

## Unit E: Skeletal System

**Program Area:** Health Occupations Education

**Course Title:** Medical Sciences I

**Number:** 7221

**Unit Title:** Skeletal System

**Suggested  
Time for**

**Instruction:** 5 class periods (90 minute classes)  
10 class periods (55 minute classes)

**Course Percent:** 5%

**Unit Evaluation:** 100% Cognitive

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**Competency:** MD05.Analyze the anatomy and physiology of the skeleton.

**Specific Objectives:**

- MD05.01 Describe the structure of the bones.
- MD05.02 Analyze the function of the skeletal system.
- MD05.03 Analyze characteristics and treatment of common skeletal disorders.

# Unit E Master Outline

## E. Skeletal System

### MD05.01 Explain the structure of the bones.

- A. Structure of long bones
  - 1. Osteocytes
  - 2. Fontanel
  - 3. Structure
    - a. Diaphysis (compact bone)
    - b. Epiphysis
    - c. Medullary canal
    - d. Endosteum
    - e. Spongy bone
    - f. Periosteum
    - g. Articular cartilage
- B. Parts of the skeleton
  - 1. Axial skeleton
    - a. Skull
      - i. Parietal
      - ii. Frontal
      - iii. Occipital
      - iv. Temporal
      - v. Nasal bone
      - vi. Zygomatic arch
      - vii. Infraorbital foramen
      - viii. Mental foramen
      - ix. Mandible
      - x. Maxilla
      - xi. Vomer
      - xii. Mastoid process
      - xiii. Styloid process
      - xiv. External auditory meatus
      - xv. Suture
    - b. Spinal column/vertebra
      - i. Cervical vertebrae
      - ii. Thoracic vertebrae
      - iii. Lumbar vertebrae
      - iv. Sacrum
      - v. Coccyx
    - c. Ribs and sternum
      - i. Xiphoid process
  - 2. Appendicular skeleton
    - a. Clavicle and scapula
    - b. Humerus, radius and ulna
    - c. Carpals, metacarpals and phalanges
      - i. Thumb
      - ii. First through fourth digits
    - d. Pelvis
      - i. Ilium
      - ii. Ischium
      - iii. Pubis

- e. Femur, patella, tibia and fibula
  - f. Tarsals, metatarsals, phalanges
  - g. Calcaneus
- C. Joints
- 1. Ball and socket joints
  - 2. Hinge joints
  - 3. Pivot joints
  - 4. Gliding joints
  - 5. Suture

**MD05.02 Analyze the function of the skeletal system.**

- A. Supports
- B. Protects internal organs
- C. Movement and anchorage
  - 1. Abduction and adduction
  - 2. Circumduction and rotation
  - 3. Flexion and extension
  - 4. Pronation and supination
- D. Mineral storage (calcium and phosphorus)
- E. Hemopoiesis
  - 1. White blood cells made in yellow marrow
  - 2. Red blood cells made in red marrow
- F. Bone formation
  - 1. Embryo skeleton starts as osteoblasts, then change to cartilage
  - 2. Ossification (bone replaces cartilage) starts at 8 weeks
  - 3. Fontanel – soft spot on baby’s head
  - 4. Periosteum – tough covering of long bones, contains blood vessels, lymph vessels and nerves
- G. Vertebral column
  - 1. Encloses spinal cord
  - 2. Separated by pads of cartilage = intervertebral discs
- H. Bones
  - 1. 12 pairs of ribs = 7 true, 3 false, 2 floating
  - 2. Femur is longest and strongest bone in body
- I. Joints
  - 1. Synovial fluid - lubrication
  - 2. Types of joints
    - a. Ball and socket joints – ball-shaped head, examp. Hip and shoulder
    - b. Hinge joints – move in one direction or plane, examp. Knees, elbows, outer joints of fingers
    - c. Pivot joints – rotate on a 2<sup>nd</sup>, arch-shaped bone, examp. radius and ulna
    - d. Gliding joints – flat surfaces glide across each other, examp. vertebrae
    - e. Suture – immovable joint in skull

## MD05.03

### Discuss characteristics and treatment of common skeletal disorders.

- A. Trauma
  - 1. Fracture – any break in a bone
    - a. Greenstick fracture – common in children, bone bent and splintered but never completely separates
    - b. Comminuted fracture – splintered or broken into many pieces
    - c. Compound fracture (open fracture) broken bones pierce skin, can lead to infection
    - d. Simple fracture (closed fracture) bone broken, broken ends do not break the skin
    - e. Spiral fracture – bone twists, resulting in one or more breaks
    - f. Closed reduction – cast or splint
    - g. Open reduction/internal fixation – surgical intervention with devices such as wires, metal plates or screws to hold the bones in alignment
    - c. Traction – pulling force used to hold the bones in place, used for fractures of long bones
  - 2. Sprain – sudden or unusual motion, ligaments torn
  - 3. Strain – overstretching or tearing of muscle
  - 4. Dislocation – bone displaced from proper position in joint
  - 5. Whiplash – trauma to the cervical vertebra, usually from a car accident
- B. Arthritis – inflammation of one or more joints
  - 1. Rheumatoid – chronic, autoimmune disease, joint becomes swollen and painful, joint deformities common
  - 2. Osteoarthritis – degenerative, occurs with aging, joints become large and painful, Rx with medications
- C. Spinal defects – abnormal curvature
  - 1. Kyphosis - hunchback
  - 2. Lordosis - swayback
  - 3. Scoliosis – lateral curvature
- D. Bursitis – inflammation of bursa (joint sacs)
- E. Herniated disk
  - 1. Intervertebral disk ruptures or protrudes, putting pressure on spinal nerve, usually lumbo-sacral
  - 2. Treat with bedrest, traction and surgery
- F. Osteomyelitis – bone infection
- G. Osteoporosis
  - 1. 80% affected are women
  - 2. Loss of bone mass leading to thin, porous bones that are prone to fracture
  - 3. On x-ray, looks like swiss cheese
  - 4. Prevented by dietary calcium
- H. Rickets
  - 1. Found in children
  - 2. Caused by lack of vitamin D
  - 3. Bones become soft
  - 4. Rx with calcium, vitamin D and sunshine
- I. Gout – uric acid deposited in joint cavity, mostly the great toe in men

J. Treatment and diagnosis

1. Bone marrow aspiration – removal of bone marrow sample with a needle for diagnostic purposes
2. Arthroscopy – examination of joint using arthroscope with fiber optic lens, most knee injuries treated with arthroscopy
3. Radiography – x-ray of bones

**Unit E:    Skeletal System**

**Competency MD05:                    Analyze the anatomy and physiology of the skeleton.**

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***Materials/Resources***

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Scott, Ann Senisi and Elizabeth Fong. Body Structures & Functions. Delmar Publishers, Current Edition. [www.DelmarAlliedHealth.com](http://www.DelmarAlliedHealth.com)

National HOSA Handbook: Section B. Published by HOSA, Flower Mound, Texas. Current Edition. [www.hosa.org](http://www.hosa.org)

Simmers, Louise. Diversified Health Occupations. Delmar Publishers, latest edition, [www.delmar.com/delmar.html](http://www.delmar.com/delmar.html)

**Teaching/Learning Indicators:** *The following letters are used to indicate specific skills/areas required in the instructional activity.*

<b>R</b>	Reading	<b>SS</b>	Social Studies
<b>W</b>	Writing	<b>S</b>	Science
<b>M</b>	Math	<b>A</b>	The Arts
<b>H</b>	Health professional/parent/community involvement		

## Objective MD05.01

## Describe the structure of the bones.

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### **Teaching/Learning Activities**

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- **Cognitive S**

Using a classroom skeleton or anatomical chart, review the anatomy of the bones.

Given a drawing of the skeleton, (see Body Structures and Functions) or from the appendix of this guide (*Appendix MD05.01C*) have students label the bones and skull; and the long bone, using the “Skeletal Anatomy” list. (*Appendix MD05.01B and MD05.01D*)

- **Critical Thinking S, H**

Have students look at X-rays and name the bones that appear on the X-ray. Students must apply prior learning in order to identify the X-rays. You may also ask “Is it normal?” to see if students can pick out the fractures and pathology of abnormal films.

Obtain discarded x-rays from doctors’ offices, clinics, and hospitals. Using an overhead projector, x-rays can be treated as transparencies. X-rays can be used to view bone structure as well as a diagnostic tool. (Hospitals, etc. purge their x-rays files periodically. Check to see when your health care agencies purge, in order to get films.)

- **Teamwork S, A**

Working in pairs, have students assemble and label a model skeleton. This may be done using materials chosen by the students. (Teacher may decide or may encourage student creativity.) This makes a good room decoration at Halloween.

- **Critical Thinking S, A**

Using a roll of newsprint, cut the paper the length of students. Working in pairs or small groups, have the students trace the body outline of a classmate. Have the students draw in the skeleton and label it. These skeletons can be saved and additional body systems added as the year progresses.

## Objective MD05.01 Describe the structure of the bones.

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### ***Teaching/Learning Activities (Continued)***

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- **Cognitive S**  
Simon Says: Review for a test with “Simon Says.” Teacher: Simon Says:  
Touch your patella.
- **Critical Thinking S, H**  
Have students examine a bone. Obtain bones from a butcher shop or grocery store. Examine and discuss bone marrow, cartilage, ligaments, periosteum, etc. For variety, get different types of bones and cuts.
- **HOSA S**  
Have students participate in a simulation of the Medical Spelling event using the Terminology lists provided for this unit of instruction.
- **Critical Thinking S**  
Have students take the “Critical Thinking Quiz – The Skeletal System.” (*Appendix MD05.01D*) Grade the quizzes in class, and call on students to explain the relationship among the three correct answers.
- **Special Needs**  
Each student will reach the highest level of mastery in the least restrictive environment as recommended in the student’s IEP.



## Objective MD05.02

## Analyze the functions of the skeletal system.

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### ***Teaching/Learning Activities***

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- **Critical Thinking** S, R, A

Have students read the text section on “Joints and Related Structures.” (Body Structures and Functions)

Given what was learned from the text, have students construct a joint to demonstrate movement. Students may use materials of choice. Suggested materials: door hinge, wooden blocks, ball, cup, wooden spools, rubber bands, nails.

Students should share their “joint” with the class, explaining the type of movement, and where their joint would be found in the body.

- **Technology** S

Using the CD ROM which accompanies the textbook (Body Structures and Functions), allow students time to explore functions of the skeletal system. Multiple choice questions, as well as fun games are available (concentration, hangman, etc.)

- **HOSA** S, A

Using HOSA guidelines for Extemporaneous Writing, have the student write a paper entitled “How Your Bones Protect Your Body.”

- **Critical Thinking** S

Bones as storage units: Remove the skin, muscle, etc. from an uncooked chicken leg. Place the bone in a container that has an air tight seal. Cover the bone with white vinegar. Cover and refrigerate for a couple of days. Observe the color change of the vinegar as nutrients are withdrawn from the bone. Examine the bone. It becomes very soft as the nutrients are removed.

- **Cognitive** S

Have students quiz each other on the types of motion: flexion, extension, abduction, adduction, circumduction, rotation, pronation, and supination.

- **Special Needs**

Each student will reach the highest level of mastery in the least restrictive environment as recommended in the student’s IEP.

## Objective MD05.03

## Analyze characteristics and treatment of common skeletal disorders.

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### **Teaching/Learning Activities**

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- **Cognitive S**

Using the matching worksheet in the appendix, match the common fracture types with treatments. (*Appendix MD05.03A*)

- **Critical Thinking S, A**

Have students apply a cast using real plaster cast materials: Using small branches from trees to make fractures, have students realign the ends and fragments, and apply a cast. Students will realize importance of immobility in the healing of a fracture.

- **Employability H**

Arrange for a radiologic technologist to talk to the class regarding x ray procedures used to diagnose fractures. In addition, ask the technologist to bring films that show kyphosis, lordosis, and scoliosis, as well as a normal spine – to explain/contrast the differences.

Arrange for a physical therapist to talk to the class regarding rehabilitation of skeletal injuries and defects.

- **Technology S, R**

Have students do an Internet search on the disorders “arthritis” and “osteoporosis.” The goal will be to fill out a summary chart comparing the two disorders. (*Appendix 005.03B*)

- **HOSA S, R**

Have students participate in a Biomedical Debate on the topic “Osteoporosis vs. Arthritis.” One group should argue that Osteoporosis is worse, and the other that Arthritis is worse. Teams may use data from the Internet search in the preceding activity.

- **HOSA S, A**

Singularly or in pairs, assign students a topic related to the characteristics and treatment of skeletal disorders. Using the Extemporaneous Health Poster guidelines, have students create a poster illustrating the key points of the assigned topic.

Have students share their posters in class, explaining/teaching their topic to the rest of the class.

Suggested topics: Use the terminology list for “Disorders and Related Terminology.” There are 28 terms listed. Combine like terms as necessary to make sure that all terms are addressed in the posters.

- **Special Needs**

Each student will reach the highest level of mastery in the least restrictive environment as recommended in the student’s IEP.

## Daily Lesson Plans

### Unit E: Skeletal System

Lessons: 5

Hours: 7 ½ clock hours

Steps	Lesson #1	Lesson #2	Lesson #3
<b>Focus and Review</b>	Review medical terminology from Unit A that pertains to the Skeletal System.	Play skeletal "Simon Says."	Have students demonstrate their joint. See if the class can determine the type of joint, and give an example.
<b>Statement of Objectives</b>	MD05.01 Describe the structure of the bones.	MD05.02 Analyze the function of the skeletal system.	MD05.03 Analyze characteristics and treatment of common skeletal disorders.
<b>Teacher Input</b>	Using a classroom skeleton and anatomy overheads (E.24-E.26), review the anatomy of the skeletal system.  Use x-rays as overheads to show how bones appear on x-rays.	Using the overheads, discuss the function of the skeletal system.	Using the overheads, briefly introduce students to common skeletal disorders.  Assign the Health Poster activity, assigning topics for students to research and illustrate.
<b>Guided Practice</b>	In groups of 3-4, have students trace the outline of a classmate on a long sheet of newsprint, and then let the teams draw in the bones.	Go to the school's computer lab and, using the CD ROM that came with the <i>Body Structures and Functions</i> textbook, have students complete the "Structure of the Skeletal System" activities.	Allow students time to research their topic using classroom or Internet resources, and create a plan for their poster.
<b>Independent Practice</b>	Homework - Using the skeletal anatomy list (MD05.01B) label the parts of the skeleton (MD05.01C) and the skull (MD05.01D).	Homework: Create a joint. The more creative, the better. Use any type of material. May work independently or in pairs.	Complete the health poster as assigned on posterboard.  Prepare to describe the poster in class.
<b>Closure</b>	Give a 10-question skeletal anatomy spelling quiz. Give one bonus point for on the unit test for all students who spell all 10 terms correctly.	Review types of motion by explaining an activity and having students identify the motion. Examples: 1. Miss America wave. 2. Kicking a ball.	Remind students of homework assignment, and that they will be graded on their poster using the HOSA EHP rating sheet.
<b>Materials</b>	Skeleton Skeletal system overheads X-rays of bones Newsprint Handouts for homework	Computer Lab <i>Body Structures and Functions</i> CD ROM Handouts	Overheads EHP rating sheets

**Unit E: Skeletal System (Continued)**

<b>Steps</b>	<b>Lesson #4</b>	<b>Lesson #5</b>	
<b>Focus and Review</b>	* Poster presentations	Answer student questions before the test.	
<b>Statement of Objectives</b>	MD05.03 Analyze characteristics and treatment of common skeletal disorders.	MD05.03 Analyze characteristics and treatment of common skeletal disorders.	
<b>Teacher Input</b>	<p>Allow students to review and teach the objective through the sharing and explanation of assigned posters. Class members should take notes on the poster content as they are presented.</p> <p>Teacher should assure that key points of each disorder/treatment are addressed on the student presentations.</p> <p>Posters should be put up around the classroom for students to see. They should be taken down immediately before the test.</p>	TEST – Skeletal System	
<b>Guided Practice</b>	Test review: In pairs – take the Critical Thinking quiz – The Skeletal System.	<p>Take unit test.</p> <p>Grade test in class.</p>	
<b>Independent Practice</b>	Study for test.	Have students look up the answers to the questions they got wrong and turn in their corrected test.	
<b>Closure</b>	<p>Discuss answers to Critical Thinking quiz in class.</p> <p>Review important points from each disease poster.</p>	<p>Introduce the next unit.</p> <p>Make a reading assignment.</p> <p>Use remaining class time for HOSA business/update.</p>	
<b>Materials</b>	Handouts – Critical Thinking Quiz	<p>Test and key.</p> <p>Green pens for grading tests.</p>	

## Unit E: Skeletal System Terminology List\*

- |                          |                     |
|--------------------------|---------------------|
| 1. abduction             | 16. hemopoiesis     |
| 2. adduction             | 17. hinge joint     |
| 3. appendicular skeleton | 18. joint           |
| 4. axial skeleton        | 19. medullary canal |
| 5. ball and socket joint | 20. ossification    |
| 6. bursa                 | 21. osteocyte       |
| 7. circumduction         | 22. periosteum      |
| 8. compact bone          | 23. pivot joint     |
| 9. diaphysis             | 24. pronation       |
| 10. endosteum            | 25. rotation        |
| 11. epiphysis            | 26. spongy bone     |
| 12. extension            | 27. supination      |
| 13. flexion              | 28. suture          |
| 14. fontanel             | 29. synovial fluid  |
| 15. gliding joint        |                     |

\* See also – Skeletal Anatomy terminology

### Disorders and Related Terminology

- |  |                                      |
|--|--------------------------------------|
| 1. arthritis (rheumatoid and osteoarthritis) | 13. lordosis                         |
| 2. arthroscopy                               | 14. open reduction/internal fixation |
| 3. bone marrow aspiration                    | 15. osteomyelitis                    |
| 4. bursitis                                  | 16. osteoporosis                     |
| 5. closed reduction                          | 17. radiography                      |
| 6. comminuted fracture                       | 18. rickets                          |
| 7. compound fracture                         | 19. scoliosis                        |
| 8. dislocation                               | 20. simple fracture                  |
| 9. gout                                      | 21. spiral fracture                  |
| 10. greenstick fracture                      | 22. sprain                           |
| 11. herniated disk                           | 23. strain                           |
| 12. kyphosis                                 | 24. traction                         |
|  | 25. whiplash                         |

*Appendix MD05.01A*

## Skeletal Anatomy - Terminology

You will be required to identify the following bones on a diagram of the skeleton:

- |                        |                  |
|------------------------|------------------|
| 1. skull               | 17. pubis        |
| 2. cervical vertebrae  | 18. carpals      |
| 3. clavicle            | 19. metacarpals  |
| 4. scapula             | 20. thumb        |
| 5. sternum             | 21. first digit  |
| 6. xiphoid process     | 22. second digit |
| 7. humerus             | 23. third digit  |
| 8. ribs                | 24. fourth digit |
| 9. radius              | 25. femur        |
| 10. ulna               | 26. patella      |
| 11. thoracic vertebrae | 27. tibia        |
| 12. lumbar vertebrae   | 28. fibula       |
| 13. sacrum             | 29. tarsals      |
| 14. coccyx             | 30. metatarsals  |
| 15. ilium              | 31. phalanges    |
| 16. ischium            | 32. calcaneus    |

You will be required to identify the following parts of the skull:

- |                         |                              |
|-------------------------|------------------------------|
| 1. parietal             | 9. mandible                  |
| 2. frontal              | 10. maxilla                  |
| 3. occipital            | 11. vomer                    |
| 4. temporal             | 12. mastoid process          |
| 5. nasal bone           | 13. styloid process          |
| 6. zygomatic arch       | 14. external auditory meatus |
| 7. infraorbital foramen | 15. suture                   |
| 8. mental foramen       |                              |

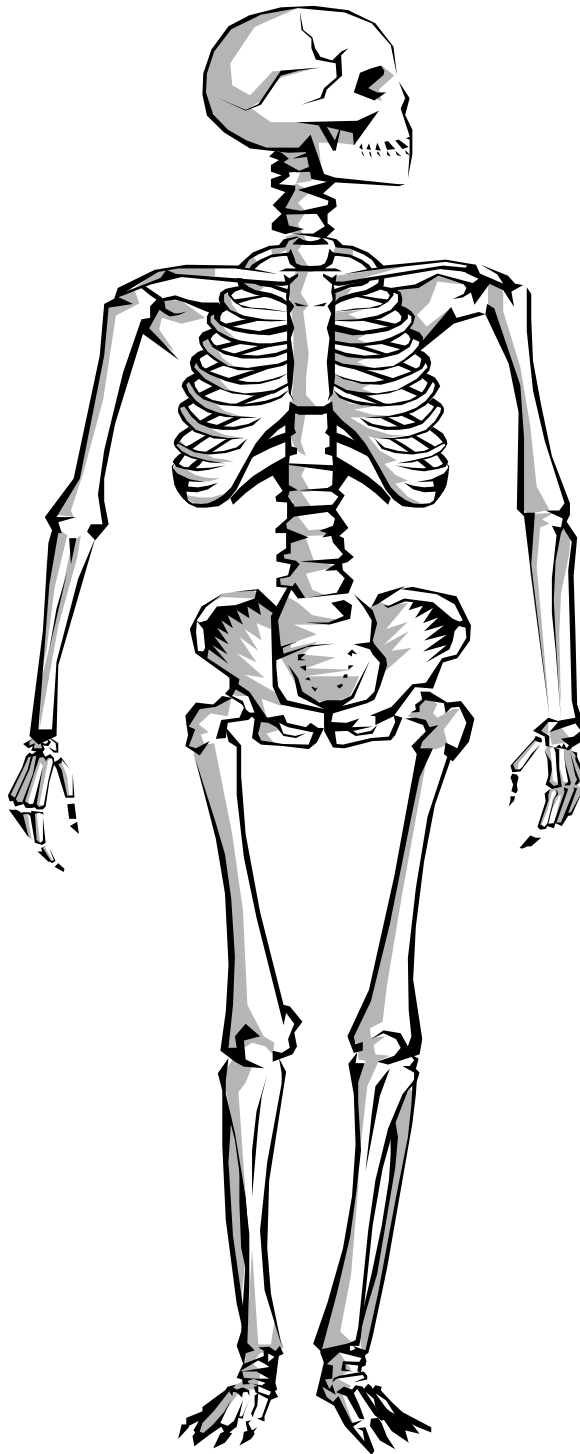
You will be required to label the following parts of the long bone:

- |                 |                        |
|-----------------|------------------------|
| 1. epiphyses    | 6. yellow marrow       |
| 2. diaphysis    | 7. periosteum          |
| 3. red marrow   | 8. articular cartilage |
| 4. spongy bone  | 9. medullary canal     |
| 5. compact bone |                        |

Name \_\_\_\_\_

Date \_\_\_\_\_

## The Skeleton

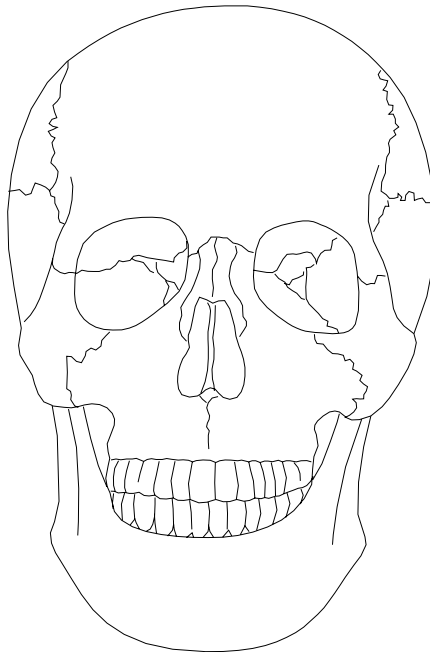
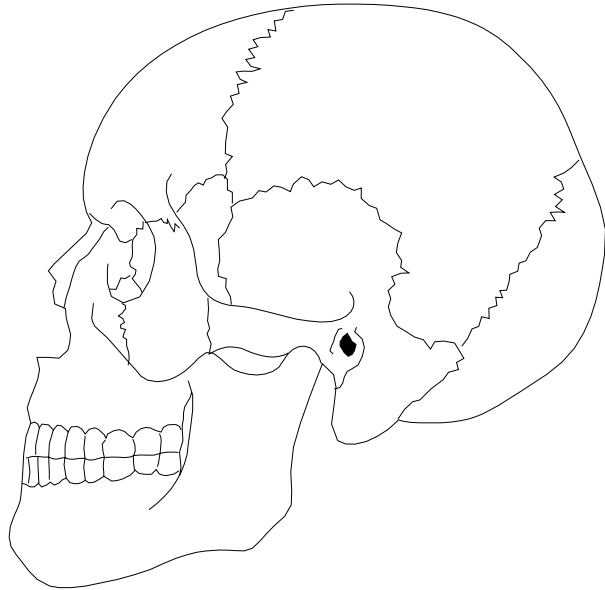


*Appendix MD05.01C*

## The Skull

Label and color the following parts of the skull:

parietal  
frontal  
occipital  
temporal  
nasal bone  
zygomatic arch  
infraorbital foramen  
mental foramen  
mandible  
maxilla  
vomer  
mastoid process  
styloid process  
external auditory meatus  
suture



*Appendix MD05.01D*



## Critical Thinking Quiz – The Skeletal System

Circle the term that does not belong with the other three.

1. tibia                      ulna                      fibula                      femur
2. skull                      rib cage                      pelvis                      vertebral column
3. mandible                      frontal bone                      temporal bone                      occipital bone
4. ischium                      scapula                      ilium                      pubis
5. humerus                      ulna                      radius                      phalanges
6. suture                      red marrow                      spongy bone                      yellow marrow
7. calcaneus                      mandible                      scapula                      occipital
8. articular cartilage                      red marrow                      medullary cavity                      epiphysis
9. cervical                      lumbar                      thoracic                      sternum
10. maxilla                      zygomatic                      mandible                      occipital
11. mental foramen                      maxilla                      occipital                      nasal bone
12. patella                      tibia                      radius                      humerus
13. phalanges                      ribs                      xiphoid process                      vertebrae
14. coccyx                      xiphoid process                      ischium                      vomer
15. scapula                      calcaneus                      sternum                      ilium



## ANSWER KEY: Critical Thinking Quiz – The Skeletal System

Circle the term that does not belong with the other three.

- |     |                     |                 |                  |                  |
|-----|---------------------|-----------------|------------------|------------------|
| 1.  | tibia               | ulna            | fibula           | femur            |
| 2.  | skull               | rib cage        | pelvis           | vertebral column |
| 3.  | mandible            | frontal bone    | temporal bone    | occipital bone   |
| 4.  | ischium             | scapula         | ilium            | pubis            |
| 5.  | humerus             | ulna            | radius           | phalanges        |
| 6.  | suture              | red marrow      | spongy bone      | yellow marrow    |
| 7.  | calcaneus           | mandible        | scapula          | occipital        |
| 8.  | articular cartilage | red marrow      | medullary cavity | epiphysis        |
| 9.  | cervical            | lumbar          | thoracic         | sternum          |
| 10. | maxilla             | zygomatic       | mandible         | occipital        |
| 11. | mental foramen      | maxilla         | occipital        | nasal bone       |
| 12. | patella             | tibia           | radius           | humerus          |
| 13. | phalanges           | ribs            | xiphoid process  | vertebrae        |
| 14. | coccyx              | xiphoid process | ischium          | vomer            |
| 15. | scapula             | calcaneus       | sternum          | ilium            |

## Fractures Worksheet

**MATCHING:** Match common fracture types with treatments. Write the correct answer in each blank. (*An answer may be used more than once.*)

- |                        |                        |
|------------------------|------------------------|
| a. greenstick fracture | b. simple fracture     |
| c. compound fracture   | d. comminuted fracture |
| e. closed reduction    | f. open reduction      |
| g. traction            |                        |

- \_\_\_\_\_ 1. Surgical correction of a broken bone.
- \_\_\_\_\_ 2. Bone is broken completely, but ends do not penetrate the skin.
- \_\_\_\_\_ 3. Nonsurgical correction of broken bone and application of a cast.
- \_\_\_\_\_ 4. A fracture in which the bone splinters, but the break is incomplete.
- \_\_\_\_\_ 5. Bones are broken into many pieces.
- \_\_\_\_\_ 6. A fracture in which the bone ends penetrate the skin.
- \_\_\_\_\_ 7. A pulling force used to hold the bones in place.
- \_\_\_\_\_ 8.





## Answer Key: Fractures Worksheet

**MATCHING:** Match common fracture types with treatments. Write the correct answer in each blank.

- |    |                     |    |                     |
|----|---------------------|----|---------------------|
| a. | greenstick fracture | b. | simple fracture     |
| c. | compound fracture   | d. | comminuted fracture |
| e. | closed reduction    | f. | open reduction      |
| g. | traction            |    |                     |

\_\_\_f\_\_\_ 1. Surgical correction of a broken bone.

\_\_\_b\_\_\_ 2. Bone is broken completely, but ends do not penetrate the skin.

\_\_\_e\_\_\_ 3. Nonsurgical correction of broken bone and application of a cast.

\_\_\_a\_\_\_ 4. A fracture in which the bone splinters, but the break is incomplete.

\_\_\_d\_\_\_ 5. Bones are broken into many pieces.

\_\_\_c\_\_\_ 6. A fracture in which the bone ends penetrate the skin.

\_\_\_g\_\_\_ 7. A pulling force used to hold the bones in place.

\_\_\_b\_\_\_ 8.



## Disease Disorder Comparison Chart

Name \_\_\_\_\_

Class \_\_\_\_\_

<b>Name of Disease/ Disorder</b>		
Brief Description		
Occurrence/statistics		
Signs and Symptoms		
Diagnosis		
Treatment		
Prognosis		

*Appendix MD05.03B*

# Unit E: Skeletal System

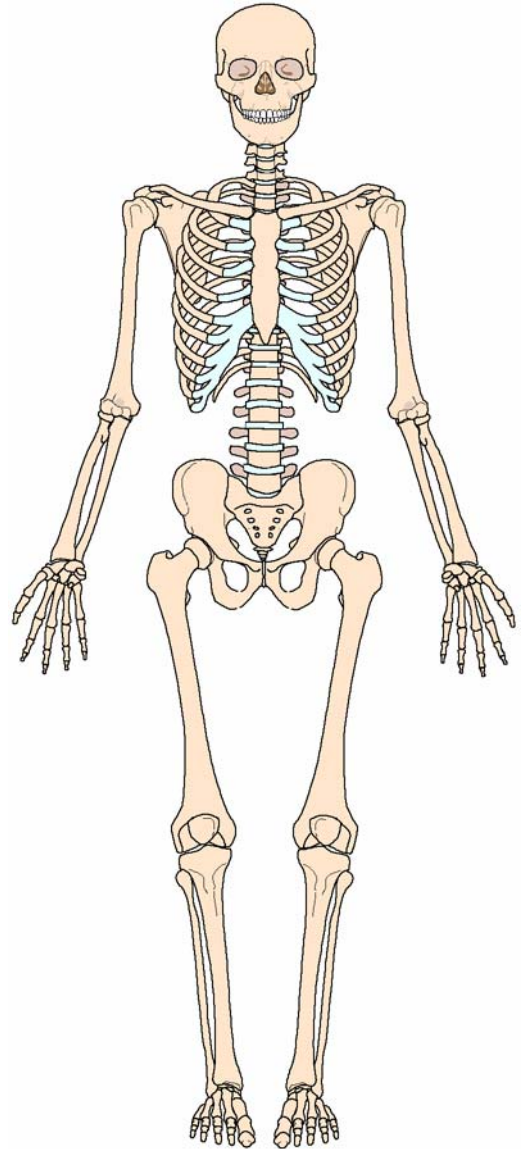


# ***Skeletal System***

206 bones in the body

## **FUNCTIONS**

1. Supports body and provides shape.
2. Protects internal organs.
3. Movement and anchorage of muscles.
4. Mineral storage. (Calcium and phosphorus)
5. Hemopoiesis



**OSTEOCYTE** – mature bone cell

## **BONE FORMATION**

Embryo skeletal starts as osteoblasts

(primitive embryonic cells) – then change to cartilage.

At 8 weeks, **OSSIFICATION** begins. (Mineral matter begins to replace cartilage) Infant bones soft because ossification not complete at birth.

**FONTANEL** - Soft spot on baby's head

## **STRUCTURE OF LONG BONE**

**DIAPHYSIS** – shaft

**EPIPHYSES** – ends

**MEDULLARY CAVITY** – center of shaft, filled with yellow bone marrow, which is mostly fat cells, also cells that form white blood cells.

**ENDOSTEUM** – lines marrow cavity

Shaft is made of **COMPACT BONE** – ends are **SPONGY BONE**. Ends contain red marrow where red blood cells are made.

**PERIOSTEUM** – tough, outside covering of bone – contains blood vessels, lymph vessels and nerves.

## **AXIAL & APPENDICULAR SKELETON**

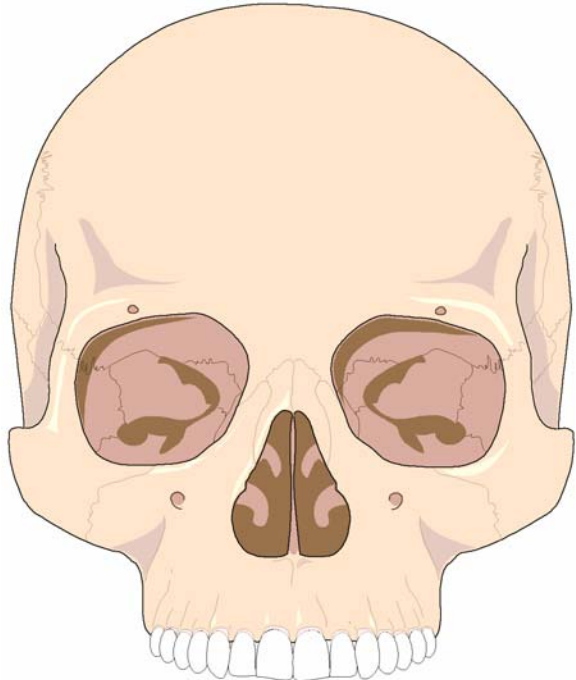
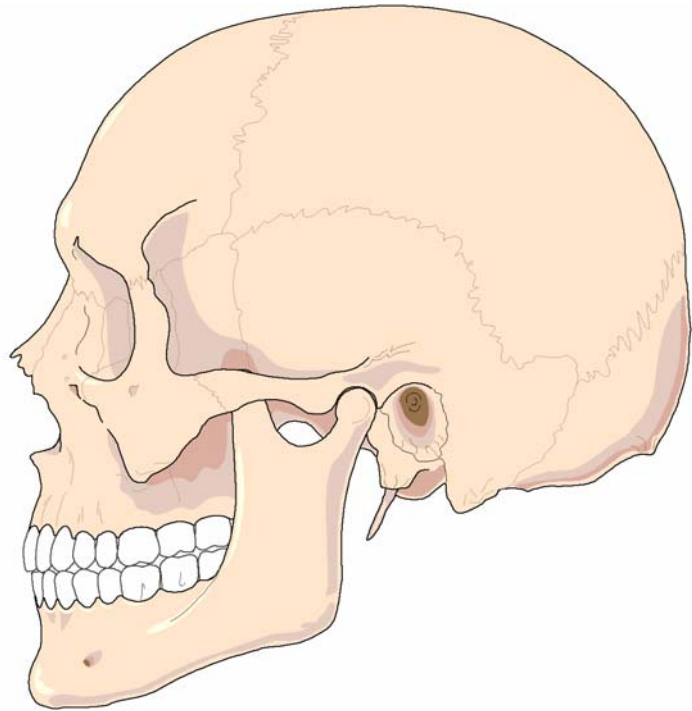
**AXIAL** – skull, spinal column, ribs, sternum, hyoid

**APPENDICULAR** – shoulder girdle, arms, pelvis, legs



# Skull

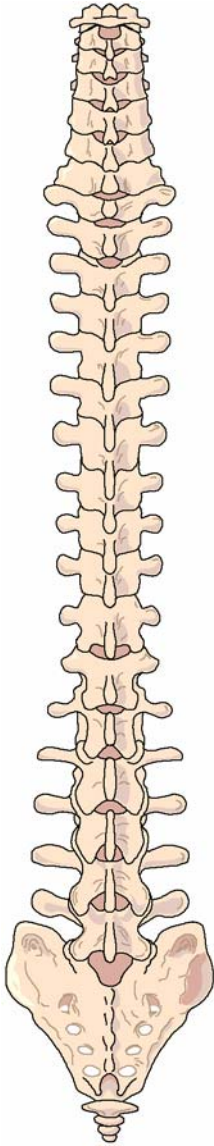
- 1 frontal
- 2 parietal
- 2 temporal
- 1 occipital
- 1 ethmoid
- 1 sphenoid



- 2 nasal
- 1 vomer
- 2 inferior concha
- 2 maxilla
- 2 lacrimal
- 2 zygomatic
- 2 palatine
- 1 mandible

# Spine – Vertebral Column

Encloses the spinal cord



Vertebrae – separated by pads of cartilage = intervertebral discs

Cervical vertebrae (7)

Thoracic vertebrae (12)

Lumbar vertebrae (5)

Sacrum

Coccyx

## Ribs and Sternum

Sternum divided into 3 parts – bottom tip is **XIPHOID PROCESS**

12 pairs of ribs – first 7 are true ribs – connected to sternum by cartilage

- next 3 are false ribs – cartilage connects them to 7<sup>th</sup> rib (not sternum)
- next 2 are floating

## Appendicular Skeleton

- clavicle – collar bone
- scapula – shoulder blade
- humerus – upper arm
- radius and ulna – lower arm
- carpals – wrist bones – held together by ligaments
- metacarpals – hand bones
- phalanges – fingers
- pelvis – 3 bones (ilium, ischium, and pubis)
- femur – upper leg, longest and strongest bone in body
- tibia and fibula – lower leg
- patella – kneecap
- tarsal bones – ankle
- calcaneus – heel bone
- metatarsals – foot bones

## JOINTS

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Joints are points of contact between 2 bones – classified according to movement:

**SYNOVIAL FLUID** – lubricating substance in joints

- ◆ **BALL AND SOCKET JOINT** – bone with ball-shaped head fits into concave socket of 2<sup>nd</sup> bone. Shoulders and hips.
- ◆ **HINGE JOINTS** – move in one direction or plane. Knees, elbows, outer joints of fingers.
- ◆ **PIVOT JOINT** – those with an extension rotate on a 2<sup>nd</sup>, arch shaped bone. Radius and ulna, atlas and axis.
- ◆ **GLIDING JOINTS** – flat surfaces glide across each other. Vertebrae of spine.
- ◆ **SUTURE** – immovable joint

## Types of Motion

- **FLEXION**
- **EXTENSION**
- **ABDUCTION**
- **ADDUCTION**
- **CIRCUMDUCTION**
- **ROTATION**
- **PRONATION**
- **SUPINATION**

# Disorders of the Bones and Joints

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**FRACTURE** – a break

Treated by:

- **CLOSED REDUCTION** – cast or splint applied
- **OPEN REDUCTION** – surgical intervention with devices such as wires, metal plates or screws to hold the bones in alignment (internal fixation)
- **TRACTION** – pulling force used to hold the bones in place – used for fractures of long bones

**CLOSED** or **SIMPLE** fracture – bone broken, broken ends do not break the skin

**OPEN** or **COMPOUND** – broken bones pierce the skin, can lead to infection

**GREENSTICK** – in children, bone bent and splintered but never completely separates

**COMMINUTED** – splintered or broken into many pieces

**SPIRAL** – bone twists, resulting in one or more breaks

**DISLOCATION** – bone displaced from proper position in joint

**SPRAIN** – sudden or unusual motion , ligaments torn but joint not dislocated

**STRAIN** – overstretching or tearing muscle

**RADIOGRAPHY** – x-ray, for diagnosis evaluation of bones

# Diseases of Bones

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**BURSITIS** – inflammation of a bursa – joint sacs

**ARTHRITIS** – inflammation of one or more joints

- **RHEUMATOID ARTHRITIS** – chronic, autoimmune disease – joints become swollen and painful, joint deformities common
- **OSTEOARTHRITIS** – degenerative, occurs with aging, 80% Americans affected, joint becomes enlarged and painful.

**GOUT** – increase of uric acid deposited in joint cavity, mostly the great toe in men.

**RICKETS** – found in children, caused by lack of Vitamin D, bones become soft. Treated with calcium, Vitamin D and sunshine.

**HERNIATED DISC** – intervertebral disc ruptures or protrudes, putting pressure on spinal nerve, usually lumbar-sacral region, treated with bedrest, traction and surgery.

**WHIPLASH** – trauma to the cervical vertebra, usually from a car accident

## Abnormal curvatures of the spine:

- **KYPHOSIS** – hunchback
- **LORDOSIS** – swayback
- **SCOLIOSIS** – lateral curvature

**OSTEOPOROSIS** – 80% of those affected are women. Mineral density of bone is reduced 35% - 65%. The loss of bone mass leaves the bone thinner, porous and more prone to fracture. (On x-ray, looks like swiss cheese.) Prevented by dietary calcium.

**OSTEOMYELITIS** – bone infection

## Diagnosis and Treatment:

- **ARTHROSCOPY** – examination into joint using arthroscope with fiber optic lens, most knee injuries treated with arthroscopy.
- **BONE MARROW ASPIRATION** – removal of marrow sample with a needle for diagnostic purposes.