

# Human Biology Final Exam (4) Study Guide

## Chapter 11 - Skeletal System

- approx. # of questions on exam: 12-15

### Functions of Skeletal System

- Supports the body
- Produces blood cells
- Allows for movement by attaching muscles
- Protects soft body parts
- Stores minerals (calcium, phosphate & fat)

### Organization of Skeletal System

- # of Bones: **206**
- **Axial Skeleton:** skull, hyoid bone, vertebral column, rib cage (ribs/ sternum)
- **Appendicular Skeleton:**  
pectoral girdle & upper limb = arm  
pelvic girdle & lower limb = leg

### Anatomy of Long Bone

- **Diaphysis-** shaft of the bone made of compact bone filled with yellow marrow
- **Epiphysis-** ends of the bone made mostly of spongy bone
- **Articular Cartilage-** hyaline cartilage found on the ends of long bones
- **Yellow Bone Marrow-** stores fat
- **Red Bone Marrow-** makes blood cells found in spongy bone & fat bones
- **Periosteum-** living, outer covering of fibrous connective tissue

What does compact bone & spongy bone look like?

#### Compact Bone

- composed of osteons with a central canal containing blood vessels
- contains living bone cells called **osteocytes**
- Chambers called **lacunae**

#### Spongy Bone

- made of plates with spaces filled with red bone marrow

### Bone development & growth

**Ossification-** the formation of bone in 2 distinct ways

1) **Intramembranous Ossification-** bone development between sheets of fibrous connective tissue, used in flat bones (such as ribs & skull)

2) **Endochondrial Ossification-** cartilage is replaced by bone, used by most bones

What are important cells in bone growth, remodeling & repair?

- **Osteoblasts**: bone-forming cells
- **Osteocytes**: mature bone cells
- **Osteoclasts**: bone-absorbing (removing) cells
- **Chondrocytes**: cartilage-forming cells

How do bones lengthen? & how do hormones affect bone growth?

- **Growth Hormone (GH)**: stimulates general bone growth & the epiphyseal plates
- **Sex Hormones**: increases growth during adolescence
- **Vitamin D**: converted into a hormone to allow calcium absorption in the intestine

**Bone Remodeling**: bone renewal at a rate of up to 18% per year

- allows bones to respond to stress
- regulates the calcium in the blood through hormones....
  - **Parathyroid Hormone (PTH)**: increases blood calcium by accelerating bone removal (calcium leaves bone)
  - **Calcitonin**: decreases blood calcium (more calcium input bone)

Bone fractures & repair: bones put back into position, bones immobilized (casts, plates/screws, external fixation)

Bones tell a story:

- aging: epiphyseal plates & fontanelles
- sex determination

## Chapter 12 – Muscular System

-approx. # of questions on exam: 12-15

Function of Skeletal Muscles

- Support the body by allowing us to stay upright
- Allow for movement by attaching to skeleton
- Help maintain a constant body temp.
- Assist in movement of fluids in cardiovascular & lymphatic
- Protect internal organs & stabilize joints

Arrangement of skeletal muscles:

by attachments...

- **Tendon**: connective tissue that connects bone to muscle
- **Origin**: attachment of a muscle on a stationary bone
- **Insertion**: attachment of a muscle on a bone that moves  
origin, insertion synergistic, antagonistic

By Action...

**Synergistic:** muscles working in groups for a common action

**Antagonistic:** muscles that work in opposite pairs

### Skeletal Muscle Terminology

- Size - the *gluteus maximus* is largest buttock muscle
- Shape - the *deltoid* is triangular (delta= $\Delta$ )
- Location - the *frontalis* overlies the frontal bone
- Direction of muscle fiber - the *rectus abdominus* (rectus means straight)
- Attachment- the *brachioradialis* is attached to the brachium & radius
- # of attachments - the *biceps brachii* has 2 attachments
- Action- the extensor *digitorum* extends the digits

### Visualizing muscle structure

Muscle fiber = muscle cell

- Terminology for cell structure
  - The plasma membrane is called **sarcolemma**
  - The cytoplasm is called **sarcoplasm**
  - The SER of a muscle cell is called **sarco-plasmic-reticulum** & stores calcium
- Terminology for structure within a whole muscle
- Muscle (entire organ)
- Fascicles: microscopic bundles of muscle fibers
- Muscle fiber (myofiber): individual cylindrical muscle cell
- **Myofibrils** are bundles of protein strands (myofilaments) that run the length of fiber
- **Myofilaments** are proteins (actin & myosin) that are arranged in repeating units
- **Sarcomeres...**

The Sarcomeres: are the repeating units of actin & myosin found along a myofibril (this is the microscopic unit which can contract - shorten)

- Made of 2 protein myofilaments
- Actin: are the thin filaments
- Myosin: are the thick filaments shaped as a golf club
  - \*these slide over one another during muscle contraction

### Steps in Muscle Contraction: the sliding filament model

- Nerve impulses travel down motor neurons to a neuromuscular junction
- Acetylcholine (Ach) is released from the neurons & bind to the muscle fibers
- This binding stimulates fibers causing *calcium* to be released from the sarcoplasmic reticula
- Released calcium causes actin to interact with myosin