

Chapter 36 Skeletal, Muscular, and Integumentary Systems**Summary****36–1 The Skeletal System**

The skeletal system supports the body, protects internal organs, provides for movement, stores mineral reserves, and provides a site for blood cell formation. The skeleton is divided into two parts: the axial skeleton and the appendicular skeleton. The axial skeleton includes the skull, ribs, and spine. The appendicular skeleton includes all the bones associated with the arms and legs, including bones of the shoulders, hips, hands, and feet.

The bones that make up the skeletal system are living tissue. Bones are a solid network of living cells and protein fibers that are surrounded by deposits of calcium salts. A typical bone is surrounded by a tough layer of connective tissue called the periosteum. Beneath the periosteum is a thick layer of compact bone. Running through compact bone is a network of tubes called Haversian canals. These canals contain blood vessels and nerves. Within bones are cavities that contain a soft tissue called bone marrow. Bone marrow can be yellow or red. Yellow marrow is fat. Red marrow produces blood cells.

The skeleton of an embryo is composed almost entirely of cartilage. Cartilage is a type of connective tissue that is tough but flexible. Cartilage is replaced by bone during the process of bone formation, ossification. Ossification starts before birth and continues until adulthood.

A place where one bone attaches to another bone is called a joint. Joints permit bones to move without damaging each other. Depending on its type of movement, a joint is classified as immovable, slightly movable, or freely movable. Immovable joints, such as the joints in the skull, allow no movement. Slightly movable joints, such as the joints in the spine, allow a small amount of restricted movement. Freely movable joints permit movement in one or more directions. Freely movable joints are classified by the type of movement they permit.

Ball-and-socket joints, such as the shoulder, allow the widest range of movement of any joint. Hinge joints, such as the knee, permit only back-and-forth movement.

Strips of tough connective tissue, called ligaments, hold bones together in a joint. The bony surfaces of the joint are covered with cartilage. A substance called synovial fluid forms a thin film on the cartilage and makes the joint surfaces slippery.

Bones and joints can be damaged by excessive strain or disease. Arthritis is a disorder that involves inflammation of the joints. Osteoporosis is a condition in which bones weaken. Weak bones are likely to fracture, or break.

36–2 The Muscular System

Muscle tissue is found everywhere in the body. There are three different types of muscle tissue: skeletal, smooth, and cardiac. Skeletal muscles are usually attached to bones. They appear to be striped, so they are also called striated muscles. Skeletal muscles are responsible for voluntary movements such as dancing. Smooth muscles line blood vessels and the digestive tract. They are not striated or under conscious control. Smooth muscles move food through the digestive tract and control the flow of blood through the circulatory system. Cardiac muscle is found only in the heart. Like smooth muscle, it is not under conscious control.

Skeletal muscle cells are called muscle fibers. Muscle fibers are composed of smaller structures called myofibrils. Each myofibril is made up of even smaller structures called filaments. Filaments can be thick or thin. Thick filaments are made of a protein called myosin. Thin filaments are made of a protein called actin. A muscle contracts when the thin filaments in the muscle fiber slide over the thick filaments.

Impulses from motor neurons control the contraction of skeletal muscles. The point of contact between a motor neuron and a muscle fiber is called a neuromuscular junction. A neurotransmitter named acetylcholine is released by the motor neuron into the synapse. Acetylcholine transmits the impulse across the synapse to the skeletal muscle cell. The more muscle cells that are stimulated to contract, the stronger the contraction.

Skeletal muscles are joined to bones by tough connective tissues called tendons. Tendons pull on bones and make them work like levers. Muscles provide the force to move the bones.

Regular exercise is important in maintaining the strength and flexibility of muscles. Regular exercise also strengthens bones. Strong bones and muscles are less likely to become injured.

36–3 The Integumentary System

The skin is the single largest organ of the body. It is also the largest component of the integumentary system. The integumentary system serves as a barrier against infection and injury, helps to regulate body temperature, removes waste products from the body, and provides protection against ultraviolet radiation from the sun.

The skin is made up of two main layers: the epidermis and the dermis. The epidermis is the outer layer of the skin. Cells of the epidermis produce keratin. Keratin is a tough, fibrous protein that helps keep the epidermis flexible and waterproof. The epidermis also contains cells, called melanocytes, that produce melanin. Melanin is a dark brown pigment that helps protect the skin from ultraviolet rays.

The dermis is the inner layer of skin. It contains nerves, blood vessels, glands, and other structures not found in the epidermis. The dermis works with other organs to maintain homeostasis. It helps to regulate body temperature. Sweat glands in the dermis produce sweat when the body gets too hot. When the sweat evaporates from the skin, it cools the body.

Too much sunlight can produce skin cancer. You can protect against skin cancer by wearing a hat, sunglasses, and protective clothing. You also should use sunscreen with a sun protection factor (SPF) of at least 15.

In addition to the skin, the integumentary system includes the hair and nails. Both hair and nails are composed mainly of keratin. Hair on the head protects the scalp from sunlight and cold. Hair in the nostrils and around the eyes prevents dirt from entering the body. Hair is produced by structures called hair follicles. Hair follicles are located in the dermis. Nails grow from an area called the nail root. Nails protect the tips of the fingers and toes.