I. Introduction
A. Function
1. Provides _________ and allows us to move
2. Protects the soft body parts, produces _________ cells, and acts as a storage unit for minerals and fat
3. There are ______ bones in the adult skeleton, along with cartilage, ligaments, and joints.

II. Bone
A. Although bones are composed of nonliving minerals such as _________ and _________, they are very much alive.

B. The word _________ comes from the Greek meaning "dried up body."

C. Classified according to their shape
1. _________ bones—bones are longer than they are wide
2. _________ bones—equal in width and length
3. _________ bones—thinner and can be either flat or curved
4. Irregular bones—odd in shape, and include the hipbone

D. Basic Bone Anatomy—ex. long bone
1. _________
   a. Outer covering of tough fibrous connective tissue
   b. Contains blood vessels, lymph vessels, and nerves
   c. Acts as anchor points for _________ and tendons.
2. _________ and Diaphysis
   a. Both ends of a long bone increase in size to form the epiphysis.
   b. The region running between two epiphyses is called the _________.
   c. The diaphysis is hollow (called the medullary cavity). It acts as a storage area for the yellow bone marrow.
      i. Red marrow makes _________ blood cells.
      ii. Yellow marrow has a high fat content and can convert to red marrow in an emergency.

E. Bone tissue - Two types
1. _________
   Dense, hard tissue normally composing the shafts of long bones; found as the outer layer of the other bone types
   a. Mature bone cells form concentric circles around blood vessels.
   b. The area around the bone cells is filled with bone matrix.
2. _________
   a. Arranged in bars and plates
   b. Irregular holes give the bone a spongy appearance and make the bone lighter in weight.

F. Surface structure of bones
1. Bone is not perfectly smooth.
2. Projections act as points of _________ for muscles, ligaments, or tendons.
3. Grooves and depressions act as pathways for nerves and blood vessels.
4. Projecting structures and depressions can work together as joining or articulation points to form joints, such as the ball-and-socket joint in your hip.

G. Bone growth and repair
1. ______________: formation of bone in the body
2. Types of cells involved in bone formation and growth include osteoprogenitor, osteoblasts, ______________, and osteoclasts.
3. Bone development and growth - bone development begins when you are an embryo through ossification.
4. Bone repair
   a. Hematoma forms; inflammation
   b. Soft ______________ forms (cartilage)
   c. Bony callus forms
   d. The bone is remodeled until the fracture is nearly undetectable.

III. Cartilage
A. Cartilage is a special form of dense connective tissue that can withstand a fair amount of ______________, tension, and ________________.
B. Made up of cells called chondrocytes. They exist in holes in a gel-like matrix.
C. Location and functions
   1. The flexible part of your nose and ears are ______________.
   2. Makes a flexible connection between bones, as between the ribs and sternum, allowing chest flexion during deep breathing
   3. Cartilage acts as a cushion between ________________; articular cartilage is located on the ends of bones and acts as a shock absorber, preventing the ends from grinding together during movement.

IV. Joints
A. When two or more bones join, an articulation or ______________ is formed.
B. Many joints must be held together, yet still be movable, which is accomplished by special connective tissue called ________________.
C. Tendons are cordlike structures that attach muscle to ________________.
D. Joints can be classified by function or structure.
   1. Function
      a. Immobile
      b. Move a little
      c. No ________________
   2. Structure
      a. Fibrous: bones joined by short connective tissue strands
      b. Cartilaginous: bones united by ________________
      c. Synovial: bones united by ________________ filled joint cavity
         i. Pivot joint—turnstile movement in the neck and forearm
         ii. Ball-and-socket joint—hip and ________________
         iii. Hinge joint—allow up and down movement in the ________________ and elbows
         iv. Gliding joint—wrists and ankles
         v. Saddle joint—shaped like a saddle found in the thumb
         vi. Ellipsoidal joint—oval-shaped bone end fitting into an elliptical cavity in the other bone so there is movement from one plane to another but no rotation—fingers and toes
E. Movement classification
1. Flexion—decreasing the angle of joint
2. ________________—increasing angle of a joint
3. Plantar Flexion—pointing ________________ down
4. Dorsiflexion—bending the foot up toward the body
5. ________________—moving away from the body’s midline
6. Adduction—moving toward the midline of the body
7. Inversion—turning the foot ________________ toward other foot
8. Eversion—turning the foot outward away from opposing foot
9. Circumduction—circular arm movement

V. Bones of the Skeleton
A. Two main divisions of the skeleton
1. ________________ skeleton—bones of the thorax, spinal column, hyoid bone, bones of the middle ear, and skull. They protect the body organs and are composed of 80 bones.
   a. The ________________—many bones forming brain case and facial structures
   b. The thorax—ribs and sternum, protects thoracic cavity
   c. The ________________ Column
      i. Also called vertebral column; houses the spinal cord; the superhighway for information coming to and from the central nervous system
      ii. The individual bones or vertebrae are numbered and classified according to the body region where they are located.
2. ________________ skeleton—these are the bones of your arms, ________________, hips, and shoulders and are comprised of 126 bones.
   a. The appendicular region consists of the arms and legs.
   b. Half the bones in the body are located in the hands and ________________.

VI. Common Disorders of the Skeletal System
A. Aging affects the cartilage and bones; although a natural process, it can sometimes be slowed.
1. Composition of cartilage changes as we age, becoming more ________________ and yellow due to calcification. This can lead to ________________, an inflammatory process of the joints, reducing flexibility and decreasing range of motion.
2. Bone mass decreases with age. Beginning in our 50s the breakdown of bone is greater than the buildup.
   a. Osteoporosis: light, weak, porous bones. More common in ________________, but can be diagnosed in men.
   b. Treatment and prevention of osteoporosis
      i. Even though bone loss is a natural aging process, it can be slowed by a healthy lifestyle.
      ii. Proper ________________ intake during the formative years and through adulthood decreases the risk of osteoporosis.
      iii. Vitamin D is important because it allows the body to absorb ingested calcium from the digestive tract.
      iv. Exercise, especially weight-bearing, plays a vital role in developing, and maintaining strong bones.
      v. Drink less ________________.
      vi. Quit smoking.
      vii. Medication
B. Bone fractures
1. A ________________ fracture looks like a piece of hair on the x-ray. It is a fine fracture that doesn’t completely break or displace the bone.
2. Simple or closed fracture—a break with minimal displacement and no tear in the skin
3. Greenstick fractures are incomplete breaks often found in children
4. Spiral fracture—caused by a _______________ motion to the bone
5. Comminuted fracture—when the bone fragments or _______________
6. Compound or open fracture—when the bone protrudes through the _______________, with the potential of infection from exposure.

Test Your Knowledge Page 124
1. A term that can be used to describe the formation of bone is:
   a. Ossification
   b. Periosteum
   c. Bonafide
   d. Osteoclasts
2. These cells actually form bones:
   a. Osteoclasts
   b. Pericytes
   c. Generator cells
   d. Osteoblasts
3. Another term for the growth plate?
   a. Tectonic plate
   b. Epiphyseal plate
   c. Upper plate
   d. Periostium plate
4. This connective tissue forms a cushion in joints?
   a. Tendons
   b. Ligaments
   c. Cartilage
   d. Cartridge
5. A skeleton is found buried in a land fill. Examination shows that the epiphyseal plates are completely calcified. What was the age of the skeleton at time of death?
   a. 5 years
   b. 10 years
   c. 15 years
   d. 25 years
6. Riding his ATV one day, Jim falls and shatters his tibia, breaking it into many small pieces. At the hospital the surgeons use pins, plates, and screws to put pieces back in the right places. Why?
   a. Bone must be touching to repair itself.
   b. Bone cannot repair itself.
   c. Inflammation is reduced by surgery.
   d. The bone will never be strong enough to support weight after injury.
1. A movement that increases the angle of a joint is known as:
   a. Flexion
   b. Abduction
   c. Rotation
   d. Extension

2. A joint in which bones are connected by short connective tissue strands is known as a
   a. Cartilaginous joint
   b. Fibrous joint
   c. Synovial joint
   d. Freely moving joint

3. A joint in which flat bone surfaces move side to side past each other is known as a
   a. Condyloid joint
   b. Hinge joint
   c. Saddle joint
   d. Gliding joint

4. This lubricant helps to prevent wear in joints:
   a. Pleural fluid
   b. Synovial fluid
   c. Mucus
   d. Petroleum jelly

5. These structures attach bone to bone:
   a. Ligaments
   b. Tendons
   c. Cords
   d. Articulations

6. A young gymnast falls form the balance beam, rotating her knee. This is a problem because
   a. The knee is a hinge joint and should not rotate
   b. The knee should only rotate when standing
   c. The knee joint is not a freely moving joint
   d. There is no problem, knees are supposed to rotate

Test Your Knowledge Page 138

1. Which of the following bones is considered to be part of the axial skeleton?
   a. Humerus
   b. Patella
   c. Femur
   d. Sternum

2. The number of vertebra in the thoracic region is
   a. 5
   b. 7
   c. 12
   d. 120
3. The posterior skull bone is the
   a. Parietal
   b. Cervical
   c. Occipital
   d. Zygomatic

4. The last two pairs of ribs are
   a. Vertebrosternal
   b. Vertebrocostol
   c. Vertebroclavical
   d. None of the above

5. The shoulder blade is more technically known as the
   a. Clavicle
   b. Scapula
   c. Sternum
   d. Pelvis

6. The collar bone is more technically known as the
   a. Clavicle
   b. Scapula
   c. Sternum
   d. Pelvis

Review Questions Page 140

1. Your elbow is an example of what type of joint?
   a. Hinge joint
   b. Ball-and-socket joint
   c. Gliding joint
   d. Fibrous joint

2. The sternum is the correct medical term for which bone?
   a. Shin bone
   b. Breast bone
   c. Shoulder blade
   d. Collarbone

3. The end of a long bone is the:
   a. Diplodicus
   b. Epiphysis
   c. Condylcorn
   d. Perla

4. The presence of a(n) ___________ in skeletal remains indicates the skeleton is a teenager or child.
   a. Torquer center
   b. Ossifier
   c. Mantoux membrane
   d. Epiphyseal plate
5. The aging process, excessive caffeine, and cigarette smoking can each contribute to this bone disease:
   a. Ligamental stenosis
   b. Osteoporosis
   c. Cartilential dementia
   d. Ossification

6. Joe injured his elbow as a child and now, as an adult, his injured arm is much shorter than the other arm. Why?
   a. Fractured bone is always shorter
   b. His epiphyseal plate was damaged and the bone didn’t grow
   c. He has arthritis in the joint, which decreases bone growth
   d. He has a congenital problem that caused both the injury and the shorter bone

Fill in the Blank Page 141
1. Name three large appendicular bones: __________________, __________________, and ____________________.
2. List three places where cartilage is found in the body: __________________, __________________, and ________________.
3. _____________________________ is a liquid found in joints that keep them lubricated.
4. The specialized cells that constantly rebuild bone are called ________________________.
5. These specialized cells are needed to tear down bone: ____________________________.
6. Bone must be ____________________ to heal after fracture.

Short Answer Page 141
1.