Chapter 7: Skeletal System

I. Bone Structure

A. Bone Classification

1. The four classes of bone according to shape are __________________________
   __________________________

2. Examples of long bones are ____________________________________________
   ____________________________________________

3. Short bones are shaped like __________________________

4. Examples of short bones are ____________________________________________

5. Flat bones are __________________________ structures.

6. Examples of flat bones are ____________________________________________

7. Irregular bones have a variety of __________________________

8. Examples of irregular bones are __________________________________________

9. Round bones are also called__________________________

10. Sesamoid bones are _______, and _______ and embedded in________

11. An example of a sesamoid bone is the__________________________

B. Parts of a Long Bone

1. An expanded end of a long bone is an________________________

2. An epiphysis articulates with________________________

3. Articular cartilage is located __________________________

4. The shaft of a long bone is called a __________________________

5. Periosteum is __________________________

6. Periosteum functions to __________________________

7. Processes provide sites for __________________________

8. The wall of the diaphysis is composed of________________________ bone.

9. Compact bone has __________________________

10. The epiphyses are largely composed of________________________ bone.

11. Spongy bone consists of bony plates called________________________

13. A canal called________________________ runs through the diaphysis.

14. Endosteum lines __________________________

17. The two forms of marrow are __________________________
C. Microscopic Structure

1. Introduction
   a. Bone cells are called ________________________________
   d. Osteocyes transport ________________________________
   e. Cellular processes of osteocytes pass through ______________
   f. The intercellular matrix of bone is composed of ______________

2. Compact Bones
   a. An osteon is _________________________________
   b. The substance of compact bone is formed from ________________
   c. Each central canal contains ______________________________
   d. Perforating canals connect ______________________________
   e. Perforating canals contain ______________________________

3. Spongy Bone
   a. Spongy bone is also composed of ______________________________
   b. Unlike compact bone, the bone cells do not ________________
   c. Instead the cells lie within ______________________________
   d. Osteocytes get nutrients from ______________________________

II. Bone Development and Growth

A. Introduction
   1. Parts of the skeleton begin to form ______________________________
   2. Bony structures continue to grow until ______________________________
   3. Bones form by replacing ______________________________
   4. Intramembranous bones originate within ______________________________
   5. Endochondral bones originate within ______________________________

B. Intramembranous Bones
   1. Examples of intramembranous bones are ______________________________
   3. During their development, ______________________________
   appear at the sites of their future bones.
   4. ______________________________ supply the connective tissue layers.
5. Osteoblasts are _____________________________

6. Osteoblasts deposit__________________________

7. Spongy bone can become_____________________

8. As development continues, osteoblasts may become surrounded by __________

9. Matrix surrounding the processes of osteoblasts give rise to ______________

10. Once isolated, osteoblasts become__________________________

11. Periosteum comes from __________________________

12. Compact bone is formed by___________________________

13. Intramembranous ossification is __________________________

C. Endochondral Bones

1. Most of the bones of the skeleton are __________________________

2. Endochondral bones develop as___________________________

3. Eventually the cartilage __________________________

4. As the cartilage decomposes, _______________ forms from_______

5. __________________________ invade the disintegrating tissue.

6. Some of the cells differentiate into __________________________

7. Osteoblasts form __________________________

8. Endochondral ossification is __________________________

9. The primary ossification center is __________________________

10. Secondary ossification centers appear __________________________

11. The epiphyseal plate is __________________________

E. Homeostasis of Bone Tissue

1. Throughout life, osteoclasts___________________________

   and osteoblasts __________________________

2. About __________________________ of bone calcium is exchanged each year.

F. Factors Affecting Bone Development, Growth, and Repair

1. Factors that affect bone development, growth and repair include___________________________

2. Vitamin D is necessary for___________________________

3. Lack of vitamin D can lead to the diseases __________________________

4. Vitamin A is necessary for___________________________
5. Vitamin C is required for ________________________________
6. Growth hormone stimulates ____________________________
7. In children, the absence of growth hormone leads to ______________
10. Thyroid hormone can halt ____________ by causing ___________
11. Deficiency of thyroid hormone may stunt ______________________
12. Parathyroid hormone stimulates ______________________________
13. Androgens are ________________________________
14. Androgens promote ________________________________
15. Sex hormones also stimulate ____________________________
16. Females typically reach their maximum heights earlier than males because ______________
17. Physical stress stimulates ______________________________

III. Bone Function

A. Support and Protection

2. The bones of __________________________ support the body’s weight.
3. The bones of the skull protect ________________________________
4. The bones of the __________________________ protect the heart and lungs.
5. Bones of the pelvic girdle protect ______________________________

B. Body Movement

1. Bones and muscles interact as ________________________________
2. The four basic components of a lever system are ________________________________

C. Blood Cell Formation

1. Hematopoiesis is ________________________________
2. Blood cell formation begins ________________________________
3. Later in development, blood cells are made ________________________________
4. Marrow is ________________________________ within ________________________________
5. Red marrow functions in ________________________________
6. Red marrow occupies ________________________________
7. With increasing age, ________________________________ replaces red marrow.
8. Yellow marrow stores ________________________________

D. Inorganic Salt Storage
1. Intercellular matrix of bone tissue contains __________________________
   __________________________________________________________________

4. The body requires calcium for _________________________________
   __________________________________________________________________

IV. Skeletal Organization

B. Divisions of the Skeleton

1. Two major portions of the skeleton are ____________________________

2. The axial skeleton contains _________________________________

3. The skull is composed of _________________________________

4. The hyoid bone supports _________________________________

5. The hyoid bone is located _________________________________

6. The vertebral column consists of _________________________________

9. The thoracic cage is composed of _________________________________
   __________________________________________________________________

10. The appendicular skeleton consists of _________________________________
    __________________________________________________________________

11. The pectoral girdle is formed by _________________________________

14. Each upper limb consists of _________________________________
    __________________________________________________________________

15. The humerus, radius, and ulna articulate _________________________________

16. The wrist bones are called _________________________________

18. Bones in the fingers are called _________________________________

19. The pelvic girdle is formed by _________________________________

20. The pelvic girdle connects _________________________________

22. Each lower limb consists of _________________________________

23. The femur and tibia articulate with each other at _________________________________

24. The kneecap is called the _________________________________

25. The ankle bones are _________________________________

26. The bones of the instep of the foot are called _________________________________

27. Bones of the toes are called _________________________________

V. Skull

B. Cranium

1. The cranium encloses and protects _________________________________

2. The surface of the cranium provides attachments for _________________________________
5. The eight bones of the cranium are ____________________________

6. The frontal bone forms______________________________________

10. One parietal bone is located_______________________________
11. Together the parietal bones form____________________________
14. The occipital bone joins the parietal bones along the __________
15. The occipital bone forms the ________________________________
19. A temporal bone on each side of the skull joins the parietal bone along a ___

20. The temporal bones form____________________________________
27. The zygomatic process projects_______________________________
and joins the ________________________________________________
28. The sphenoid bone helps form the____________________________

31. The ethmoid bone is located _________________________________

C. Facial Skeleton
1. The facial skeleton consists of___________ immovable bones and a movable
__________________________________________________________
3. The ________________________________ forms the upper jaw.
12. The palatine bones are located______________________________
18. Lacrimal bones are located _________________________________
21. The vomer is located_______________________________________

D. Infantile Skull
1. At birth, the skull is _________________ developed with____________
__________________________________________________________ connecting the cranial bones.

VII. Thoracic Cage
A. Introduction
1. The thoracic cage includes____________________________________

2. The thoracic cage supports__________________________________
and protects________________________________________________

C. Sternum
1. The sternum is located
2. The three parts of the sternum are

VIII. Pectoral Girdle
A. Introduction
1. The four parts of the pectoral girdle are
2. The pectoral girdle supports and is an attachment for

B. Clavicles
2. Clavicles run between

C. Scapulae
2. The spine of a scapula divides

IX. Upper Limb
A. Introduction
1. The bones of the upper limb form
2. The bones of the upper limbs are

C. Radius
1. The radius is located on the side of the forearm

D. Ulna
1. The trochlear notch of the ulna is
2. The trochlear notch articulates with

E. Wrist and Hand
1. The wrist is at the junction of
2. The bones of the wrist are called
6. The metacarpals form the framework of
12. Each finger has phalanges and the thumb has phalanges.

X. Pelvic Girdle
A. Introduction
1. The pelvic girdle consists of
3. The pelvic girdle supports
4. The pelvic girdle provides attachments for and protects
XI. Lower Limb

A. Introduction
   1. The bones of the lower limb form the framework of ______________________________

B. Femur
   1. The femur extends from ________________________________________________

C. Patella
   1. The patella is a _______________ bone located in ______________________

D. Tibia
   1. The shinbone is _________________________________________________________
   2. The tibia is located on _______________________________ side.

E. Fibula
   1. The fibula is on the ________________________________ side of the tibia.

F. Ankle and Foot
   1. The ankle and foot consist of _____________________________________________
   10. The bones of the toes are called _________________________________________
   11. Each toe has _____________ phalanges except the great toe because it lacks

   __________________________________________________________________________
Chapter 9: Muscular System

I. Structure of a Skeletal Muscle

A. Introduction
   1. A______________________________ is an organ of the skeletal system.
   2. A skeletal muscle is composed of ________________________________

B. Connective Tissue Coverings
   7. A fascicle is ________________________________________________

C. Skeletal Muscle Fibers
   1. A skeletal muscle fiber is a single ____________________________
   2. The sarcolemma is __________________________________________
   3. The sarcoplasm is __________________________________________
   4. The sarcoplasm contains _____________________________________
   5. Myofibrils are _______________ and are located in the _____________
   6. Myofibrils play a fundamental role in __________________________
   7. Thick myofilaments are composed of ___________________________
   8. Thin myofilaments are composed of _____________________________
   9. The organization of myofilaments produce ________________________
      ____________________________________________________________
10. A sarcomere is ____________________________________________

11. Myofibrils may be thought of as ___________________ joined end to end.

13. Z lines are _______________________________________________

18. A sarcomere extends from one ________________________________

19. Each myosin molecule consists of ____________________________

20. Thin filaments consist of double _____________________________

21. Actin has a binding site to which__________________________ can attach.

23. Sarcoplasmic reticulum is _________________________________

II. Skeletal Muscle Contraction

A. Neuromuscular Junction

1. Each skeletal muscle is connected to ___________________________

2. A motor neuron passes out from ______________________________

3. Normally, a skeletal muscle fiber contracts only upon ______________

4. A neuromuscular junction is _________________________________

5. A motor end plate is _________________________________

6. A motor unit is __________________________________________

B. Stimulus for Contraction

1. __________________________ is the neurotransmitter that motor neurons use
to control skeletal muscle.

2. ACh is synthesized in the cytoplasm of________________________

   and is stored in ___________________________________________

3. When a nerve impulse _____________________________, acetylcholine is released
   into the synaptic cleft.

4. ACh combines with _____________________________ on the motor end plate,
   and stimulates ___________________________________________

5. A muscle impulse is __________________________________________

C. Excitation Contraction Coupling

1. The sarcoplasmic reticulum has a high concentration of________________

2. In response to a muscle impulse, the membranes _______________________

   ____________________________, and the calcium_________________________

   _______________________________________________________________

3. When a muscle fiber is at rest, ___________________________ block the binding
sites on the actin molecules.
4. Calcium ions bind to ________________, changing its ________________
   and altering ________________________________
5. The movement of the tropomyosin molecule exposes____________________
   __________________________, allowing____________________

D. The Sliding Filament Theory
1. The functional unit of skeletal muscles is ____________________________
2. According to the sliding filament theory, when sarcomeres shorten, ________
   ____________________________
3. As contraction occurs, _______________ and ______________ get narrower
   and________________________ move closer together.

E. Cross-bridge Cycling
1. The force that shortens the sarcomeres comes from ____________________________
2. A myosin cross-bridge attaches to actin in order to__________________________
3. When a muscle is stimulated to contract, a ________________ attaches to
   __________________________ and pulls_________________________,
   shortening the ____________________________

F. Relaxation
1. In order for a muscle fiber to relax, acetylcholine must be decomposed by an
   enzyme called ____________________________
2. The action of acetylcholinesterase prevents ____________________________
3. When acetylcholine is broken down, ____________________________
   ____________________________ ceases.
5. When calcium is removed from the cytoplasm, the____________________
   break and__________________________ rolls back into its groove, 
   preventing ____________________________
6. ATP is necessary for both muscle ____________________________
   and__________________________
7. The trigger for contraction is ____________________________

H. Oxygen Supply and Cellular Respiration
1. Glycolysis occurs __________________________ and is __________________________
2. Glycolysis releases a few ____________________________

3. The complete break down of glucose occurs in________________________ and requires________________________

5. Oxygen is carried in the blood stream bound to ____________________________

I. Oxygen Debt

1. Lactic acid threshold is ____________________________

2. Under anaerobic conditions, glycolysis breaks down glucose into __________ and converts it to ____________________________

3. Lactic acid is carried by the blood to the__________________________

4. Liver cells can convert lactic acid to ____________________________

5. Oxygen debt reflects ____________________________

J. Muscle Fatigue

1. Fatigue is ____________________________

2. Fatigue may result from__________________________

__________________________

3. A cramp is ____________________________

4. Physically fit people make less lactic acid because__________________________

III. Muscle Responses

A. Introduction

1. One way to observe muscle contraction is to__________________________

________________________________

2. An_________________________is usually used to produce muscle contraction.

B. Threshold Stimulus

1. Threshold stimulus is ____________________________

2. An impulse in_________________________ normally releases enough_________________________ to bring the muscle fibers in its_________________________ to ____________________________

C. Recording a Muscle Contraction

1. A twitch is ____________________________

2. A myogram is__________________________

3. Three periods of a muscle fiber contraction are__________________________
4. During the period of contraction, a muscle fiber is
________________________________
________________________________

5. The latent period is
________________________________

6. The period of relaxation is
________________________________

8. An all-or-none response is
________________________________
________________________________

D. Summation
1. Twitches in a muscle can combine to become
________________________________

2. Summation is
________________________________

3. Tetanic contractions are
________________________________

E. Recruitment of Motor Units
1. The ____________ in the motor units, the more
the movements can be produced in a particular muscle.

2. All muscle fibers in a motor unit are stimulated at
______________ time.

3. Multiple motor unit summation is
________________________________

4. Recruitment is
________________________________

5. As the intensity of stimulation increases, ________________
continues until all possible motor units are activated in a muscle.

4. Muscle tone is
________________________________

IV. Smooth Muscles
A. Smooth Muscle Fibers
1. Compared to skeletal muscle fibers, smooth muscle fibers
________________________________
________________________________

2. Two major types of smooth muscle are
________________________________

3. Multiunit smooth muscle is located________________________
________________________________

4. Visceral smooth muscle is located________________________
________________________________

5. Fibers of visceral smooth muscle are connected by
________________________________

6. Rhythmicity is ____________________________

7. Peristalsis is__________________________

8. Peristalsis helps force__________________________

B. Smooth Muscle Contraction
1. Compared to skeletal muscle fibers, smooth muscle fibers lack _______________ and use __________________________ to bind calcium instead.

2. Two neurotransmitters that affect smooth muscle are __________________________

3. Hormones affect smooth muscle by __________________________

4. Stretching of smooth muscle can trigger __________________________

5. Smooth muscle is ________________ to contract and ________________ to relax than skeletal muscle.

6. Unlike skeletal muscle, smooth muscle fibers can change length without changing ________________

V. Cardiac Muscle

A. Cardiac muscle appears only in __________________________

B. Cardiac muscle is composed of __________________________ cells, forming fibers that are __________________________

C. Cardiac muscle fibers can contract __________________________ then skeletal muscle fibers.

D. Intercalated discs are __________________________

E. Intercalated discs allow muscle impulses to __________________________

F. A syncytium is __________________________

VI. Skeletal Muscle Actions

A. Introduction

1. Skeletal muscles generate __________________________

2. The action of each muscle mostly depends upon __________________________

B. Origin and Insertion

1. The origin of a muscle is __________________________

2. The insertion of a muscle is __________________________

3. When a muscle contracts, its __________________________ is pulled toward its __________________________

4. The head of a muscle is __________________________

5. The origins of the biceps brachii are __________________________

6. The insertion of the bicep brachii is __________________________

7. When the biceps brachii contracts, the __________________________ bends.
1. A prime mover is ____________________________________________

2. A synergist is ______________________________________________

3. An antagonist is _____________________________________________

VII. Major Skeletal Muscles

A. Introduction

1. The name of a muscle may reflect __________________________________

2. An example of a muscle named for it size is ________________

3. An example of a muscle named for its shape is __________________

4. An example of a muscle named for its function is ________________

5. An example of a muscle named for its number of origins is __________

6. An example of a muscle named for its attachments site is __________

7. An example of a muscle named of the direction of its muscle fibers is _____

B. Muscles of Facial Expression

1. As a group, muscles of facial expression connect ________________

2. For the following muscles, list their origins, insertions, and actions.
   
   Epicranius
   Orbicularis oculi
   Orbicularis oris
   Buccinator
   Zygomaticus
   Platysma
C. Muscles of Mastication
   1. Muscles of mastication produce____________________________ movements.
   2. For the following muscles, list their origins, insertions, and actions
      Masseter
      Temporalis
      Medial pterygoid
      Lateral pterygoid

D. Muscles That Move the Head and Vertebral Column
   1. For the following muscles, list their origins, insertions, and actions
      Sternocleidomastoid
      Splenius capitis
      Semispinalis capitis
      Erector spinae

E. Muscles That Move the Pectoral Girdle
   1. For the following muscles, list their origins, insertions, and actions
      Trapezius
      Rhomboideus major
      Levator spinae
      Serratus anterior
      Pectoralis major

F. Muscles That Move the Arm
   1. For the following muscles, list their origins, insertions, and actions
      Coracobrachialis
      Pectoralis major
      Teres major
      Latissimus dorsi
      Supraspinatus
      Deltoid
      Subscapularis
      Infraspinatus
      Teres minor

G. Muscles That Move the Forearm
   1. For the following muscles, list their origins, insertions, and actions
      Biceps brachii
H. Muscles That Move the Hand

1. For the following muscles, list their origins, insertions, and actions
   - Flexor carpi radialis longus
   - Flexor carpi ulnaris
   - Palmaris longus
   - Flexor digitorum profundus
   - Flexor digitorum superficialis
   - Extensor carpi radialis
   - Extensor carpi radialis brevic
   - Extensor carpi ulnaris
   - Extensor digitorum

I. Muscles of the Abdominal Wall

1. The linea aspera is _____________________________

2. For the following muscles, list their origins, insertions, and actions
   - External oblique
   - Internal oblique
   - Transversus abdominis
   - Rectus abdominis

J. Muscles of the Pelvic Outlet

1. The pelvic diaphragm forms _____________________________

2. The urogenital diaphragm fills _____________________________

3. For the following muscles, list their origins, insertions, and actions
   - Levator ani
   - Coccygeus
   - Superficial transversus perinea
   - Bulbospongiosus
   - Ischiocavernosus
   - Sphincter urethra
K. Muscles That Move the Thigh
   1. For the following muscles, list their origins, insertions, and actions
      Psoas major
      Iliacus
      Gluteus maximus
      Gluteus medius
      Gluteus minimus
      Pectineus
      Adductor longus
      Adductor magnus
      Gracilis

L. Muscles That Move the Leg
   1. For the following muscles, list their origins, insertions, and actions
      Biceps femoris
      Semitendinosus
      Semimembranosus
      Sartorius
      Quadriceps femoris group

M. Muscle That Move the Foot
   1. For the following muscles, list their origins, insertions, and actions
      Tibialis anterior
      Fibularis tertius
      Extensor digitorum longus
      Gastrocnemius
      Soleus
      Flexor digitorum longus
      Tibialis posterior
      Fibularis longus

VIII. Life-Span Changes
   A. Signs of aging of the muscular system begin to appear _______________________
   B. At a microscopic level, _________________________ decline.
   C. ___________________________ being to replace some muscle tissue.
   D. ___________________________can help maintain a healthy muscular system
   E. According to the National Institute on Aging, exercise should include ____________