: Take hatha, Iyengar, gentle, restorative, yin yoga, or any alignment-focused practice.

Want to put it all together? Check out "A Yoga Sequence for Osteoporosis," which offers a sequence that makes use of Reif's recommendations above.

Those living with varying degrees of decreased bone density still have a rich practice available to them which has the potential to stimulate deep change. Through asanas that are carefully selected and, at times, modified for greatest benefit, we can retain—and even regain—not only strength of muscle but strength of bone.

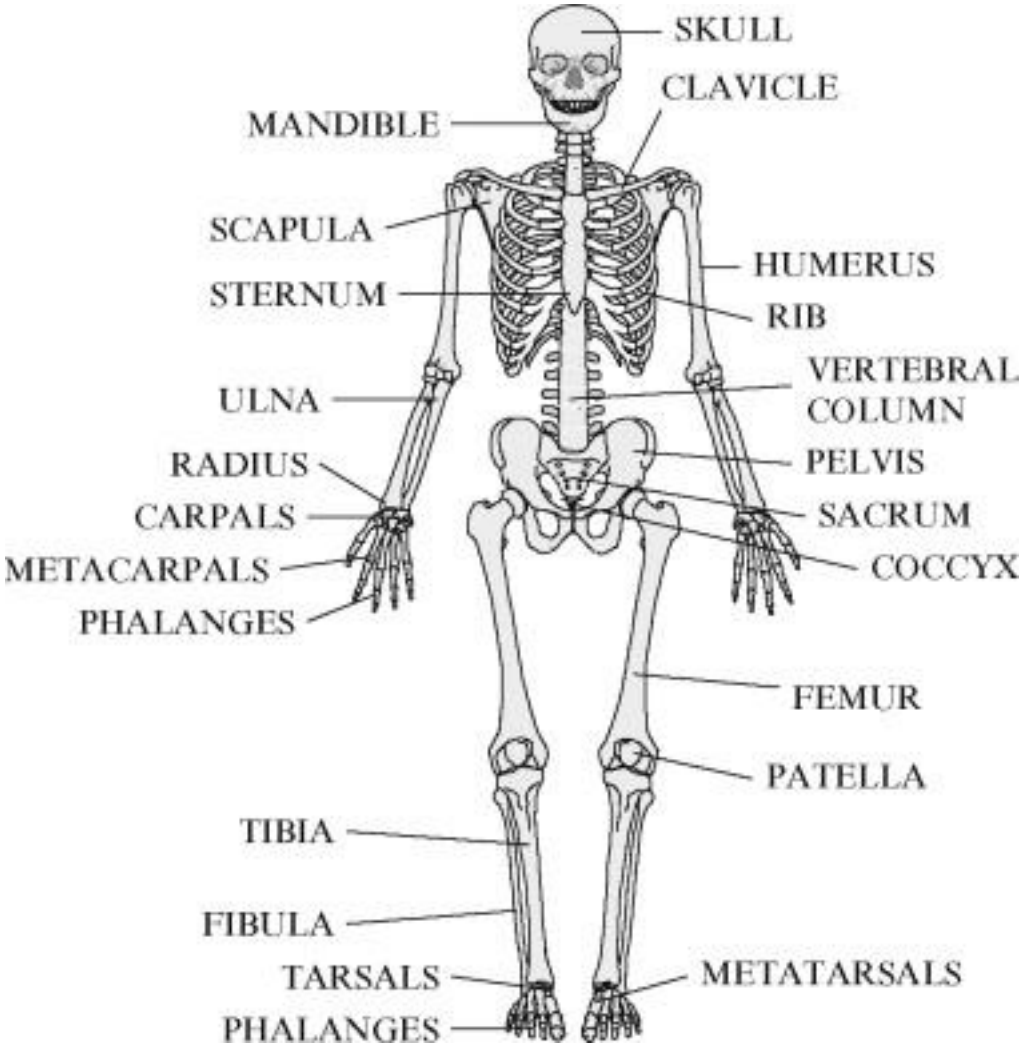
Chapter 2: Divisions of the Skeleton

The skeleton is divided into two main parts:

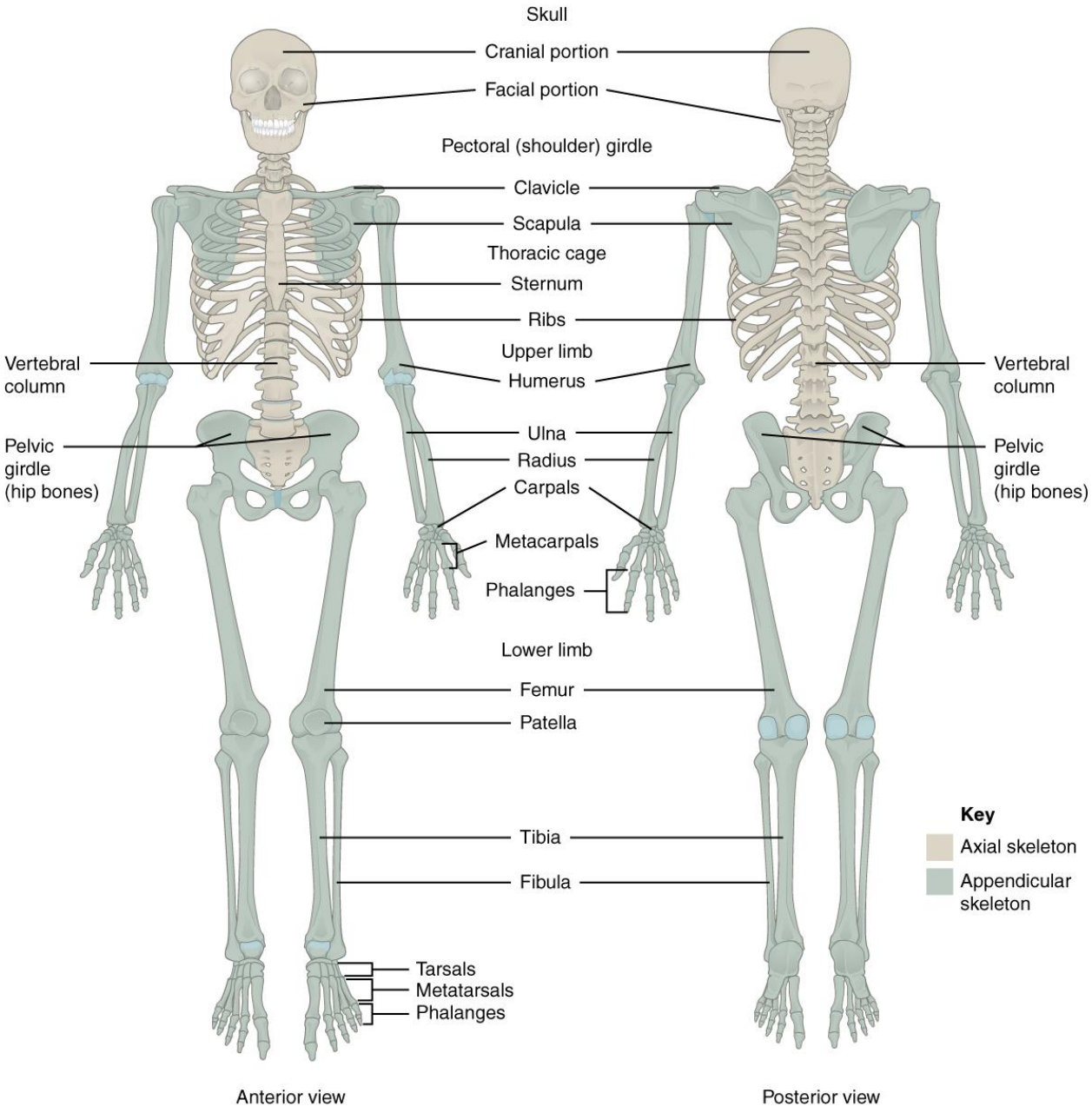
1. **Axial Skeleton** - Forms the central axis of the body (80 bones).

The 80 bones of the axial skeletal system can be distinguished as follows:

- The skull comprises 22 bones out of which 14 are facial bones and 8 are cranial.
- 6 middle ear ossicles (3 in each ear),
- 1 hyoid bone in the neck.
- 26 bones of the vertebral column.
- 1 sternum.
- 24 ribs (12 pairs).



2. **Appendicular Skeleton** - Includes the limbs and girdles (126 bones).



Upper Limbs:

- Clavicle (collarbone)
- Scapula (shoulder blade)
- Humerus (upper arm bone)
- Ulna and Radius (forearm bones)
- Carpal bones (wrist bones)
- Metacarpal bones (palm bones)
- Phalanges (finger bones)

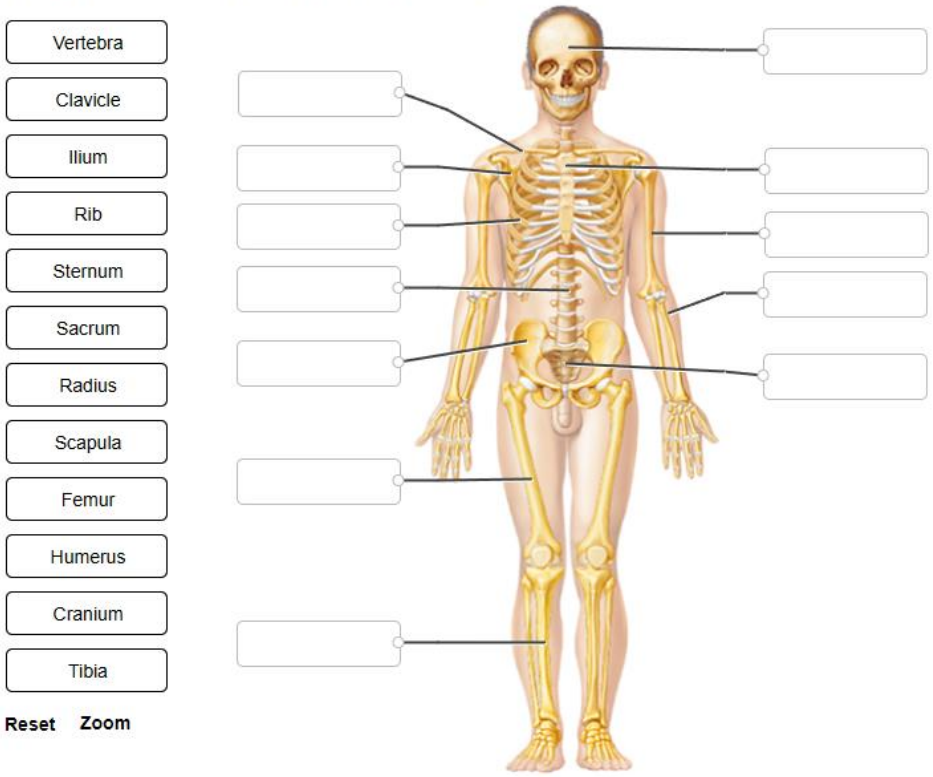
Lower Limbs:

- Pelvis (hip bone)
- Femur (thigh bone)
- Patella (kneecap)
- Tibia and Fibula (shin and calf bones)
- Tarsals (ankle bones)
- Metatarsal bones (top of the foot bones)
- Phalanges (toe bones)

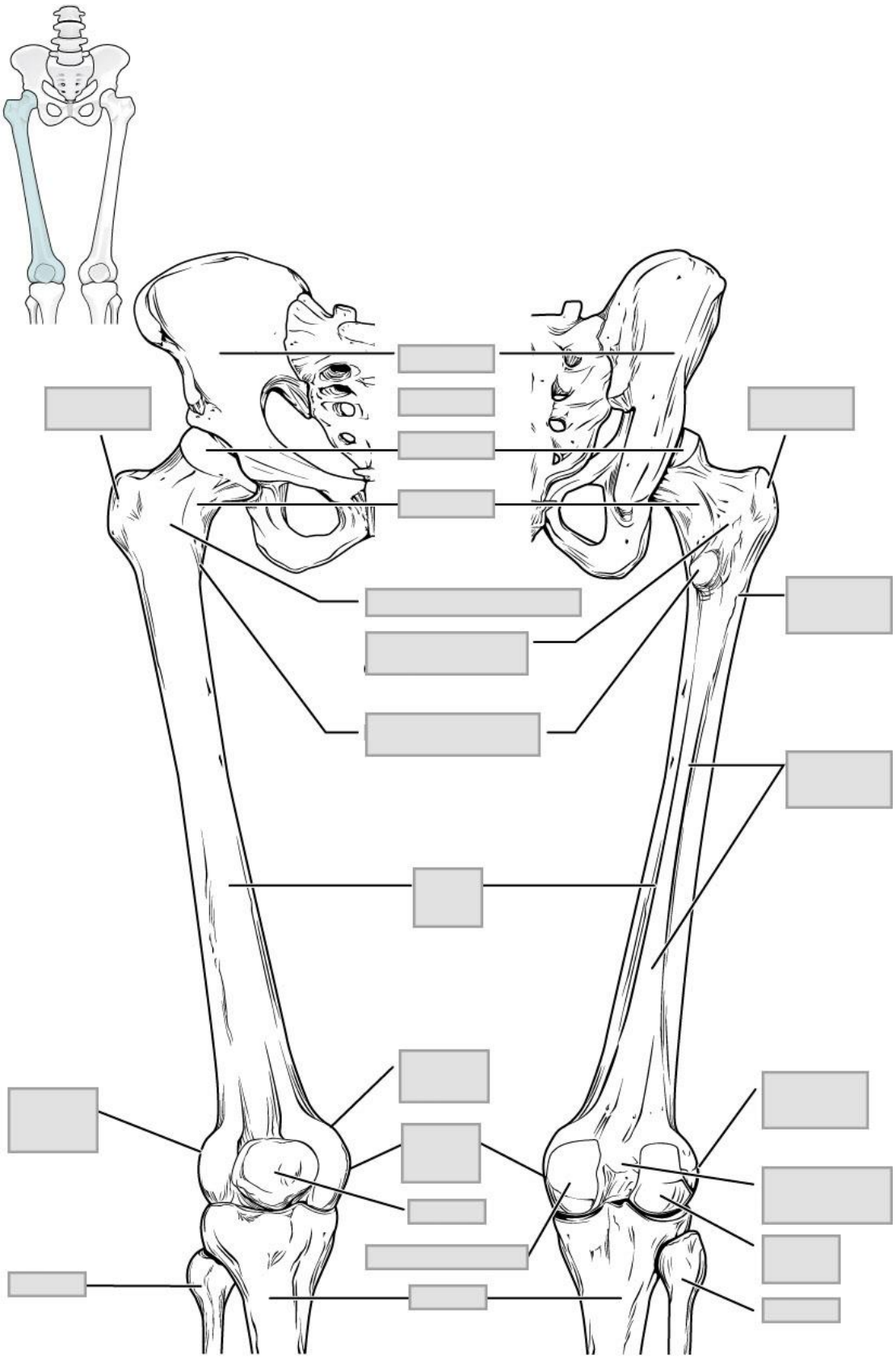
Label the Axial Skeleton diagram: Try not to peak!

Bones of the Axial Skeleton

Label **only** the bones that are part of the axial skeleton.

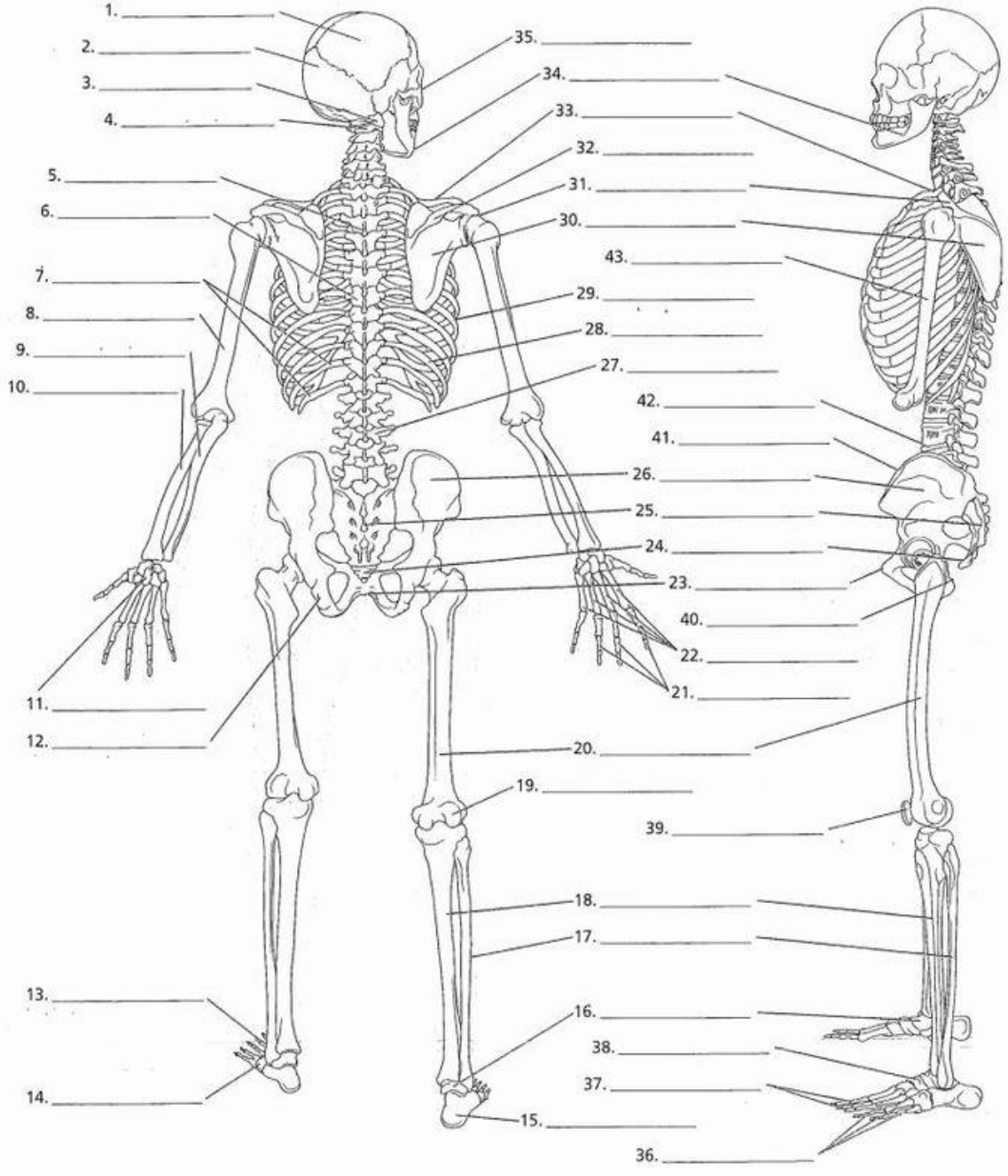


Label the appendicular skeleton:


Anterior view
Posterior view

Skeletal System—posterior view

Skeletal System—lateral view



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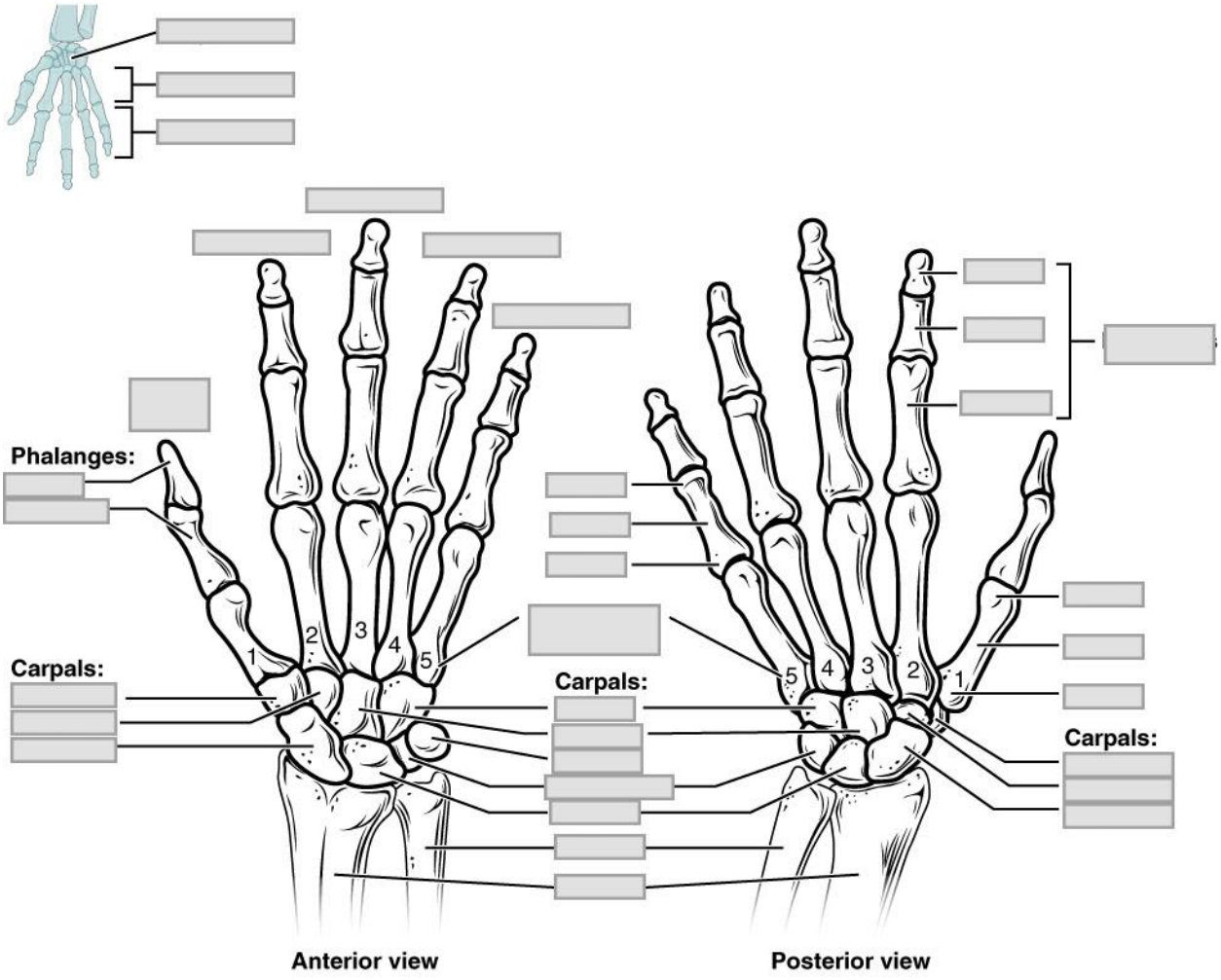
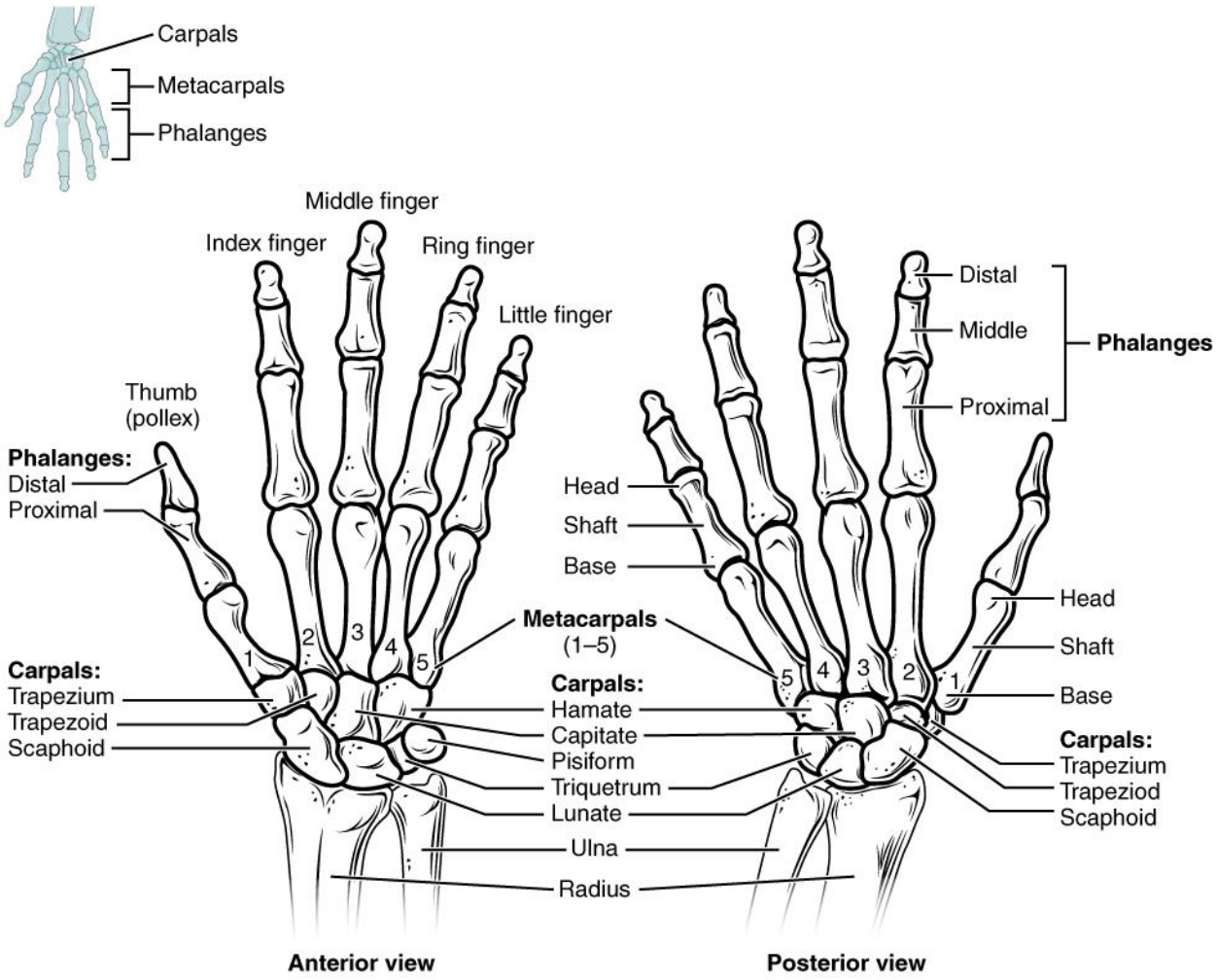




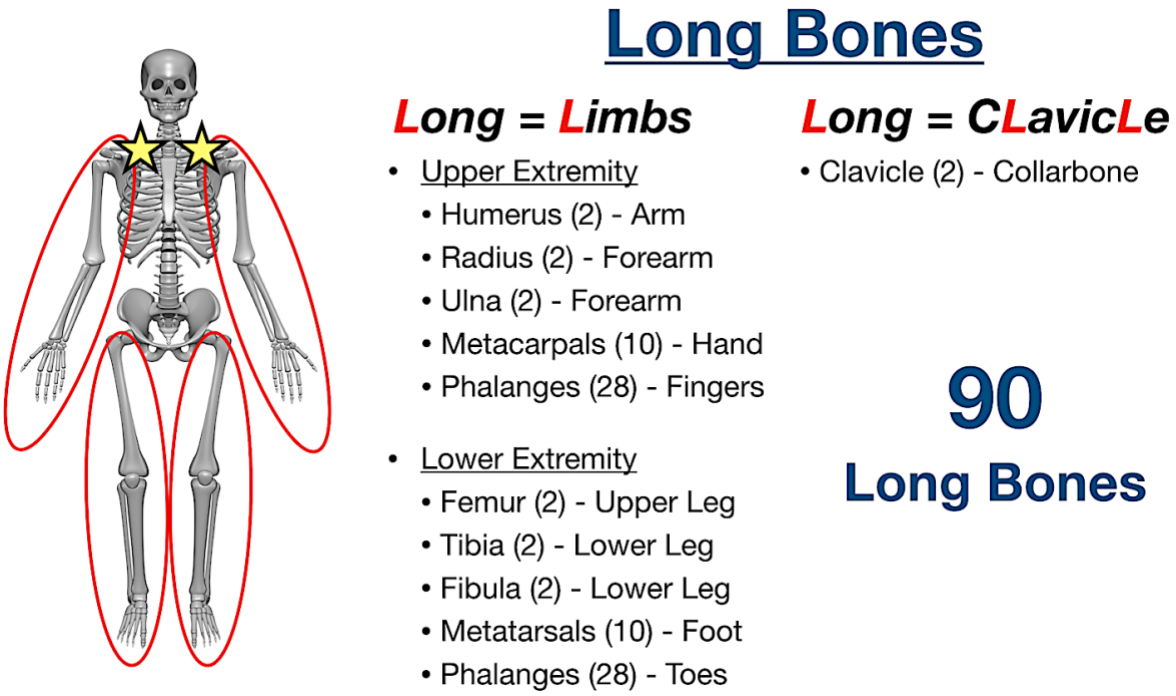
Review:

Division	Main Components	Number of Bones
Axial Skeleton	Skull, vertebral column, rib cage	80
Appendicular Skeleton	Shoulder girdle, arms, pelvic girdle, legs	126

Chapter 3: Types of Bones

Bones are classified based on their shape:

- **Long Bones** - Longer than they are wide (e.g., femur, humerus).



What types or what poses effect the long bones?

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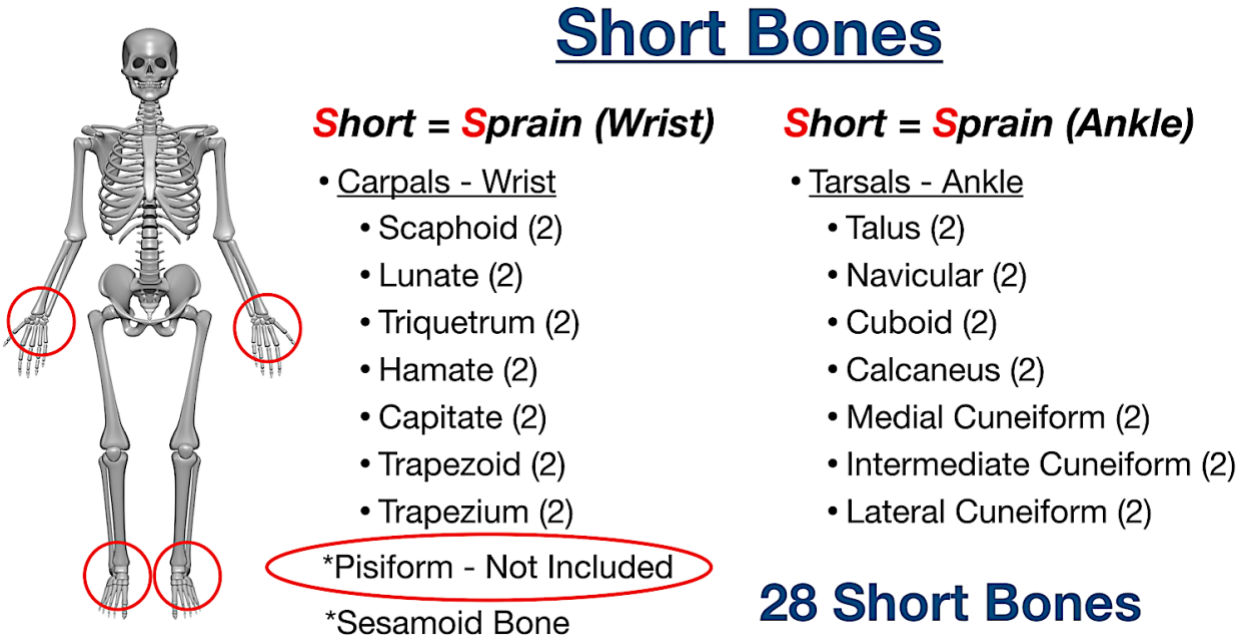
- **Short Bones** - Cube-shaped (e.g., carpals, tarsals).



What types or what poses effect the short bones?

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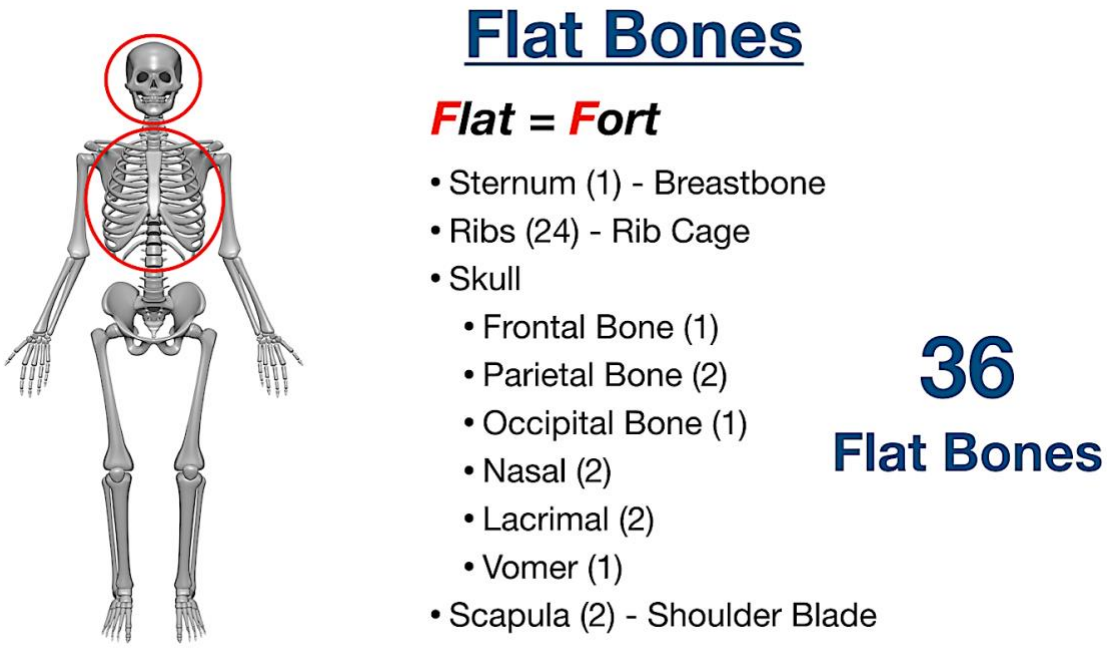
- **Flat Bones** - Thin and flat (e.g., ribs, skull).



What types or what poses effect the flat bones?

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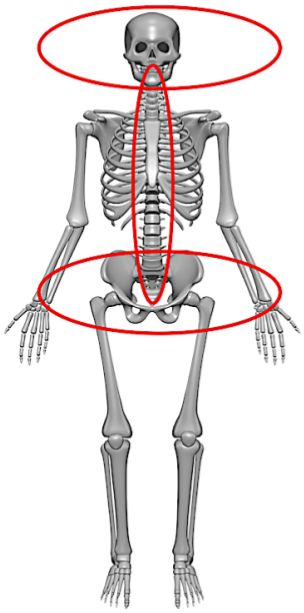
- **Irregular Bones** - Complex shapes (e.g., vertebrae).



Irregular Bones

Irregular = I-shaped

- Hip Bones (2)
- Vertebral Column
  - Cervical (7)
  - Thoracic (12)
  - Lumbar (5)
  - Sacrum (1)
  - Coccyx (1)
- Hyoid Bone (1)
- Skull
  - Temporal Bone (2)
  - Ethmoid (1)
  - Sphenoid (1)
  - Zygomatic (2)
  - Maxilla (2)
  - Mandible (1)
  - Inferior Nasal Concha (2)
  - Palatine (2)
- Ear Ossicles
  - Malleus (2)
  - Incus (2)
  - Stapes (2)

48 Irregular Bones

What types or what poses effect the irregular bones?

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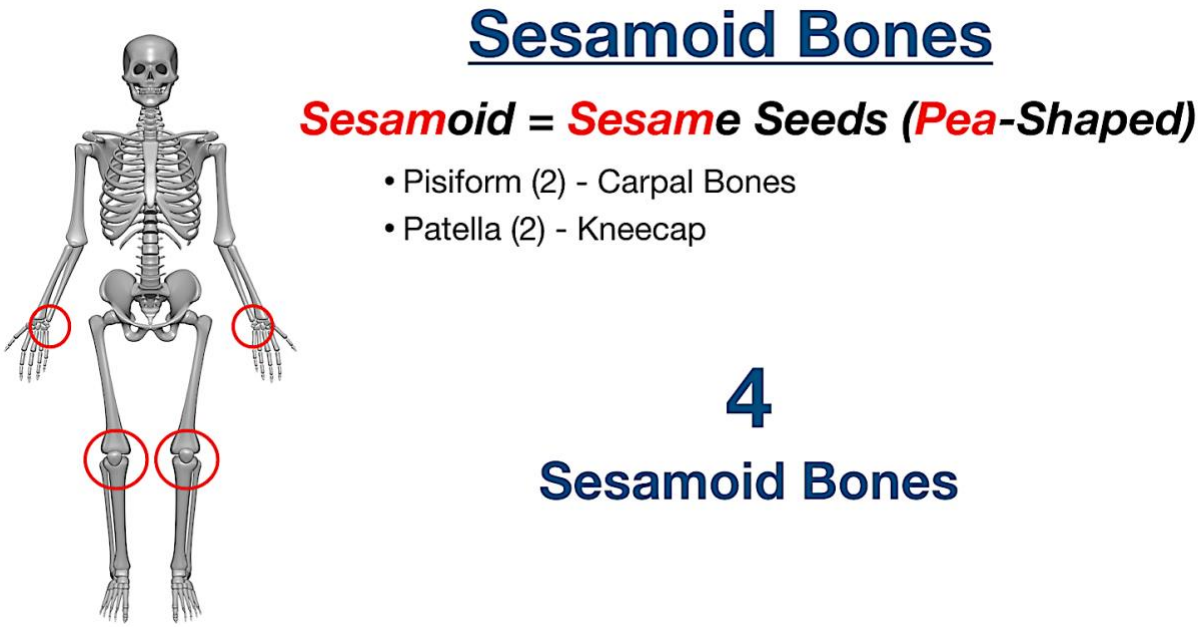
- **Sesamoid Bones** - Embedded in tendons (e.g., patella).



What types or what poses effect the sesamoid bones?

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Notes:

Chapter 4: Major Bones of the Axial Skeleton and Related Yoga Poses

Skull

- **Bone Function:** Protects the brain and supports facial structure.
- **Yoga Pose:** *Savasana* (Corpse Pose) - Promotes relaxation and releases tension in the head and neck.

Name 10 more poses, with Sanskrit name if you would like:

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Vertebral Column

- **Cervical Spine (7):** Supports the neck and head.
    - **Pose:** *Matsyasana* (Fish Pose) - Stretches and strengthens the cervical spine.

Name 10 more poses with Sanskrit name if you prefer:

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- **Thoracic Spine (12):** Protects organs and supports the rib cage.
    - **Pose:** *Bhujangasana* (Cobra Pose) - Enhances flexibility in the thoracic region.

Name 10 more poses with Sanskrit name if you prefer:

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- **Lumbar Spine (5):** Supports the lower back.
    - **Pose:** *Ardha Matsyendrasana* (Half Lord of the Fishes Pose) - Improves spinal rotation and relieves tension.

Name 10 more poses with Sanskrit name if you prefer:

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Rib Cage

- **Bone Function:** Protects the lungs and heart.
- **Yoga Pose:** *Setu Bandhasana* (Bridge Pose) - Opens the chest and strengthens the ribs and thoracic muscles.

Name 10 more poses with Sanskrit name if you prefer:

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Notes:

Chapter 5: Major Bones of the Appendicular Skeleton and Related Yoga Poses

Upper Limb

- **Clavicle (Collarbone):** Provides stability to shoulders.
    - **Pose:** *Garudasana* (Eagle Pose) - Strengthens the shoulders and improves flexibility.

Name 10 more poses with Sanskrit name if you prefer:

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- **Scapula (Shoulder Blade):** Supports arm movement.
    - **Pose:** *Gomukhasana* (Cow Face Pose) - Enhances scapular mobility and releases tension.

Name 10 more poses with Sanskrit name if you prefer:

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- **Humerus, Radius, and Ulna (Arm Bones):** Enable movement and strength.
  - **Pose:** *Vasisthasana* (Side Plank Pose) - Builds arm strength and stability.

Name 10 more poses with Sanskrit name if you prefer:

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Lower Limb

- **Pelvis (Hip Bones):** Provides support for the torso and connects the spine to legs.
    - **Pose:** *Malasana* (Garland Pose) - Improves hip flexibility and strengthens the pelvis.

Name 10 more poses with Sanskrit name if you prefer:

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- **Femur (Thigh Bone):** Supports body weight and aids movement.
    - **Pose:** *Warrior II* (Virabhadrasana II) - Strengthens the legs and enhances stability.

Name 10 more poses with Sanskrit name if you prefer:

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- **Tibia and Fibula (Lower Leg Bones):** Provide structural support.
    - **Pose:** *Virabhadrasana I* (Warrior I) - Builds leg strength and balance.

Name 10 more poses with Sanskrit name if you prefer:

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Notes:

Chapter 6: Joints, Movements, and Yoga Applications

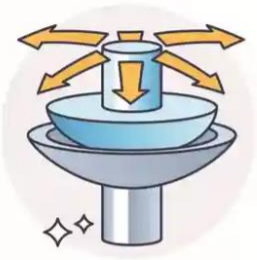
Joints allow movement and flexibility. a joint can be classified in two different ways depending on whether you are looking at its structure (histological classification) or its function (functional classification), meaning a single joint can fall into different categories based on these different classifications; for example, a joint that is classified as "fibrous" structurally would also be classified as "immovable" functionally.
Key points about joint classification:

- **Structural classification (histological):**

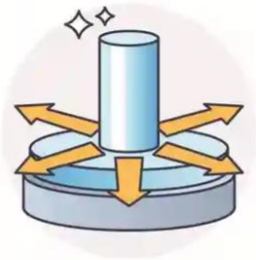
  This categorizes joints based on the type of connective tissue that holds the bones together, with options like fibrous, cartilaginous, and synovial.

- **Functional classification:**
  This categorizes joints based on the degree of movement they allow, with options like synarthrosis (immovable), amphiarthrosis (slightly movable), and diarthrosis (freely movable).

TYPES OF SYNOVIAL JOINTS



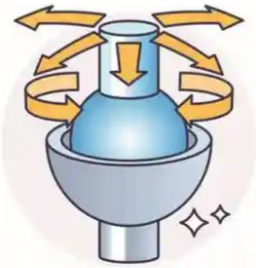
ELLIPSOID JOINT



PLANE JOINT

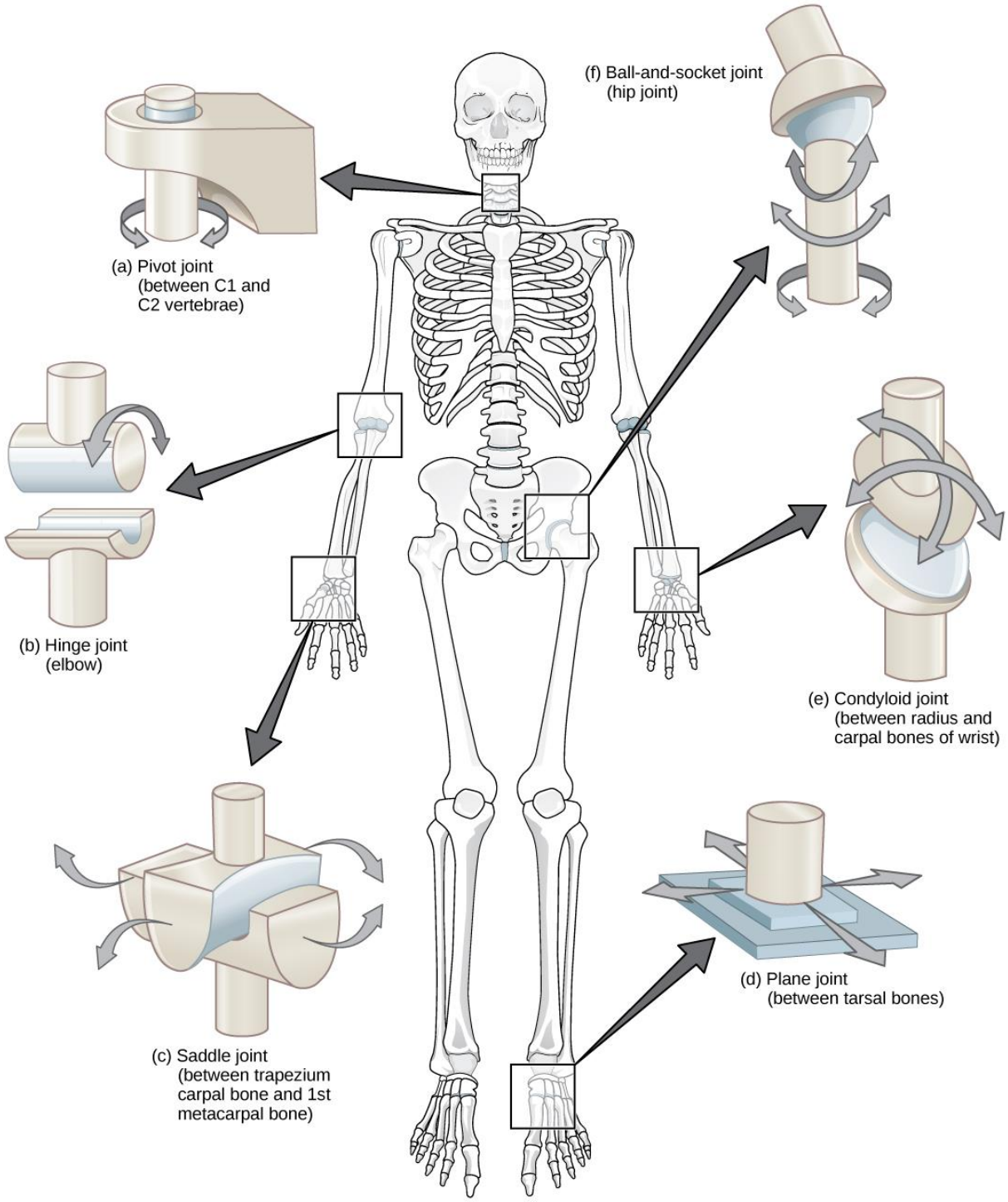
HINGE JOINT

SADDLE JOINT



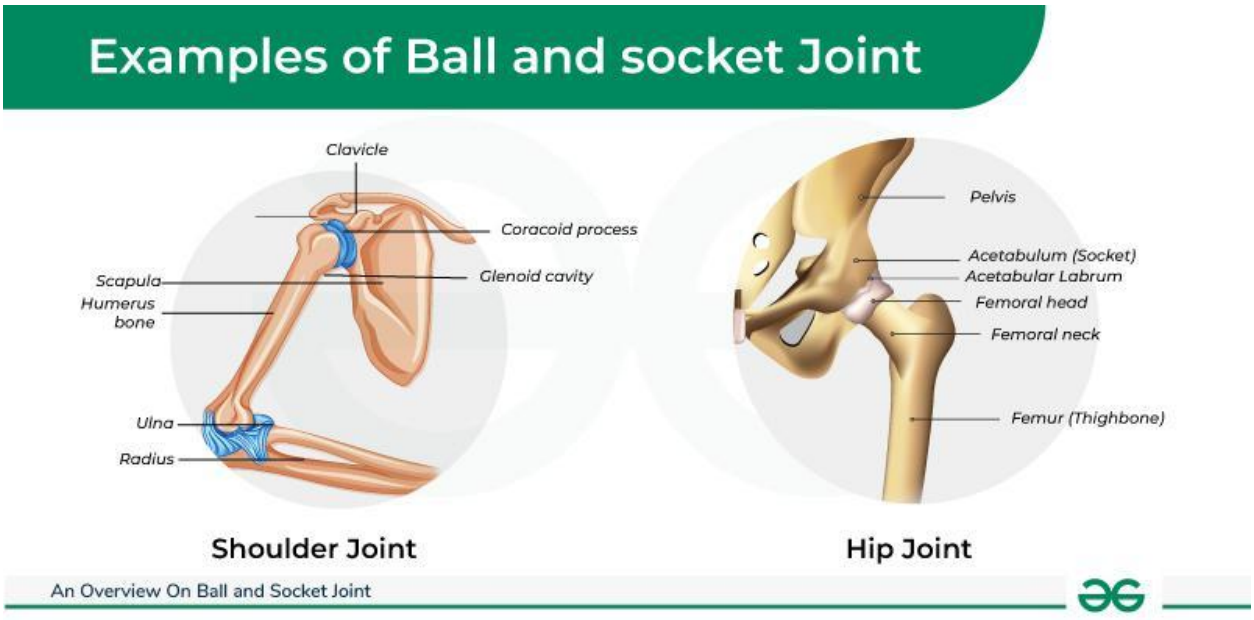
BALL AND SOCKET JOINT

PIVOT JOINT



Types of Joints and Yoga Poses:

- **Ball-and-Socket Joints** (Hip, Shoulder)
    - *Pose: Eka Pada Rajakapotasana* (Pigeon Pose) - Opens hip joints.



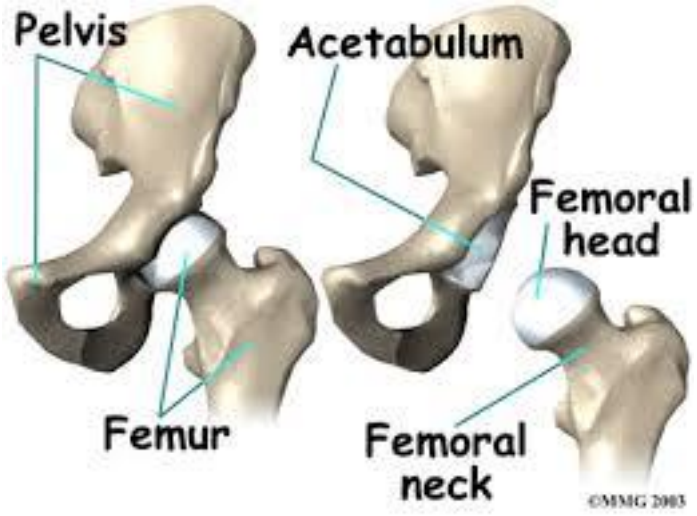
Ball-and-socket Joint

Ball and Socket Joint: A ball and socket joint (also called a spheroid joint or spheroidal joint) is a synovial joint in which the rounded or spherical end of one bone fits into a cup-like depression of another bone. The distal bone is capable of motion around an indefinite number of axes, which have one common center. Examples of ball and socket joints include the hip and shoulder (glenohumeral) joints.

- Note: These joints allow movement in all planes of motion and permit all joint actions, including flexion/extension, abduction/adduction, horizontal abduction/horizontal adduction, and internal rotation/external rotation.

Examples of Ball-and-socket Joints of the Human Body:

- **Shoulder Joint (Glenohumeral Joint)**: The ball-shaped head of the humerus (upper arm bone) approximates the dish-like depression of the glenoid fossa of the scapula (shoulder blade).
- **Hip Joint**: The ball-shaped head of the femur (thigh bone) approximates the cup-like depression of the acetabulum (hip socket) of the pelvis.



Name 10 more poses with Sanskrit name if you prefer that effect the ball and socket joints:

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- **Hinge Joints** (Knee, Elbow)
    - *Pose: Uttanasana* (Standing Forward Bend) - Strengthens knees and stretches hamstrings.

Hinge Joint

Hinge Joint: A hinge joint (also called a ginglymus joint) is a synovial joint in which the articular surfaces fit one another in a way that is analogous to the hinge of a door. Generally, these joints permit motion in one plane. Examples include the elbow, the knee (unless considered a condyloid joint), and the interphalangeal joints.

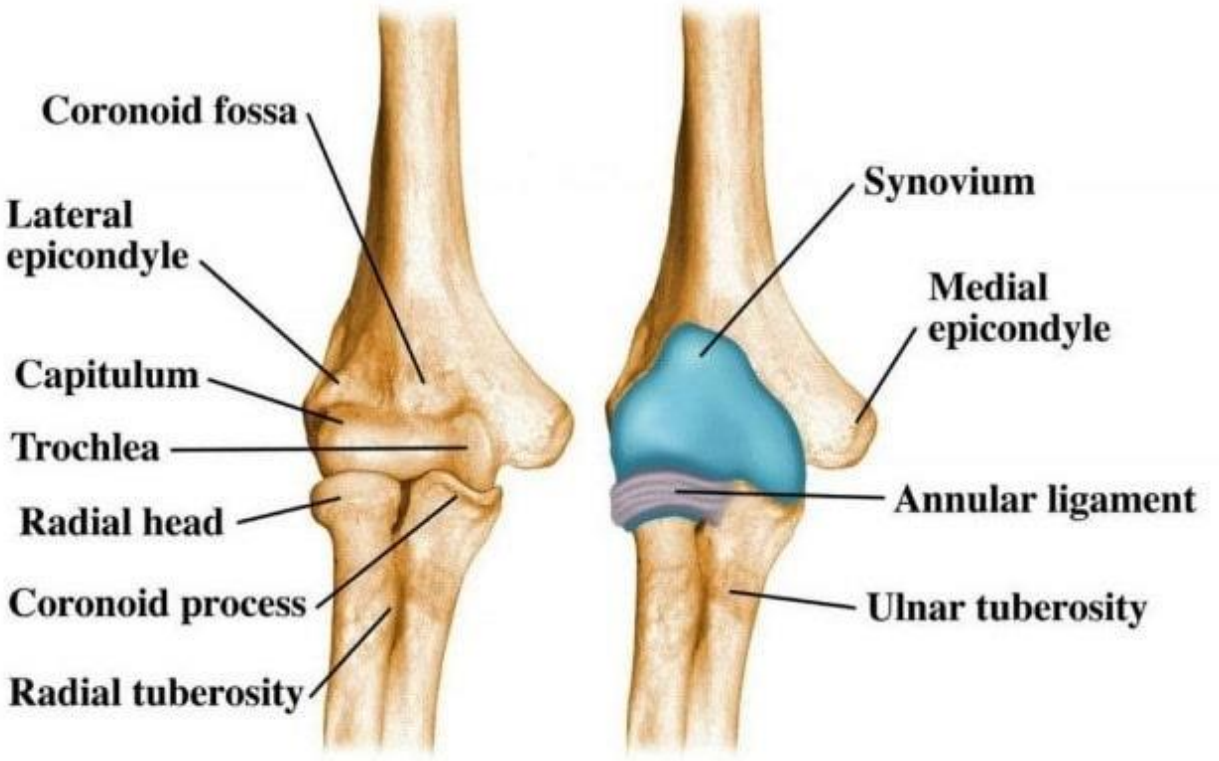
- Note: These joints primarily allow movement in one plane of motion, and usually the sagittal plane. These motions can be described as flexion and extension.

Examples of Hinge Joints of the Human Body:

Here is a list of the joints in the human body that are classified as "hinge joints":

1. **Elbow Joint** (Humeroulnar Joint): Articulation between the humerus and ulna.
2. **Knee Joint (Tibiofemoral Joint)** : Articulation between the femur and tibia.
3. **Ankle Joint (Talocrural Joint)** : Articulation between the tibia, fibula, and talus.
4. **Interphalangeal Joints** (Fingers and Toes): Articulations between the phalanges in both the fingers and toes. This includes: proximal interphalangeal (PIP) joints, distal interphalangeal (DIP) joints, and interphalangeal joint of the thumb
5. **Temporomandibular Joint (TMJ): A**rticulation between the mandible (lower jawbone) and the temporal bone of the skull

Elbow



Knee

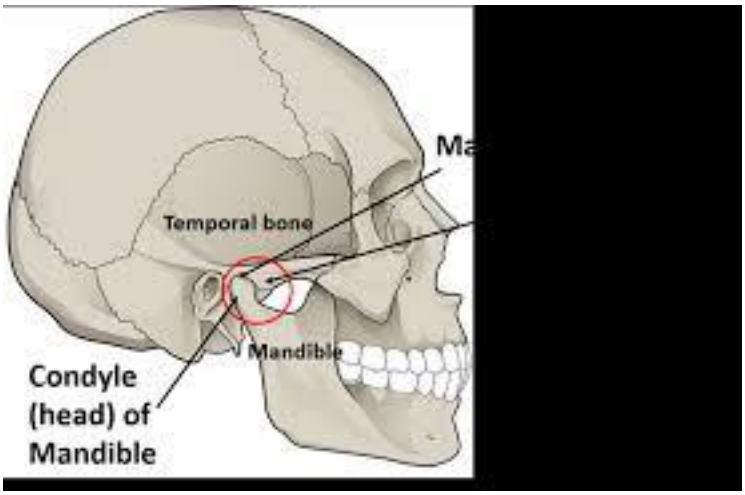

Anterior cruciate ligament
Posterior cruciate ligament
Lateral condyle
Medial condyle
Fibular (lateral) collateral ligament
Tibial (medial) collateral ligament
Lateral meniscus
Medial meniscus
Biceps femoris tendon
Transverse ligament
Tibia
Fibula
Patellar ligament
Knee Joint Anatomy

Ankle


The Ankle Joint of the Right Foot
Tibia
Fibula
Talus
Calcaneus
Metatarsal V
Lateral (outside) view
Anterior (front) view

Interphalangeal

Temporomandibular



Name 10 more poses with Sanskrit name if you prefer that effect the hinge joints:

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- **Pivot Joints** (Neck)
  - *Pose: Parivrtta Trikonasana* (Revolved Triangle Pose) - Enhances spinal rotation.

Pivot Joint

Pivot Joint: A pivot joint (also called a trochoid joint, rotary joint, or lateral ginglymus joint) is a type of synovial joint in which the cylinder of one bone fits into a corresponding cavity,

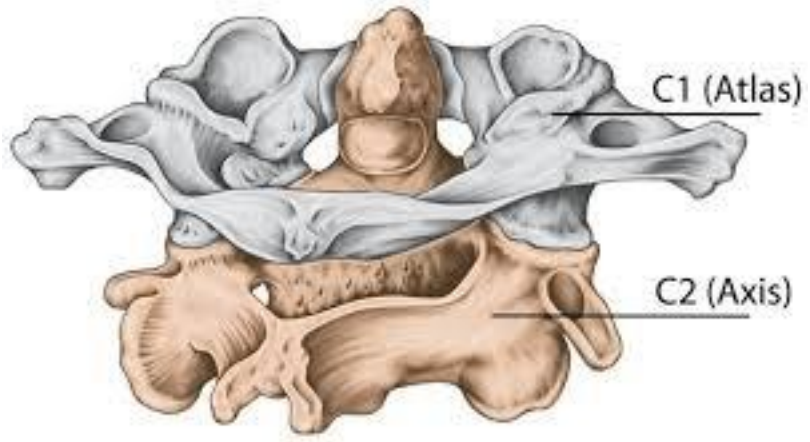
allowing for rotational motion. Examples include the articulation between the first and second cervical vertebrae (c1/c2 a.k.a. atlas/axis) and the proximal radioulnar joint.

- Note: These joints primarily allow movement in one plane of motion, and usually the transverse plane. These motions can be described as rotation (ipsilateral rotation and contralateral rotation).

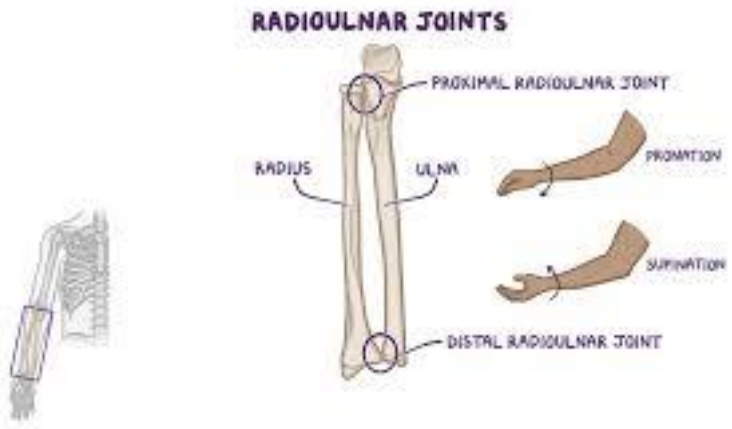
Examples of Hinge Joints of the Human Body:

Here is a list of the joints in the human body that are classified as "hinge joints":

1. **Atlantoaxial Joint (C1-C2 Joint)**: This joint is the junction of the first and second cervical vertebrae (i.e., atlas and axis). It allows the head to rotate from side to side, such as when shaking your head to indicate "no."

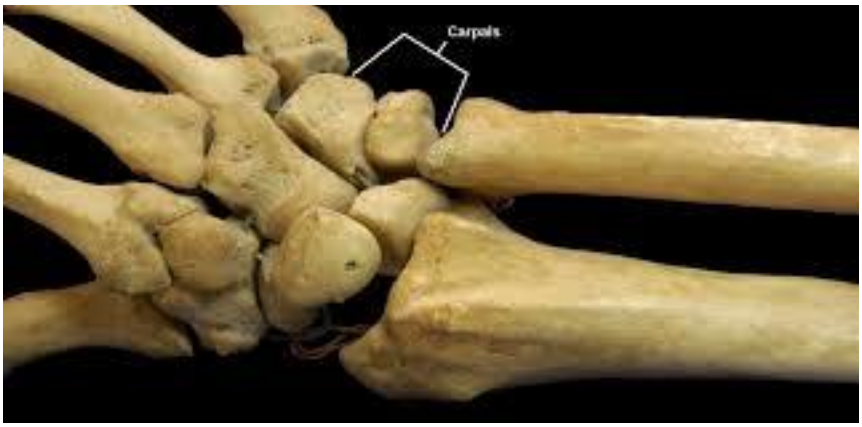


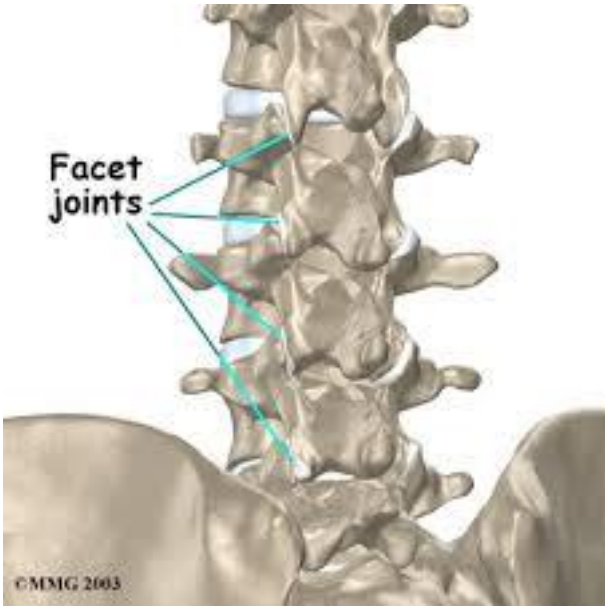
2. **Radioulnar Joint**: This joint is found near the elbow, between the head of the radius and the radial notch of the ulna. It allows the forearm to rotate, enabling movements such as turning the palm up (supination) and down (pronation).



Gliding Joint

Gliding Joint: A gliding joint (also called an arthrodial joint, plane joint, or plane articulation) is a synovial joint that allows only gliding movement in the plane of the articular surfaces. The opposed surfaces of the bones are flat or almost flat, with movement generally limited by tight capsules and ligaments. Gliding joints are numerous, are most often small, and allow very little motion. Examples include the carpal joints of the wrist, the tarsal joints of the ankle, and the facet joints of the spine.





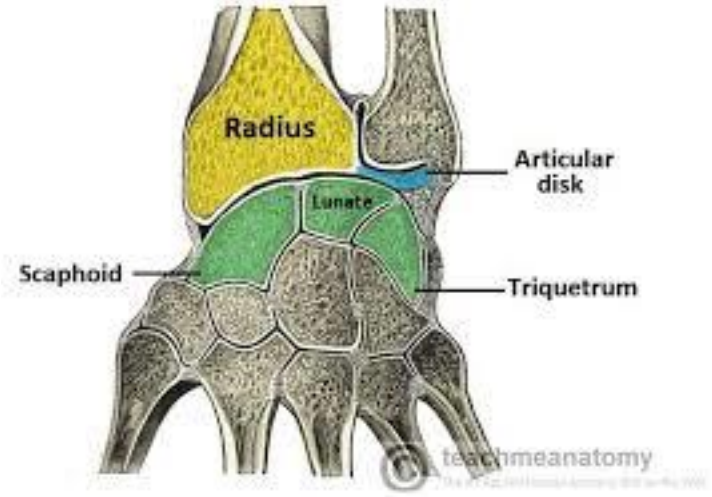
Condyloid Joint: A condyloid joint (also called condylar, bicondylar, ellipsoid, or ellipsoidal) is an ovoid articular surface, or condyle, that is received into an elliptical cavity. These joints permit movement in two planes. Examples include the knee, metacarpophalangeal joints, and metatarsophalangeal joints.

- Note: These joints primarily allow movement in two planes of motion, usually the sagittal plane and the frontal plane. These motions include flexion/extension and abduction/adduction.

Examples of Condyloid Joints of the Human Body:

Condyloid joints, also known as ellipsoidal joints, allow movement in two planes: flexion/extension and abduction/adduction. Here are the main condyloid joints in the human body:

1. **Wrist Joint (Radiocarpal Joint):** The articulation between the distal end of the radius and the proximal row of carpal bones. This joint allows for flexion, extension, radial deviation (abduction), and ulnar deviation (adduction).

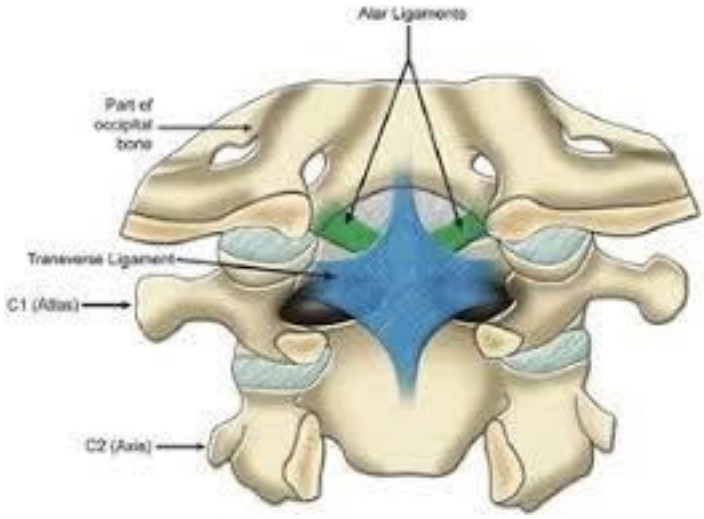


2. **Metacarpophalangeal Joints (MCP Joints):** The articulation between the metacarpal bones (long bones of the palm) and the proximal phalanges of the fingers. These joints allow for flexion, extension, abduction, and adduction of the fingers.

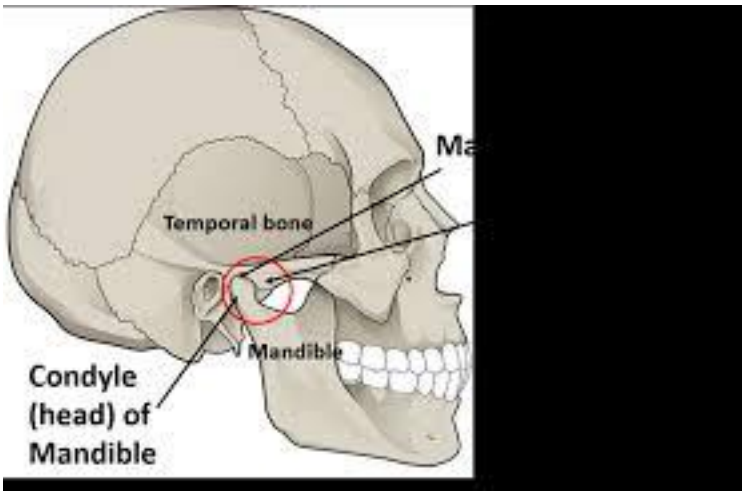
3. **Metatarsophalangeal Joints (MTP Joints):** The articulation between the metatarsal bones (long bones of the foot) and the proximal phalanges of the toes. These joints allow for mostly flexion and extension but also permit some abduction and adduction.

Other joints that may be considered condyloid joints in some texts include the atlanto-occipital Joint (C1, C2), temporomandibular joint, and the tibiofemoral joint (knee).

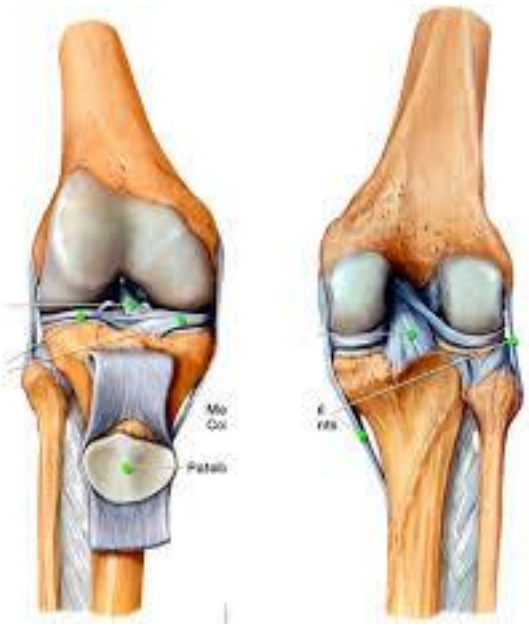
Atlanto-occipital



Temporomandibular



Tibiofemoral



Saddle Joint

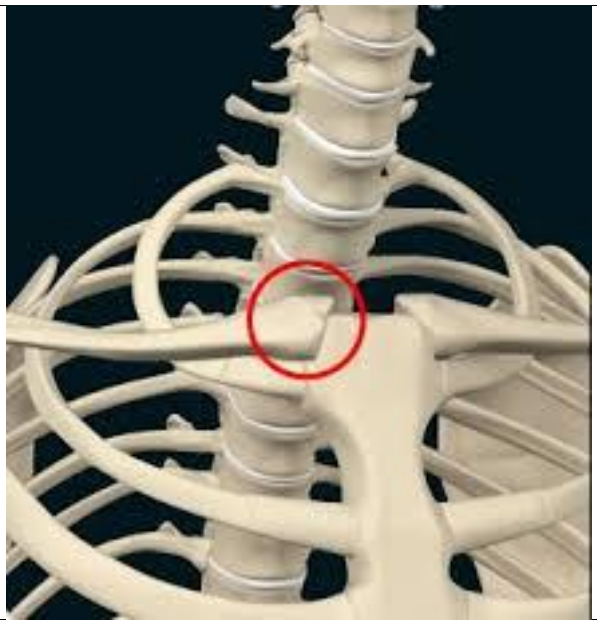
Saddle Joint: In a saddle joint (also called a sellar joint or articulation by reciprocal reception), the opposing surfaces are reciprocally concave-convex, allowing for motion in 2 planes. Motion is like how a horseback rider can move in a saddle. Examples include the trapeziometacarpal (TMC) joint of the thumb (1st carpometacarpal joint) and the sternoclavicular (SC) joint.

- Note: These joints allow movement primarily in two planes of motion, including flexion/extension and abduction/adduction of the thumb, and elevation/depression and protraction/retraction of the SC joint.

Examples of Saddle Joints of the Human Body:

- **Carpometacarpal joint of the thumb (CMC joint):** This joint is located between the trapezium bone (carpal bone of the wrist) and the first metacarpal bone (1st long bone) of the thumb. It allows the thumb to perform opposition, which is the movement that enables the thumb to touch the tips of the other fingers, facilitating grasping and manipulating objects.

- **Sternoclavicular joint:** This is the joint between the sternum (breastbone) and the clavicle (collarbone). It is the only true bony attachment between the shoulder girdle and shoulder joint, and the upper body. It allows for elevation, depression, protraction, retraction, and some rotation, which is important for facilitating the motion of the scapula.



Name 10 more poses with Sanskrit name if you prefer that effect the pivot, gliding, condyloid and saddle joints:

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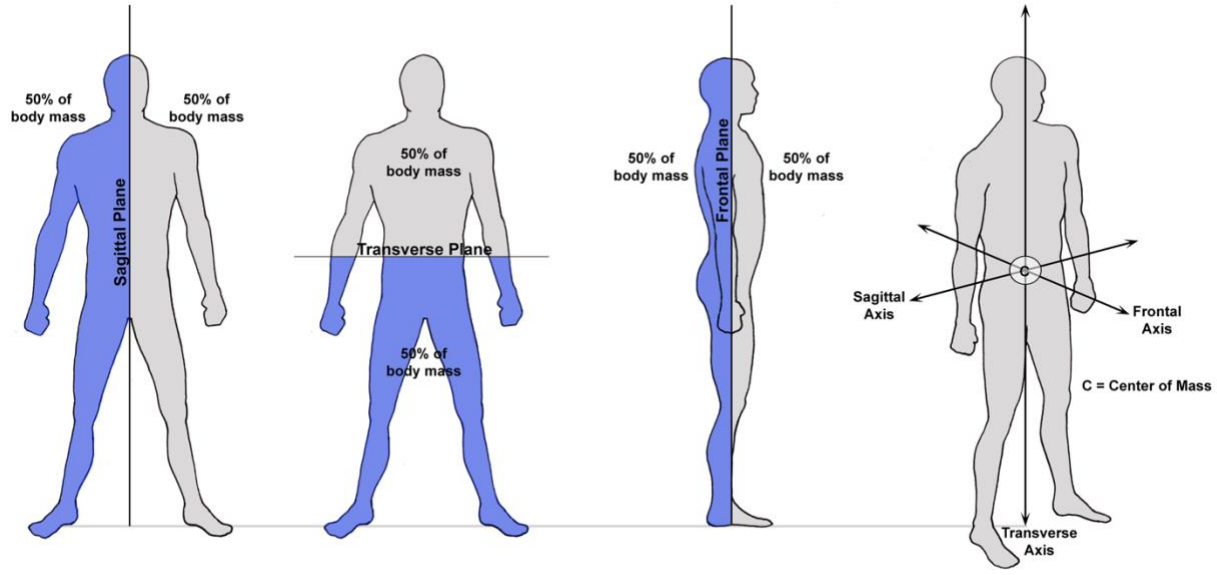
Chapter 7: Anatomical Terms and Directions

Terms to Describe Position:

- **Anterior (Ventral):** Front side.
- **Posterior (Dorsal):** Back side.
- **Superior:** Above.
- **Inferior:** Below.
- **Medial:** Toward the midline.
- **Lateral:** Away from the midline.



Name 5 poses that effect the anterior of the body:

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5.

Name 5 poses that effect the posterior of the body:

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5.

Name 5 poses that effect the superior of the body:

1.

2.

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5.

Name 5 poses that effect the inferior of the body:

1.

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Name 5 poses that move on the sagittal plane of the body:

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2.

3.

4.

5.

Name 5 poses that move on the transverse plane of the body:

1.

2.

3.

4.

5.

Name 5 poses that move on the frontal plane of the body:

1.

2.

3.

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Notes:

Chapter 8: Practice Exercises and Quizzes

Write a class that is heavy in sagittal plane movement

Write a class that is heavy in transverse plane movement

Write a class that is heavy in frontal plane movement

Chapter 9: Benefits of Yoga for Bone Health

Yoga supports bone health by:

- **Improving Posture:** Aligns the spine and strengthens core muscles.
- **Increasing Flexibility:** Enhances joint mobility and reduces stiffness.
- **Building Strength:** Weight-bearing poses stimulate bone growth.
- **Reducing Stress:** Lowers cortisol, which can weaken bones over time.
- **Enhancing Circulation:** Improves nutrient delivery to bones.
- **Supporting Balance:** Reduces fall risk, especially in older adults.

The Benefits of Yoga for Bone Health

Yoga has been widely recognized as an effective practice for improving bone health by promoting strength, flexibility, and balance. The gentle weight-bearing nature of yoga poses helps to stimulate bone growth and density. Studies, such as one published in *Topics in Geriatric Rehabilitation* in 2016, demonstrate that consistent yoga practice can improve bone density, particularly in the spine and femur, areas often prone to fractures in osteoporosis. By challenging the body to maintain poses that apply gentle stress to bones, yoga encourages the natural process of bone remodeling, promoting stronger and healthier bones over time.

In addition to enhancing bone density, yoga reduces the risk of falls and fractures by improving balance and proprioception. Research from the *Journal of Alternative and Complementary Medicine* highlights that yoga practitioners exhibit greater balance and stability compared to non-practitioners. Poses such as *Tree Pose* (Vrikshasana) and *Warrior II* (Virabhadrasana II) challenge stability, strengthening both muscles and bones while improving coordination, which is crucial for fall prevention in older adults.

Yoga also supports joint health, which indirectly benefits bones by enhancing mobility and reducing stiffness. Postures like *Cat-Cow* (Marjaryasana-Bitilasana) promote synovial fluid circulation, lubricating joints and protecting cartilage. Improved joint health reduces strain on bones, minimizing wear and tear that could lead to degenerative conditions such as osteoarthritis. Furthermore, yoga's ability to reduce inflammation through stress management and improved circulation also plays a role in preserving bone and joint health.

Hormonal balance achieved through yoga practices can further benefit bone health by regulating calcium metabolism and bone remodeling. Stress reduction through meditation and breathing exercises has been shown to lower cortisol levels, which, when elevated, can lead to bone loss. A 2015 study published in *Osteoporosis International* found that yoga practitioners had lower levels of stress hormones, which may contribute to stronger bones by reducing the impact of stress-induced bone resorption.

Finally, yoga promotes mental and emotional well-being, which is essential for maintaining motivation and consistency in health practices. Combining mindfulness with physical movement

encourages greater awareness of posture and alignment, preventing habits that could lead to bone injuries. With its holistic approach, yoga not only strengthens the body but also nurtures a mindset conducive to long-term health and vitality. These combined benefits make yoga an accessible and effective tool for improving and maintaining bone health at any age.

Would you consider any specific poses if you were planning a class for bone health?

Write a class, consider holds, moves and stretches for a complete class.

Chapter 10: Glossary

- **Femur:** Thigh bone, the longest bone in the body.
- **Phalanges:** Bones of the fingers and toes.
- **Suture:** Immovable joint in the skull.

Notes: